Looked at plots of

1. Stem diameter vs. stem weight
2. Stem diameter vs. leaf weight
3. Leaf weight vs. stem weight

Plotting data for one species X age at a time, to look for outliers and observe general data patterns.

Overall, noted following:

1. I don’t think some of the segments with names like “1.2” or “1.1.2” are being added in. This seems to be a 2-part problem, but I’ve only work out the 2nd issue:
   1. Went to script “Growth.R” and ran code “unique(HarvestData$segment)”; it returns only the numeric segments 1 to 8, not the ones like 1.2, etc. Haven’t yet found the source of this error
   2. Playing around with Growth.R (with original copy saved as Growth2.R), the second problem is that for the lines like:

segments[["1"]] <- c(as.character(1:8, "1.2", "1.3", "1.2.1", "1.2.1.1", "1.1.2", "1.1.2.1", "1.1.1.2"))

only the numbers 1 to 8 are being stored as “segment[1]”.

It works correctly when the following code is used:

segments[["1"]] <- c("1","2","3","4","5","6","7","8", "1.2", "1.3", "1.2.1", "1.2.1.1", "1.1.2", "1.1.2.1", "1.1.1.2")

So I’ve changed the code for the three segment which have a mixture of integer and “character” codes

But there is a second problem that

1. Omitting 4 individuals that have very few leaves relative to all other individuals on plot.
   1. LEES-B-04, PELA 113, PILI 403, PUTU 904
2. Identifying some segments that seem to have incorrect diameters: these “segments” plot fine in terms of stem weight vs. leaf weight, but stand out on vs. stem diameter plots – will follow these through on plant maps or even bags with parts
   1. COER 334 diameter of two smallest segments is too large 🡪 agree on overall scale, but diameter of all really lightweight segments for COER seem large, probably because leaves sort-of sheath stems when plants very young
   2. EPMI 157, think 3rd largest stem segment weight incorrect 🡪 weights for 2 of the stem segments 10x too high – moved decimal point to correct location
   3. EPMI 307, smallest stem segment diameter is too large 🡪 smallest segment likely more .4-.45 mm (.49 quite big for short stems for this species)
   4. GRBU\_307, segment with diameter ~1.8 should be closer to 4 mm 🡪 mistyped from plant map; mistake corrected
   5. GRSP\_009, segment with diameter ~1.8 should be smaller 🡪 agree it should be smaller; probably ~1.3 based on similar segments on map, but number written on map is 1.8
   6. GRSP\_403, segment with diameter ~2.2 should be larger 🡪 mistyped from plant map; mistake corrected; but a second mistake has appeared, which is that segment “1.2” is not currently being added in
   7. GRSP\_107, fattest segment should be smaller -> IGNORE; looks OK in plots now
   8. LEES\_904, LEES 907 – skinniest segments should be bit fatter 🡪 numbers on maps look very reasonable & individual plots also look OK; ignore for now
   9. PILI 102 – skinniest segment should be smaller -> not a big enough effect to worry about
   10. PUTU 406 – diameter around 2.2 should be narrower -> mistyped from plant map; mistake corrected
   11. PUTU\_803, segment 4 -> diameter much too high, but same as plant map
   12. GRSP\_804, smallest segment diameter too big
   13. GRSP\_406, segment 1.1 is too narrow, remeasure
3. Across most species, the oldest plants (and sometimes plants ages 9 or 7) have asymptoting leaf area with increasing stem diameter/weight. For these individuals it is probably not appropriate to fit a linear regression to leaf weight vs stem diameter to determine shifts in leaf weight
   1. BOLE at age 5 ,7, 9
   2. COER at age 9
   3. GRBU at age 9, 32
   4. GRSP at age 32
   5. some LEES age 7, 9 ,32
   6. most PELA age 32
   7. PEPU age 32, slight effect
   8. most PHPH age 32
   9. most PILI > age 4
   10. most PUTU age 32, but also small effect within 7, 9 year olds
   11. see also specific species notes
4. Across most species, leaf weight correlates much better with stem weight than with stem diameter. Wondering if it wouldn’t be better to base leaf growth on a regression against stem weight instead of stem diameter.
5. For PHPH, I have bags with all the “other” stalks for a plant. PHPH plots look decent for RA calcs against age – proportional energy, but terrible for any variables plotted against plant size/weight/total reproductive output, because these “other stalks” aren’t accounted for. I think I probably need to include them. This is also apparent looking at the plot of stem weight vs. leaf weight (or against diameter) for all plants – the “biggest” plants are from any of the 3 older sites…

Additional notes for individual species:

BAER – all plots have high correlations; can use leaf weight regression to calculate leaf growth for all ages; a few of the oldest plants have just slightly asymptoting leaf area with increasing stem diameter/weight

BOLE – for ages 1.4, 2.4 leaf weight regressions (against diameter or stem weight) have high correlations; for older plants, diameter and stem weight correlate more poorly with leaf weight; not sure these have much predictive value in terms of leaf growth

COER – OK regressions

EPMI – not as bad as BOLE, but not inspiring regressions for either leaves or stem;

* EPMI 402 is an outlier with much larger than expect leaf weight
* EPMI 157 has very high stem weights for their diameter, although leaves plot fine. Possible that weight for 3rd stem segment incorrect and pushing all up
* No clear asymptoting patterns, just noise

GRSP

* Distinct asymptoting in age 32 plants, with slight effects in age 9 plants

HATE – no asymptoting in leaf weight vs. stem weight in the oldest plants

An unusual species where the worst regressions are for leaves in 1.4 year old plants

HEPU – the only regressions for leaf weight that are strong are for 1.4 and 2.4 year old plants

LEES – with 7-year old plants (and older), several individuals that have asymptoting leaf weights vs diameter or stem weight

PELA – PELA 901, 902, 905, 906, 907 all have asymptoting leaf area with increasing stem weight or diameter

PELA baby plants, good correlation between leaf and stem weights, but terrible correlations against diameter, probably because young plants have slightly sheathing bark.

PEPU – all age 32 plants have slightly asymptoting leaf area with increasing stem weight or diameter; some younger plants also show have asymptoting leaf area with increasing stem weight or diameter – obvious when you look at the plot across all plant ages

PHPH- all regressions look decent

PILI – individual regressions are all OK, but plot of all stem segments together, shows that ages 1-5 follow 1 pattern, while plants >age 5 all have much lower leaf area for a given stem weight – except segments that are just a single growing tip.

PUTU – all regressions look decent