

PLURIFOR Emerging Pests and Diseases Workshop - Task 2.2

An experience of control of fungal diseases in a *Pinus radiata* stand in Gipuzkoa, Basque Country

25th January 2018, INIAV - Oeiras, Portugal

Alejandro Cantero Amiano. HAZI Fundazioa

Example of emerging disease in the Basque Country: “cryptogamic red”

It is a set of defoliator fungi, present for many years in our forests

Lecanosticta acicola, *Dothistroma*, *Pestalotia*, *Naemacyclus*, ... are pathogens causing foliage diseases of conifers, especially *P. radiata* and *P. nigra*

In recent years, for unknown reasons, the damage has spread

This disease does not usually kill the pines, but it causes their defoliation, it weakens the pines and their growth is very low; Many forest owners end up cutting the pine forest and replacing it with other species

Each spring, new needles are formed and, when infected, they fall during the summer, especially if it is warm and rainy







Example of emerging disease in the Basque Country: “cryptogamic red”

Traditional solution: copper products, so that the needles become resistant

Bordeaux mixture (Bordo Mix) is a mixture of copper(II) sulfate (CuSO_4) and slaked lime (Ca(OH)_2) used as a fungicide. It is used in vineyards, fruit-farms and gardens to prevent infestations of downy mildew, powdery mildew and other fungi. It is sprayed on plants as a preventive solution

Copper is a classical phytosanitary in agriculture and it was the first effective pesticide. It protects crops from certain fungi, and is one of the few products (along with sulfur) of authorized mineral origin in organic farming. It should be noted that it is the only authorized bactericide in the European Union.

But in Spain there is no authorized copper product for forestry applications



cuprosan WG

COMPOSICIÓN:
cobre (óxido de cobre 50% p/p) (500 g/kg)

1 kg Contenido neto

Fungicida y bactericida preventivo

Granulado dispersable en agua (WG)

Antes de utilizar el producto, léase detenidamente la etiqueta. Uso reservado a agricultores y aplicadores profesionales.



FUNGICIDA CUPROCALCÍO

Covicampo BORDELES

POLVO MOJABLE (WP)

COMPOSICIÓN
Sulfato Cuprocálcico (expr. en Cobre) 20,0% p/p (200 g/kg)

Contenido neto 5 kg

Inscrito en el R.O.P.F. con el N° 20.048.

ANTES DE USAR EL PRODUCTO LEER PORSI LA FOLLETA
USO RESERVADO A AGRICULTORES PROFESIONALES
A FIN DE EVITAR RIESGOS Y EL MEDIO AMBIENTE DE USO.

SAPEC AGRO ESPAÑA

SAPEC AGRO ESPAÑA S.A.
Parque Industrial Tercio de Comercio 3 Pta. 1
41011 PATENA (Sevilla) España
Tel. 94 141130 Fax. 94 141131



hazi

Landa eta itsas ingurunearen
garapenerako Eusko
Jauriaritzaren Korporazioa

Corporación del Gobierno
Vasco para el desarrollo
del medio rural y marino



Experience proposed by Gipuzkoa Provincial Government, Forest Owner Association and HAZI

300 ha forest of *P. radiata*, located in the center of Gipuzkoa, 20 years old and affected for 10 years

Typical solutions have not worked: pruning, clearing, fertilisation

The possibility of testing new control systems in small areas of the forest is raised in the summer of 2017

Busca un municipio, localidad, calle o portal

Map navigation controls: zoom in (+), zoom out (-), home, scale 15, and user icon.

