

Warnings & disclaimers: *Currently not all studies included.... and I flip between counting papers at the start to looking more at rows, so you were forewarned on that.*

1 Current take home results

Out of 30 papers (we have currently 43 rows of data) 16 found evidence for GS x growth (any which way) and 9 found evidence for our definition of GS x growth. Those papers with any evidence are:

```
> sort(unique(eviany$paper_id))

[1] "Cuny2012"           "Drew & Downes 2018"
[3] "Etzold2021"        "Gao2022"
[5] "Keenan et al 2014"  "Moser2019"
[7] "Oddi2022"          "Silvestro2023"
[9] "Soolananayakanahally2013" "Zhu2021"
[11] "delpierre2017"      "francon2020"
[13] "grossiord2022"      "mckown2016"
[15] "michelot2012"       "wheeler2016"
```

And those papers with evidence of our definition are:

```
> sort(unique(eviour$paper_id))

[1] "Cuny2012"           "Drew & Downes 2018" "Oddi2022"
[4] "Silvestro2023"      "Zhang2021"          "delpierre2017"
[7] "grossiord2022"      "mckown2016"         "michelot2012"
```

and they cover both wood and plant vegetative studies:

```
> table(eviour$gsl)

plant vegetative phenology      satellite derived
                        5                        1
      wood phenology
                        5
```

Broadening beyond our definition includes studies where GS is not measured, or climate is used instead:

```
> table(eviour$gsl)

plant vegetative phenology      satellite derived
                        5                        1
      wood phenology
                        5
```

I have not checked whether that is different than random, but you can contrast that with the overall suite of GSL metrics and it looks representative to me on quick glance:

```
> table(d$gsl)

climate related to satellite phenology data
      1
      date
      1
      not measured
      5
      plant vegetative phenology
      15
      satellite derived
      3
      temperature or snow metric
      5
      wood phenology
      12
```

They also cover a pretty wide diversity of growth metrics:

```
> table(eviary$growth) # any definition

      annual core cell production (number of cells)
      3
      dendrometer/circumference
      3
      ecosystem fluxes
      2
      height
      4
      intra-annual core (xylogeneis)
      3
      photosynthesis
      1
      root:shoot ratio
      1
      stem density
      1
```

```
> table(eviour$growth) # our definition

cell production (number of cells)
      1
      dendrometer/circumference
      2
      ecosystem fluxes
      1
      height
      3
      intra-annual core (xylogeneis)
      2
      photosynthesis
      1
      root:shoot ratio
      1
```

Here's the full set of GS x growth that found it:

```
> table(eviany$gslxgrowth) # any definition

not measured x annual core
1
not measured x intra-annual core (xylogeneis)
1
plant vegetative phenology x height
4
plant vegetative phenology x intra-annual core (xylogeneis)
1
plant vegetative phenology x photosynthesis
1
plant vegetative phenology x root:shoot ratio
1
satellite derived x ecosystem fluxes
2
temperature or snow metric x annual core
2
temperature or snow metric x stem density
1
wood phenology x cell production (number of cells)
1
wood phenology x dendrometer/circumference
3
wood phenology x intra-annual core (xylogeneis)
1

> table(eviour$gslxgrowth) # our definition

plant vegetative phenology x height
3
plant vegetative phenology x photosynthesis
1
plant vegetative phenology x root:shoot ratio
1
satellite derived x ecosystem fluxes
1
wood phenology x cell production (number of cells)
1
wood phenology x dendrometer/circumference
2
wood phenology x intra-annual core (xylogeneis)
2
```

To contrast, here's what studies that did NOT find evidence looked like:

```
> table(noevianygslxgrowth) # any definition
climate related to satellite phenology data x dendrometer/circumference
                                                                    1
                                                                    date x annual core
                                                                    1
                                                                    plant vegetative phenology x annual core
                                                                    3
plant vegetative phenology x annual core (simulated to intraannual)
                                                                    1
                                                                    plant vegetative phenology x biomass
                                                                    1
                                                                    satellite derived x annual core
                                                                    1
                                                                    temperature or snow metric x annual core
                                                                    1
                                                                    wood phenology x dendrometer/circumference
                                                                    3
                                                                    wood phenology x intra-annual core (xylogeneis)
                                                                    2

> table(noeviourgslxgrowth) # our definition
plant vegetative phenology x annual core
                                                                    3
plant vegetative phenology x biomass
                                                                    1
wood phenology x dendrometer/circumference
                                                                    1
wood phenology x intra-annual core (xylogeneis)
                                                                    1
```

2 Getting back to writing our paper

Reminder of what we expected the table we worked on since April to help us with ...

1. Section: Review three reasons for not growing
 - (a) Overview paragraph of three reasons
 - i. Measurement – see box/figure (include measurement only here or briefly so we move through it fast)
 - ii. Resource limitation
 - iii. Constraints

(b) Resource limitation, evidence for an against _____

- i. Nutrients
- ii. Water
- iii. Is this more species-specific?

Table will help us with this

(c) Constraints, evidence for an against _____

- i. Leaf life span
- ii. Budset stuff ... (Zohner, Sool.)
- iii. Evidence across species? Or which is species-specific

Table will help us with this

2. What do do next (The future! Is there a framework to our future directions? It would be nice if we found one) _____

This needs a total overhaul after the table; figure out the section headers

So, we hoped these studies would help with the prevalence of evidence for external and endogenous factors. I haven't got as far on this (and we did not consistently enter whether growth or GSL or both was limiting) but here's a quick look at the 21 papers that found evidence of external factors and 8 that found evidence of endogenous (in contrast to 6 papers that looked but did not find evidence of external or 17 endogenous factors).

For those that did, they looked at these GSL metrics:

```
> table(exoyes$gsl)
```

	date	not measured
	1	4
plant vegetative phenology		satellite derived
	13	1
temperature or snow metric		wood phenology
	4	5

```
> table(endoyes$gsl)
```

	not measured	plant vegetative phenology
	1	8
wood phenology		
	4	

And specifically:

```
> table(exoyes$gs_metric_used)
```

	start metric only	start to end
	4	14
start to end (I think for SFGCC)		suitable days
	1	1

```

time with growth observed      unsure
                        2                2

> table(endoyes$gs_metric_used)

      none      start metric only      start to end
      1          1          8
time with growth observed      unsure
      1          2

```

And these growth metrics (seems a bias towards annual core studies looking at external; we have 11 annual core results):

```

> table(exoyes$growth)

      NDVI/greenness      annual core
      1          8
annual core (simulated to intraannual)      biomass
      1          2
      dendrometer/circumference      ecosystem fluxes
      3          2
      height      intra-annual core (xylogeneis)
      5          3
      photosynthesis      root:shoot ratio
      2          1
      stem density
      1

```

```

> table(endoyes$growth)

      annual core      biomass dendrometer/circumference
      1          2          4
ecosystem fluxes      growth anomalies      height
      1          1          3
      photosynthesis      root:shoot ratio
      1          1

```