

Heterobasidion Control using Borate Stump Treatments

Dr. Jeff Lloyd
WI SAF 2012

Topics

1. *Heterobasidion annosum (Fomes annosus)*
2. An introduction to Borates
3. Treatment with Cellutreat®
4. Conclusions

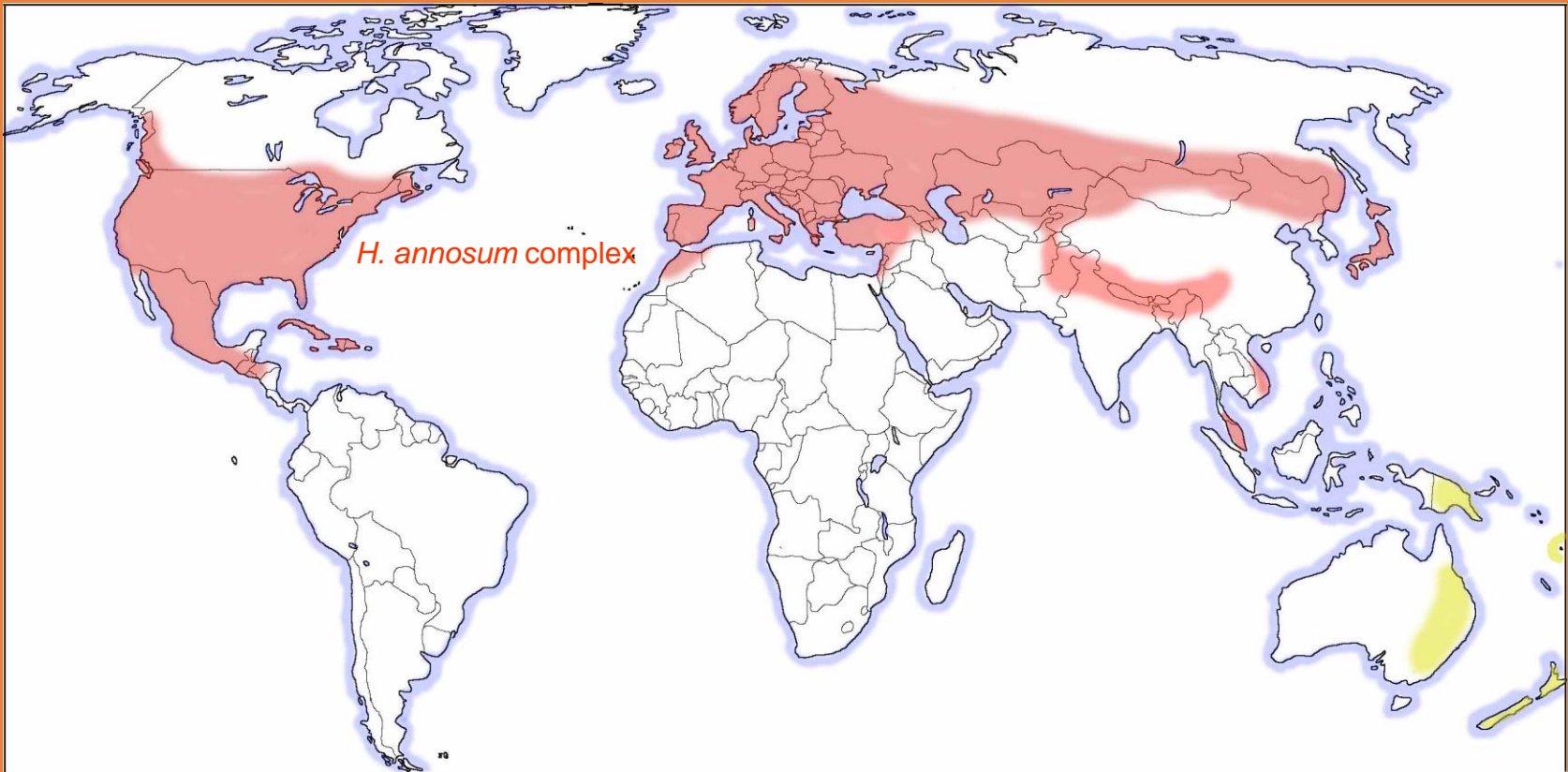
Butt Rot/Root Rot - The Culprit

- *Heterobasidion annosum* or *Fomes anosus* root rot
- A basidiomycete fungus
- Considered one of the most economically important forest pathogens - widespread in US coniferous forests



Heterobasidion spp. distribution (Korhonen, 2004)

