

Art and Science of Poplar Phyto



Phyto (Greek for plant) –environmental technology where plants grow a ‘predictable reactor’ to treat water contaminants.

Phyto’s BIG IDEA –

Every drop of water passes within an inch of a root.

Strategic Concept #1: Predictable reactor

Phyto engineering uses plants, soil, amendments to build a ‘reactor’ with a treatment capacity that can capture and treat a pollutant dose. When the dose matches, Phyto can supplement or replace other engineered systems.

Strategic Concept #2: Strategic Location

Strategic locations are where 2% of land uses controls 80+% of the drained pollutants. Where? 1. Downhill edge from annually tilled crops; 2. Downhill edge from livestock manure (where raised or spread); 3. Urban drainage ditches; 4. Discharge pipe from wastewater treatment; 5. Industrial sites and landfills.

Strategic Concept #3: Phyto Plants are Backbone

Not all plants are equal. Phyto plant traits include: perennial, fast growth, extensive rooting, tolerant, and harvestable product value. The Phyto ‘backbone’ includes trees (i.e. poplar, willow, red cedar, eucalyptus), alfalfa, and pasture grasses.

Strategic Concept #4: Use Related Technologies

Farming and agronomy technologies that optimize crop water value – such as drip irrigation and field drainage – are practical for moving waste water to and through a Phyto reactor. Pumps, valves, meters, monitors and computer controllers used on irrigated farms are practically built to suit small to large flows.

Strategic Concept #5: Significant Research is done

Phyto science is found in research and measured installations now growing around the world – which is logical because water drain from all watersheds carries particles and dissolved ‘pollutants’ into streams feeding estuaries and oceans. We all live downstream. The International Phyto Society www.phytosociety.org holds annual meetings and publishes the peer-reviewed International Journal of Phytoremediation.

Ecolotree[®] Buffer (EBuffer[®])

It's about the roots. Since 1990, Ecolotree Inc. is the oldest phytoremediation company focused on planting poplar and willow that uniquely develop deep, dense root systems in the top 12 feet below soil surface. Roots secrete carbon-rich exudates which feed soil microorganisms that mineralize organics, pathogens, pharmaceuticals and unwanted fertilizers. EBuffer[®] takes the form of a grove or a strategically placed narrow buffer reactor that acts as the final filter bordering a streamside or around a contaminated soil perimeter.

Figure 2: EBuffer poplar roots developed in 19 months in 6-ft deep trenches.

