

# Supplemental Treatment of Wood Bridges with Borate Rods



# QUESTIONS:

- **Why are ties and timbers failing prematurely and what is the financial burden?**
- **What is being done now to address the problem?**
- **What is fungal decay and what causes it?**
- **How can we extend the life cycle of our ties and timbers?**

**Approximately 23 million ties are replaced every year at a cost of over \$150 million**



# Tie Replacements is relative easy in the track.













# 30% of all Railroad Bridges are Wood

- The majority of bridges are over 50 years old
- Railroads spend about \$80 million per year on bridge replacement
- Bridge Timbers are not easy to replace
- Many bridges are at capacity because they were designed to carry smaller loads per car than what the average is now
- Bridge designs are based on sound timbers without any rot.

# Treated or not, all Wood is Vulnerable to Biodegradation

- Creosote is only an envelope treatment
- Wood checks as it seasons exposing untreated heartwood and sapwood
- Through boring and hardware attachments expose untreated wood in the middle of the timber
- Field cuts are not always field treated
- Contact with dirt or concrete.

# Causes of Biodegradation

- Fungal Decay
- Termites
- Beetles
- Carpenter Ants.

# Rot needs 4 conditions to survive

- 1. Moisture
- 2. Food
- 3. Oxygen
- 4. Temperature between 40 and 90.

# Characteristics of Fungal Decay

- Microscopic thread-like organisms
- Ubiquitous in nature – present everywhere
- Brown Rot and White Rot
  - Below and above ground
  - Can degrade wood in a relatively short time
- Soft Rot
  - Prefers warmer and wetter climates
  - Very slow and only affects the outer shell.

# Causes of Decay

- Hardware attachments and condensation
- Checks that collect water
- Field cuts that were not field treated
- Alternate wet and dry cycles
- Empty bolt or spike holes that allow water into the center.



# Life Cycle of Fungal Decay

- Spore - microscopic but in quantity looks like orange dust
- Hyphae – Fine white threadlike strands
- Mycelium – Large fleshy mass
- Fruiting Body – brackets or mushrooms which produce and release spores.
- Rot is like Wood Cancer



# Termites

- Usually follow the rot in creosoted hardwoods
- Damage can be rapid and substantial
- Mostly in the southeast, southwest and Hawaii
- Formosan termites are the biggest threat and are hitchhiking their way north as stowaways inside of used crossties being repurposed as landscape timbers.





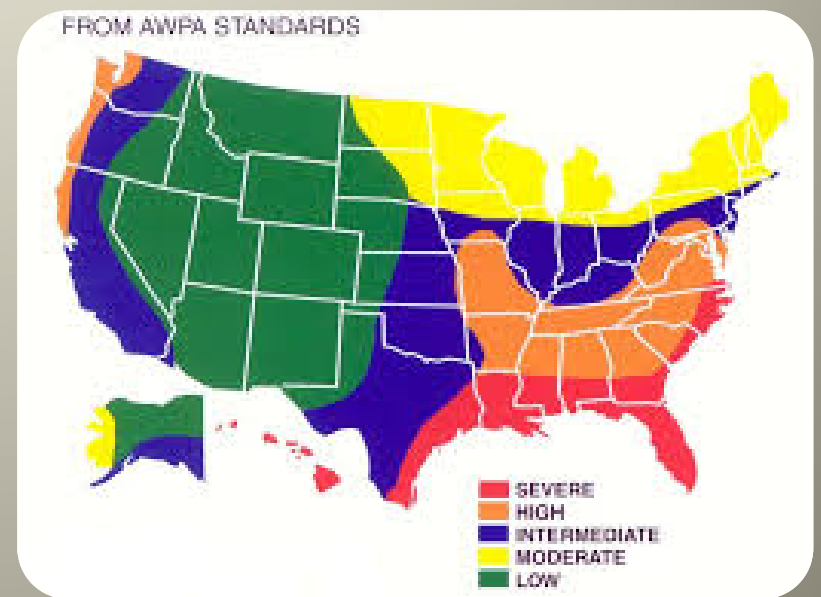
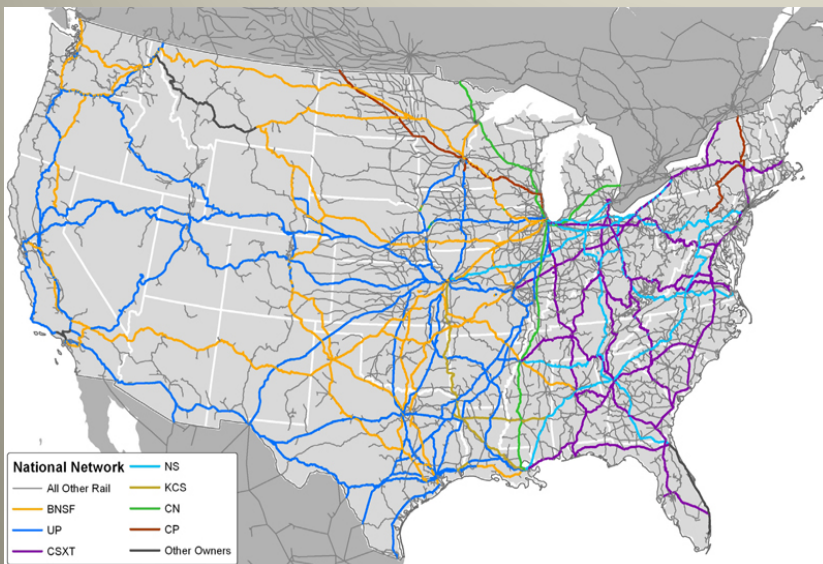
# Beetles and Carpenter Ants