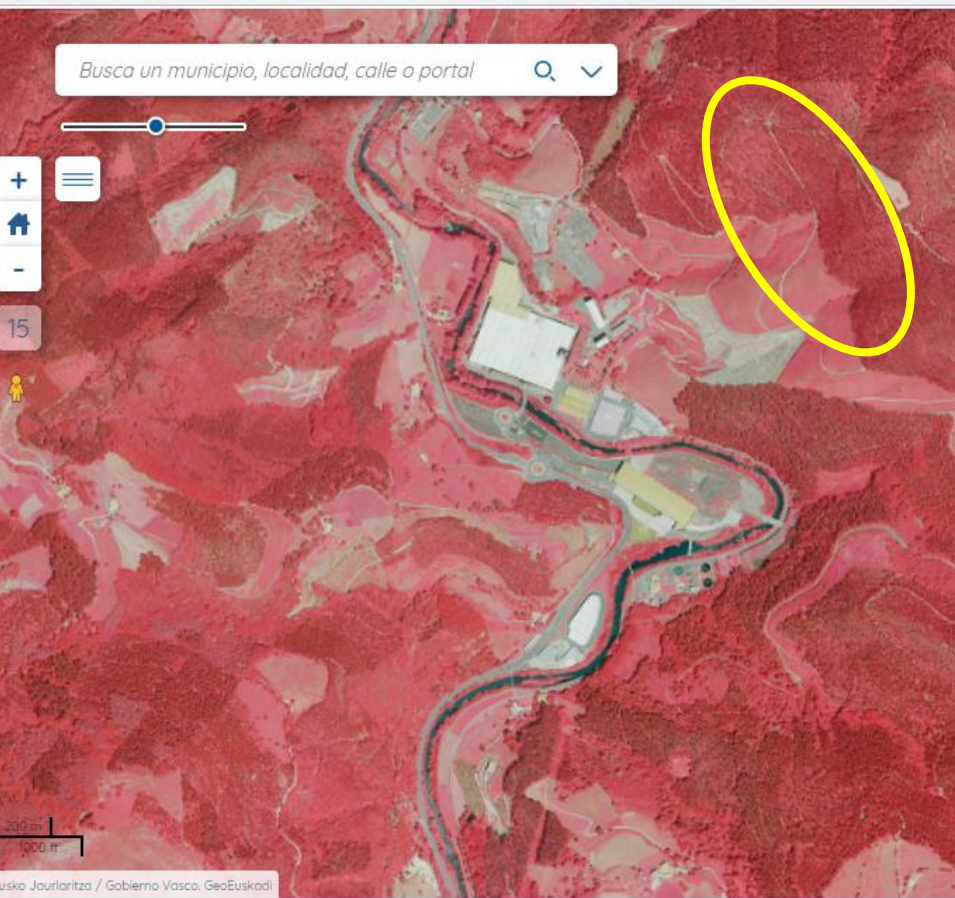


Capas base

ORTO 2016 0,25M	CARTOGRAFÍA BÁSICA	HÍBRIDO

Otros mapas base

- Orto 2011 0,25m
- Falso Color 2011 0,25m
- Orto 2010 0,25m
- Falso Color 2010 0,25m
- Orto 2009 0,25m
- Falso Color 2009 0,25m
- Orto Urbana 2007-2009 0,07m
- * Orto Núcleos Álava. Diversos Años. Fuente...
- Orto 2008 0,25m
- Falso Color 2008 0,25m
- Orto 2007 0,50m
- Orto 2006 0,25m



Experience proposed by Gipuzkoa Provincial Government, Forest Owner Association and HAZI

Two copper application systems are tested in June 2017:

- 1.- endotherapy in various trees
- 2.- application of sprayed product by truck and hose on a small forest surface

1st Experience: endotherapy

It is used Cuprosan and Bordeaux mixture

The doses are applied depending on the perimeter of the tree: One for every 30 cm. The amount applied per dose is 10 cc in the case of Cuprosan and 15 cc in the case of Bordeaux mixture. The application is simpler with Bordeaux mixture, because Cuprosan seems to precipitate more easily.

Various locations:

Plot 1.- 6 trees in *Pinus radiata* stand, planted in 1994 (dense pine forest)

Plot 2.- 2 trees in *Pinus radiata* stand, planted in 1992 (bad pine forest)

Plot 3.- 6 trees in *Pinus radiata* stand, planted in 1995 (bad pine forest)

Plot 4.- 6 trees in *Pinus laricio* stand, planted in 1993 (good development)

Plot 5.- 9 trees in Douglas fir stand, planted in 1992 (good development)

hazi

Landa eta itsas ingurunearen
garapenerako Eusko
Jauriaritzaren Korporazioa

Co
Ve
de



anted in 199
anted in 199
anted in 199
anted in 1993
anted in 1992



erreg
doe



Plans transnationaux
pour la gestion des
risques forestiers

LURIFOR

Development Fund

2nd Experience: application from truck

It is used Bordeaux mixture: 24 kg in two tanks with 1.000 liters of water each one

The ULV mean dose has been 1 l/m on each side of the road along 1 km of P. radiata stand. More or less, the product reaches 20-25 m from the truck. 5,5 kg/ha of Bordeaux mixture = 450 l/ha of application

Several problems: 1) with a little rainy weather and 2) with the form of application: speed of advance of the truck, width of the nozzle, ...





