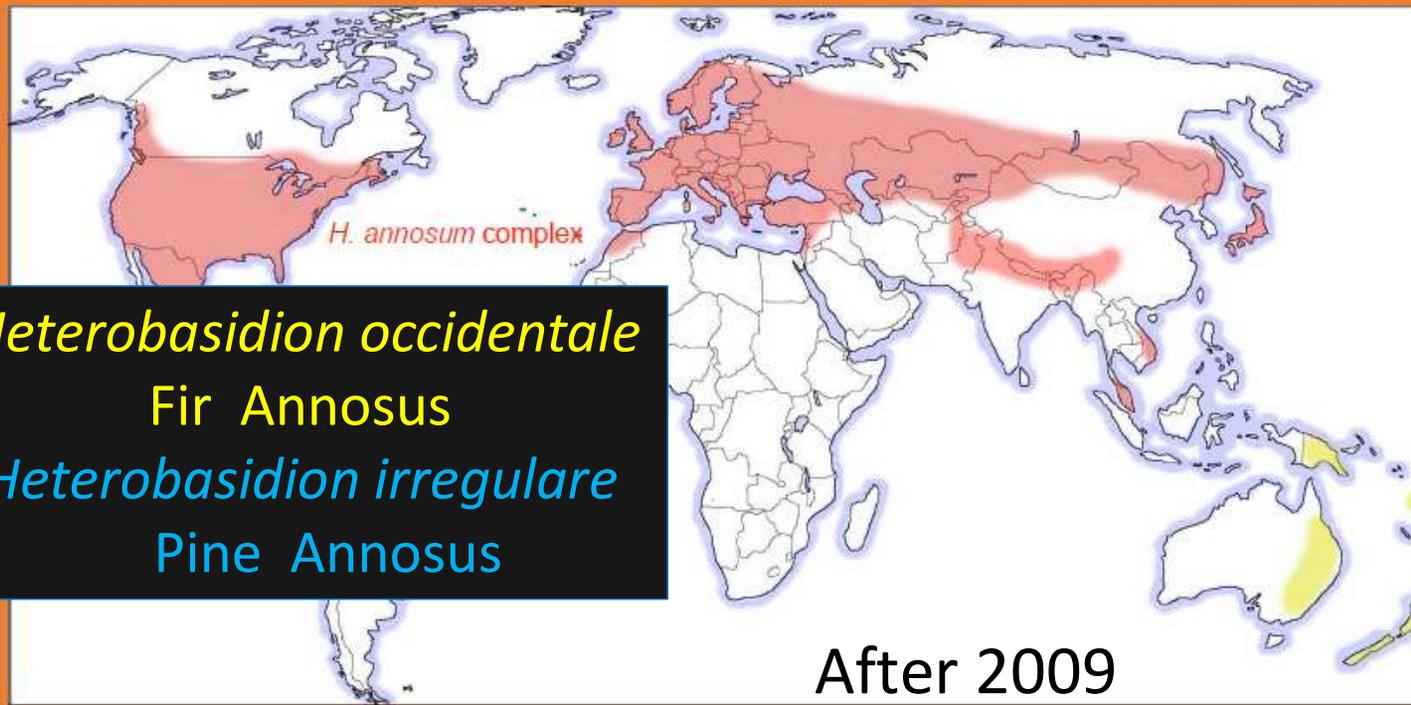


The one Question I will ask.

*Are we trying to stop WF stump infections or  
are we trying to slow down WF mortality?*

## *Heterobasidion* spp. distribution (Korhonen, 2004)

Species complex, 6 species



*Heterobasidion occidentale*

Fir Annosus

*Heterobasidion irregulare*

Pine Annosus

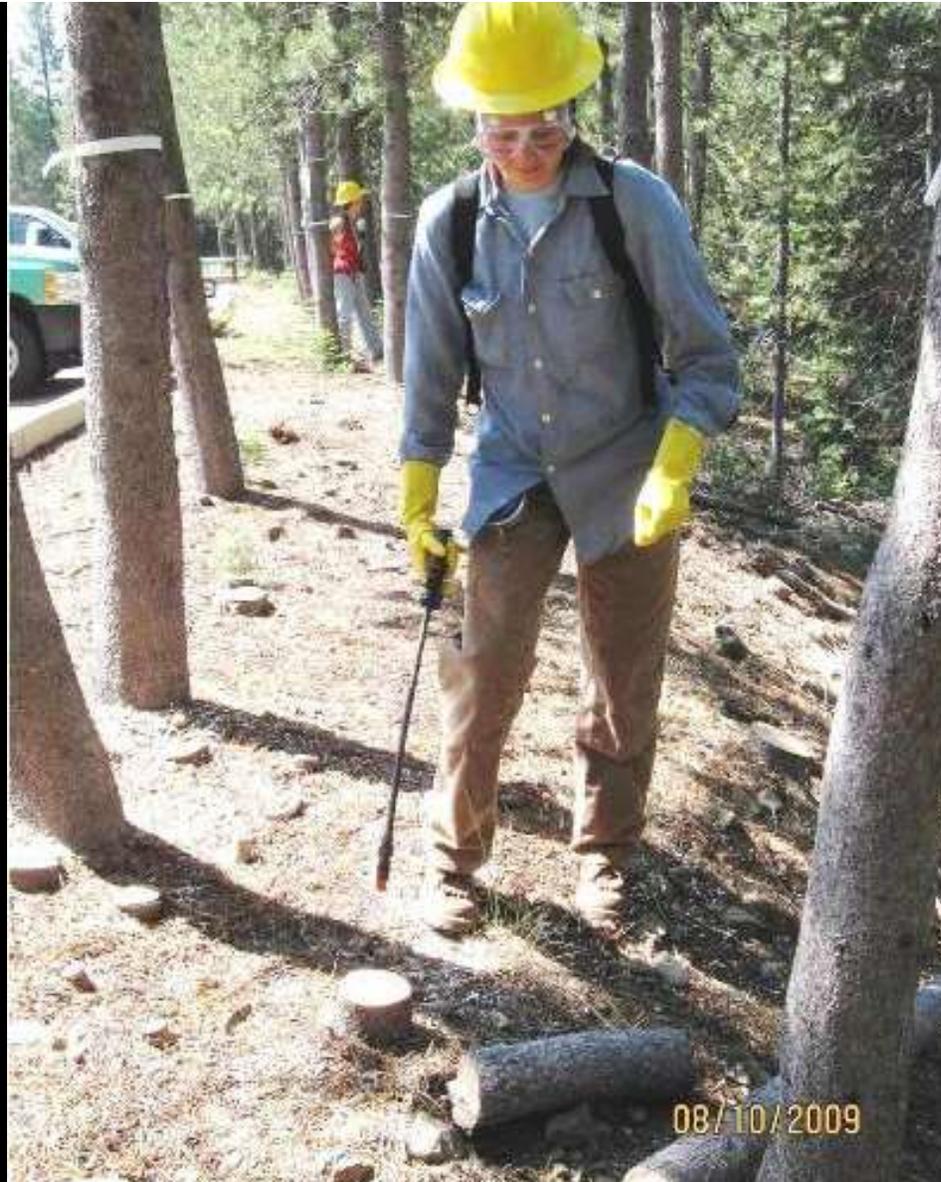
Two individual fungi, not two forms of the same fungus .



Sporax application

Notice PPE and  
application rate





Fact 1.

*Borates kill Heterobasidion spores.*

Fact 1.

*Borates kill Heterobasidion spores.*

Fact 2

*Borate is a Pesticide*

*It even kills insects*

# TERRO®

## Ant Killer<sub>II</sub> Liquid Ant Baits

Mata hormigas<sub>II</sub> Cebos líquidos para hormigas

**Kills all common household ants**  
**Pre-filled & Ready-to-use**

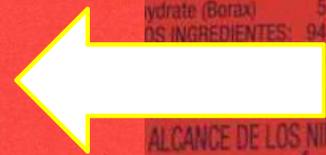
**NEW SNAP-OFF TAB!**



**6 Bait Stations**

Net Contents/Contenido Neto: 2.2 fl oz (66cc)/0.36

ACTIVE INGREDIENT/INGREDIENTE ACTIVO:	
Sodium Tetraborate Decahydrate (Borax)	5.40%
OTHER INGREDIENTS/OTROS INGREDIENTES:	94.60%
TOTAL	100.00%



KEEP OUT OF REACH  
OF CHILDREN  
**CAUTION**

MANTÉNGASE FUERA DEL  
ALCANCE DE LOS NIÑOS  
**PRECAUCIÓN**



INGREDIENTE ACTIVO:  
Sodium Tetraborate Decahydrate (Borax) 5.40%  
OTHER INGREDIENTS: 94.60%  
TOTAL 100.00%

ALCANCE DE LOS NIÑOS  
**PRECAUCIÓN**

Fact 1.

*Borates kill Heterobasidion spores.*

Fact 2.

*Borate is a pesticide.*

Fact 3.

*Borates can prevent new stump infections.*

Fact 1.

*Borates kill Heterobasidion spores.*

Fact 2.

*Borate is pesticide.*

Fact 3.

*Borates can prevent stump infection.*

.

Fact 4.

*Wilbur-Ellis could not make a profit selling Sporax.*

Fact 1.

*Borates kill Heterobasidion spores.*

Fact 2.

*Borate is a pesticide.*

Fact 3.

*Borates can prevent stump infection.*

Fact 4.

