Soil degradation

“Soil management is sustainable if the supporting, provisioning, regulating, and cultural services provided by soil are maintained or enhanced without significantly impairing either the soil functions that enable those services or biodiversity. The balance between the supporting and provisioning services for plant production and the regulating services the soil provides for water quality and availability and for atmospheric greenhouse gas composition is a particular concern” (GSP, 2017).

Plan to manage the risk of soil degradation

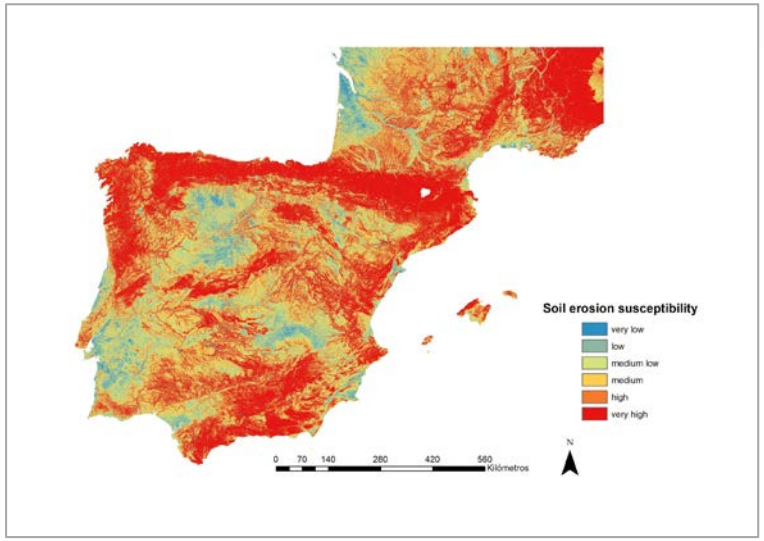
Focus for the plan

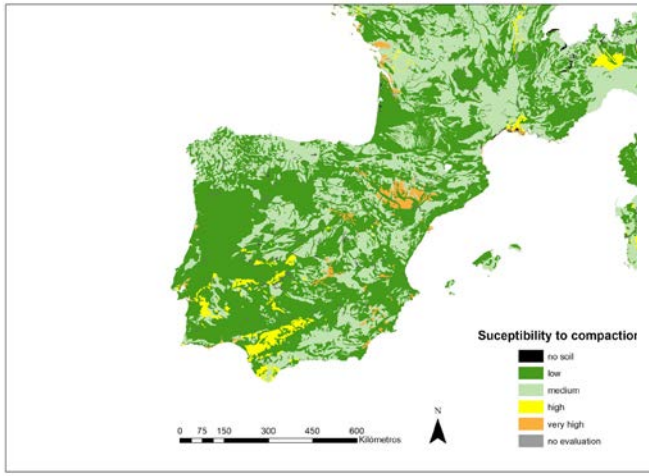
- Water Erosion
- Compaction
- Landslides
- Loss of Organic Matter and Nutrient Depletion
- Biodiversity loss

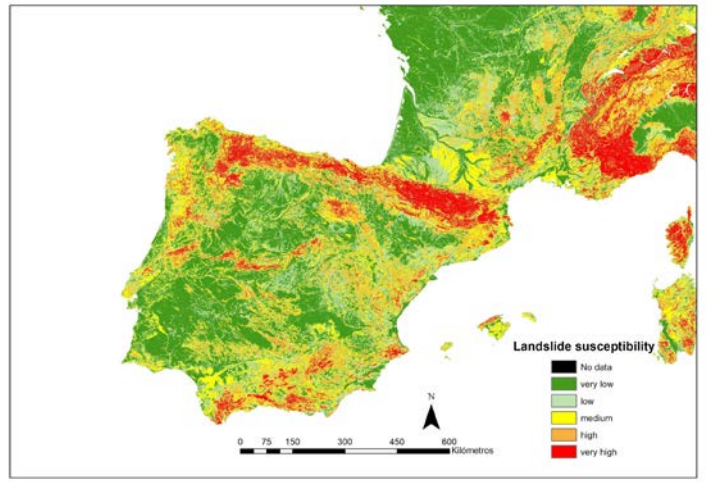
Risk assessment

Detection and Identification: Vulnerability

Water Erosion, Compaction and Landslides Susceptibility from JRC developed maps. Multi-Risk Assessment





