

Groundline decay prevention in southern yellow pine using time-released carbon source amendment

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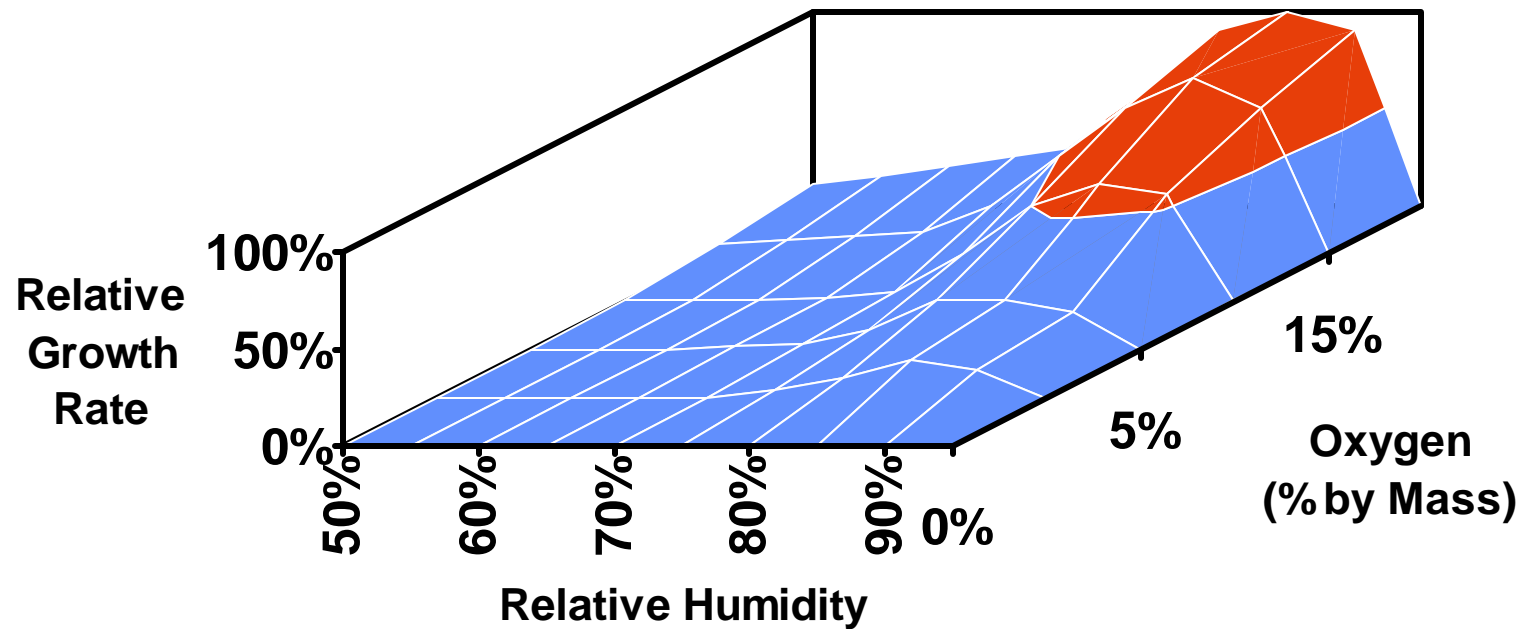
Goals

- ✍ Tell the story of how a new approach to groundline decay prevention was discovered
- ✍ Explain how time-release carbon source amendment preserves wood
- ✍ Show the data collected to this point
- ✍ Answer questions

Concept

- ✍ Frederic K. Pfaender, Ph.D
 - Department of Environmental Sciences and Engineering, UNC - Chapel Hill
 - 25+ years microbiology research
 - recognized expert in pollutant biodegradation
- ✍ Learned what conditions favor decay
- ✍ Learned what conditions are unfavorable to decay
- ✍ Decided to apply that knowledge to wood