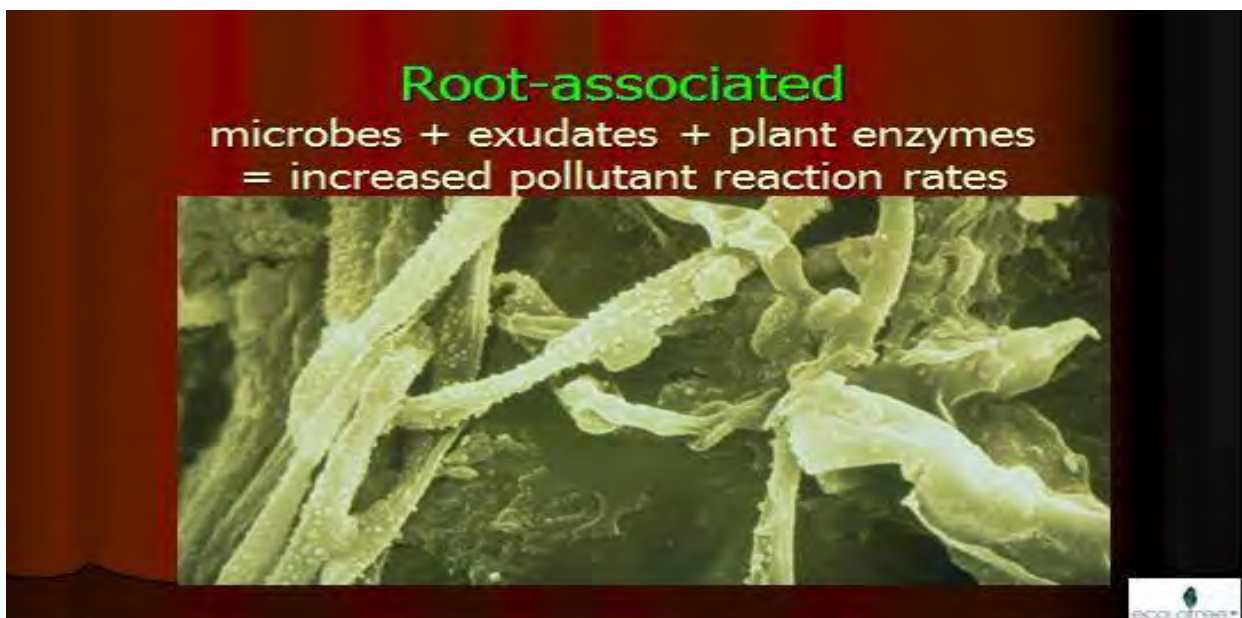


Figure 2: EBuffer installation at WPL Fond du Lac MGP site

Poplar 12 – 14 ft tall rooted stock were planted in 6 – 8 ft trenches amended with compost, biosolids and mineral fertilizer.



May 2008 Finished Site Installation



October 2008 End of 1st growing season



Figure 4: Four year old trees with understory of grass, native and invasive plants.



Ecolotree Inc. – Planting Phyto for Estuary Cleanup

The large estuaries, such as Puget Sound and Chesapeake Bay, have not been successful in containing the non-point contaminants-of-concern (COC) washing off farmed, industrial and urban landscapes. Ecolotree is assisting the Town of Coupeville in developing EBuffer as the Phyto filter.

Goal: diverted and treat ALL waste water now discharged into Penn Cove which is part of Puget Sound. This will remove a 303d listing.

The strategy:

1. Develop Phyto prototypes that can be built, operated and measured for efficacy.
2. Initially, measure nitrogen, phosphorous and pathogen removal. In near future – expand treatment estimate to pharmaceuticals and other pollutants.
3. Develop system to interface to POTW with farmed land.
4. Operate during growing season - irrigate effluent water on to Ebey Prairie field crops to sustain farming that can grow more crop mass and value
5. Operate during dormant season - irrigate deep-rooted poplar during the winter to recharge the regional aquifer to reverse sea water intrusion



Coupeville Washington, Phyto Treatment Cell Data Collection



Coupeville WA, Phyto Treatment Cell Trial for POTW Effluent Polishing



Coupeville ESwale for Stormwater Treatment



Lowden IA POTW irrigated with effluent for small sewage treatment plant

Phyto success criteria meet important challenges of this millennium:

1. Honest ‘Sustainable GREEN’ – based on photosynthesis and natural sciences;
2. Effective captures nutrients & pathogens on large and small scale;
3. Costs less when revenues are less if land is available;
4. Reverses the carbon footprint – phyto systems capture rather than emit carbon.
5. Built and managed by local people doing ‘Green-collar’ jobs;
6. Attractive to fit in neighborhoods, farmed vistas, parks, green space, bike paths
7. Year-round function when coupled with other engineered systems

Ecolotree Inc. –Phyto for Landfill Perimeter EBuffers

Chanute Air Force Base Landfill Closure



Figure 2. Typical new EBuffer on landfill edge intercepts contaminated ground water



Ecolotree Inc. –Phyto for Irrigated Leachate on Landfills

Top Photo is Barrington Illinois. 2 Million gallons per year. Bottom is Atlanta GA 1.5 million gallons irrigated per year.



Ecolotree Inc. –Phyto for Urban Brownfield Cleanup

Trees planted on old metals site closure



Ecolotree Inc. –Phyto for Process Wastewater Cleanup

Port of Morrow is researching use of EBuffers for treatment of water from food processing plants in Eastern Oregon.. Top photo is storage lagoon. Bottom is installed demonstration.





Port of Morrow, Irrigated Trees using effluent from food processing



Port of Morrow, Phyto Treatment Cell Trial