

Supplementary Materials

Supplement 1

Modern training sets:

Modern training sets are based on annual leaf collections in September of each successive year since 1996. Meteorological data and phenological observations allow a direct correlation between *B. nana* UI and the GDD₅ of the main growing season calculated as May through September. Phenological bud-burst date is defined as first day of visible green leaf laminae and has a maximum observational error of ± 2 days (pers. com. Elina Vainio, Kevo Subarctic Research Station). For the validation of correspondence between modern and fossil UI data, the GDD₅ data set is supplemented with *B. nana* leaves from high resolution dated young peat deposits from Kevo bog at Kevo station²².

GDD₅ training set:

The analysis of the modern training set based on 28 years UI results for GDD₅ in the linear regression: $UI = 1.037 + (0.000196 * GDD_5)$, $r = 0.836$, $r^2 = 0.699$, $p < 0.001$

Bud-burst date training set:

The analysis of the modern training set based on 18 years UI results for bud burst dates (day of year) since 1996 in the linear regression: $UI = 410.072 - (216.260 * BB)$, $r = 0.826$, $r^2 = 0.681$, $p < 0.001$

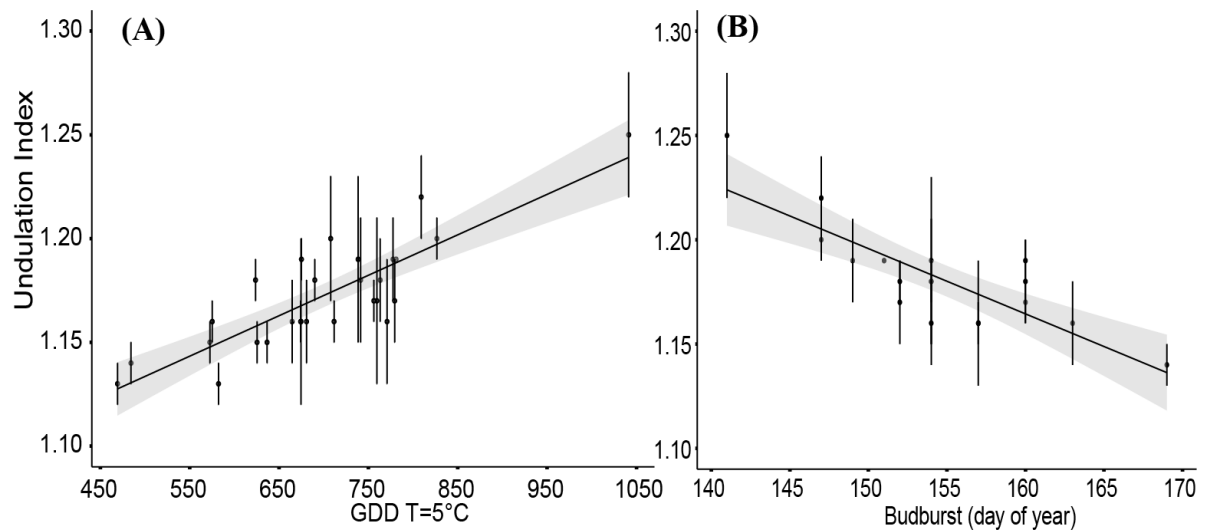


Fig S1 Modern training sets for GDD5 and budburst dates. A) Growing degree days ranging from 450 – 1050 GDD₅ measured during the period from 1976 to 2015 at Kevo Subarctic Station plotted against measured UI of *B. nana* leaves from annual leaf collection at Kevo phenological station and *B. nana* leaf remains from a well-dated young peat section at Kevo bog²². B) Bud-burst dates (day of year) ranging from 141 – 169 observed during the period from 1996 to 2015 of phenological monitoring at Kevo Subarctic Station plotted against measured UI of *B. nana* leaves from annual leaf collection at Kevo phenological station.

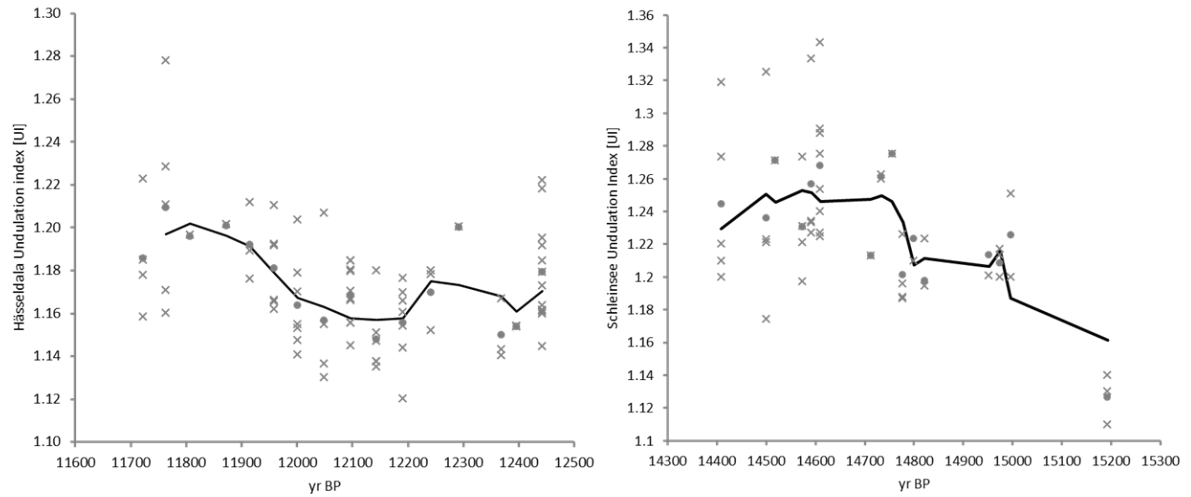


Fig. S2. UI raw data from the studied intervals of the a) Hässeldala (HÄ) and b) Schleinsee (SCH). Crosses are UI determinations from individual leaf fragments per sampled horizon, dots are averages per sampled horizon, black lines are 3-point moving averages from which GDD₅ and bud-burst dates are derived.