First results of experience: chemical analysis

During November 2017, collection of needles in the low branches of 24 pines is done: 8 in the endotherapy zone and 16 in the area treated with truck

Area	mg/kg of Cu in treated pines	mg/kg of Cu in no-treated pines
Endotherapy	51	32
Treated with truck	45	<2,5





Gipuzkoako Foru Aldundia

Berrikuntzako, Landa Garapeneko eta Turismoko Departamentua
Departamento de Innovación, Desarrollo Rural y Turismo



FRAISORO

INGURUMEN ETA NEKAZAL LABORATEGIA
LABORATORIO AGROAMBIENTAL

Markosbaso					Metal berunak						
Zenbakia	Partzela	Lagina	Produktua	Tratamendua	mg/kg Cu	mg/kg As	mg/kg Cd	mg/kg Cr	mg/kg Fe	mg/kg Mn	mg/kg Ni
201716216	1 partzela	10 Lurak	Cuproan WG	Endoleptia	91,6	<2,5	<0,7	<2,5	165	210	<2,5
201716217		10			60,4	<2,5	<0,7	<2,5	73,6	321	<2,5
201716218	2 partzela	20			50,1	<2,5	<0,7	<2,5	90	267	<2,5
201716219		Tratatu gabe			41	<2,5	<0,7	<2,5	90,7	250	<2,5
201716220		48			42	<2,5	<0,7	<2,5	122	370	9,17
201716221	3 partzela	58	Coviran po bordak	Endoleptia	31,8	<2,5	<0,7	<2,5	85,8	256	6,31
201716222		68			27,4	<2,5	<0,7	<2,5	82,6	318	3,55
201716223		Tratatu gabe			20,3	<2,5	<0,7	<2,5	88,4	240	<2,5
Basalen											
201716224	Edarnakia	Edar1	Ondo leinco	Basalen	104	<2,5	<0,7	2,67	274	207	<2,5
201716225	Edarnakia	Edar2			29,7	<2,5	<0,7	<2,5	232	170	3,37
201716226	Edarnakia	Edar3			51,7	<2,5	<0,7	<2,5	250	276	3,13
201716227	Edarnakia	Edar4			33,2	<2,5	<0,7	<2,5	223	102	<2,5
201716228	Edarnakia	Edar5			11,6	<2,5	<0,7	<2,5	166	190	5,05
Basalen					Media	<2,5	<0,7	<2,5	229	191	-
					CV(%)				18	33	
201716229	Eskuakia	Esku1	Ondo leinco	Basalen	62,2	<2,5	<0,7	2,69	248	237	<2,5
201716230	Eskuakia	Esku1 leinco			24,7	<2,5	<0,7	3,25	333	139	2,81
201716231	Eskuakia	Esku2			69	<2,5	<0,7	<2,5	176	247	<2,5
201716232	Eskuakia	Esku3			14,9	<2,5	<0,7	<2,5	236	154	4,07
201716233	Eskuakia	Esku4			70,9	<2,5	<0,7	<2,5	140	211	3,81
201716234	Eskuakia	Esku5			20	<2,5	<0,7	<2,5	144	136	3,67
Basalen					Media	<2,5	<0,7	-	213	187	-
					CV(%)				35	27	
201716235	Basalen	Tratatu gabe1		Basalen	<2,5	<2,5	<0,7	<2,5	162	180	<2,5
201716236	Basalen	Tratatu gabe2			<2,5	<2,5	<0,7	<2,5	201	149	2,83
201716237	Basalen	Tratatu gabe3			<2,5	<2,5	<0,7	2,5	248	97,2	<2,5
201716238	Basalen	Tratatu gabe4			<2,5	<2,5	<0,7	3,1	290	136	<2,5
201716239	Basalen	Tratatu gabe5			<2,5	<2,5	<0,7	<2,5	233	138	2,64
Basalen					Media	<2,5	<2,5	<0,7	-	227	140
									21	21	