*Wilbur-Ellis could not make a profit selling Sporax.*

Fact 5

*USFS and Private Industry essentially stopped using Sporax.*

Fact 1.

*Borates kill Heterobasidion spores.*

Fact 2

*Borate is a pesticide*

Fact 3

*Borates can prevent stump infection.*

Fact 4.

*Wilbur Ellis could not make a profit selling Sporax.*

Fact 5.

*USFS and Private Industry essentially stopped using Sporax.*

***Everything from here on is Fir Annosus specific.***

Fact 6.

*“P” and “S” type conks look alike.*

*However,  $H. occidentale \neq H. irregulare$ .*

*(These fungi behave differently, and may have evolved independently for many millions of years)*

Now for some History



**Emilio Pepe Michael Meinecke**, the first director of the Division of Forest Pathology in the Bureau of Plant Industry (later the division was transferred to USDA FS). Meinecke studied under **Robert Hartig** (The father of Forest Pathologist).

Between 1914 and 1934 Meinecke went on to publish 32 major papers on F.H.

*Emilio Pepe Michael Meinecke 1869 - 1957*

## *Emilio Pepe Michael Meinecke 1869 - 1957*

**1909.** *Fomes annosus* was identified in the West for the first time 1909.  
Sat in a Gov't file until 1914.

**1914.** The earliest field guide for foresters Meinecke's "*Forest Tree diseases common in California and Nevada.*" In 67 pages has one mention "*Although present apparently somewhat rare in California*".

**1916.** "*Fomes annosus is not yet reported on white fir to the writer's knowledge*".

**1946.** *Fomes annosus* a problem but extent not yet known (Wagener & Cave, 1946)

**What Changed with WF between WWI and WWII ?**



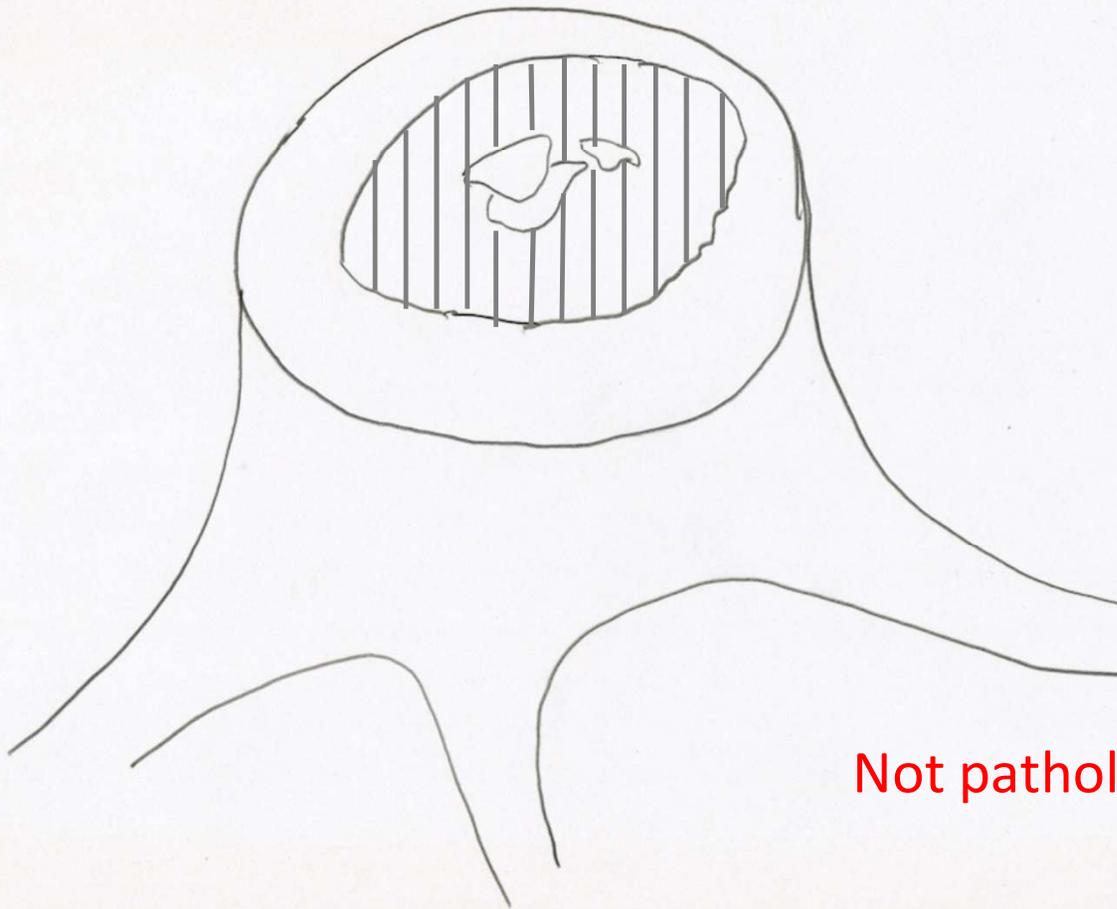
*Answer = WF Stumps*



However,

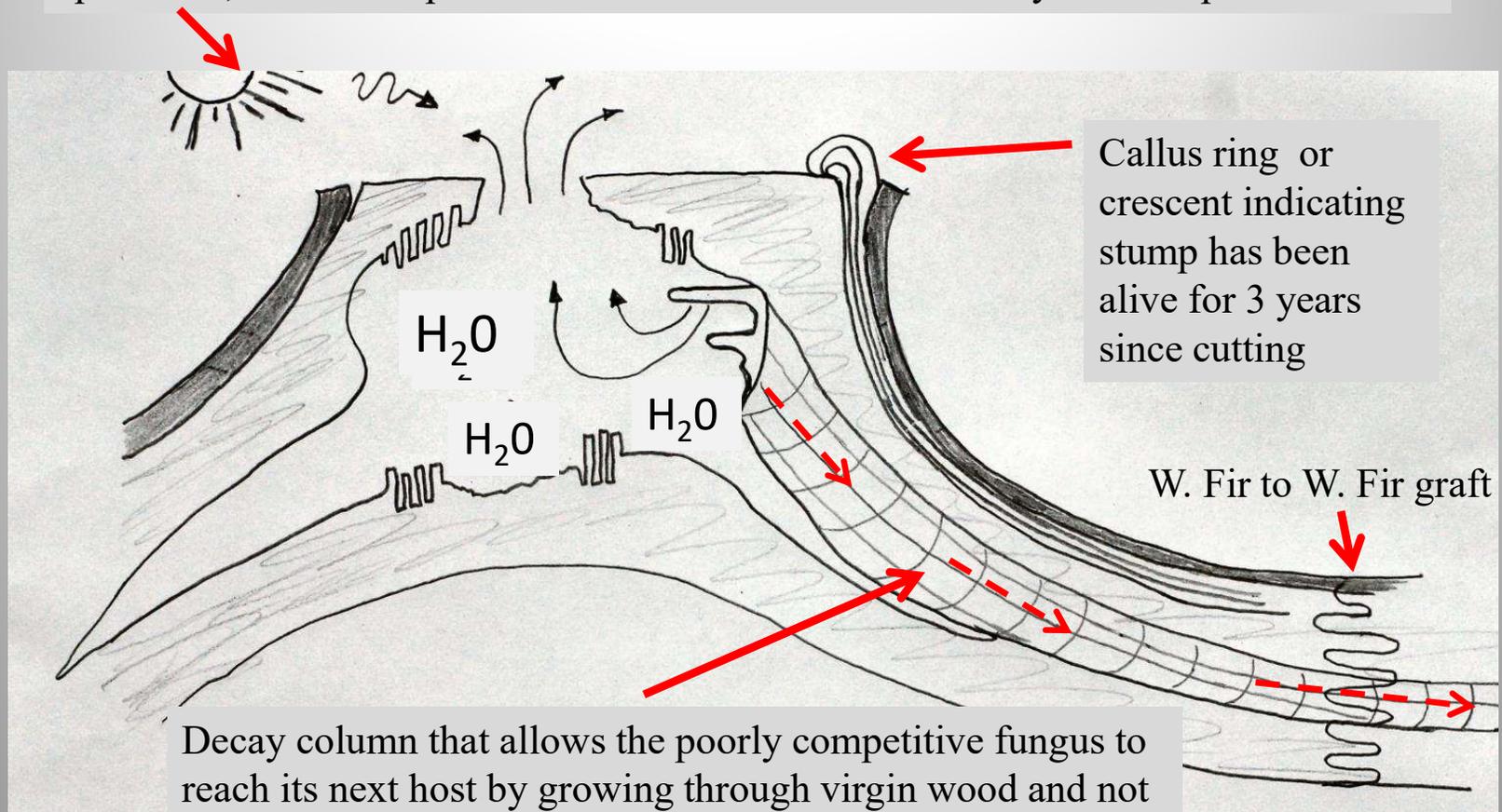
Answer = WF Stumps

WF stumps with Fir Annosus conks inside them!



Not pathologists !

(1) Sun warms the moist air in the decay chamber and the rising warm air carries the spores out, to be transported in the breeze to the next freshly cut stump.



Callus ring or crescent indicating stump has been alive for 3 years since cutting

W. Fir to W. Fir graft

Decay column that allows the poorly competitive fungus to reach its next host by growing through virgin wood and not have to encounter antagonistic organisms.

