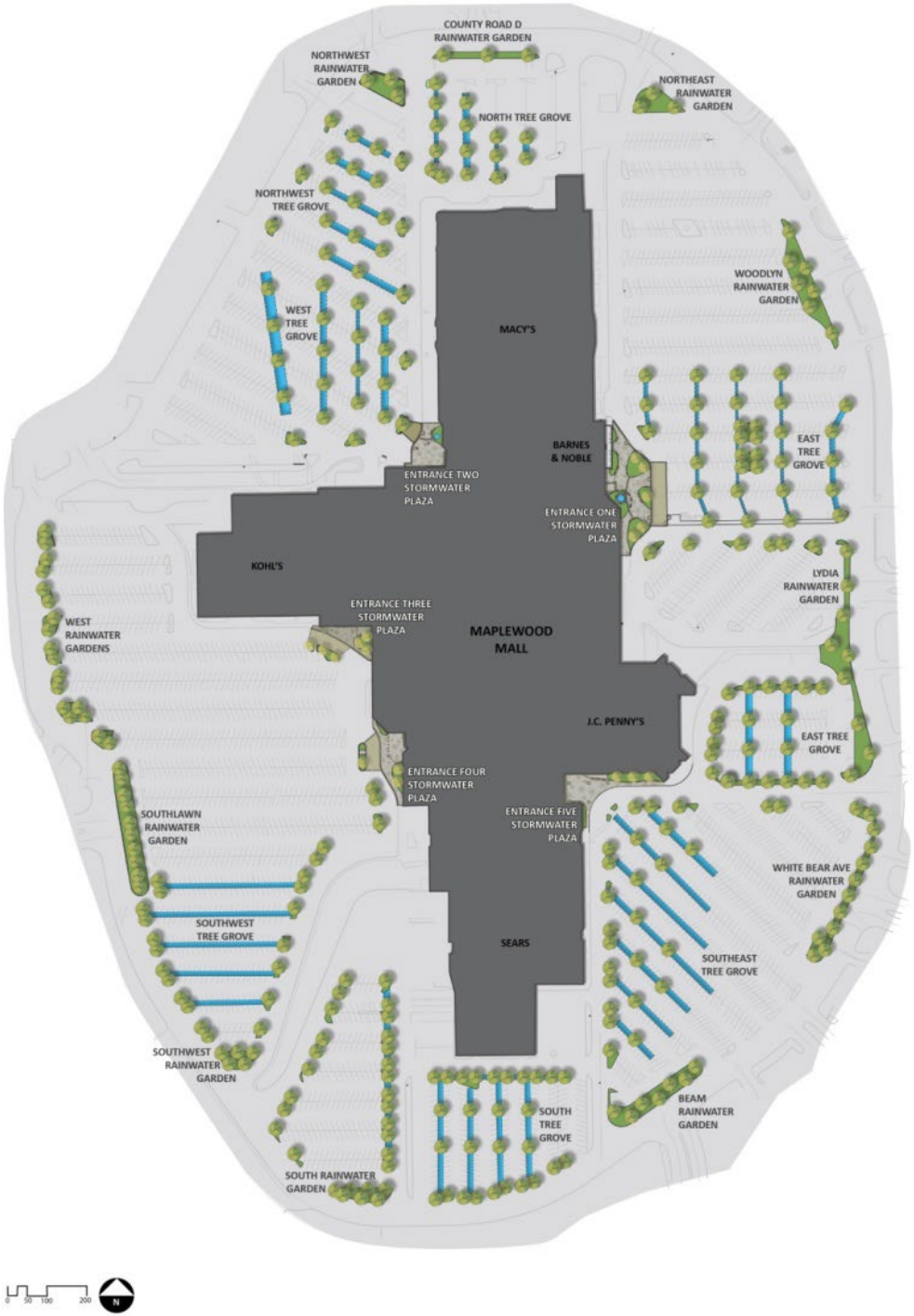
BARR

Maplewood Mall Stormwater Retrofit Project

Five Year Project Anniversary Inspection and Inventory

Project Overview

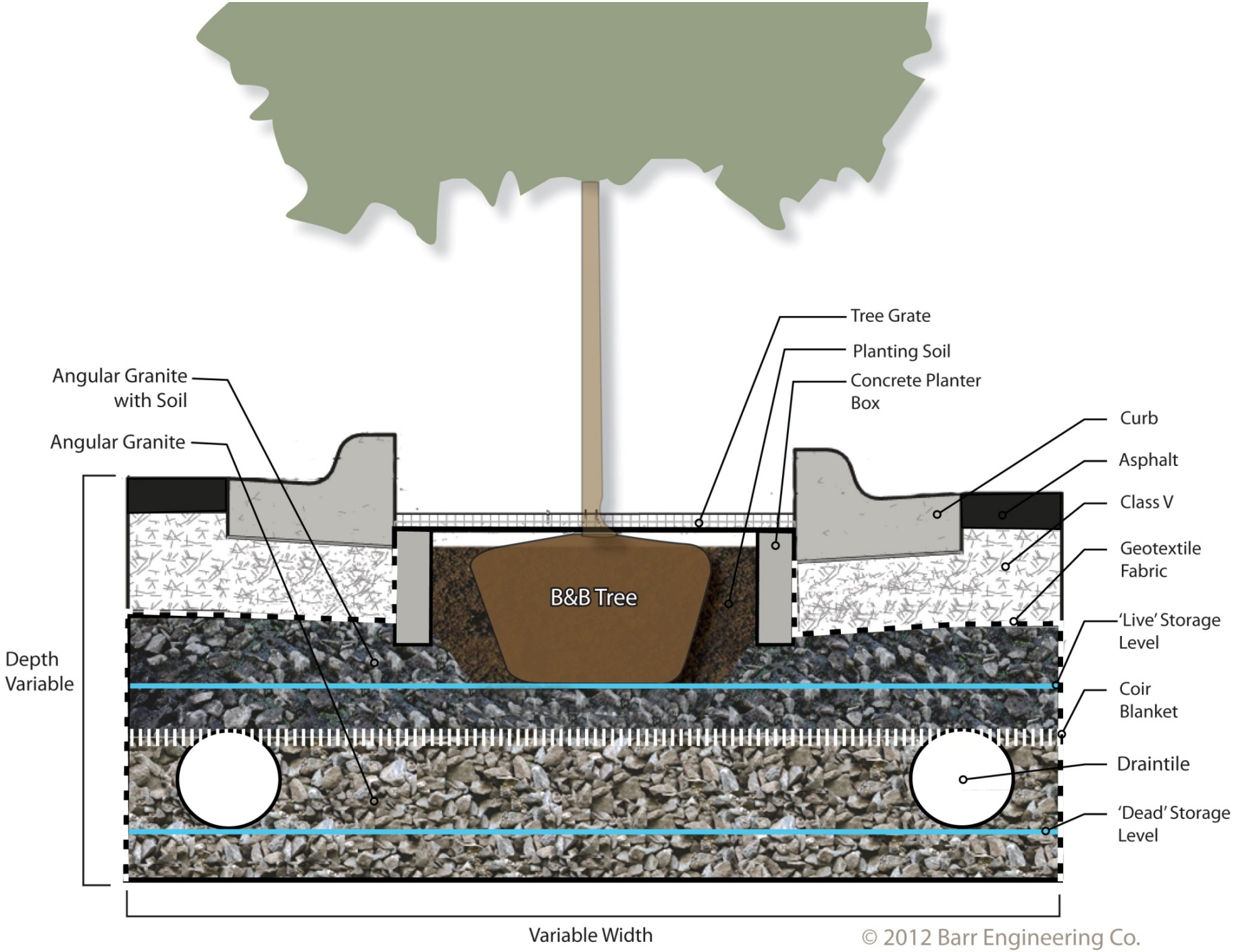


- 55 rainwater gardens (19 of which have enhanced sand filters)
- 6,733 sf permeable pavers
- 1 mile of tree trenches
- 354 trees
- A 5,700 gal cistern that catches roof runoff
- 20 million gallons of storm water per year intercepted from the parking lot (67% of total)

Overall Project Condition Notes

- The project is functioning well and weathering the storm of heavy mall traffic.
- Rain gardens and entry plantings are very healthy growing environments; water quality improvement as planned. Existing maintenance program very valuable.
- Tree trench design supporting good tree growth for some species, some species struggling. Overall design still very promising.
- Stormwater infrastructure in solid shape but some areas worth watching, potentially repairing.