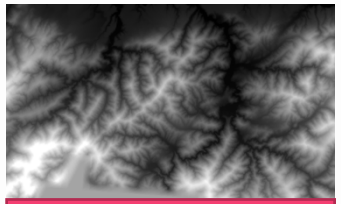


Asturias and Basque Country are developing new tools with higher resolution .

Risk assessment

Asturias: Development of soil erosion map. Use of LiDAR data to improve LS and C factor.

LS
slope length and steepness factors → LiDAR PNOA

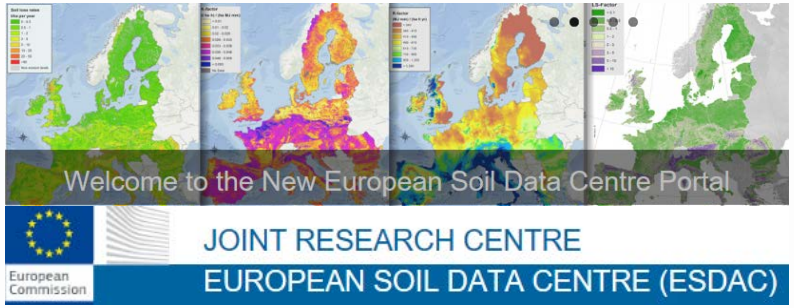


MDT (5 m pixel)