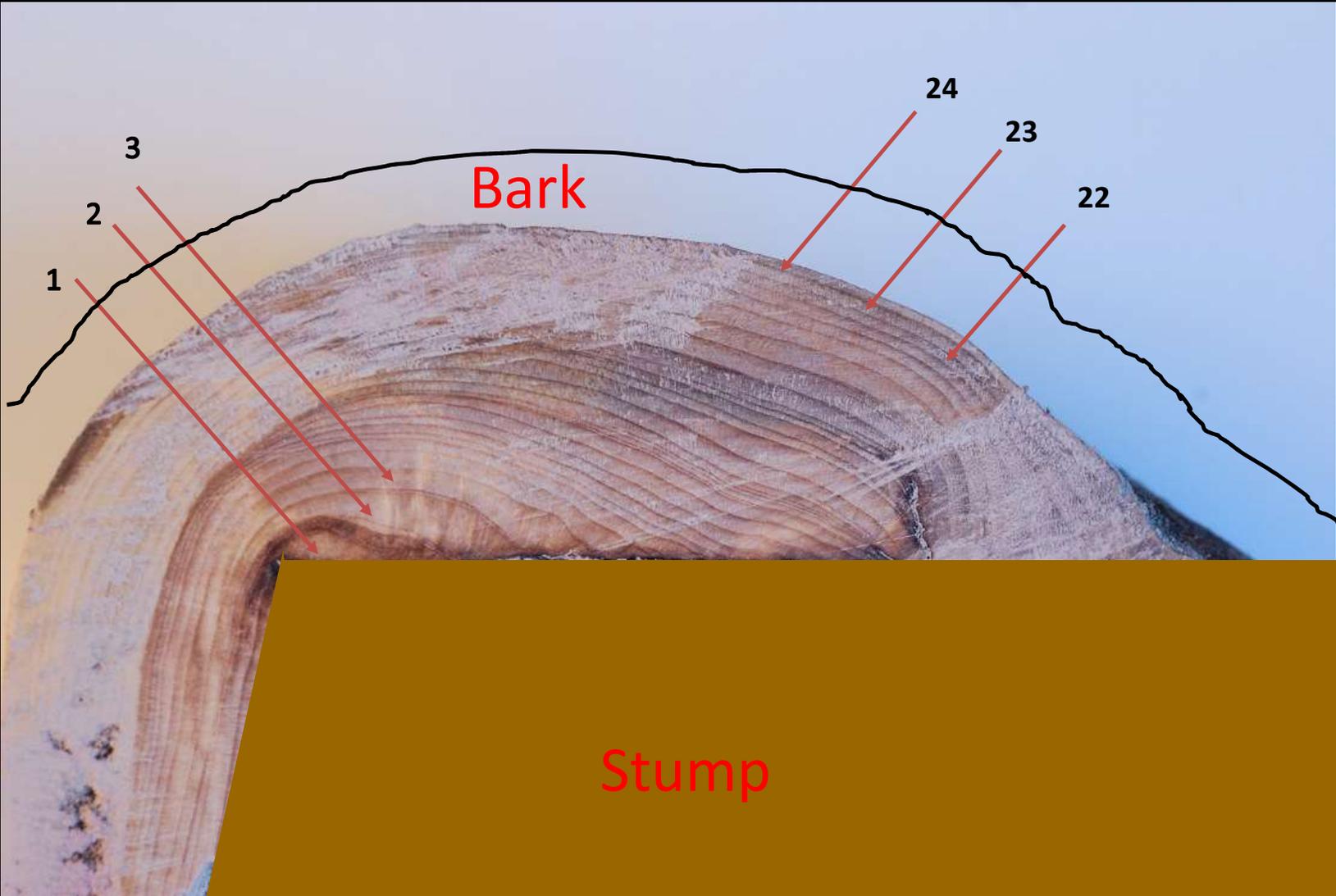
## Stump Survey of the Cold Springs Project

- In a survey of the Cold Spring project it was shown that 94% of the white fir stumps showed callusing which indicates that they were grafted to a once living adjacent white fir tree.
- Unfortunately, 82% of the time the closest white fir to those stumps had died by the time of the next entry.
- In the Cold spring survey 35 trees were cut (i.e., became stumps) but ~~64~~ 65 trees eventually died.

MacKenzie, unpublished







*If the number of WF stumps is the one thing that has changed since WWII.*

*What is the one thing that has not changed since WWI?*

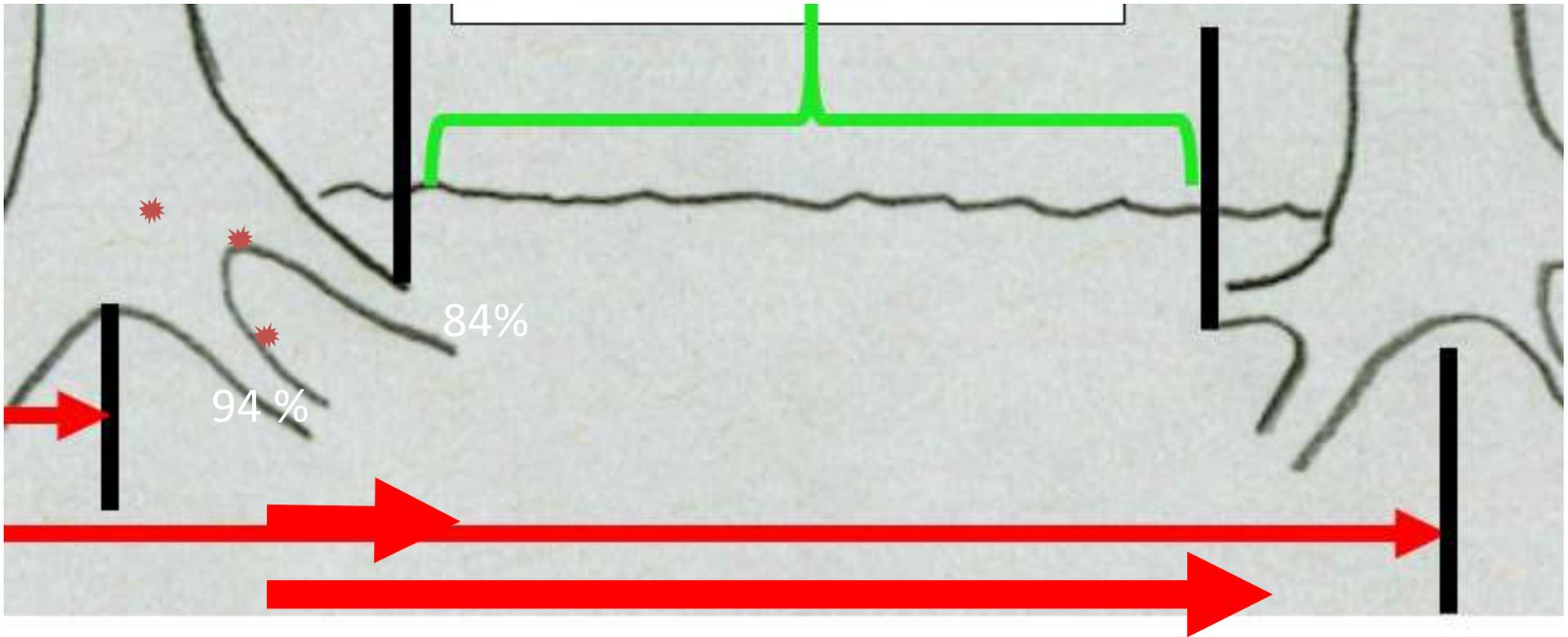
*Prejudice against white fir is widely established and not always confined to lumbermen. Only IC was considered a more inferior tree.*

*Meinecke (1916)*

*WF is still considered a “Weed” or at least a “Non-preferred” species.*

*Gordon (1978)*

*White fir is still considered a Trash Tree !*



and white fir tree.