- Can cause notable damage in some situations but their overall significance is nothing compared to Decay and Termites



# Effects of Climate

- Moisture and Temperature and the two most important considerations for fungal decay.

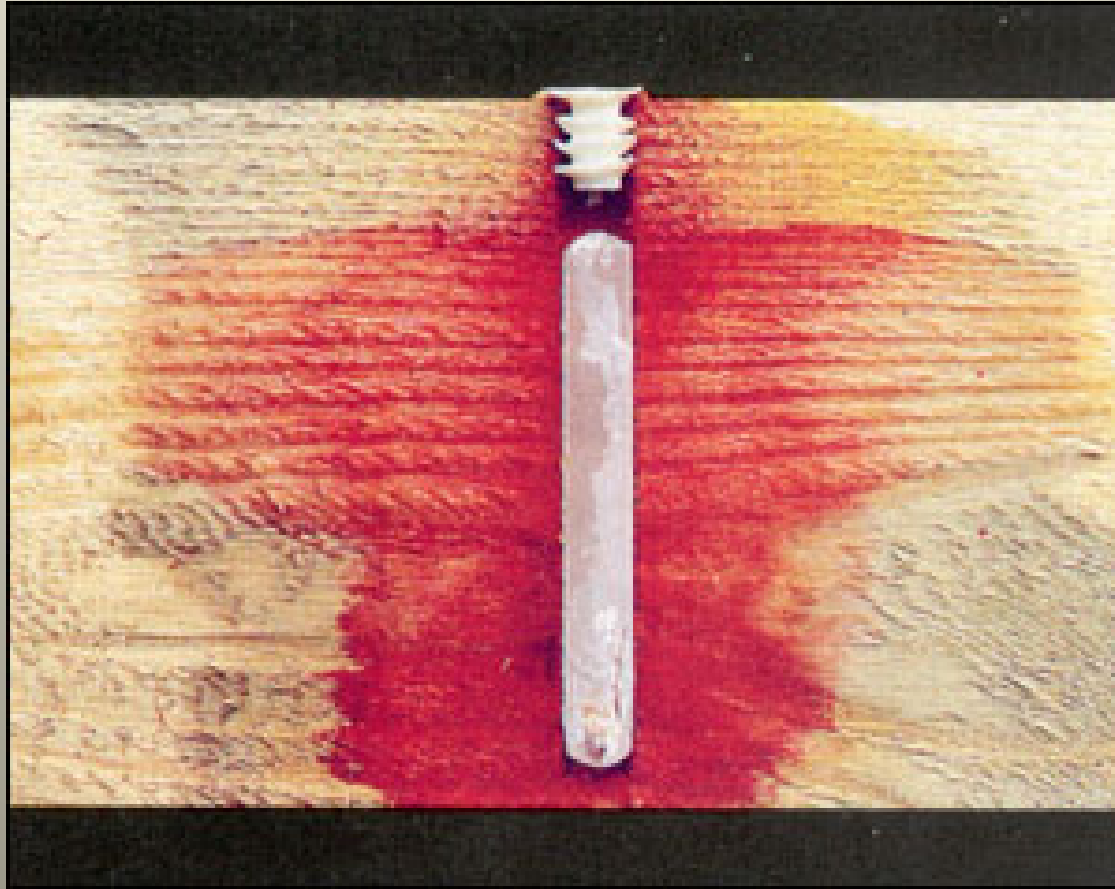




# Fused Boron Rods

- Very high concentration of borate wood preservative
- Inserted into drilled holes
- Boron Rods slowly dissolve when moisture content is high enough to support decay
- Provides a “time released” preventative treatment if the wood is dry
- There are over 40 technical papers showing the efficacy of boron rods
- Boron Rods are EPA registered pesticides but do not require an applicators license
- They protect wood against termites, beetles, carpenter ants and wood rot for over 10 years.

# Boron Diffusion from Rods





# Treatment of Decay using Boron Rods

- Boron Rods are a way to treat specific locations of timbers while they are in place
- Safe and easy to use - no risk of spillage compared to liquids or granular fumigants
- Exact dosage – no guesswork. 1 hole, 1 rod
- Extends the life of timbers a decade or more
- Cost effective
- With plastic reusable plugs, ties can be easily retreated periodically

# 15 Year Exposure Report

- **Cordele and Jessup Georgia in 1989**
- **One end of ties treated with rods, then compared after 15 years**
  - Treated ends still had enough borate to be above the toxic threshold to prevent and kill fungi
  - Decay had advanced in untreated ends of ties
  - Treated ends had no rot
  - Best results on ties with one Boron Rod placed on either side of the tie plate.