Tree Trench Design



Infrastructure Condition

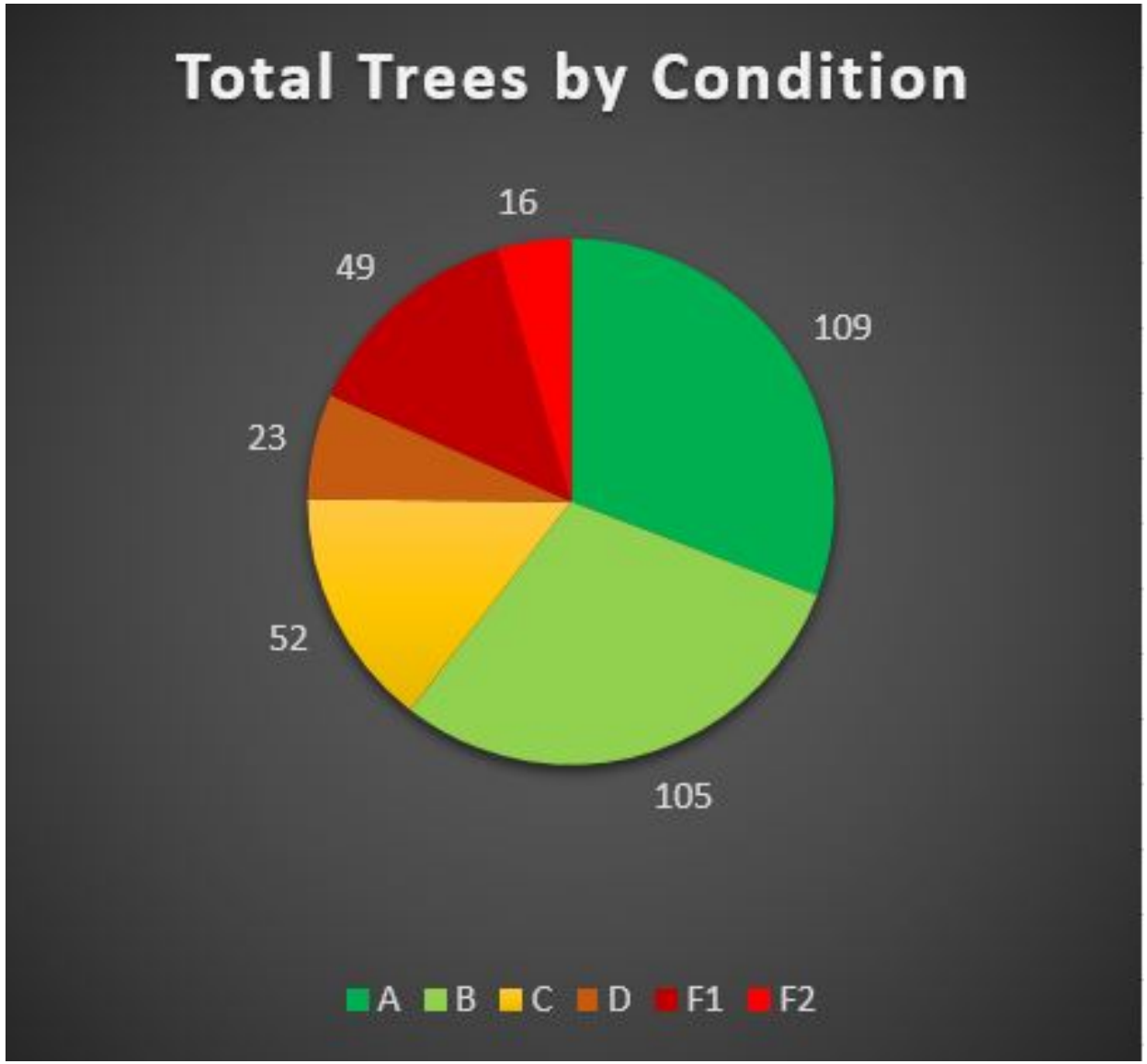
- Failing mortar and other construction concerns in 26 structures of the over 400 structures
- Sediments clogging trench drain inlet in some areas
- Recommend monitoring “Poor” structures, consider including in 2019/20 CIP repair work
- Assess sediment removal in Spring, coordinate with Mall staff and consider additional sweeping

Rain Gardens

- Two of the 55 rain gardens have long term standing water
- Likely due to sediment loading and compacted planting soil during construction
- Recommend removing clogged soils, refurbishing filtration systems
- Ongoing maintenance program has been critical to healthy plantings

