OSPREE Traits Update

Team Traitors

Update: where we are at

Hypotheses writing

Equation writing

Data cleaning

Selected data to play with

Traits:

SLA – Specific leaf area. Ratio of leaf area to dry mass.

Hight – species level expected maximum hight

Wood Strength – measured as wood density

LMA – leaf mass per area

N – leaf nitrogen content

LDMC – Leaf Dry Matter Content

PhR – Photosynthetic Rate

Hypotheses

Split traits between chilling, forcing and photoperiod

Chose how traits will affect either chilling, forcing or photoperiod. Or more than one.

Two different suites of hypothesis/models

Hypotheses Suite 1

Include chilling, forcing and photoperiod

Based mostly around the relative competitive abilities

Chilling

Species with high chilling requirements will have traits associated with greater competitive abilities since they require longer to accumulate chilling and will budburst later in the spring

- taller heights and stronger wood (higher SSD)
-- Lower SLA, greater leaf mass relative to area, and lower leaf nitrogen content

Forcing

Species with low forcing requirements will express traits related to greater frost tolerance and faster resource acquisition

- leaves are less costly: high SLA, low LDMC
-- but take advantage of more light in the canopy by having high N content, high photosynthetic rate

Photoperiod

Species with high photoperiod requirements will bb later and should also have traits associated with greater competitive abilities

- taller heights and stronger wood (higher SSD)
-- Lower SLA, greater leaf mass relative to area, and lower leaf nitrogen content

Equation

$$DOY \sim Normal\left(\mu, \sigma^2\right)$$

$$\mu = \alpha + \beta_F F + \beta_C C + \beta_P P$$

$$where\, \beta_F, \beta_C, \beta_P\, are\ functions\ of\ traits$$

$$\beta_F = \alpha_F + SLA + LDMC + N + PhR$$

$$\beta_C = \alpha_C + hight + woodStrength + SLA + LMA + N$$

$$\beta_P = \alpha_P + hight + woodstrength + SLA + LMA + N$$

Hypotheses Suite 2

Trying to simplify things more, but very similar hypotheses in Suite 1

Only focusing on chilling and forcing because they are influential across all species

Also trying to seperate chilling and forecing related traits

Which traits should relate to chilling vs forcing?

Chilling

Maybe chilling is more closely related how important it is to avoid spring frost damage? So it should be closely alligned to traits corresponding to the cost of an accidental post budburst frost?

“protective traits”

Leaf shape - big flat leaves more vulnerable? Also more costly to lose? SLA

Leaf Cost? Some leaves are more costly to lose? LMA? N? LDMC?

Forcing

Maybe forcing is more closely related to the plant’s need to have enough resources (light and warmth) to thrive when it bursts bud?

“productivity traits”

Nitrogen content? Maybe leaves with higher content need more forcing to make sure conditions are good enough to grow such costly leaves?

Photosynthetic rate? Maybe trees with a lower photosynthetic rate need to wait until conditions are warmer and sunnier to be compatative?

Hight and wood density? Trees that grow big need to be out when they are most efficient?

Which traits should relate to chilling vs forcing?

$$DOY \sim Normal\left(\mu, \sigma^2\right)$$

$$\mu = \alpha + \beta_F F + \beta_C C + \beta_P P$$

$$where\, \beta_F, \beta_C, \beta_P\, are\, functions\, of\, traits$$

$$\beta_F = \alpha_F + N + PhR + hight + woodStrength$$

$$\beta_C = \alpha_C + SLA + LMA + N + LDMC$$

Questions and next steps

Finalise our questions/hypotheses/model

Prepare data

Start making plots

Finalising questions/hypotheses/model

Do our ideas make sense?

Can we combine the two sets of ideas?

Is our model too complicated? Should we include fewer traits?

Is is OK to have traits affecting both chilling and forcing?