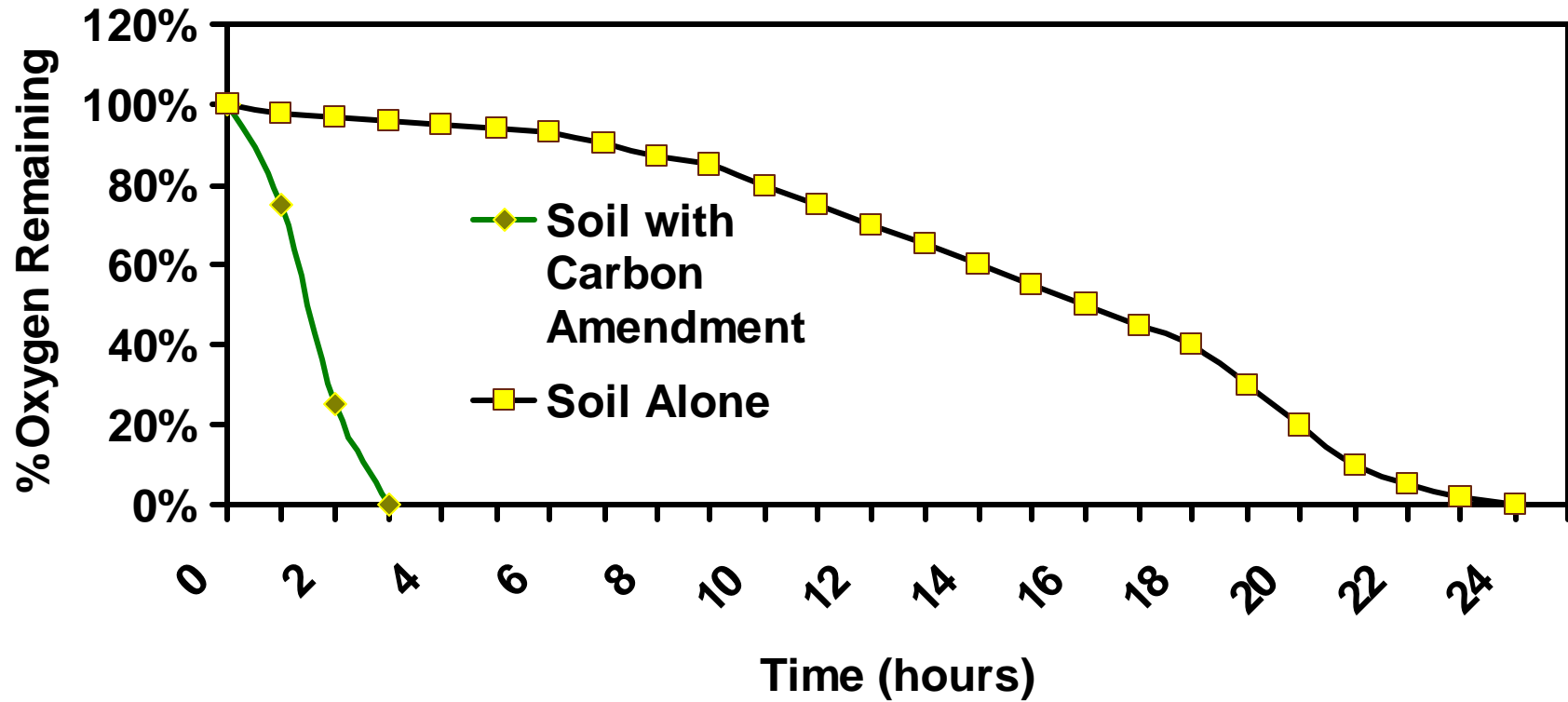
The Effect of Moisture and Oxygen on Microbial Growth



Making conditions unfavorable for decay

- ✍ Wood decay needs oxygen, moisture, and fungi
- ✍ Moisture content regulates oxygen in soil
 - Soil bacteria and fungi deplete oxygen under wet conditions
- ✍ Fungi need both oxygen and moisture to grow and compete for these with bacteria

Oxygen Consumption Rates



Controlling the microbial community in soil

- ✍ Wood is composed of cellulose and lignin
- ✍ Fungi are needed to degrade the lignin
 - there are no known bacteria capable of lignin degradation
- ✍ Fungi require oxygen and can't compete with bacteria when feeding on a simple carbon source
 - the bacteria reproduce faster and thrive when there are simple carbon sources present
- ✍ Bacteria can overpower fungi in a system whenever the carbon sources are simple and abundant

How does carbon source amendment work?