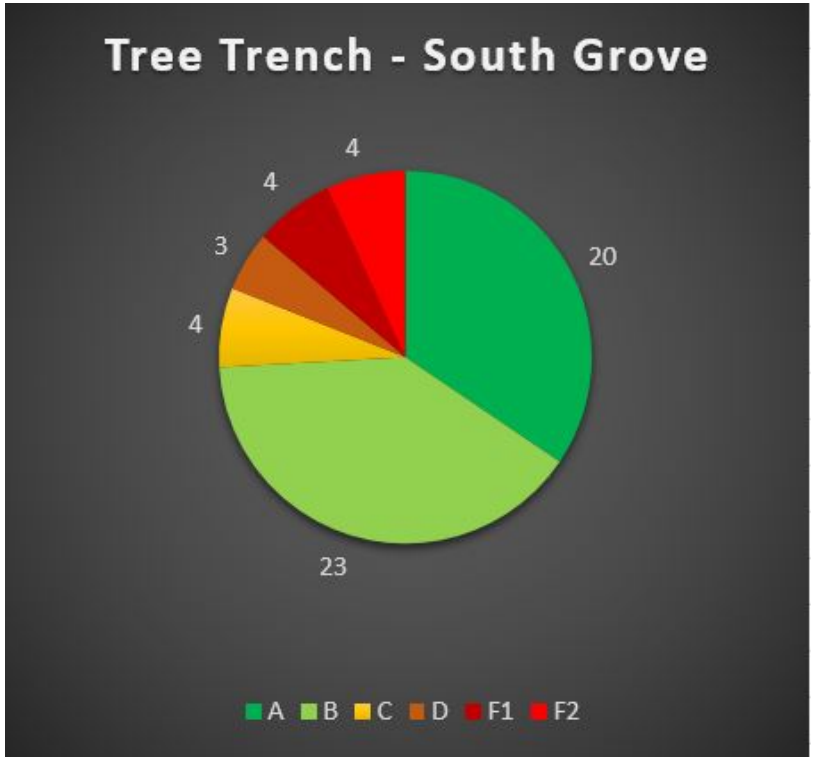
Tree Health Grades

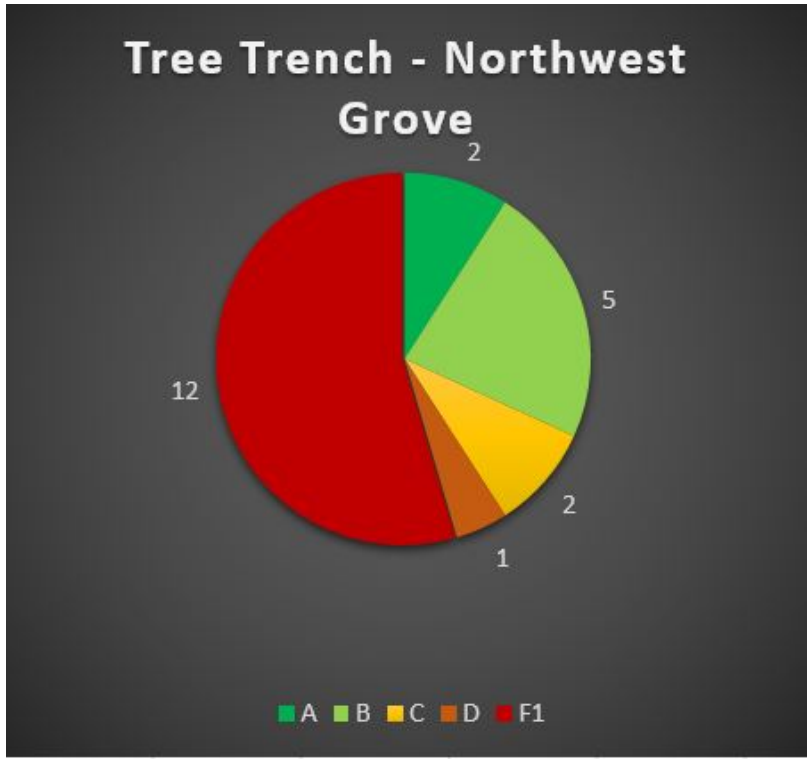
- A – Vigorous Growth (Full canopy)
- B – Strong Growth
- C – Fine Growth (75-50% canopy)
- D – Dying (<50% canopy)
- F1 – Dead (Replacement recommend)
- F2 – Dead (No replacement recommend)