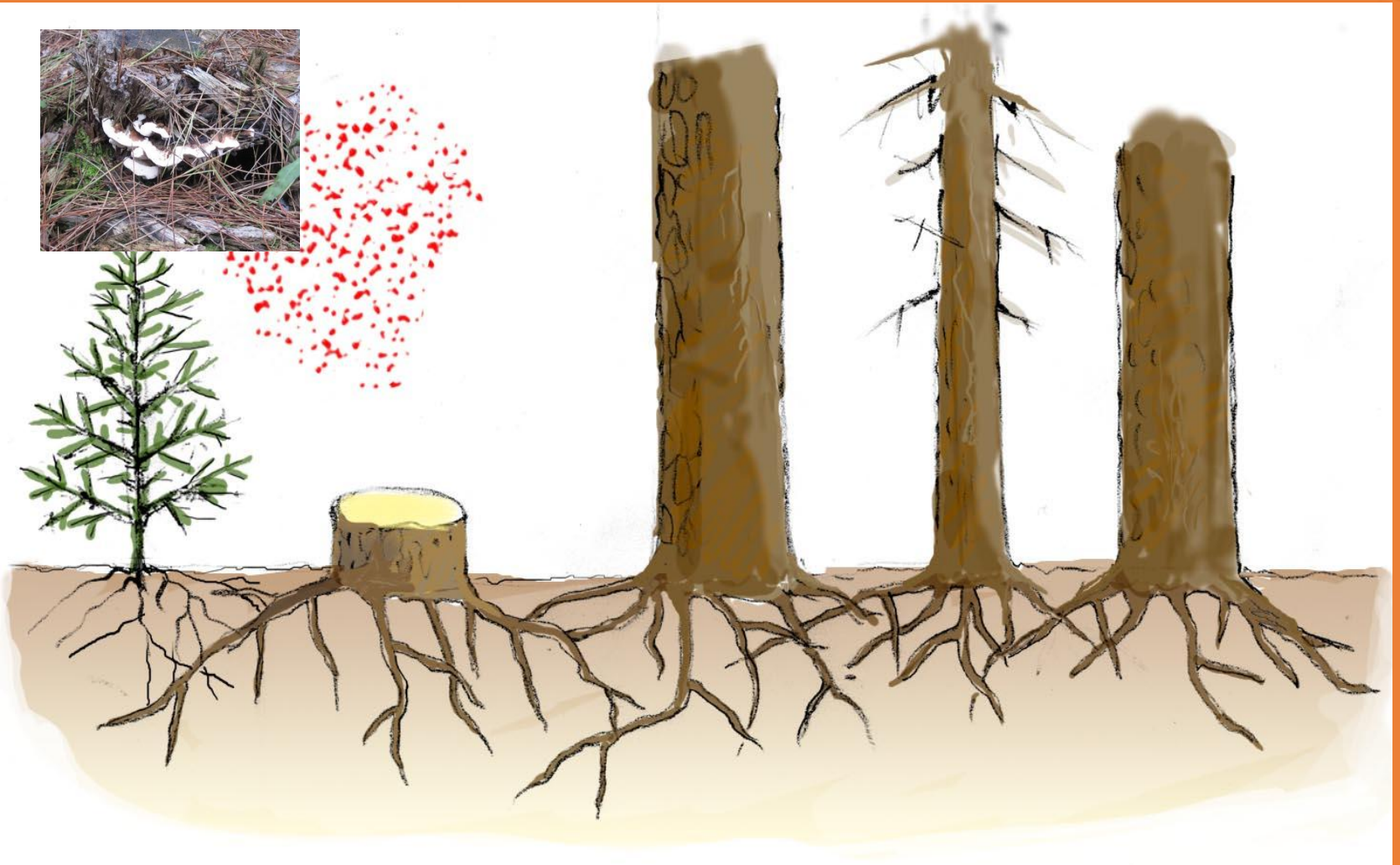
Species complex, 6 species



Symptoms

- Staining & butt rot (not often seen in Red Pine)
- Conk formation
- Thin crowns, pockets of reduced growth
- Pocket Mortality
- Fruiting bodies on trees and stumps

