





StormTree established in 2014

- Offices in Providence RI & CA
- Registered in Canada with sales and engineering representation in Ontario
- Al materials are sourced in Canada
- 400+ system installations
- 50% public; 50% private
- 60% streetscape
- 30% parking lots
- 10% meds & eds
- Completing 3rd party certification for our nutrient and pollutant removal claims



Tree Pits (healthy thriving trees; enhanced tree canopy)

Tree filter system for stormwater management (runoff reduction/pollutant removal)









Closed (vault) Box

Open Design



No infiltration of treated water



Infiltration of treated water





Stormwater Management













FIRE TRIANGLE TREE SURVIVAL TRIANGLE



Root Structure

StormTree









Relative soil particle sizes





Texture and Pore Space

Comparison of Coarse Textured and Fine Textured Soils

Coarse Textured Soil

StormTree



Less pore space but more macropores



Fine Textured Soil

More total pore space but only micropores

Tradeoff is more oxygen vs more water



High Infiltration Engineered Media





Existing Soil < 10 inches/hr <250mm/hr

- Less infiltration
- Prone to compaction

Engineered Media > 50 inches/hr >1300mm/hr

- Resists compaction
- Greater aeration



Trees have shallow root systems and can survive and thrive with a narrow root zone





Over 80% of a mature tree's root system are in the top 24" or <70 cm of soil layer



100 year old bonsai



Shallow root system in a confined space



Conventional Tree Pits



Compacted soils

Not the ideal conditions for trees to initiate growth and thrive





It's better to dig a five-dollar hole for a fifty-cent plant than to dig a fifty-cent hole for a five-dollar plant." goes the old garden adage and how true that is.



Ye olden days











Now





Sidewalk settling due to poor base material or insufficient compaction









SIDEWALK CONSTRUCTION

<1 POURED CONCRETE ≥110mm SUBGRADE/BASE Potential oxygen ≥100mm (COARSE AGGREGATE) rich zone



Once roots have a foothold, It's party time!!















Avoid trees with a surface root systems:

- Silver/Sugar/Norway maple
- Beeches
- Pin oak
- Sweetgum
- Aspen
- Sycamore
- Poplars
- Magnolia



Roots can be redirected without disturbing or affecting their growth



Tree well systems Also serving as suspended sidewalks



Conventional tree pits

- As the tree matures its root flare typically rises forming a shallow cone that sheds water instead of infiltrating
- Fines buildup on the surface restricting infiltrations

Recessed tree planting (well) allows for surface capture providing supplemental irrigation



Proper Compaction for Sidewalks



Material	IMPACT	VIBRATION
GRAVEL	Poor	Good
SAND	Poor	Excellent
SILT	Good	Poor
CLAY	Excellent	No





Rammer

Vibrating Plate Compactor













Epoxy resin mulch













No structural cells used

Sustainable Technologies



Typical Stormwater Pollutants

Nitrogen Phosphorus Lead Zinc Copper Cadmium Chromium Nickel Manganese Cyanide Sodium/Calcium chlorides Petroleum

Typical Tree Fertilizer Total Nitrogen (N) Available Phosphoric Acid (P2O5) Soluble Potash (K₂O) Calcium (Ca) Magnesium (Mg) Sulfur (S) Boron (B) Chlorine (Cl) Cobalt (Co) Copper (Cu) Iron (Fe) Manganese (Mn) Molybdenum (Mo) Sodium (Na) Cadmium Cobalt Mercury Molybdenum Nickel Lead Selenium Zinc





Trees like to dine out







Outdoor dining

E	THE PARTY	
TIL		

Providence Restaurant District Nutrient Testing			
Date	Nitrogen (mg/L)	Phosphorous (mg/L)	
	(Nitrate (Ammonia)	(phosphates)	
May 2019	0.89	1.01	
June 2019	1.02	0.78	
July 2019	1.20	0.89	
Sept 2019	0.98	0.09	
October 2019	0.89	0.12	
November 2019	<0.25	<0.02	
April 2020	<0.25	0.02	
May 2020	NT	NT	
NT Net Tested	÷		

<u>NT Not</u> Tested





High Pollutant Removal Rates

>60%

- TSS: >80%
- Total Phosphorus: >60%
- Dissolved Copper: >40%
- Dissolved Zinc:

Based on 3rd party testing of StormTree tree filter media Field trials with precast structure to begin in August 2019

Infiltration rate: 50-200 in/hr 130cm-300cm/hr













StormTree



Sustainable Technologies

Fiberglass Grating

- ADA compliant
- Delivered as one sheet
 - Cut on site
 - Flexibility in determining opening position/size or no opening at all
- Adjusted for setback requirements
- Supports minimum 500 lbs/ft2







Faster growth rate due to increased irrigation and nutrient (pollution) uptake







2012

2014

2018

Healthier Tree Growth

- greater porosity in engineered media
- direct contact with adjacent soils
- additional irrigation due to captured rainwater runoff



























Trees for regulatory tree filter systems

- Small height attaining trees: 8m or less
- Native and Non-Native, climate based
- 3-6cm caliper
- Acer, Prunus, Malus typical species
- Fastigiata forms







Trees for tree pit systems

- No limitations to variety or caliper
- All standard street trees apply













- System on the right collects and distributes to other tree pits
- Distribution pipe for supplemental irrigation in heavily impervious sidewalk application
- No structural soil cells were used
- Only vibratory compaction









Systems can be combined with precast concrete structures and plastic chambers to manage high flow and volume











Water collection and dispersal



Sustainable Technologies

Water collection, storage, and retrieval









Trees can acclimate to an impervious environment and grow strong and healthy given moisture and air at the roots





























Tree Systems for Stormwater Management

Thank You

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