Izurkilen 2017ko abenduaren 29an

Ixaskun Carton eta Amaia Urkola

First results of experience: NDVI analysis by dron

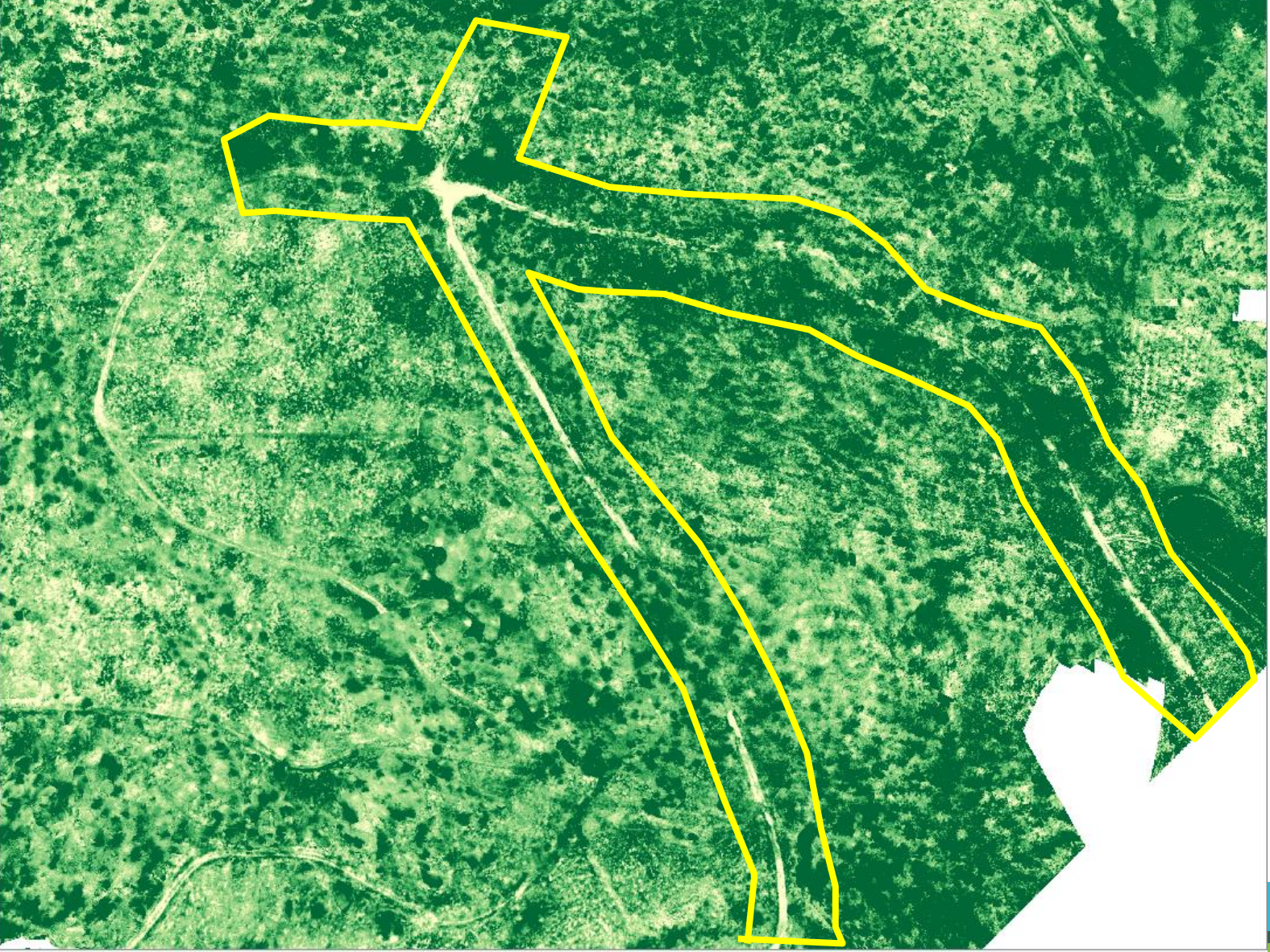
During December 2017, a part of the area treated with truck was flied by dron and IR image

The pines treated from the road show better photosynthetic activity (higher NDVI index) than the untreated pines