Stump to the closest Living wh

Distance 2 ¼ ft  
0- 8 ft

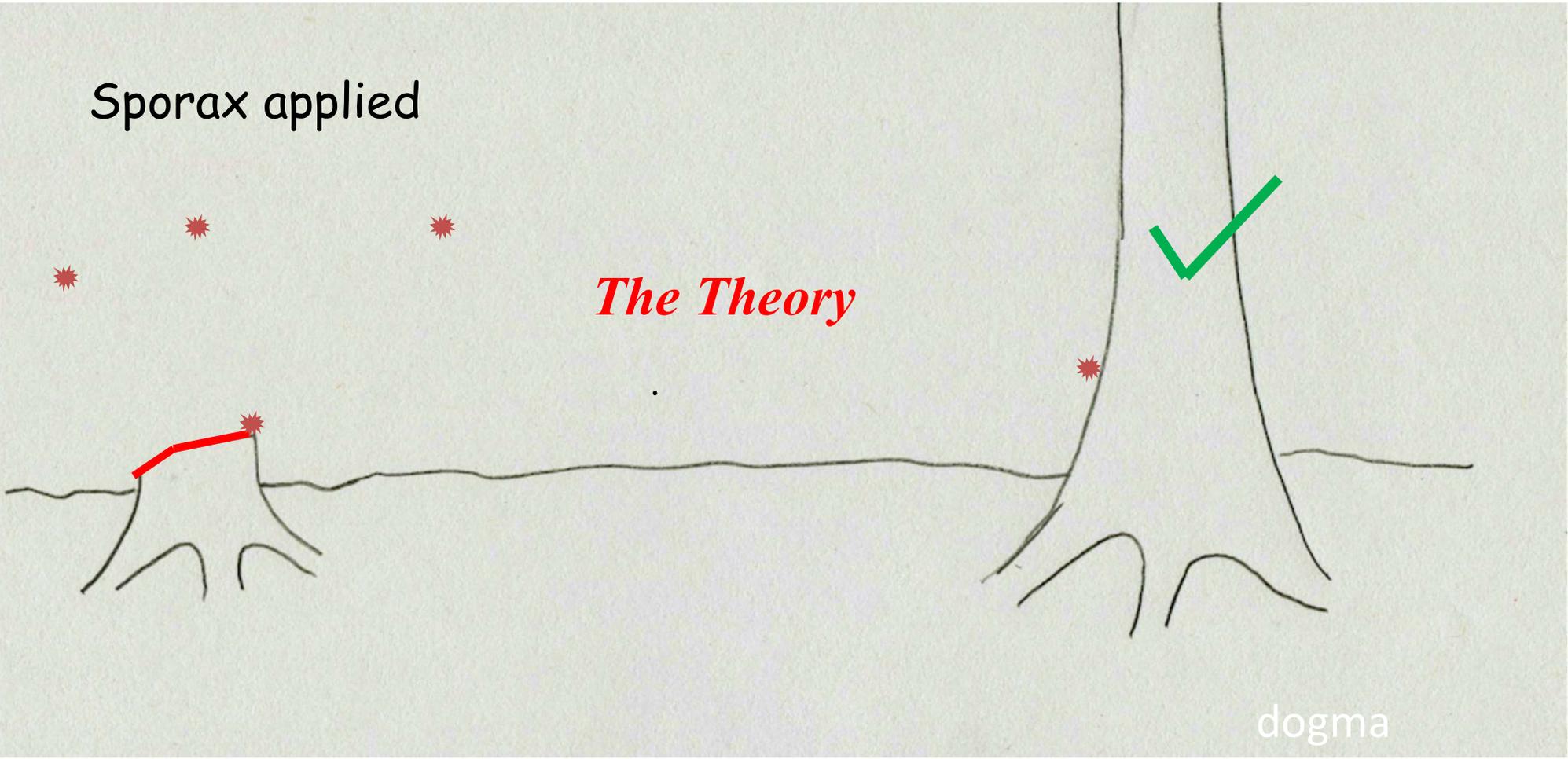
Average distance  
Range 13 - >5

Sporax applied

*The Theory*

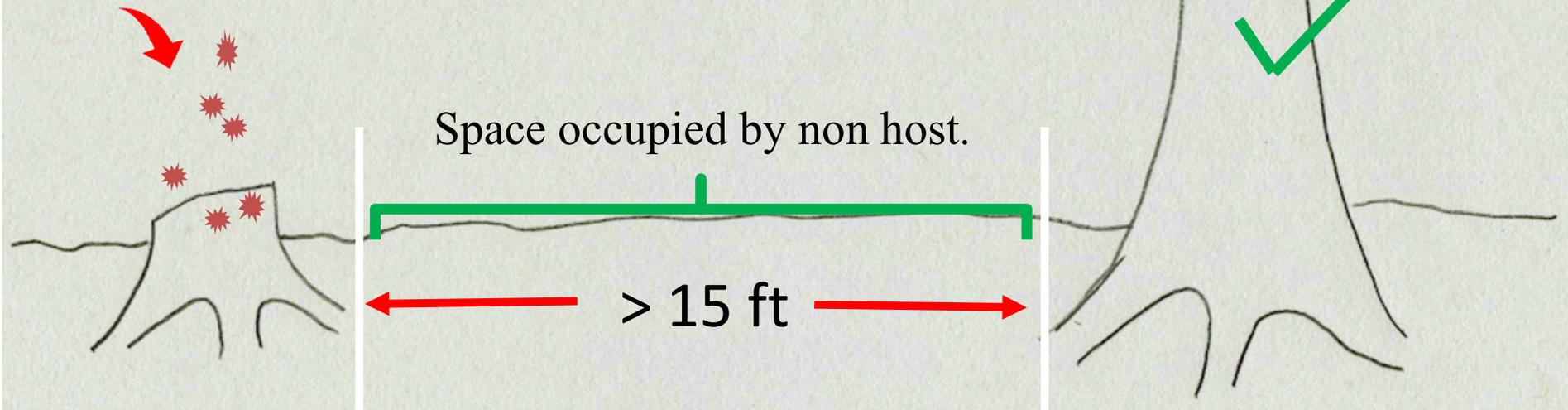


dogma



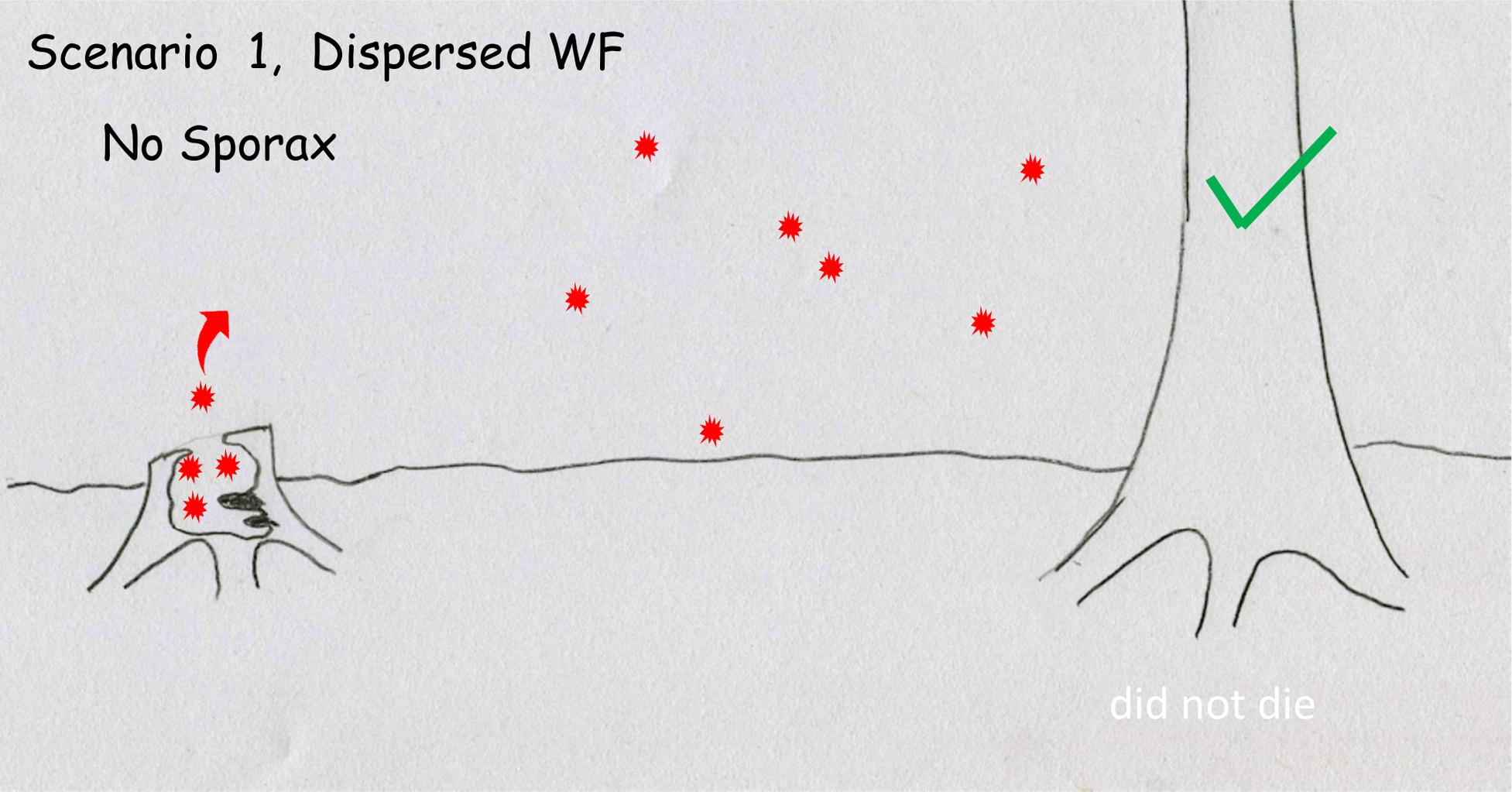
# Scenario 1, Dispersed WF

No Sporax



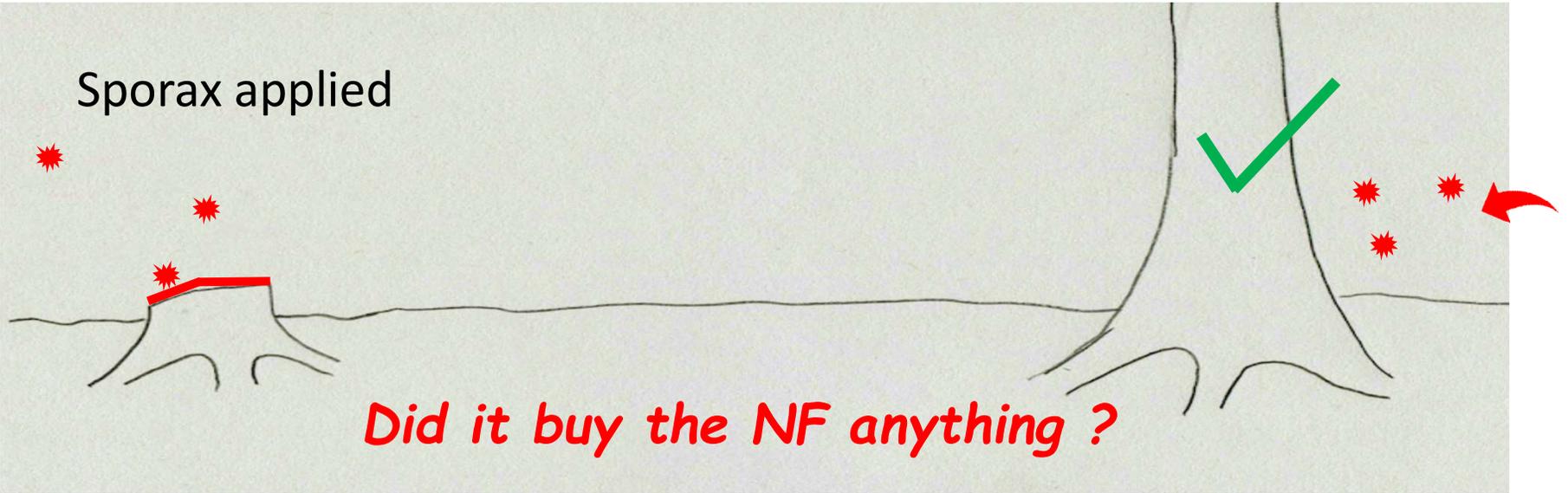