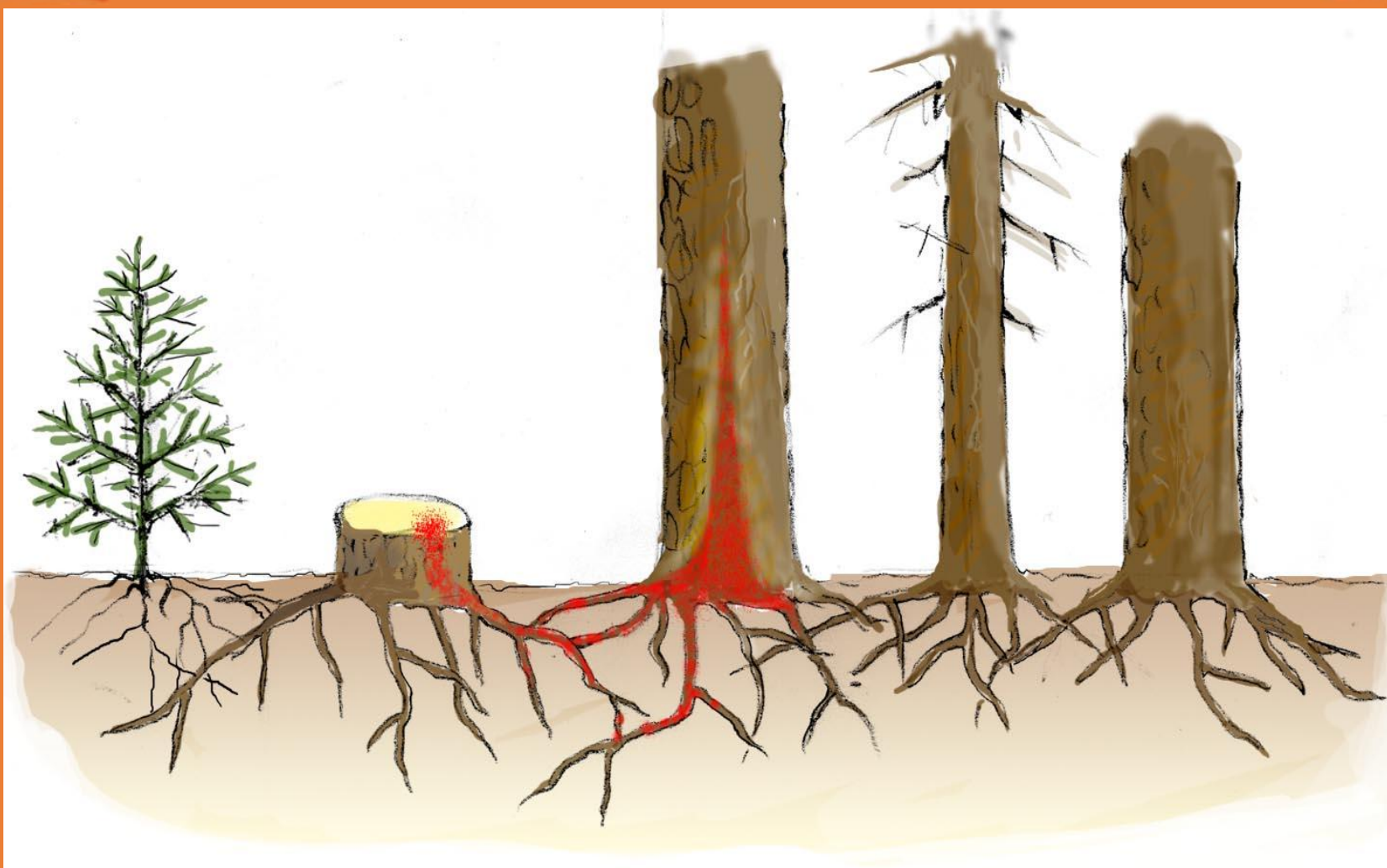




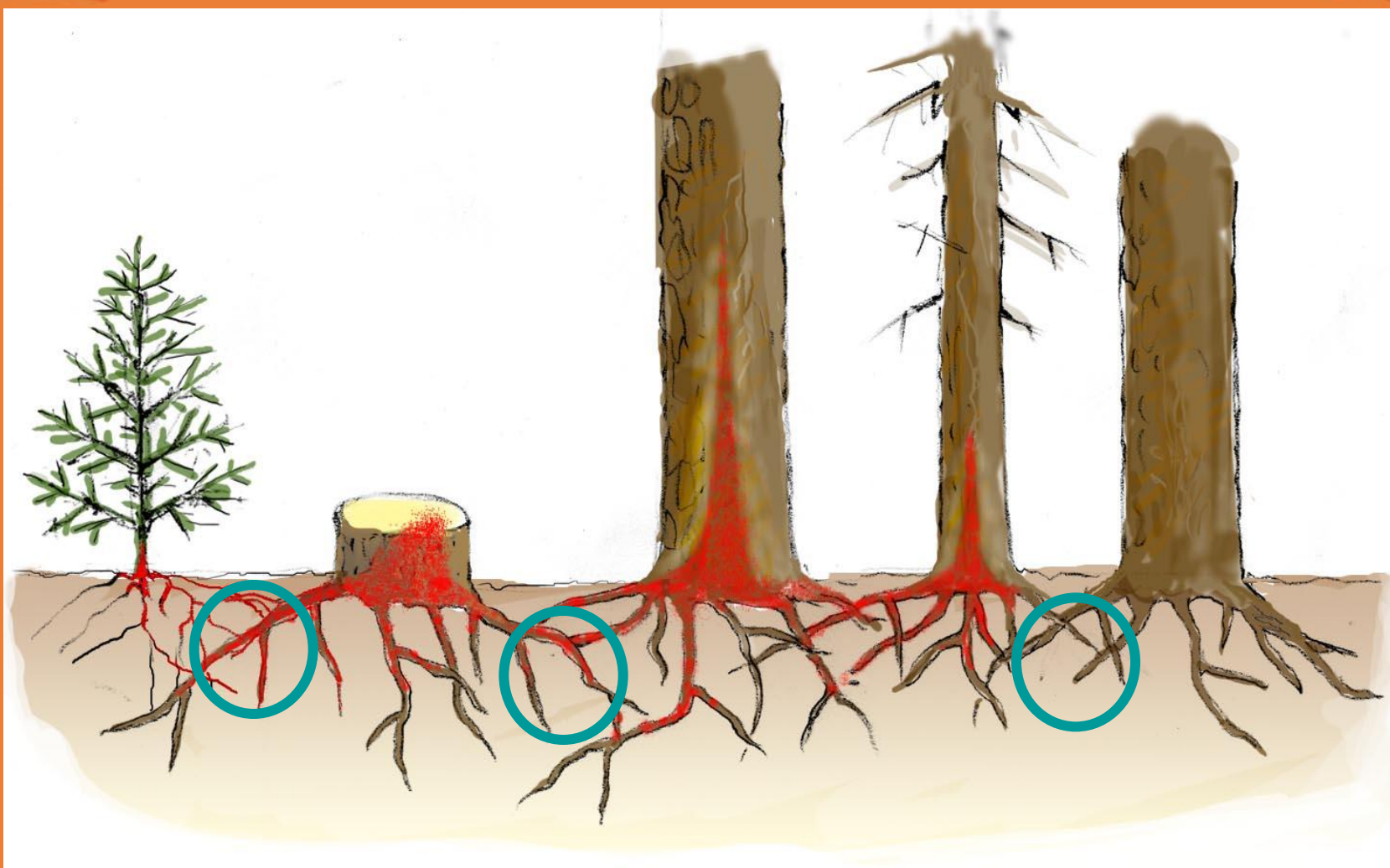
Spores produced by fruit bodies can travel up to 500 miles