C
Land cover management factor → LiDAR PNOA

FCC y H arbolado

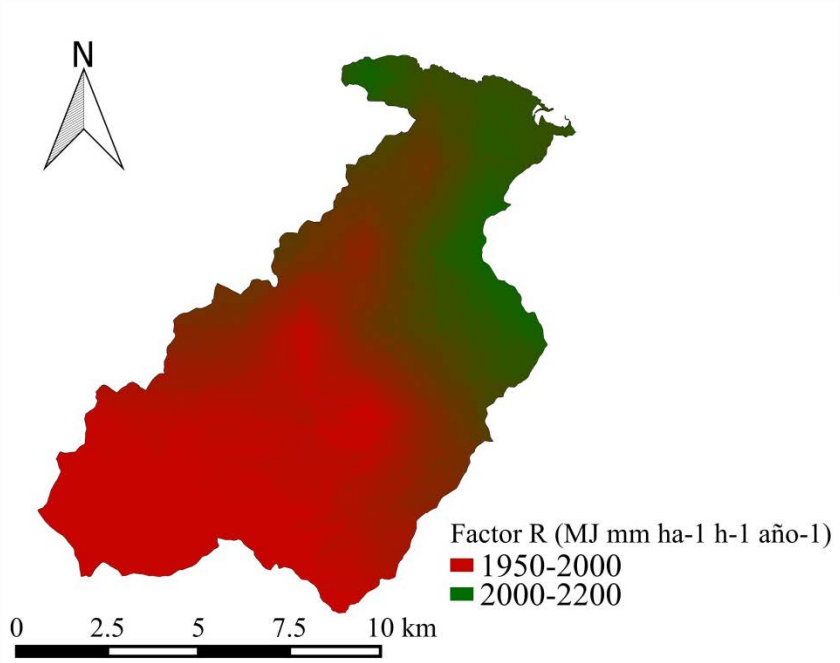
FCC y H Matorral

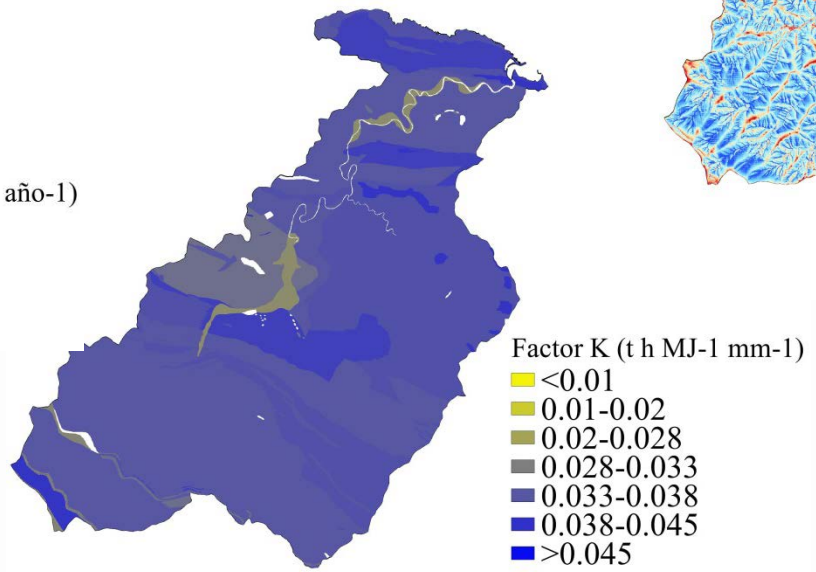


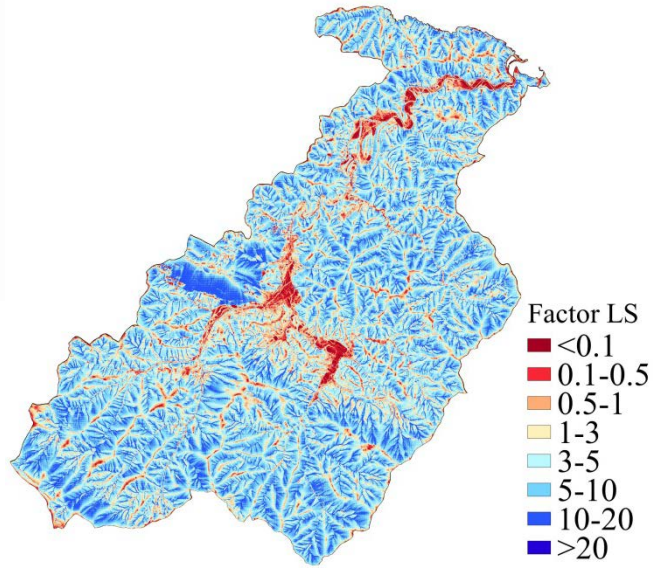
RUSLE → A=R.K.LS.C.P

Risk assessment

Basque Country: Monthly rainfall erosivity and soil erodibility. Soil Compaction







Contingency plan

Prevention

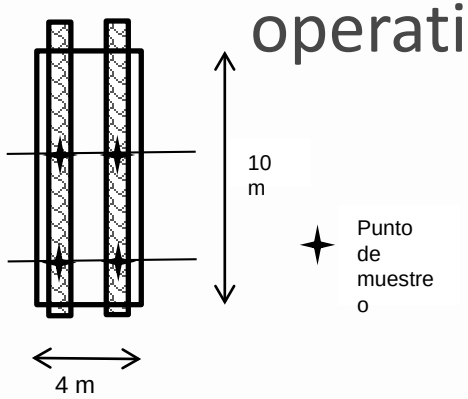
Voluntary Guidelines for Sustainable Soil Management