Scenario 1, Dispersed WF

No Sporax



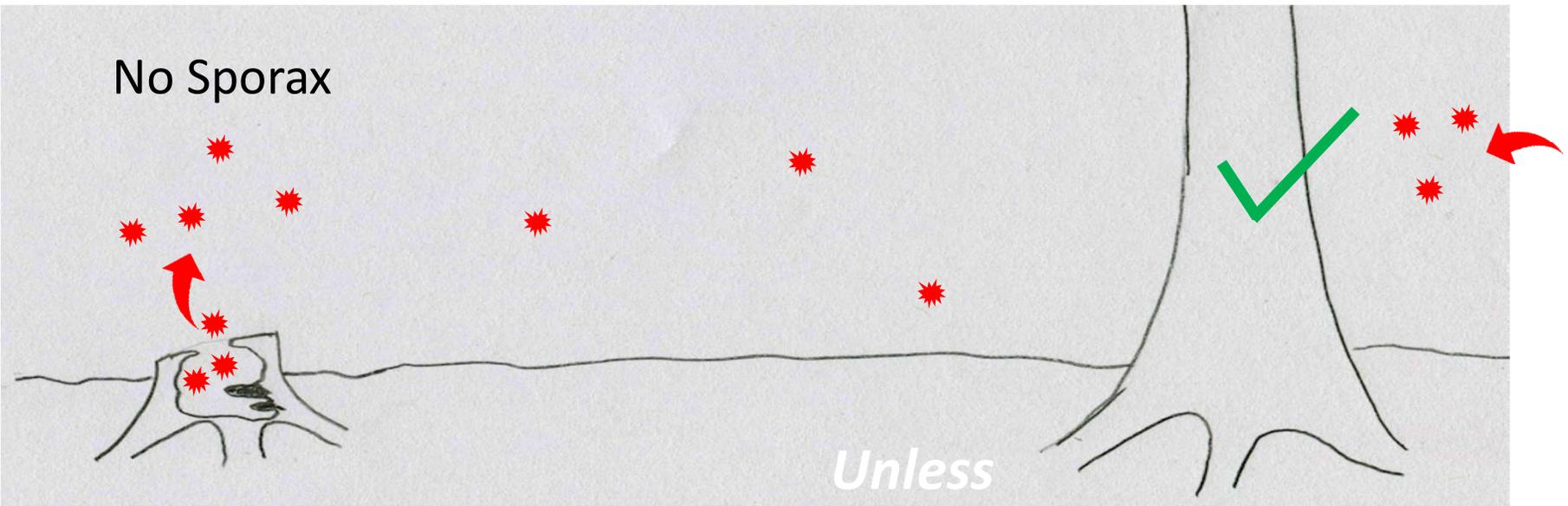
did not die

Sporax applied



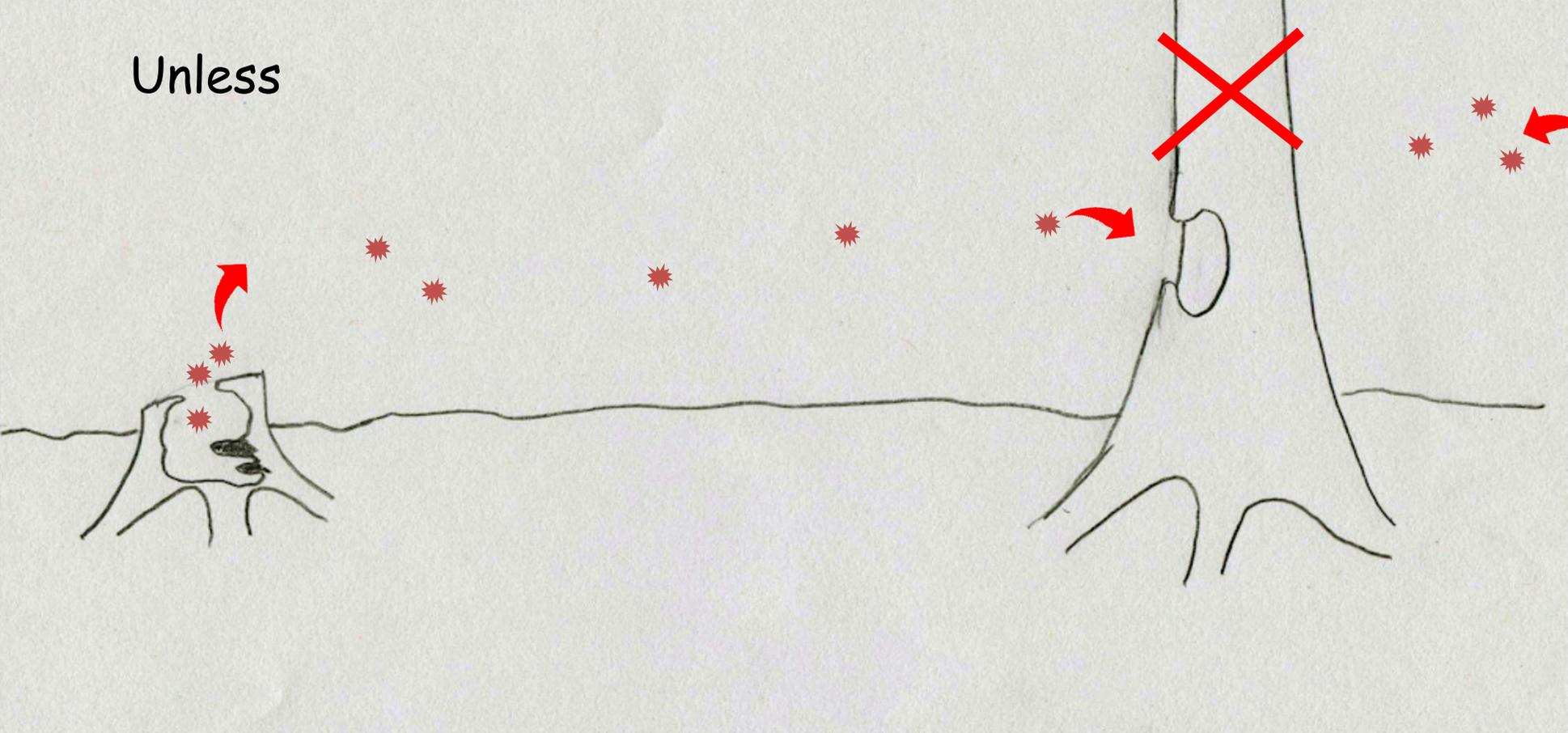
*Did it buy the NF anything ?*

No Sporax

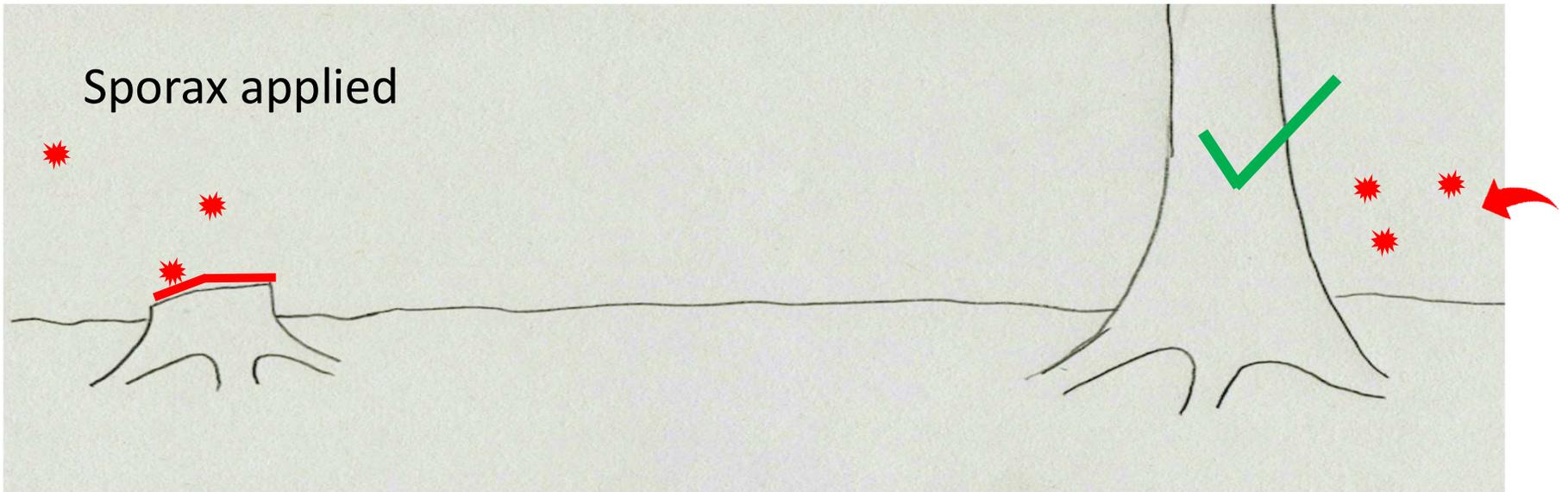


*Unless*

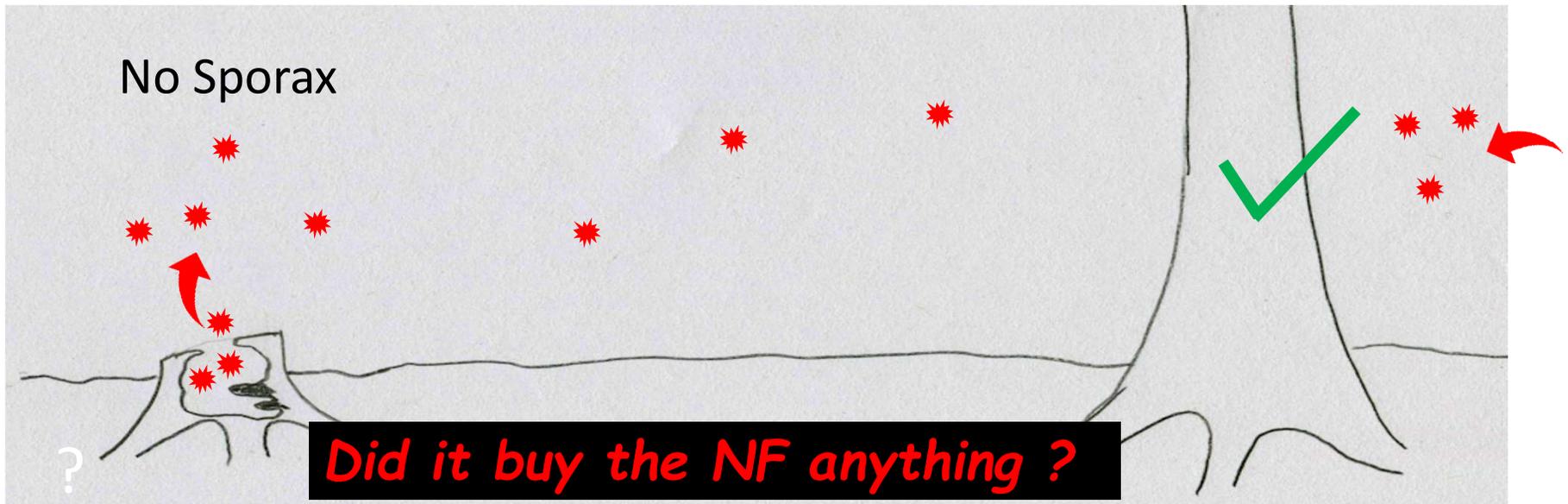
Unless