Stump colonization, germination + mycelium formulation



Decay advance in stump roots + spread to adjacent tree roots



Transfer of decay between root systems (also to young trees)



Management

Physically remove all stumps during thinning or harvesting or re-plant with non susceptible species (hardwoods)

Or

Treatment of stumps after or during harvest

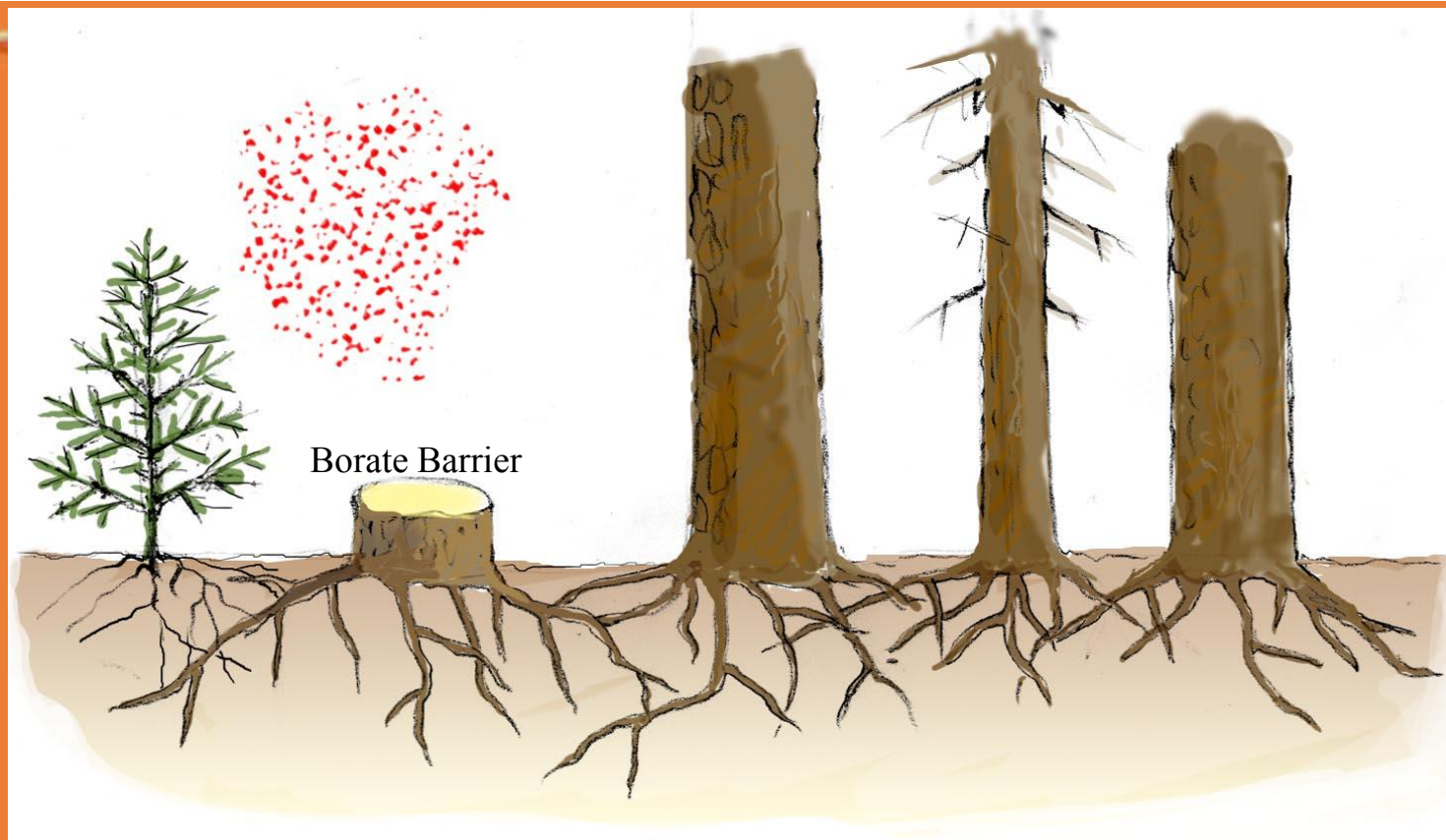
Cellutreat® a borate powder for aqueous application (NISUS)

Sporax®, a dry borax compound (WILBUR-ELLIS)



Stump Treatment





Control: Logging when temperature $< 0^{\circ}\text{C}$ or ground deep snow covered for extended periods.

