

Tree Protection Versus Construction Reality

It is not unusual for trees to conflict with infrastructure projects. Whether a new road or highway, electrical distribution system or cellular tower, these improvements are often located in areas containing existing urban forests. I often work as a sub-consultant to engineering and landscape architectural firms, providing tree inventories, designing specifications and best management practices (BMP'S), for tree protection during

construction, field implementation, and monitoring.

Fortunately, there is an increased awareness toward tree preservation. Project managers, engineers, landscape architects and government agencies frequently utilize a certified arborist to consult on tree protection issues. A certified arborist is gualified to make recommendations to resolve conflicts between trees and infrastructure improvements, and design and implement tree protection BMP's during construction.

I separate tree protection into two tasks. The first task is collecting the tree data needed to understand the construction constraints for designing tree protection specifications and best management practices. Data collection usually involves taking a tree inventory, recording size, location and tree health metrics.



Future high-speed bus lanes to be constructed within existing tree lined medians

The second task for tree protection is implementing the tree protection specifications and best management practices in the field. Field implementation can be very challenging due to lack of knowledge and education among contractors and consultants.

This article discusses tree and infrastructure conflicts, how trees are damaged during construction, tree protection best management practices (BMP's) and why field implementation can be difficult.

How Trees are Damaged During Construction

Construction and infrastructure projects use heavy equipment for grading, excavation, trenching, backfilling and compaction. These activities invariably damage or kill tree roots, trunks and crowns in a number of ways:

- Soil compaction, reduces oxygen, water and nutrient absorption by tree roots.
- Mechanical damage to tree roots by cutting, ripping and tearing.
- Mechanical damage to the trunk or crown.
- Spoils from excavation piled up against tree trunks.
- Construction grading and excavation exposing and damaging roots.
- Fill soils placed on top of absorbing roots or near the trunk.
- ▶ Workers, trucks and equipment parked or sitting under trees.
- Elimination of irrigation during construction.



Impediments to Implementing BMP's in the Field



Heavy equipment cuts grade for road, damaging oak tree roots

I have found several factors that affect the timely implementation of many best management practices for tree protection.

Consultant, owner and contractor lacking tree knowledge and education.

> Prioritizing infrastructure construction methodology over tree protection.

Construction scheduling that minimizes, eliminates or prevents implementing tree protection best management practices.

- Pervasive attitude trees are not important or can take construction abuse without consequence.
- Tree roots thought to grow straight down like a taproot, they grow so deeply the adjacent construction will cause harm to the tree.

Taproot is Old School!

Lack of tree knowledge is not confined to just the contractors, often times the consultants and even ownership may not fully understand the importance of certain tree protection measures. I am currently working on a street improvement project that has large, mature *Eucalyptus cladocalyx*, (Sugar Gums) and Torrey Pine trees located in the street median. The old curb and guardrail are being removed with new guardrail, curb and asphalt improvements installed immediately adjacent to the median trees.



Torrey Pine roots exposed by demolition in the top 12" of soil

Despite numerous warnings, the contractors, inspectors and project manager were quite surprised at the volume and size of tree roots located within the top 12"-24" of soil. Most were under the impression due to tree size and maturity; roots would extend deeply into the soil, like a taproot.





Missing tree protection allowed grader to make road cuts prior to root pruning

This common misconception that trees grow a taproot causes unnecessary root damage. Most tree roots grow within the top 36" of the soil, with upwards of 80% of the tree roots in the top 24" of the soil. The roots grow horizontally toward the dripline of the tree crown and then well beyond the crown of the tree. Therefore, tree root protection should begin at the edge of the tree crown. Believing a tree has a taproot allows construction next to the trunk, causing significant injury to tree roots, trunk and crown.

Contractor Wants to do it His Way

Sometimes, tree protection requires cooperation and forward planning and time to implement BMP's before construction begins. Time delays caused by tree protection BMP's are a frequent issue that must be addressed. The contractor is accustomed to using heavy grading and excavating equipment, time is money, and the contractor may not care or be interested in protecting tree roots.

This attitude of many contractors is quite problematic for enforcing tree protection measures. In these situations, it is imperative for the project manager and ownership support the arborist effort at implementing the tree protection practices and insist on contractor compliance.