Tree Health Statistics

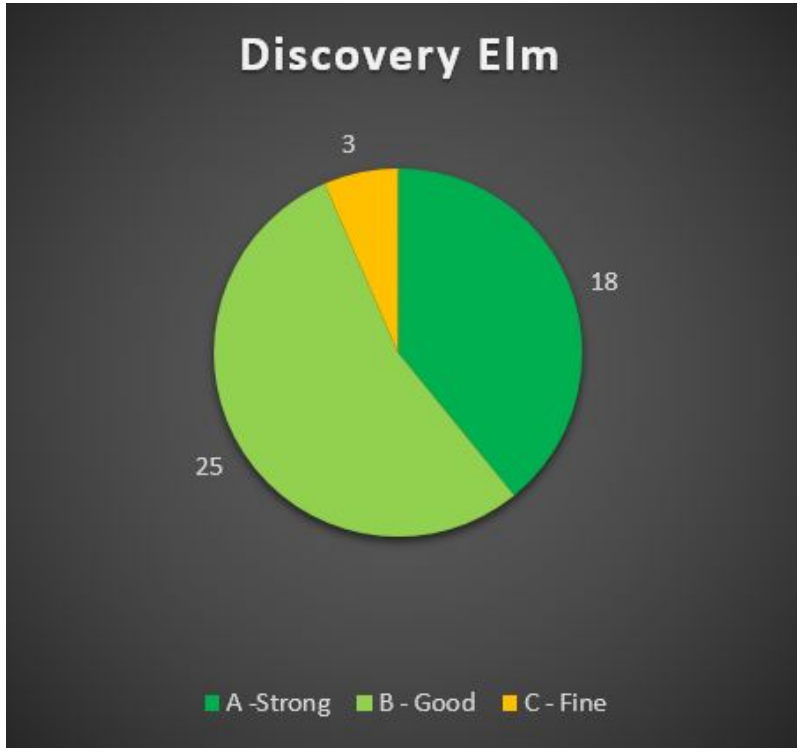
- Tree trench creates a unique growing environment well suited to some species
- Species chosen for dry conditions have struggled
- Shallower trenches have higher tree mortality

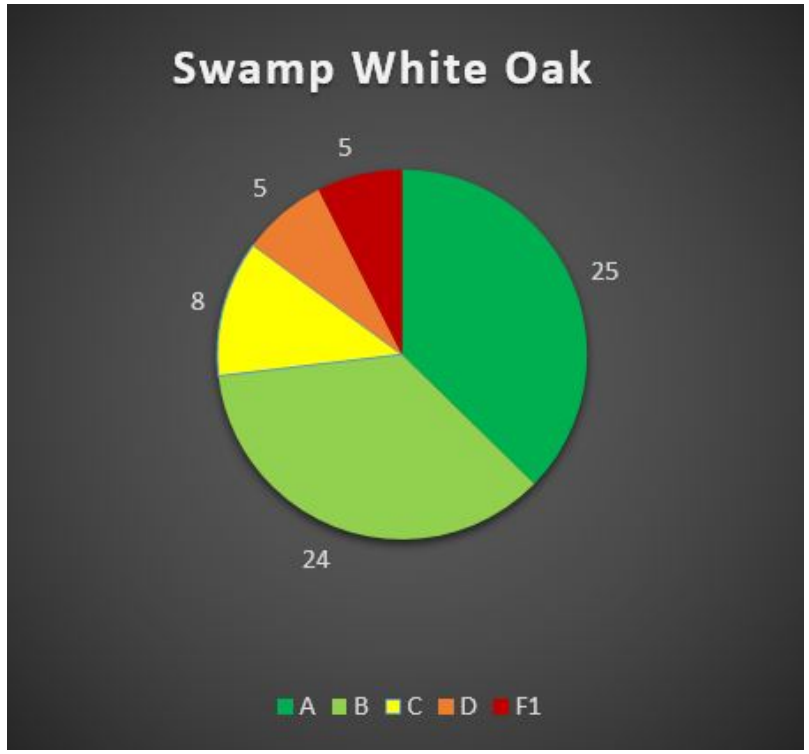




Species Health Summary

- Elm cultivars and swamp white oak showing outstanding growth
- Tree trenches creating a floodplain-like environment