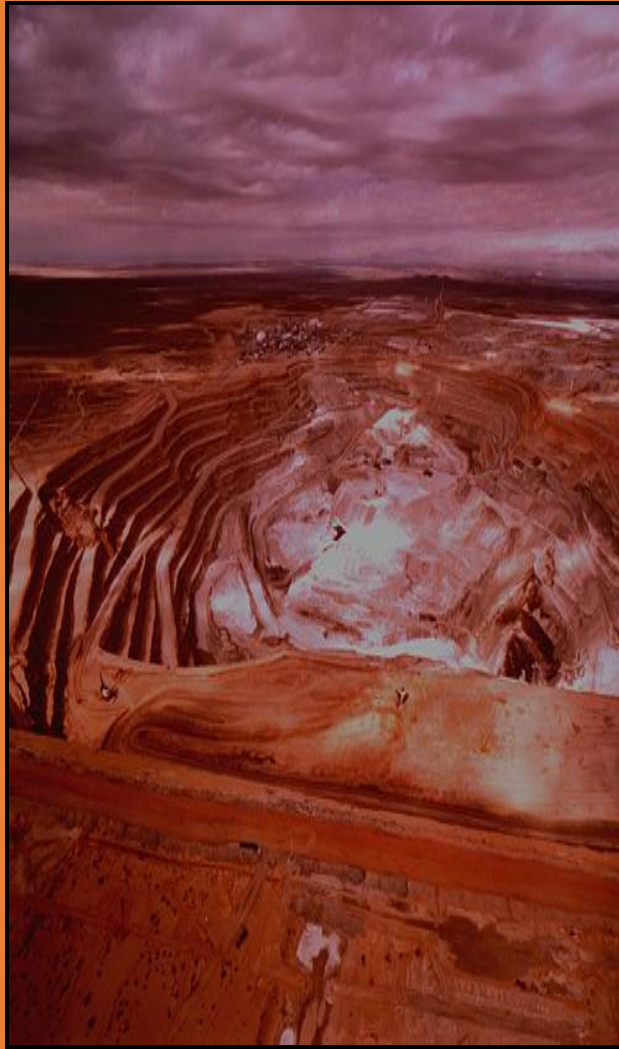
Borate stump treatment when it's possible for temperature exceed 0°C over an extended period.

Chemistry

- Inorganic chemical element
- Pure boron not found naturally
- Found as borate

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IA	IIA	IIIB	IVB	VB	VIB	VII	VIII	IB	IIB	IIIA	IVA	VA	VIA	VIIA	INERT GASES
1 H 1.008														9 F 18.998	10 Ne 20.180
3 Li 6.941	4 Be 9.012									11 B 10.811	12 C 12.011	13 N 14.007	14 O 15.999	15 P 30.974	16 S 32.06
11 Na 22.990	12 Mg 24.305									19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.88	23 V 50.942	24 Cr 52.00
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.88	23 V 50.942	24 Cr 52.00	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.69	29 Cu 63.546	30 Zn 65.38	31 Ga 69.723	32 Ge 72.64	33 As 74.922	34 Se 78.96
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.94	43 Tc 98	44 Ru 101.07	45 Rh 102.91	46 Pd 106.32	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.6
55 Cs 132.91	56 Ba 137.33	57 La 138.905	58 Ce 140.12	59 Pr 140.908	60 Nd 144.24	61 Pm 145	62 Sm 150.36	63 Eu 151.964	64 Gd 157.25	65 Tb 158.925	66 Dy 162.50	67 Ho 164.930	68 Er 167.259	69 Tm 168.933	70 Yb 173.054
87 Fr 223	88 Ra 226	89 Ac 227	90 Th 232.0377	91 Pa 231.036	92 U 238.02891	93 Np 237	94 Pu 244	95 Am 243	96 Cm 247	97 Bk 247	98 Cf 251	99 Es 252	100 Fm 257	101 Md 258	102 No 259
			90 Th 232.0377	91 Pa 231.036	92 U 238.02891	93 Np 237	94 Pu 244	95 Am 243	96 Cm 247	97 Bk 247	98 Cf 251	99 Es 252	100 Fm 257	101 Md 258	102 No 259
			118 Xe 131.29	119 Fr 223	120 Ra 226	121 Ac 227	122 Th 232.0377	123 Pa 231.036	124 U 238.02891	125 Np 237	126 Pu 244	127 Am 243	128 Cm 247	129 Bk 247	130 Cf 251



- Naturally everywhere at low levels
- Essential to plant life
- Important in human nutrition
- No adverse effects to plants or aquatic life (NEC aquatic life is at least 1 mgB/l).
- Low acute mammalian toxicity (LD 50 ~3500 mg/kg)
- ADI of 24mg B/kg bw/day

Borates



Boron Deficiency in the USA



Borates All Around Us



Heterobasidion Control with Cellutreat[®]

- Disodium octaborate tetrahydrate
 - Spray dried powder for instant dissolution in water
 - High active concentration, non corrosive, compatible with equipment
 - Stable at 5 % solution concentration at high or low temperatures
 - Can add anti-freeze



Heterobasidion Control with *Cellutreat*®

- High toxicity to *Heterobasidion sp.*
 - Very high initial surface layer
- Diffuses into and across the stump surface
- Odorless/colorless (marker dye can be added)
- Low acute toxicity
- Positive environmental impact
- Non-flammable
- Easy to use

Protection by Penetration

- Cellu-Treat penetrates into wood through diffusion
 - The process of penetration that allows borate compounds to move from the outer surface into the inner core of the wood if and when needed (moisture driven).