# Boron treatments can keep spikes and bridge hardware from corrosion



# Wood Inspection for Decay and Placements for Boron Rods

- Look for visible clues like mold, algae or checks
- Sound and Bore
- When rot is found, insert Boron Rods
- Check pilings at 2 feet above ground down to 2 feet below groundline
- Check piling in water at 2 feet above mean water line
- Take several borings since rot pockets are very irregularly shaped.







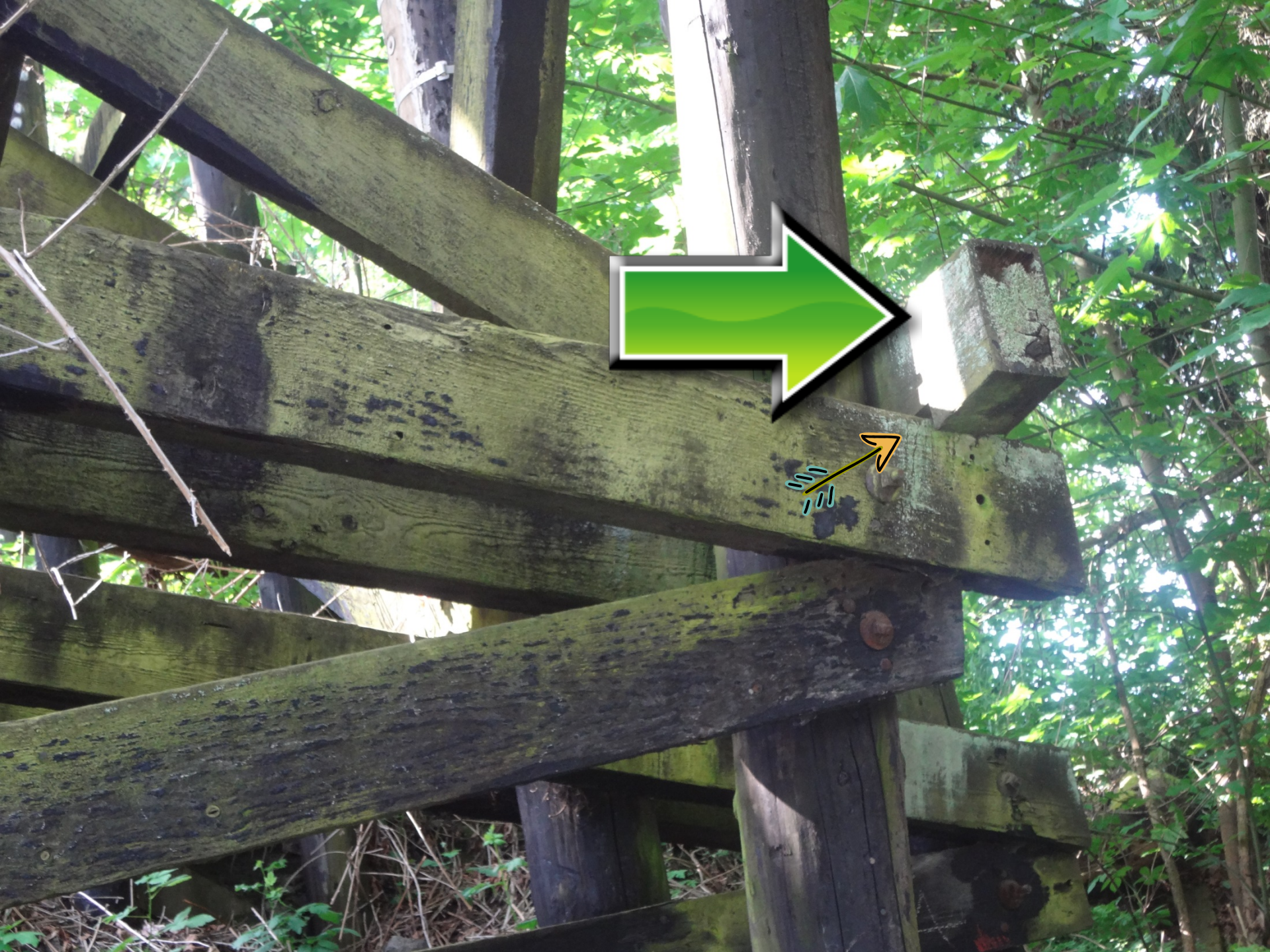
























Nathan Myers Collection-2004

# Summary

- Railroad ties and timbers have gotten very expensive to replace
- Railroad ties and timbers rot from the inside, mostly due to high moisture
- Track ties are easy to replace compared to bridge timbers
- The cost of disposal of ties is expected to skyrocket if EPA bans their use as fuel
- Thorough inspection will identify problems before they become catastrophic problems
- Boron Rods stop and prevent biodegradation.



*Thank you for your attention*