GLOBAL SOIL PARTNERSHIP

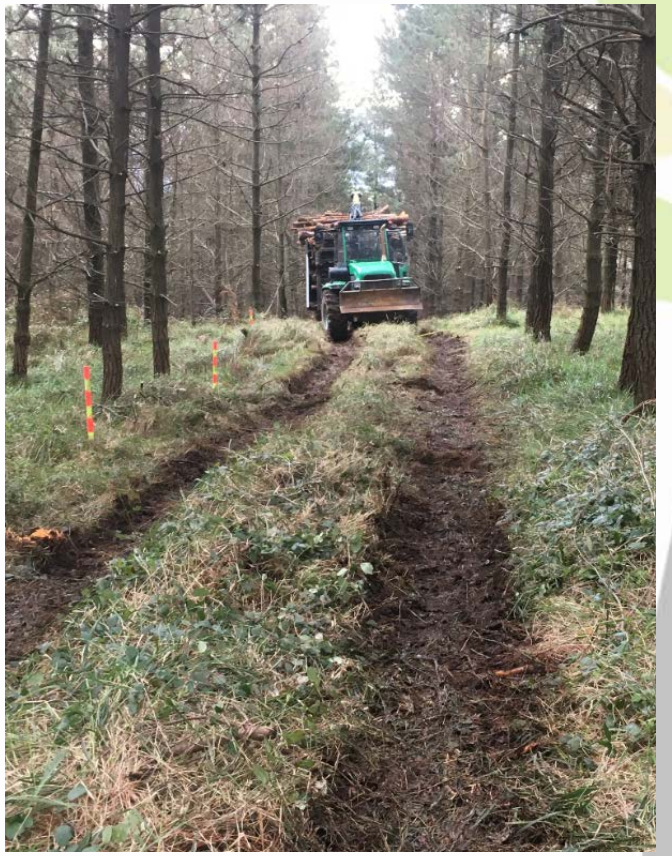
Contingency plan

Prevention

- Effects of forwarding on soil hydrological properties in thinning operation in northern Spain



- The aim of this study was to evaluate the effects of forwarding on the hydrological properties of a high compaction-risk soil with a moisture content of almost 62%.
- A single-factor factorial design with three replications was used involving three traffic intensities of a Dingo AD6-24 forwarder (3, 6 and 9 passes).
- Four undisturbed soil samples were taken in each treatment plot and specific soil properties were measured in the laboratory: bulk density, porosity, saturated hydraulic conductivity and gravimetric water content -10 kPa (field capacity).

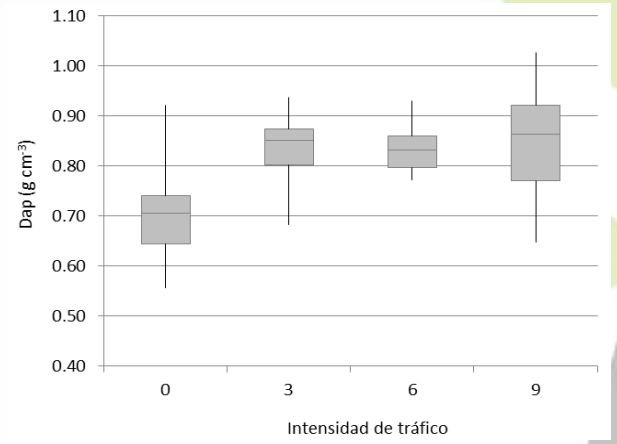


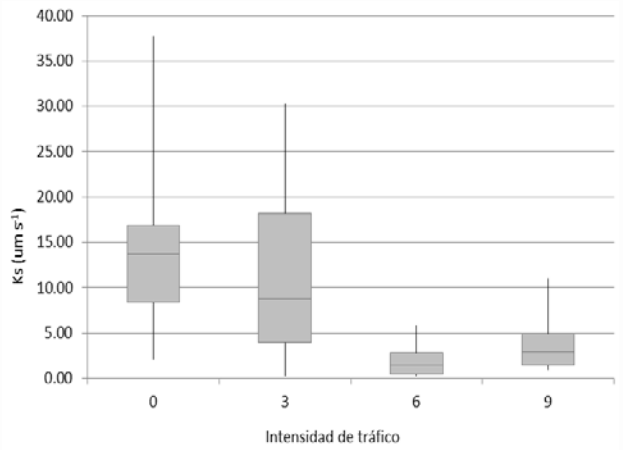
Contingency plan

Prevention

- Effects of forwarding on soil hydrological properties in thinning operation in northern Spain