Hand excavation is a best management practice used to locate and expose tree roots to avoid and minimize root damage caused by heavy



Drilling a post hole without hand excavation

equipment. However, hand excavation is time consuming, many contractors may not understand the importance of locating roots. The picture above is an example of a contractor who began drilling guardrail postholes without first hand excavating. The resultant root damage could have been avoided had the BMP been enforced.

It's Just a Root!

Workers often treat roots like they are inanimate objects. Hitting a 6" diameter structural root is no different than encountering a boulder, just get it out of the way. To many, a large exposed root might appear dead; people are unable to comprehend how this dead looking thing buried in the soil is responsible for the absorption of water and nutrients



from the soil to the tree. Unfortunately, the millions of tiny root hairs responsible for absorption of water and nutrients are not visible and were most likely destroyed when the structural and lateral roots were struck.

It's Just a Euc!

Type of species is another determinant factor in the mindset toward tree protection. In a current project, the dominant median trees are Eucalyptus. Due to the negative reputation Eucalyptus have gained, injuring or damaging a Eucalyptus tree may not have the same importance as damaging an Oak or Torrey pine tree.

Regardless of species, any tree that grows and survives to reach full maturity is worthy of our respect and admiration. We should make the effort to protect all trees from construction impacts, regardless of species.



6" structural root located in curb grade

Grading Cuts can Shred Roots, Fill Soils Can Suffocate Roots

Grading cut and fill operations are problematic when existing trees are on the very edge of the work alignment. Placing fill soil on top of roots effectively suffocates and kills the root system while cuts under the tree crown invariably cause root damage



Fill covered 18" of the tree trunk later exposed



Grading cuts damaging native oak tree roots

Sometimes, you can only do so much for an "edge" condition tree. Their location is in such close proximity to the workspace, no matter how much crown and root pruning is performed, the tree is going to suffer significant construction impact. In these instances, trying to minimize the damage is most likely the most that can be accomplished.



Don't be Shy

Construction is rough and tumble world. When working as a consultant in the field, implementing tree protection specifications and best management practices can be a difficult experience. You must stand your ground and have the support of ownership and project management to enforce the BMP's you have developed. Weekly and daily field meetings provide the opportunity to review the tree protection program, discuss weaknesses and area of improvement. It is the responsibility of



Equipment is frequently parked under trees

the consulting arborist to make every effort to ensure implementation and compliance with the BMP's.

A Successful Project?



Preconstruction crown pruning to compensate for expected root loss

Project success is viewed differently by those involved. While budget and schedule are the usual metrics used to measure a successful project, I measure success based on tree survival. Unfortunately, it might take 3-5 years for trees impacted by construction to fully recover and survive, so I do not always get the opportunity to see the final construction results.

With effort and communication, tree protection best management practices that help reduce tree stress during construction can be accomplished. I believe successive accumulation of best management practices increases the odds for tree survivorship and reduces tree mortality.

As a consulting arborist, I feel a responsibility to not just develop but to ensure proper implementation of tree protection BMP's. As I discovered, there is far

more to implementation than just issuing a written document explaining what should be done. I make every effort to establish a direct line of communication with the general contractor. I spend time not only explaining but educating the site supervisor on the merits of the BMP's, why, how and when various BMP's should be implemented.





Trenching under rather than through roots is a good thing!

My final take is regardless of the level of detail or sophistication, a tree protection management plan and best management practices are only as good as the field implementation permits. It is imperative for the consulting arborist to communicate and engage both the management and construction team on the importance of fully implementing and adhering to the protection plan measures. When things don't go your way, continue to remind and seek support for your position from management.

By teaming with the general contractor, I have been successful in getting them to "buy" into the tree protection program. Once that buy in has occurred, implementation and compliance run much more smoothly and effectively. The picture on the left shows how the contractor decided to tunnel under large structural roots to install irrigation mainlines. At the start of the project, the contractor was inadvertently damaging these kinds of roots. I worked with the supervisor explaining the importance of root protection and over time, he really began to take the protection program to heart. It was his suggestion that they tunnel under the roots to install mainline.



Curb and gutter is installed, will the trees survive? Only time will tell.