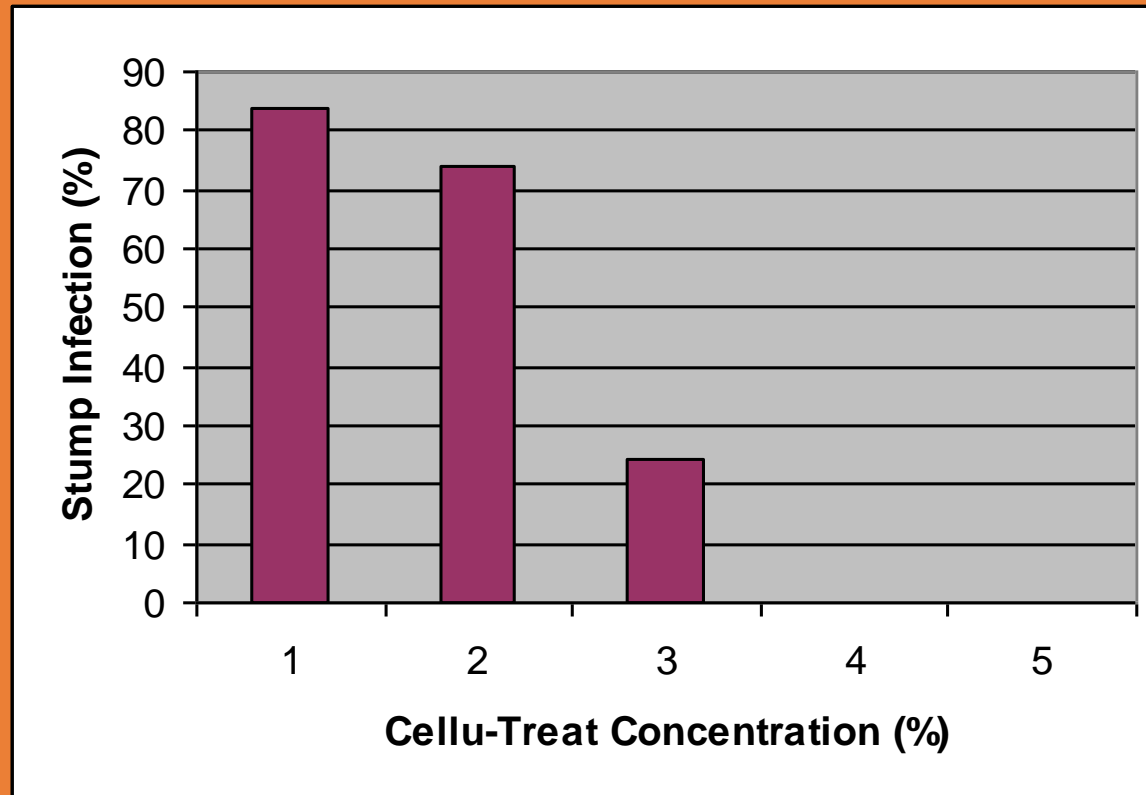
Penetration by Diffusion



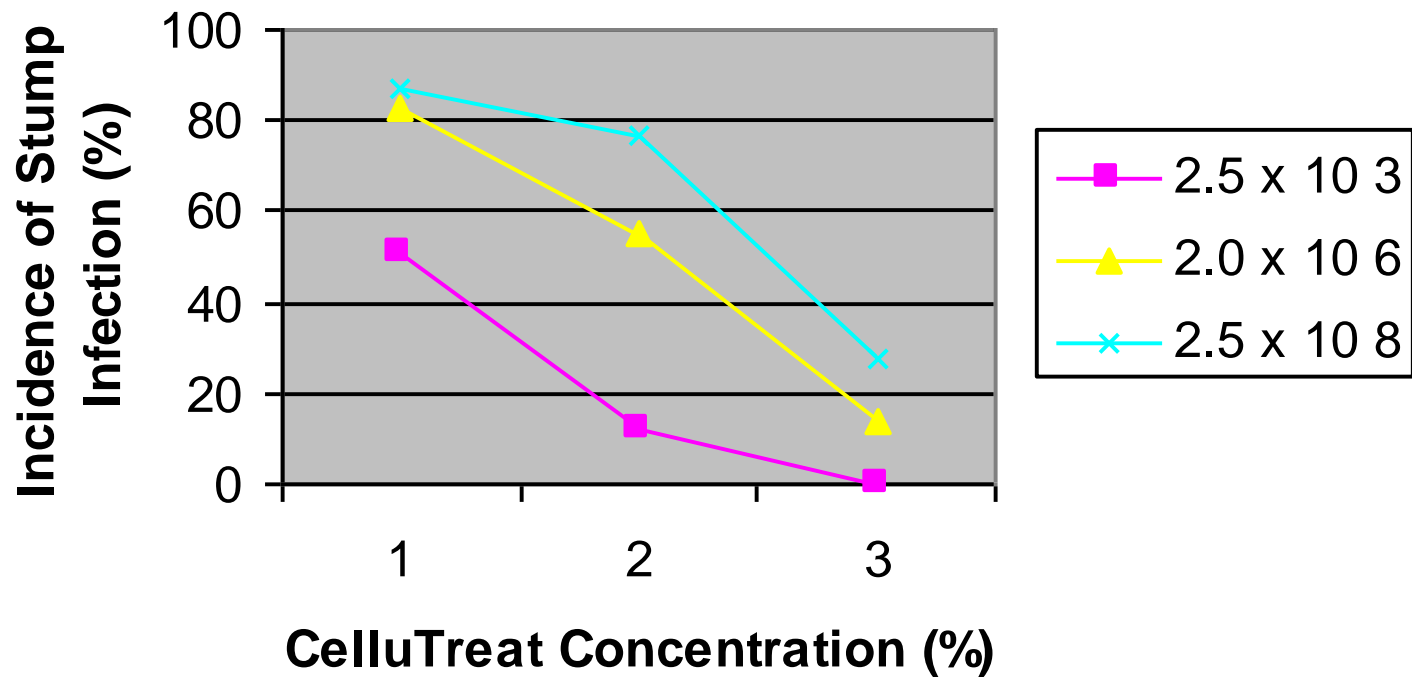
(red color indicated by curcumin Smith & Williams, 1968: AWP A3-08 17)

Incidence of Stump Infection at Different Treatment Concentrations