- The results demonstrated that 3 passes of the forest machine are enough to significantly increase bulk density with successive passes having no additional effect.
- However, additional passes (6 or 9) significantly reduced the saturated hydraulic conductivity of soils, increasing soil erosion risk.
- These results indicate that in a soil with a high compaction risk, forwarding alters its physical properties and recovery from the disturbance should be followed up.

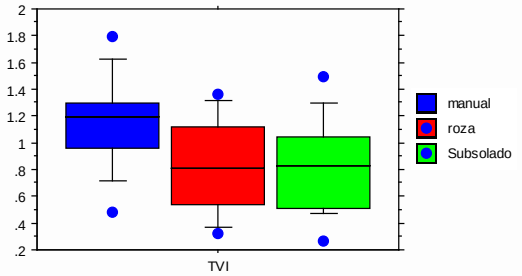




Contingency plan

Prevention

- Soil compaction and recovery after 15 years of mechanized final felling and site preparation



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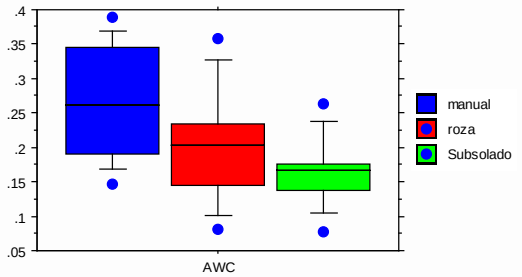
p<0.05



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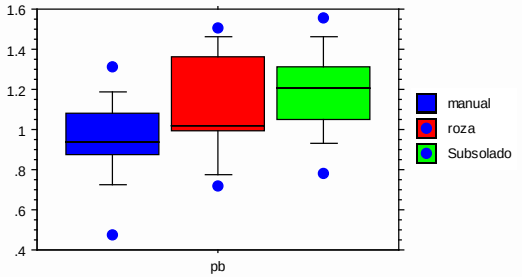

F-value= 3.92

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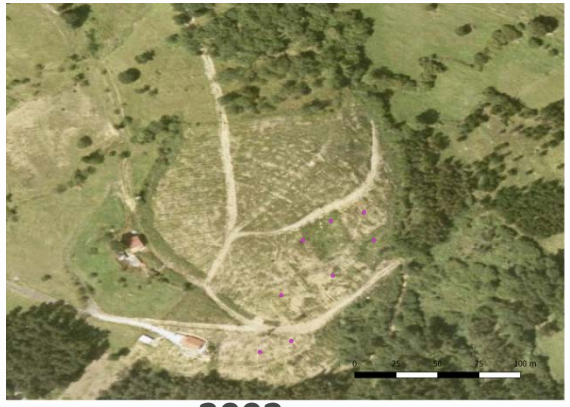


2002

2008

2013

2016

Contingency plan

Surveillance

- Forest soil disturbance monitoring protocol. App to gather information easily.