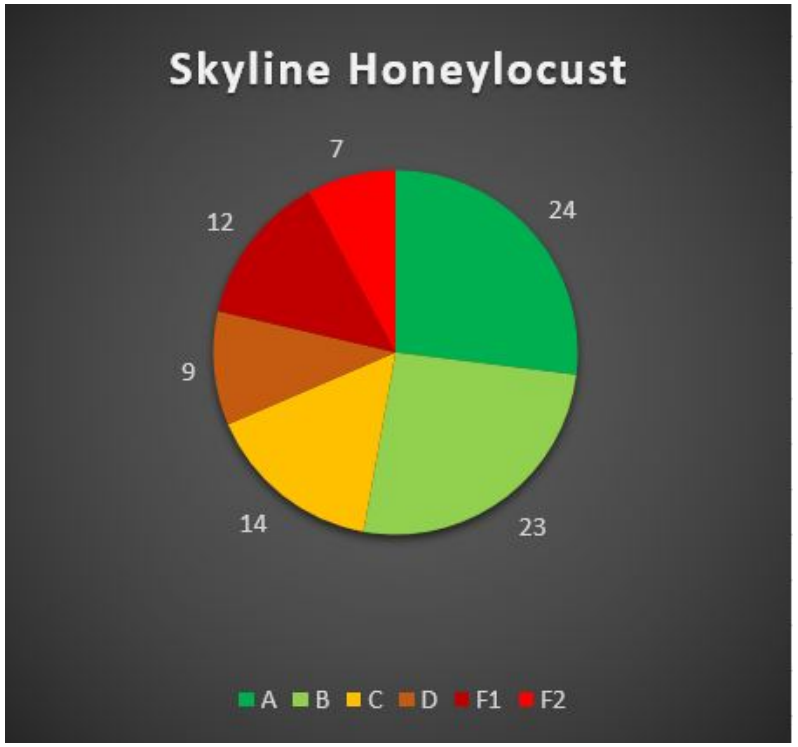


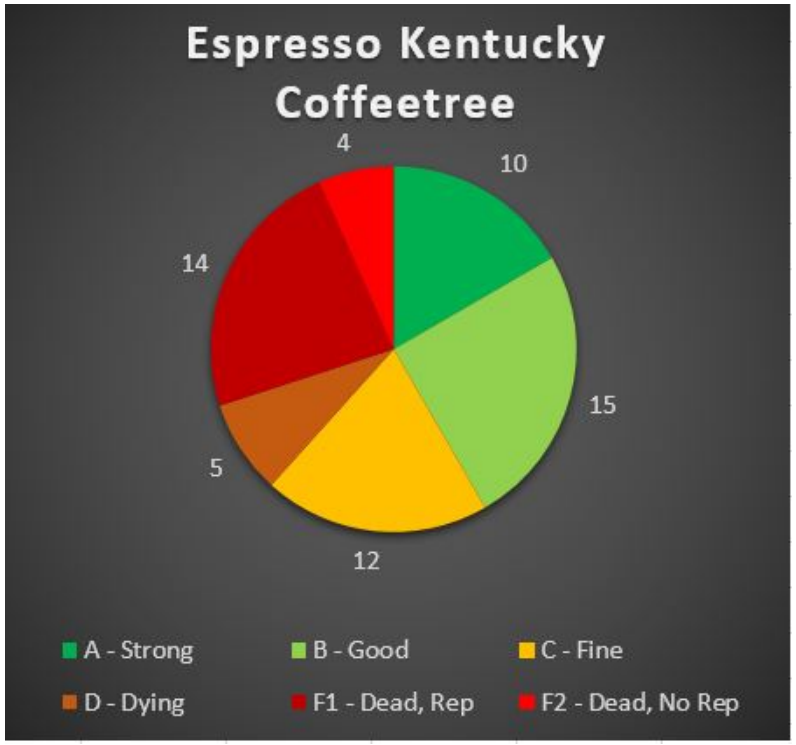
Species Health Summary

- Elm in West Grove
- Swamp white oak in East Grove
- Some trees installed at 2” DBH currently up to 5.5”+ DBH

Species Health Summary

- Honeylocust and Kentucky Coffeetree have struggled to thrive
- Other widely used urban trees failed to establish





Healthy vs. Struggling Kentucky Coffeetree

Tree Trench Design Takeaways

- Tree trench creates a unique growing environment well suited to some species.
- Species chosen for dry conditions have struggled.
- Leave AgriDrain weirs out where already removed, be prepared to replace if we reach drought conditions. Once new trees established, slowly introduce the weirs throughout the project.

Tree Replacement and Maintenance Recommendations

- Continued sump cleanout and vegetation maintenance
- Replace entrance, select end island trees and all tree trench trees. (70 graded at D and F1)
- Use similar species to those that are currently thriving (elms, English oak/white oak hybrids, introduce river birch)
- Measure root growth and soil conditions during replacements
- Replace with younger tree stock to reduce transplant shock

Questions?