Panel de capas

- 20171115_...
 - 0.510088
 - 0.604868
 - 0.699647
 - 0.75
 - 0.8



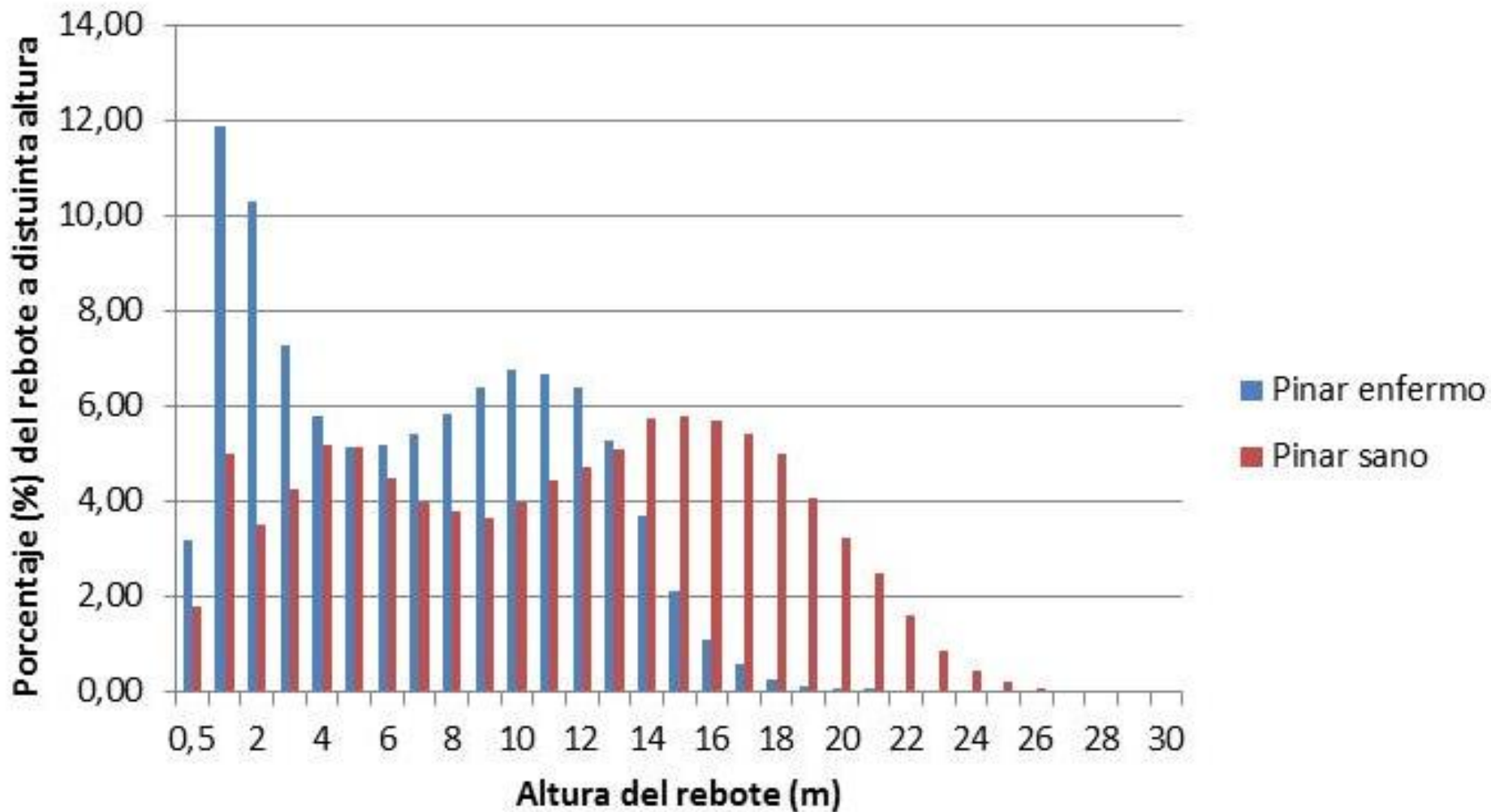
And now what?