Evaluación de transectos

Volver

Evaluador	Fecha evaluación	Código identificación	prescripción
Nahia	06/08/2003	Xaibikolanda2	Manual

Superficie Plantación (ha)	Distancia entre transectos (m)	12	Punto de comienzo	pendiente máxima permitida de subsolado
,454	Distancia entre puntos (m)	5	20 %	<30 %

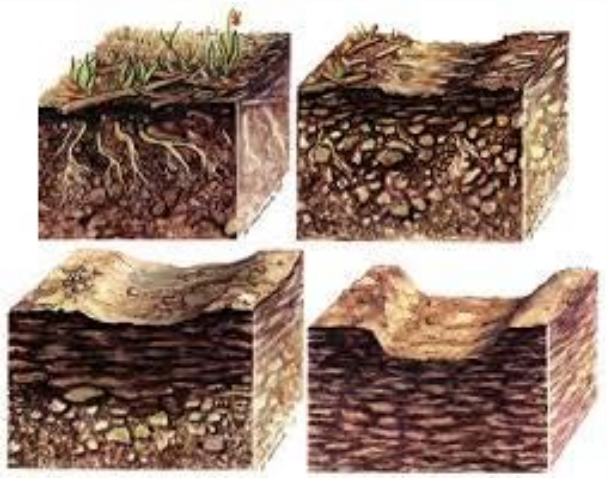
pendientes medidas: grados — prescripción: Manual — plantada — surcos con pendientes: todas

Perturbaciones	22	Compactación	2	Suelos desplazados	15
total de puntos	55	total de puntos	55	total de puntos	55
porcentaje perturbación	40	porcentaje compactación	4	porcentaje desplazamiento	27
Limite inferior	33,2	Limite inferior	1,0	Limite inferior	20,8
Limite superior	46,8	Limite superior	7,0	Limite superior	33,2
remoción del mantillo	17	Huellas de maquinaria	4	Zonas amplias sin MO	1
total de puntos	55	total de puntos	55	total de puntos	55
porcentaje mantillo	31	porcentaje huellas	7	porcentaje zonas sin MO	2
Limite inferior	24,5	Limite inferior	3,2	Limite inferior	2,0
Limite superior	37,5	Limite superior	10,8	Limite superior	2,0

	pendiente media (%)	
surcos totales		
surcos no permitidos		
surcos todas		

Decapados	0
total de puntos	55
porcentaje decapado	0
Limite inferior	0,0
Limite superior	0,0