from Lloyd & Pratt (1997)



Effect of CelluTreat Concentration & Inoculum Density



from Lloyd & Pratt (1997)

Acceptable Coverage (>80% & even)

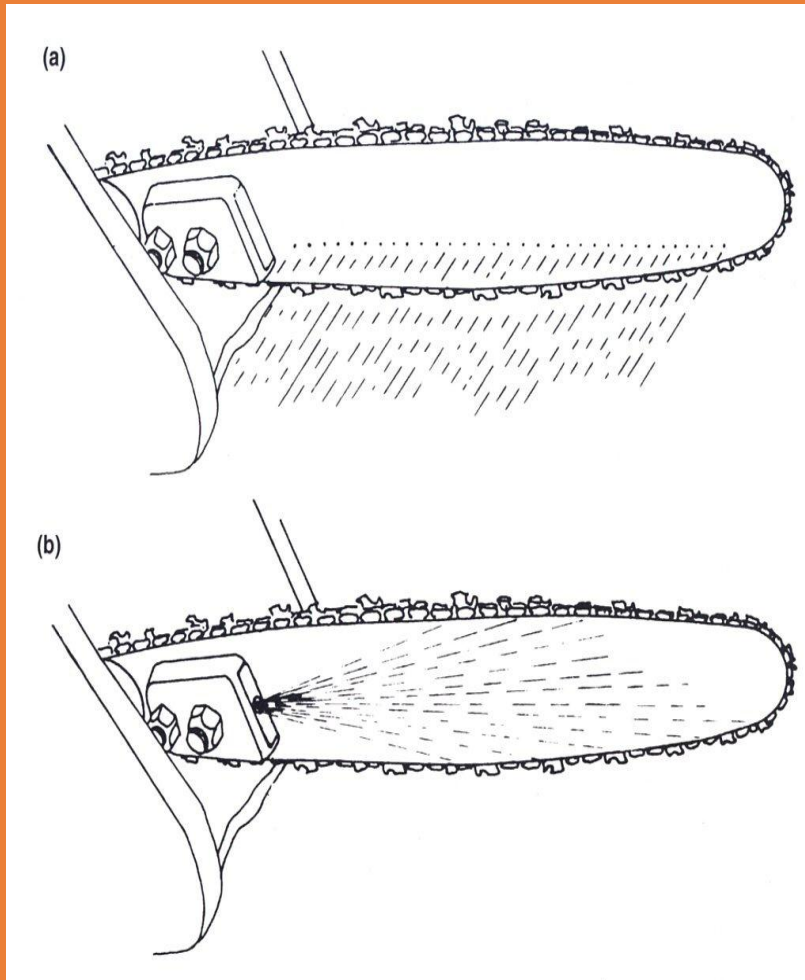


Borates can be tested using curcumin (Smith and Williams 1968 & AWP A3)