Sporax applied



No Sporax

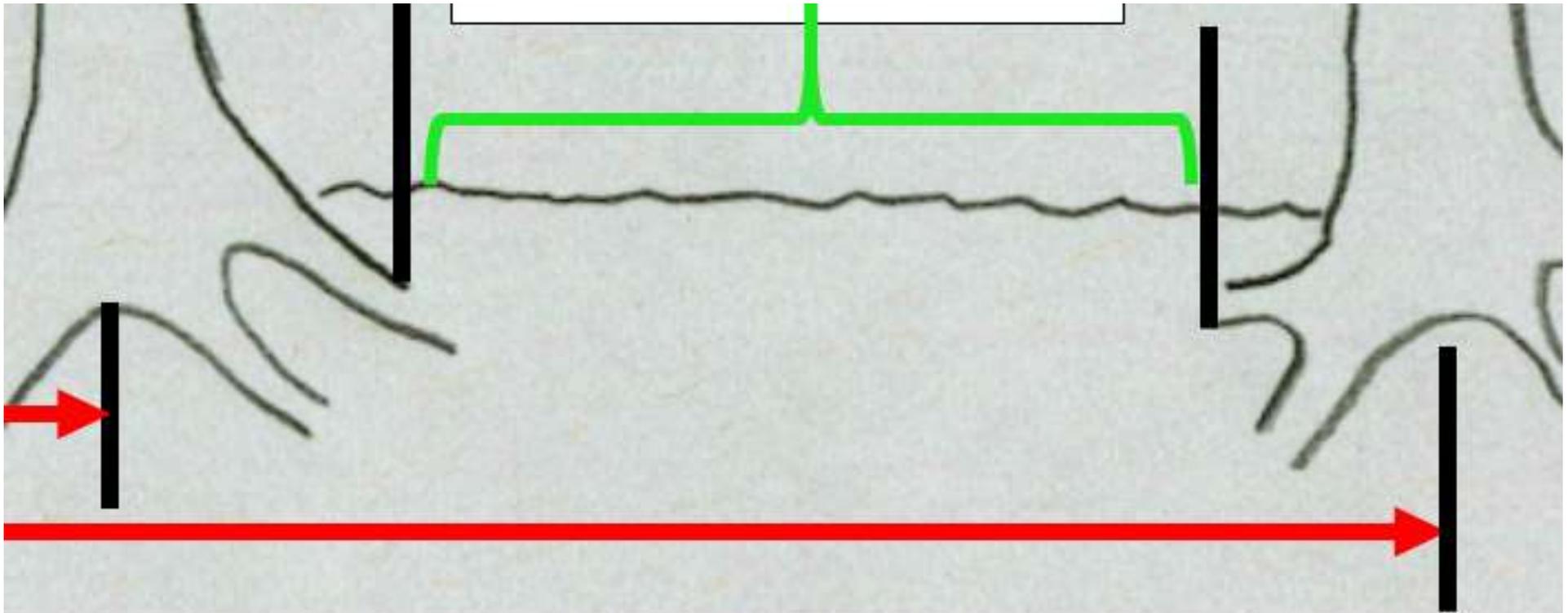


**Did it buy the NF anything ?**

The one Question I will ask.

*Are we trying to stop WF stump infections or  
are we trying to slow down WF mortality?*

*Degrees of WF clumpiness*

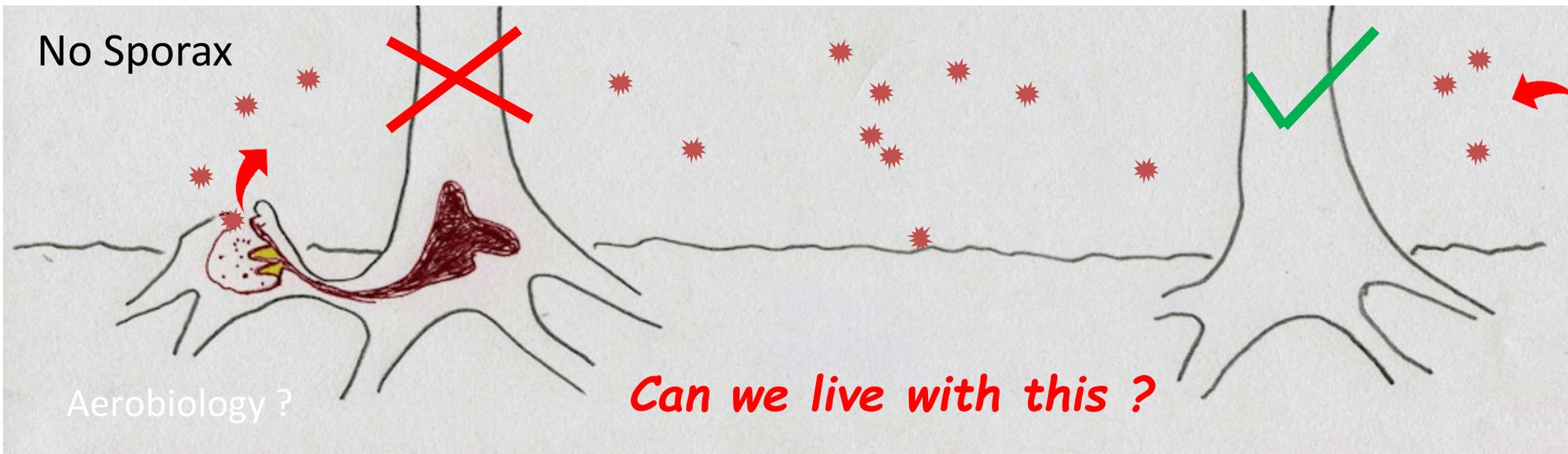


id white fir tree.