media de pendientes



Contingency plan

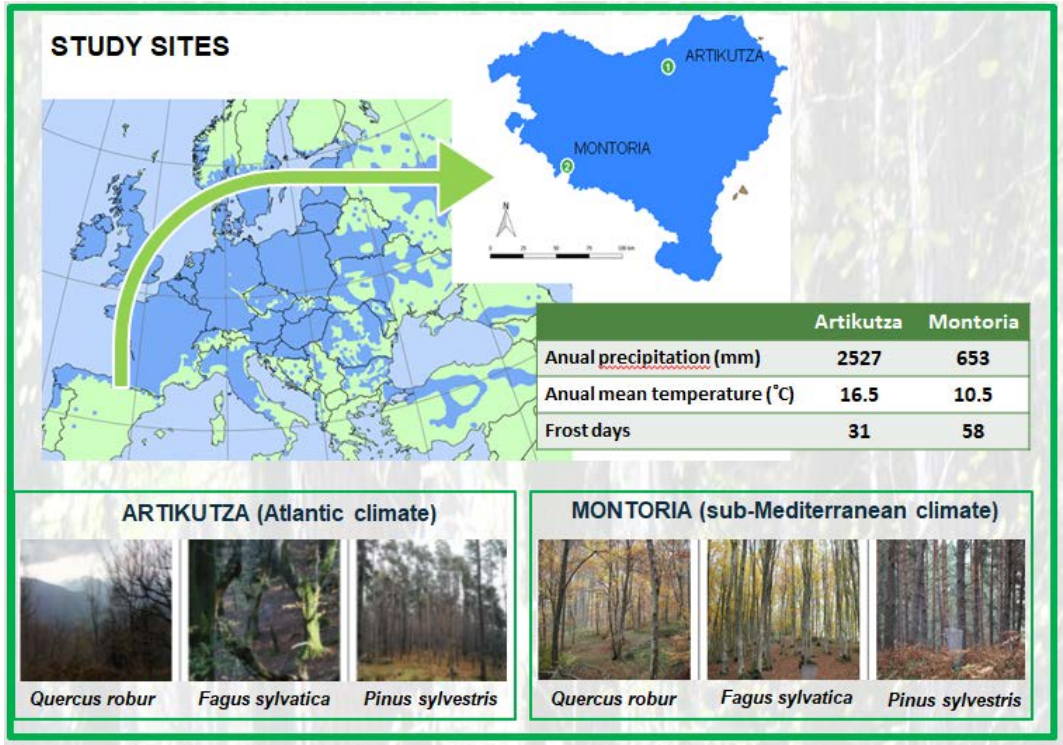
Surveillance

- System for soil quality monitoring in Forest Plantations.
- Establish soil reference sites representative from biogeoclimatic conditions.
- Indicators for soil conditioning at reference values and after different silvicultural treatments.
- In situ assessment of disturbances associated with compaction and erosion

Contingency plan

Surveillance

- Reference values for soil biodiversity: available knowledge on soil biodiversity is recognised as being very limited, little is known about the degree of biodiversity required to maintain core soil functions.



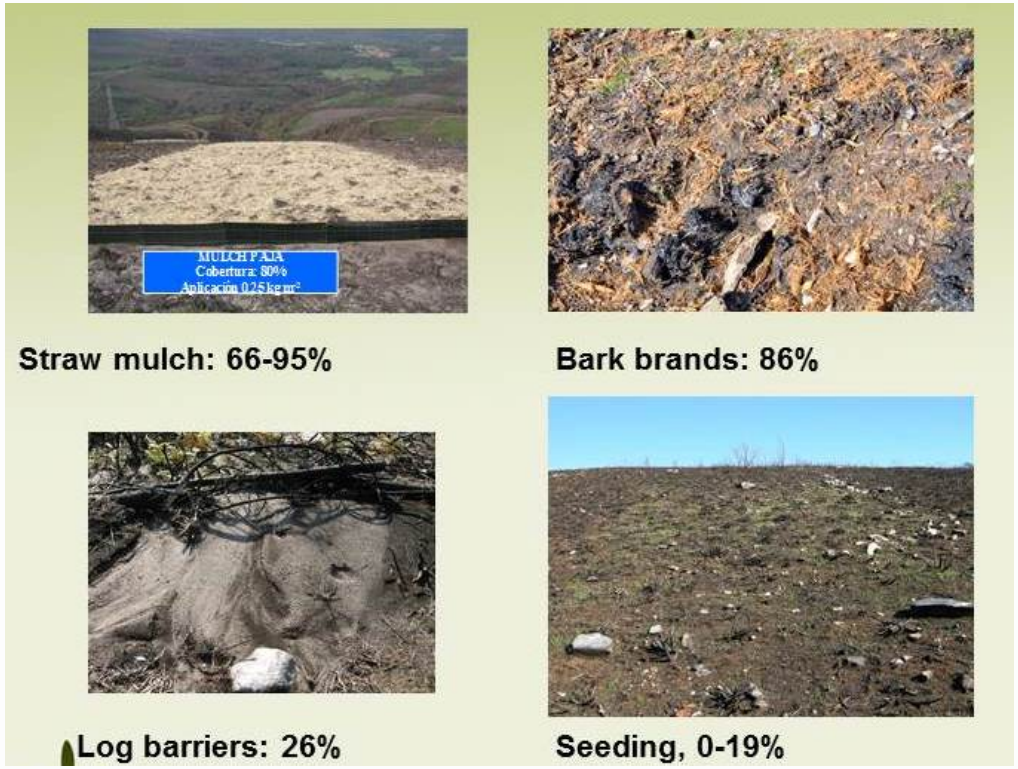
Phospholipid fatty acids determination (PLFA)

PLFA analysis is an efficient way to rapidly screen whether the fungal or bacterial part of the soil community has been affected by a treatment.