Depletes oxygen

- Anaerobic conditions are created more quickly
- Anaerobic decay is 5-10 times slower than aerobic decay
- More anaerobic days means slower overall decay

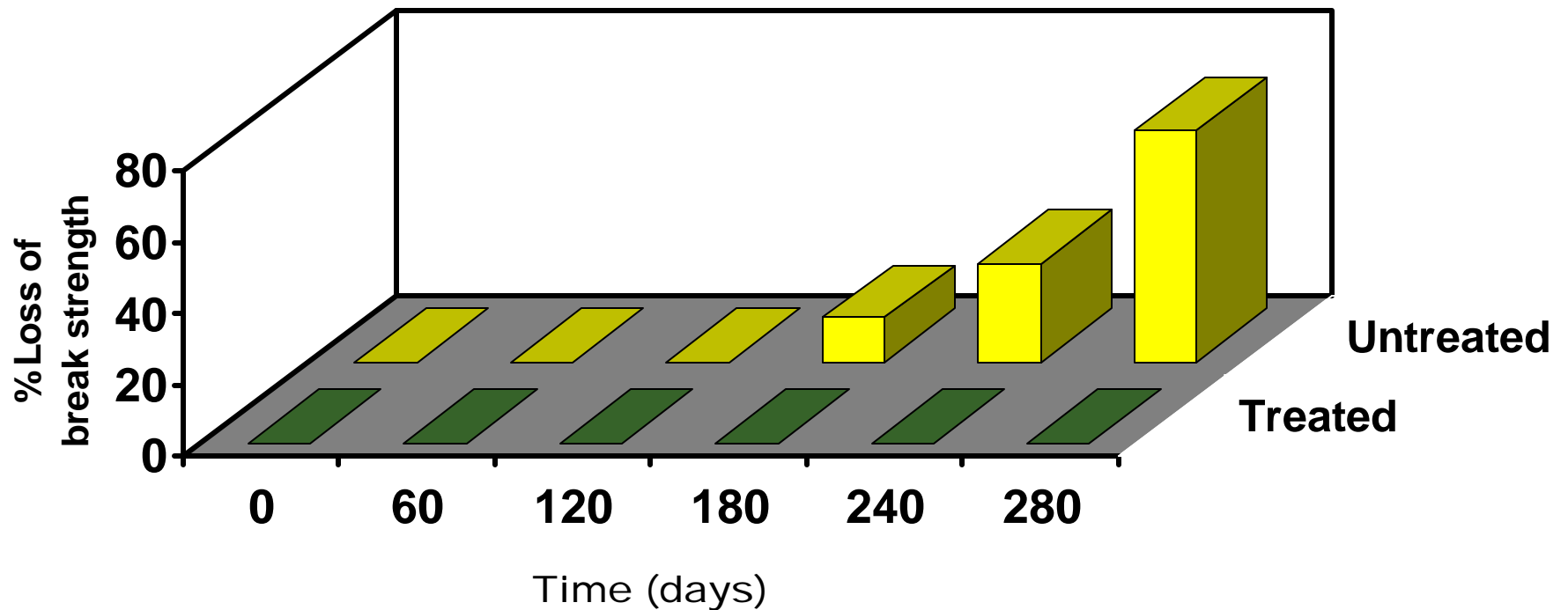
Changes microbial community

- Fungi are required for lignin degradation
- Fungi require oxygen and compete with bacteria for nutrients in soil
- carbon source amendment stimulates bacteria and reduces oxygen, thereby reducing the numbers of decay fungi

Creates unfavorable conditions for wood decay

Laboratory Testing

Loss of break strength in laboratory microcosm studies using 0.5" diameter untreated southern yellow pine



Putting carbon source amendment to work

- ✍ Impractical to apply simple carbon sources to field sites frequently
- ✍ Needs a delivery technology
- ✍ A time-release carrier to give 7-10 years treatment life
- ✍ Needs to release carbon source when biological activity is high (moist, warm etc.)

