Root regeneration after fall and spring root severance of two common urban tree species, Acer platanoides and Betula nigra.
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Background
- Roots are severed when field grown trees are transplanted, affecting the trees’ ability to absorb water until the lost roots are replaced. Thus, root regeneration after transplanting is key for further success of the tree.
- We investigated root regeneration of two common urban tree species (Acer platanoides and Betula nigra) after fall and spring root severance to help understand how seasonal differences in root regeneration affect successful transplanting.
- Transplanting success can differ depending on season and species. Acer platanoides is likely to succeed when transplanted either in spring or fall, but Betula nigra only when transplanted in the spring. Root systems begin to grow at -6°C and continue to grow more rapidly as temperature increases with optimal root growth occurring between -20-28°C. Severed roots of trees that are transplanted in the fall are subject to harsh winters which may affect the initiation and growth of new roots from the cut end. Because of this, the fall cut roots may have reduced root regeneration and could account for poor transplant success of Betula nigra in the fall.
- Our results better inform tree planting as urban and suburban sprawl continues to demand healthy trees.

Materials and Methods
- Four A. platanoides trees from Cole Nursery Co. and four B. nigra trees from J. Frank Schmidt & Son Co. in The Morton Arboretum tree nursery were used.
- Two roots approximately 2 cm diameter approximately 1.5 m from the base of each tree were cut using a pruner, one in the fall of 2017 and one in the spring of 2018.
- Minirhizotron tubes were inserted into a 7 cm diameter hole dug by a power auger near the end of each cut root.
- Approximately every other week, starting in May 2018, the roots were scanned using a CI-600 In Situ Root Scanner.
- Note: scan images from previous scans in February and April were also used in data analysis.
- The images were stitched together in Microsoft Paint and the roots were mapped on RootSnap!
- Average total length of live roots for each scan date, season, and species was calculated.

Results
- Soil temperature was above 6°C throughout the entire day by 4/29/18 according to The Morton Arboretum weather data, marking the beginning of active root growth.
- In A. platanoides roots for both spring and fall cuts regenerates equally in the spring months.
- In B. nigra the spring cut roots regenerated significantly more than fall cut roots during the spring months.
- Towards the end of the summer, A. platanoides spring cut roots regenerates more than the fall cut roots.
- Root regeneration for B. nigra was similar by the end of the summer for fall and spring cut roots.

Conclusion and Future Directions
- The lack of root regeneration during the spring months for fall cut roots in B. nigra could be responsible for its poor transplant success in fall.
- Future research may be conducted to determine the reason for faster root regeneration for spring cut roots during summer, as observed in A. platanoides.
- Further research testing variables such as water absorption, soil temperature, and drought tolerance may provide further insight into variables affecting root regeneration.
- Results from this project as well as future research projects will help arborists and nursery decide the best season to successfully transplant certain species of trees, creating greener and healthier cities.

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