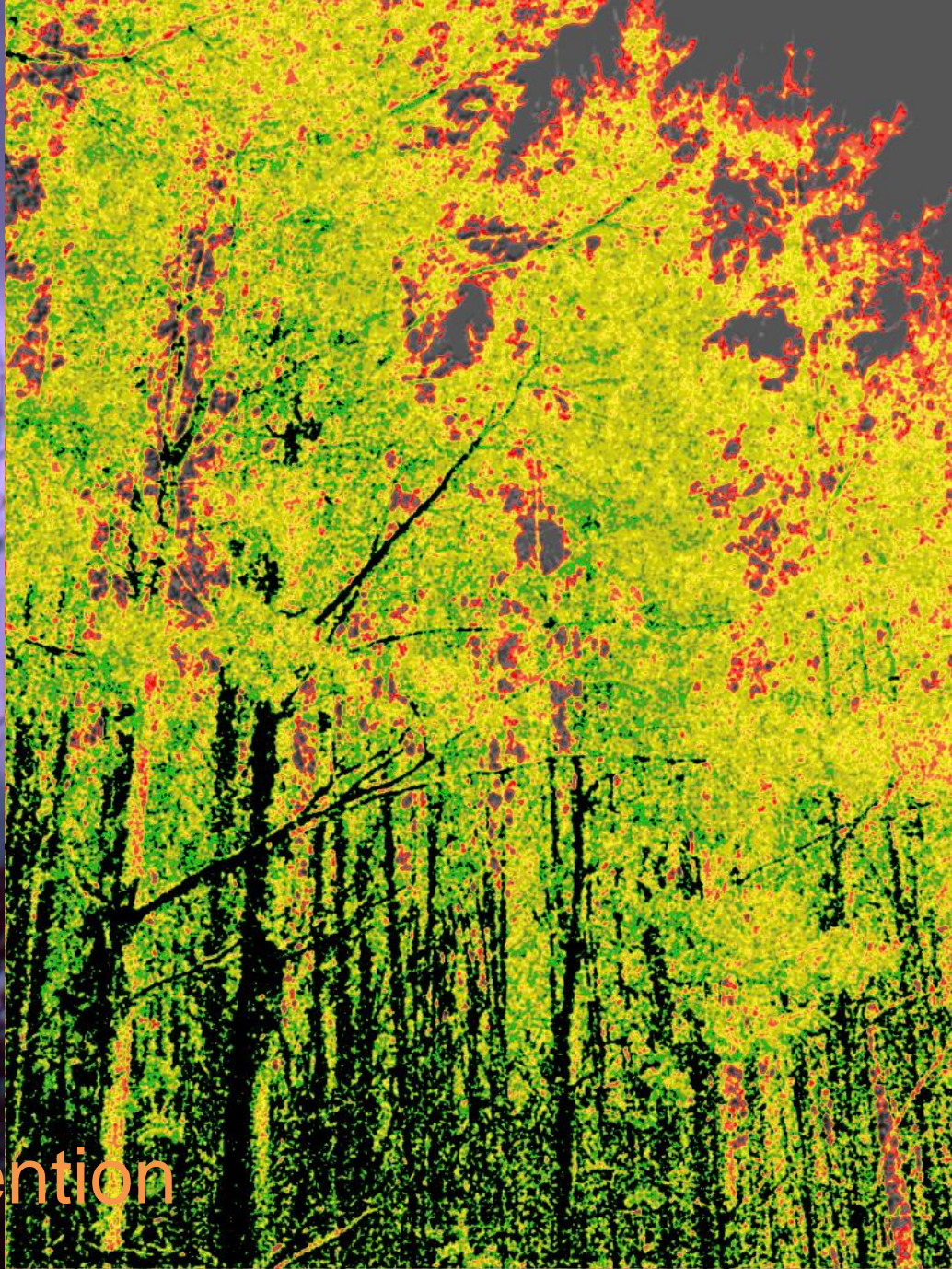
We want to continue in 2018 the evaluation in the areas already treated

We want to repeat and extend the experience of the Bordeaux mixture in other affected forests of Gipuzkoa from next spring. Endotherapy is very expensive

Will it be possible to get the authorization of a product and a dose of forest application of copper products? Is there another solution?

We all work together in the quantification of defoliation (visual inventory by Forest Administration or by Forest Owner Associations, recent LiDAR flight by Healthy Forest LIFE project) and in the search for solutions





Thank you for your attention
We keep working...