ance 2 ¼ ft

Stump to the closest Living wh

Average distanc



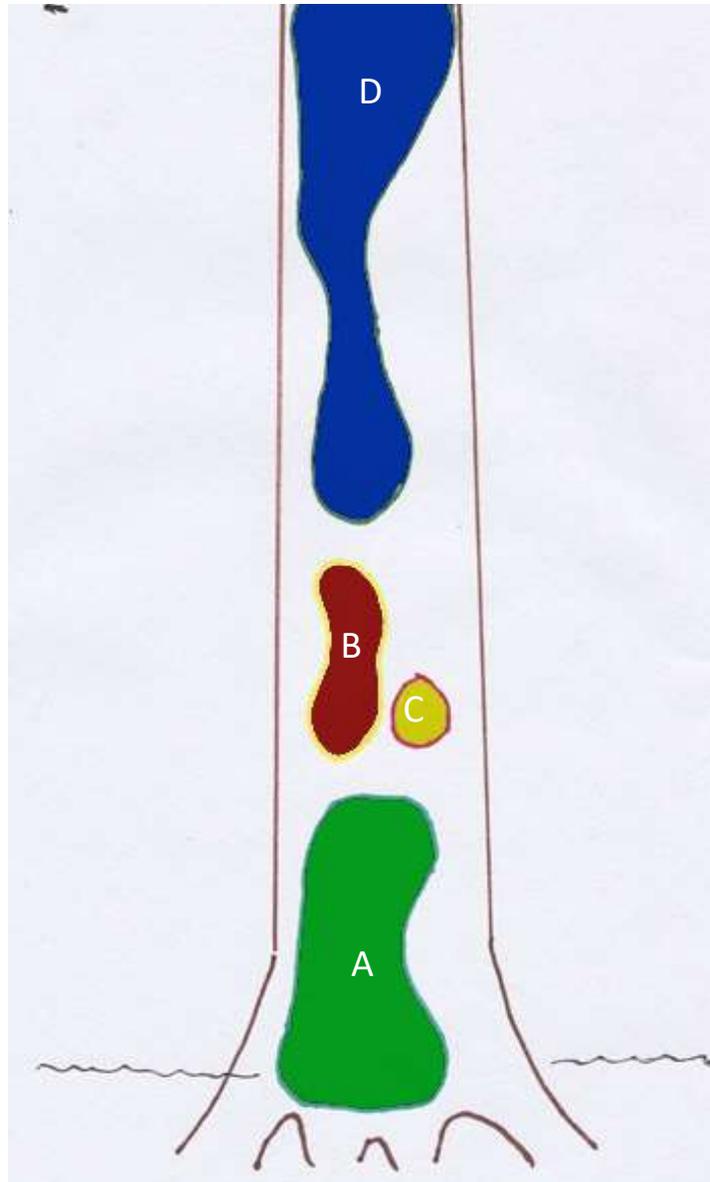
Fact 7.

*I haven't forgotten, Professors Bob Edmonds,  
Matteo Garbelotto and Dr Tom Hsiang &c. .*

Dick Parmeter,  
Fields Cobb,  
Garey Slaughter,  
Bill Otrosina,  
John Kliejunas,  
Adrian Poloni, ....

&C , &C .....

35 ft



Fir Annosus in W. Hemlock

- Chevaz *et al* (1980) 11 yrs after thinning 90% infected
  - 20 yrs 5% infected
  - Edmonds *et al* (1989) 93% had wetwood
- } Fir Annosus  
of W. Hemlock
- Slaughter & Parmeter (1989) associated wetwood in Fir Annosus of WF.

*“Borax does not appear to be effective for operational use in coastal Washington, although it may be effective if applied very carefully to stumps, particularly those close to the remaining trees.”*

Edmonds *et al* (1989)

Of 228 individual genotypes (i.e. unique infection events) 86% were found within a single stump or tree, and only 14% had spread to adjacent trees. Although they never found many large genotypes they did find that the largest distance that any of the 14% had spread was about 20 ft and the average was nearer 14 ft.

*“The isolation of *H. annosum* from the sound inner sapwood of asymptomatic trees, combined with the presence of a completely healthy root system, may indicate that the fungus undergoes a latent phase between infection and pathogenic wood colonization.”*

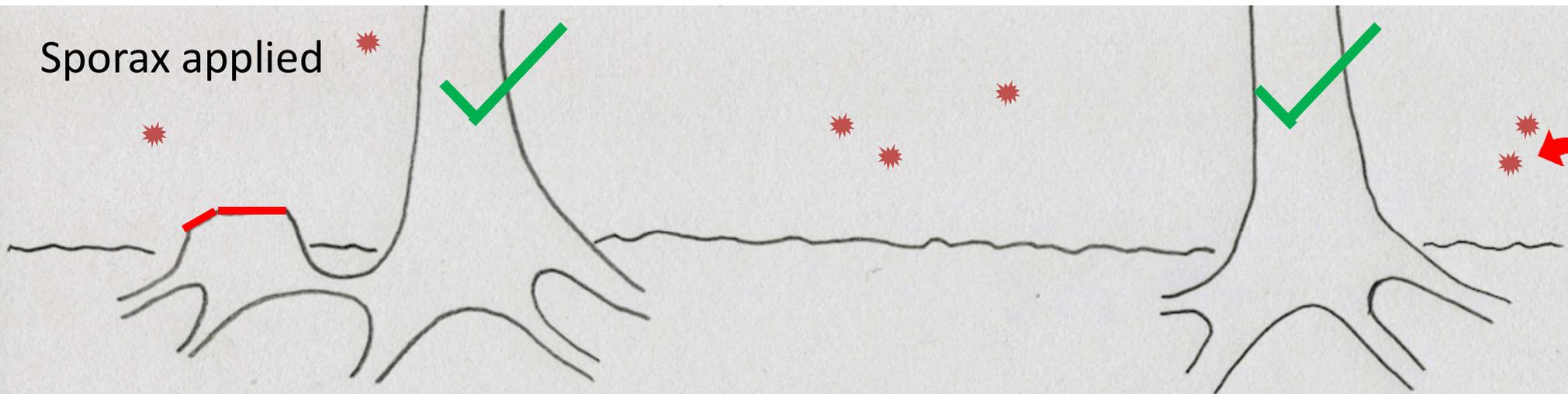
*“Stumps are not essential primary infection centers”. it is maintained “that live trees provide the most common infection courts for *H. annosum* in white fir stands of the Sierra Nevada ....”*

(Garbelotto *et al*, 1999).