Time-release

- ✍ Rely on biodegradation
- ✍ Encase carbon source in a biodegradable matrix
- ✍ As carrier degrades the carbon source is released
- ✍ Releases carbon source when biological activity is high
- ✍ Lifespan is dictated by ‘degradability’ of the matrix material

Product

- ✍ All of the ingredients are on the Food and Drug Administration (FDA) generally regarded as safe (GRAS) list
- ✍ An easy to install rod shape (could be installed without excavation)
- ✍ No environmental liability
- ✍ Reduction in the use of toxic materials
- ✍ Safe handling, transport, and storage

Patents

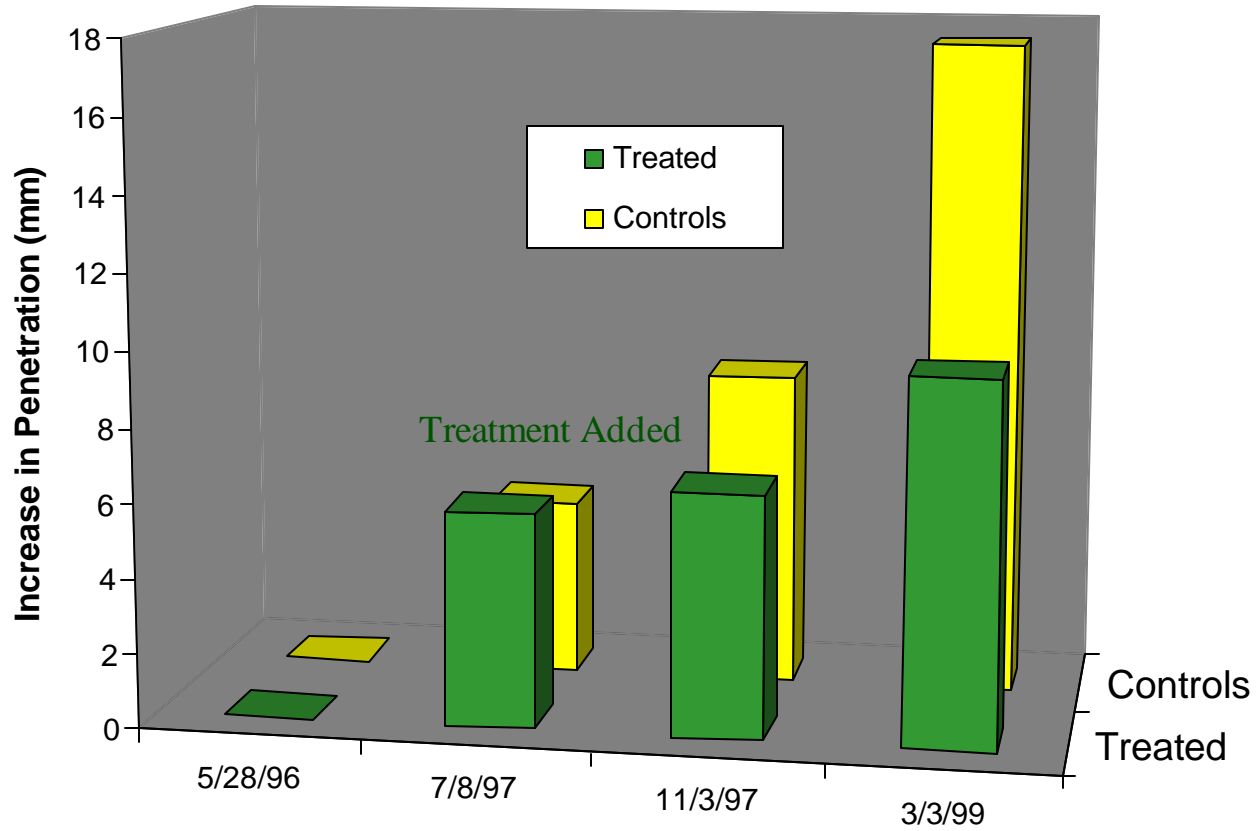
- ✍ “Environmentally friendly treatments to extend the functional life of wood structures and novel treated wood structures” U.S. Patent #5,770,265
- ✍ “Time release delivery system” U.S. Patent #6,004,572

Field Testing

- ✍ 1.5"x1.5" by 12" rods (approximately 1 lb. ea)
- ✍ Installed at a rate of 1 rod for every 6" of pole circumference
- ✍ Untreated southern yellow pine stubs were used
- ✍ Wood strength tested with Pilodyn (greater penetration is an indication of greater decay)
- ✍ Three year study

Field Testing

Change in Pilodyn Penetration with and without RS21



RS21

- ✍ Doubles the lifetime of your wood poles
 - Reduces replacement costs by 1/3 or more
- ✍ Is Non-toxic
 - Safe for workers, transporters
 - Safe for customers
 - Reduces your use of toxic materials
- ✍ Installs easily
 - Installs faster and with less effort

For More Information

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