Harvester Head Treatment Application



Through-The-Bar

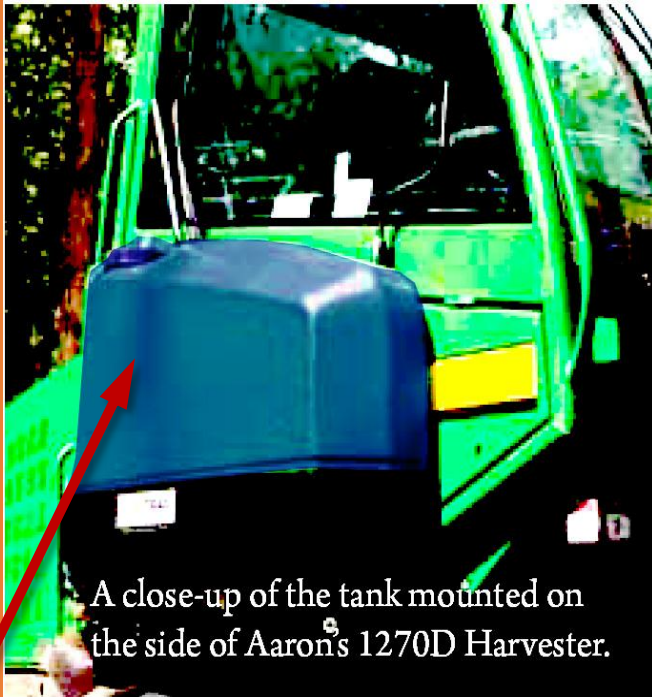
- Possible to cover large stumps
- The dominating technology
- Higher bar replacement cost
- Some spillage
- Valmet & Oregon stump treatment bar design

Under-Bar Spray Nozzle

- Best for stump diameter $< 12''$ (30 cm)
- Does not required special spray "bars"
- Higher pressure applied
- Lower spillage

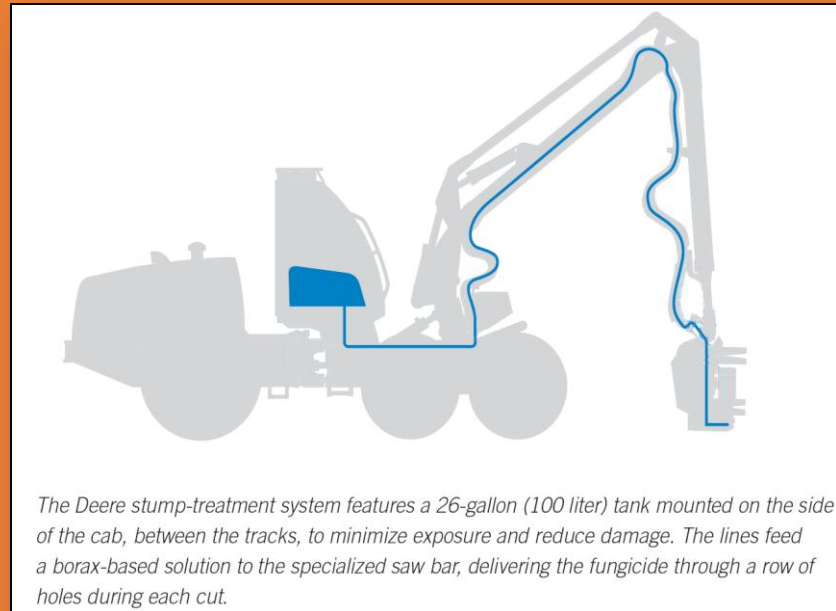


Existing Equipment with Built in Systems



A close-up of the tank mounted on the side of Aaron's 1270D Harvester.

Deere tank (highlighted in blue) is "blister" mounted on side of cab.



The Deere stump-treatment system features a 26-gallon (100 liter) tank mounted on the side of the cab, between the tracks, to minimize exposure and reduce damage. The lines feed a borax-based solution to the specialized saw bar, delivering the fungicide through a row of holes during each cut.

	Valmet	Deere
Water Tank	40 Gal (150L) 50% larger	26 Gal (100L)
Location	Protected in front frame	Unprotected on outside of cab

New Equipment With Application Equipment



CAT® Stump Spray System

Tailor-Made for PF-48 and Fabtek 18R

Prevent Annosum root rot from spreading with the new Stump Spray System from Caterpillar® Forest Products. Safer and more cost effective than manual application and designed specifically for the Prentice PF-48 and Fabtek 18R Series 2000 harvesting heads.



- Sawbar sprays while cutting - does not increase cycle time.
- Securely mounts to Cat and Fabtek track harvesters.
- Special 3/4" stump spray bar can be flipped for double life.
- Tank has drain valve and holds 8 gals. of solution - enough to cover 2,000 12" diameter tree stumps.
- Pump and control system specifically designed for stump treatment - over 10 years of stump treatment experience.
- Controller allows pressure, flow and duration to be controlled in the cab.
- Operator controls spray with joystick button.

Manufacturers with Add on Application equipment



Conclusions

1. *Cellutreat*® an ideal material for *Heterobasidion* sp. control
2. Legal application with EPA and State registrations for this application
3. Effective when applied to stumps at correct concentration (5 %) and reasonable coverage
4. Application by spray or 'through the Bar' during mechanical harvesting
5. Consider your equipment carefully (easy fill and mix, physically and freeze protected tanks and hoses)

CELLUTREAT

Borate DOT Wood Preservative



Green Solutions

1-800 264 0870

www.nisuscorp.com

QNAPTM
COPPER NAPHTHENATE