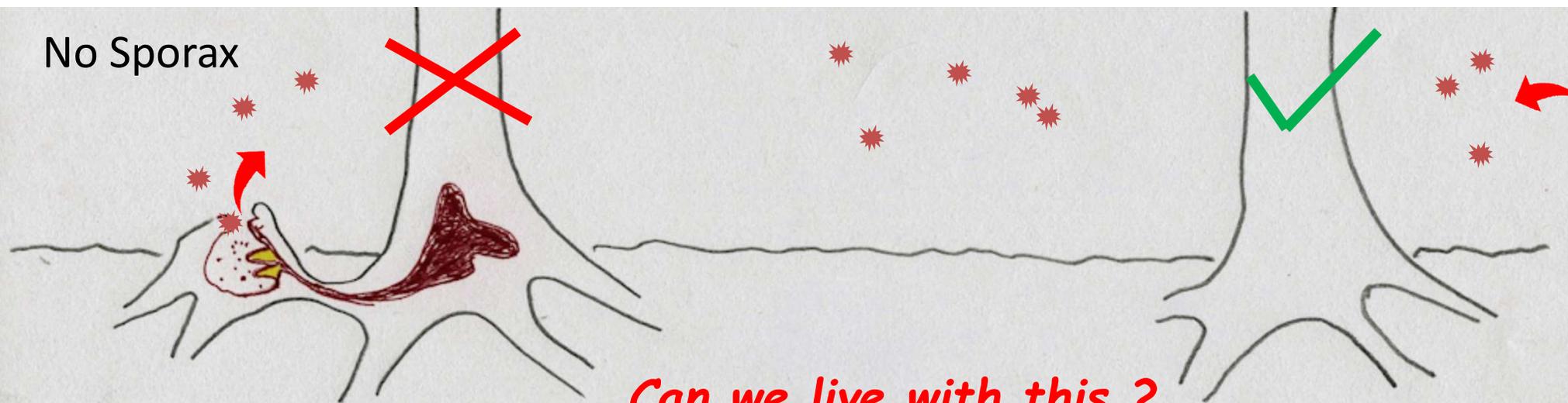


Sporax applied



Scenario 2. *Degrees of WF clumpiness*

No Sporax



*Can we live with this ?*

USFS Region 5 - BORATE STUMP TREATMENT PRIORITY BY FOREST CONDITION and HARVEST ACTIVITY			
Priority	HARVEST ACTIVITY in FOREST TYPE and CONDITION	*TREAT WHICH STUMPS?	WHY
Very Low	Salvage high severity burn (nearly all trees killed); plant	NONE	Little connectivity with seedling roots; Most dead roots get infected with competing organisms before seedling roots contact them
Very Low	Clearcut PP/JP, true fir or mixed conifer; any location including roadsides and powerline corridors	NONE	Very low probability of new establishing new infection centers
Very Low	Thin true fir which has widespread light to heavy HRD	NONE	Borates do not cure existing infection
Low	Thin PP/JP with no current or historic pine HRD within 1700 feet	NONE	Very low atmospheric spore concentration
Low	Thin PP/JP in mixed species stands; few >14" PP/JP stumps	NONE	Small pine stumps don't create HRD centers; small roots get infected fast with competing organisms
Low	Thin PP/JP in mixed species stands; few pine-to-pine root contacts	NONE	HRD won't spread from stumps that don't have root contact w/ live trees
Low	Thin Doug-fir; incense cedar; sugar pine; other conifers	NONE	Little evidence of HRD problems
Moderate	Salvage low to moderate severity burn (scattered remaining green trees)*	Consider treating >14" PP/JP and > 24" juniper stumps having possible root contact with high-value PP/JP. Treat true fir stumps in stands with no fir HRD	Borates do not cure existing infections. Treating pine stumps near high-value pine trees can protect residual pine from HRD. Large juniper stumps may facilitate spread to adjacent pines.
High	Any cutting, PP/JP, true fir in roadside and powerline corridors (including hazard tree removal and salvage* in low to moderate severity burns)	Treat all PP/JP and > 24" juniper stumps and true fir stumps >14"	Borates prevent infection; lower tolerance for new HRD centers in these areas. Large juniper stumps may facilitate spread to adjacent pines.
High	Thin PP/JP in mixed species stands; many >14" PP/JP stumps and pine-to-pine root contacts; pine HRD within 1700 feet (or distance to nearest HRD not known)	>14" PP/JP stumps (also >24" juniper stumps if present)	Borates prevent infection. Large juniper stumps may facilitate spread to adjacent pines.
High	Thin true fir with no HRD	> 14" fir stumps	Borates prevent infection
Very High	Thin PP/JP; many >14" stumps; pine HRD within 1700 feet (or distance to nearest HRD not known)	>14" PP/JP stumps	Every stump can start HRD centers
Very High	Recreation and Administrative Sites	>3" conifer stumps	Zero tolerance for new HRD centers in these areas means treating smaller stumps of all conifer species
Very High	Thin giant Sequoia groves; treat conifer stumps within 1700 feet of monarch giant sequoia trees	>3" conifer stumps	Zero tolerance for new HRD centers in these areas means treating smaller stumps of all conifer species

\* No need to treat stumps of trees with no needles or stumps of trees killed by fire >18 months earlier

**USFS Region 5 - BORATE STUMP TREATMENT PRIORITY BY FOREST CONDITION AND HARVEST ACTIVITY**

<b>Priority</b>	<b><u>HARVEST ACTIVITY in FOREST TYPE and CONDITION</u></b>	<b>*TREAT WHICH STUMPS?</b>	<b>WHY</b>
Very Low	Salvage high severity burn (nearly all trees killed); plant	NONE	Little connectivity with seedling roots; Most dead roots get infected with competing organisms before seedling roots contact them
Very Low	Clearcut PP/JP, true fir or mixed conifer; any location including roadsides and powerline corridors	NONE	Very low probability of new establishing new infection centers
Very Low	Thin true fir which has widespread light to heavy HRD	NONE	Borates do not cure existing infection
Low	Thin PP/JP with no current or historic pine HRD within 1700 feet	NONE	Very low atmospheric spore concentration

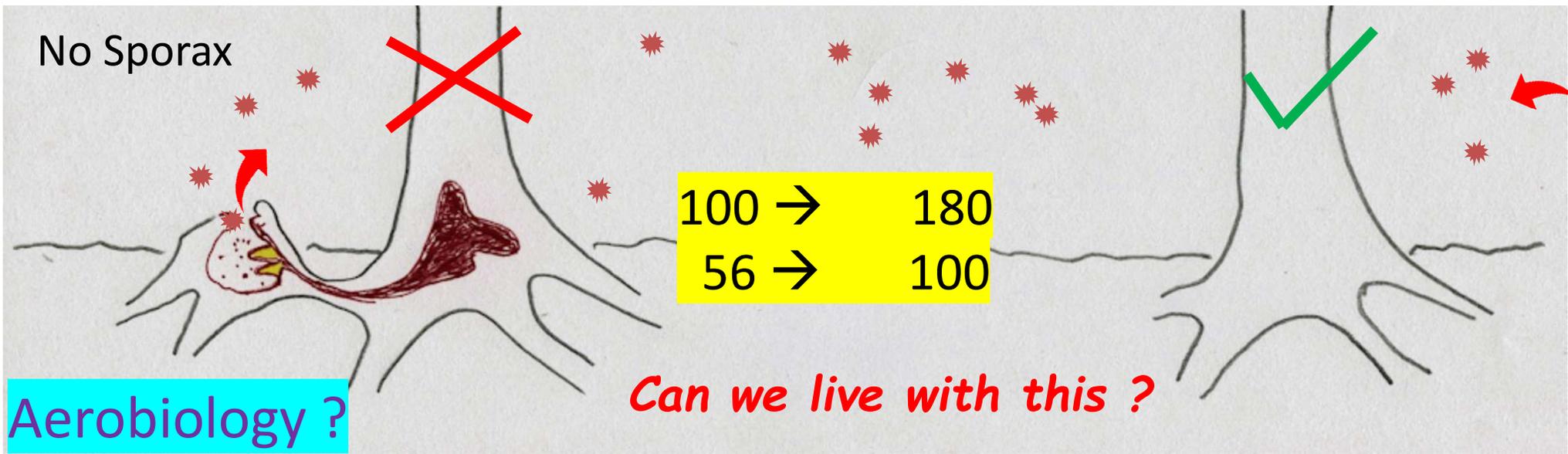
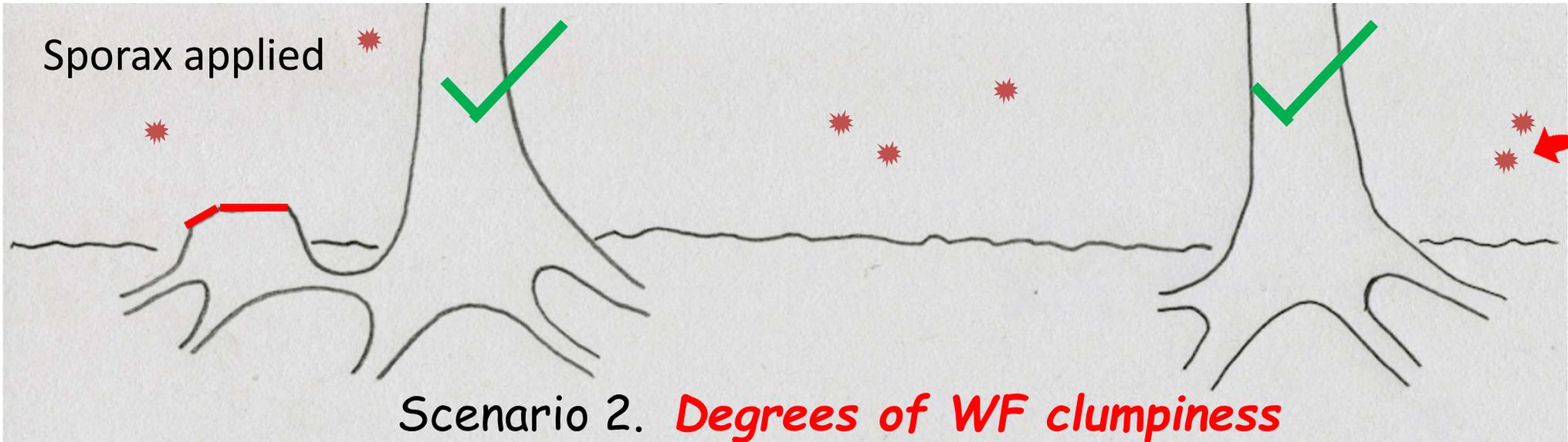
<https://www.fs.usda.gov/detail/r5/forest-grasslandhealth/insects-diseases/?cid=stelprdb5329386>

High	pine to pine root contacts; pine HRD within 1700 feet (or distance to nearest HRD not known)	(also treat jumper stumps if present)	may facilitate spread to adjacent pines.
High	Thin true fir with no HRD	> 14" fir stumps	Borates prevent infection
Very High	Thin PP/JP; many >14" stumps; pine HRD within 1700 feet (or distance to nearest HRD not known)	>14" PP/JP stumps	Every stump can start HRD centers
Very High	Recreation and Administrative Sites	>3" conifer stumps	Zero tolerance for new HRD centers in these areas means treating smaller stumps of all conifer species
Very High	Thin giant Sequoia groves; treat conifer stumps within 1700 feet of monarch giant sequoia trees	>3" conifer stumps	Zero tolerance for new HRD centers in these areas means treating smaller stumps of all conifer species

**\* No need to treat stumps of trees with no needles or stumps of trees killed by fire >18 months earlier**

Questioning the value of  
Borate Dressings.

M. MacKenzie 2021



***Please Remember***

***My observations are supported by the, peer reviewed,  
published literature;.....***

***Borating works if the new stump  
is close to a residual WF.***



Similar to a sign seen in a West Virginia dental surgery!

Sign in a WV dental Surgery.

*You don't have to floss all your teeth,  
only the ones you want to keep!*

Suggested update.

*You don't have to borate all your stumps  
only those that you think are a logging  
wound on an adjacent WF!*

*And if you can't tell ;*

*Borate the lot !!!!!*

*It's cheap insurance. P. Angwin*

*and its not a trash tree! M. MacK*

On reflection.

*Were we trying to stop the stump infections,  
of a trash tree ?*

*Red fir is not a trash tree, but the tree of the future !*