Contingency plan

Rehabilitation

- Effectiveness of different treatments for post-fire soil losses reduction.



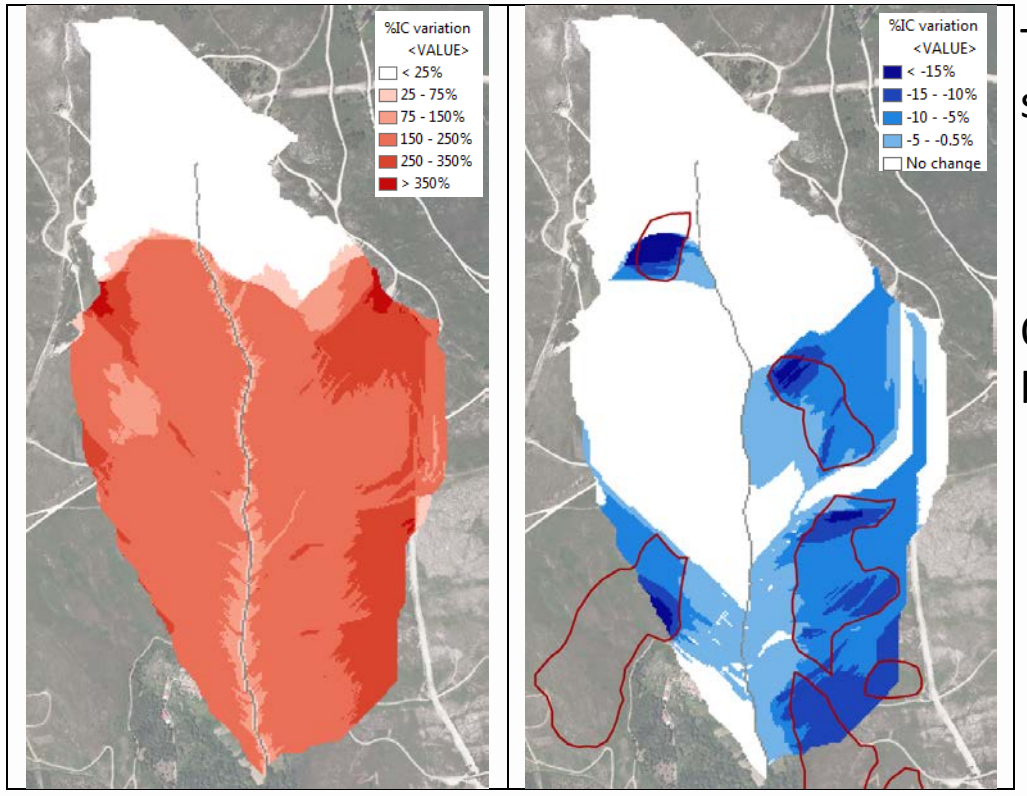
Soil erosion is a major consequences of forest fires in the North of the Iberian Peninsula.

This guide summarizes the results in terms of soil erosion reduction of different treatments carried out in Galicia (NW Spain).

Contingency plan

Rehabilitation

- Connectivity index in the planning for post-fire erosion reduction



The selection of the areas to be treated is a key step in the soil stabilization protocol after fire.

One of the most important aspects for that selection is the level of soil burn severity in the affected area.

The computation of a connectivity index in catchment burned in 2016 helps to prioritize the areas to be treated. It is also possible to see how mulch application reduces catchment connectivity.

Contingency plan

Rehabilitation

- Pine residues chipping effects on soil compaction and erosion

Thousands of hectares of non-commercial burned pine trees are being mechanically shredded every year.

The case of study provides cuantitative information on the effect of mechanical shredding on soil coverage, soil compaction and soil erosion.

Eskerrik asko!
¡Muchas gracias!
Gracies!
Grazas!
Obrigado!
Thanks a lot!