

## SEMINÁRIO

LEIRIA, 18 DE OUTUBRO DE 2018  
BIBLIOTECA JOSÉ SARAMAGO - INSTITUTO POLITÉCNICO DE LEIRIA  
COORDENADAS GPS: 39°44'0.15"N | 8°49'15.41"W

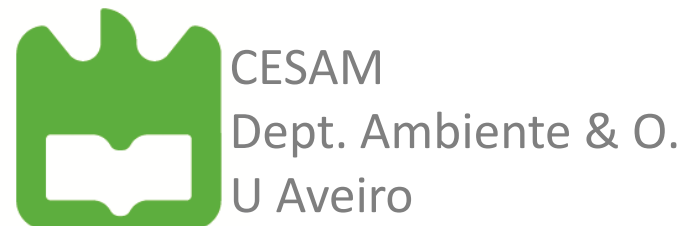
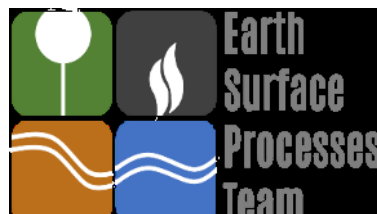
# INCÊNDIOS FLORESTAIS & ATIVIDADES ECONÓMICAS IMPACTES SOBRE OS RECURSOS HÍDRICOS

Inscrições: <https://goo.gl/ehkTet>



## Post-fire erosion and its mitigation

Jacob Keizer, Sergio Prats, Sandra Valente, Nelson Abrantes, João Pedro Nunes,  
& other esp team members




# Hydrological Processes

[Explore this journal >](#)

INVITED COMMENTARY

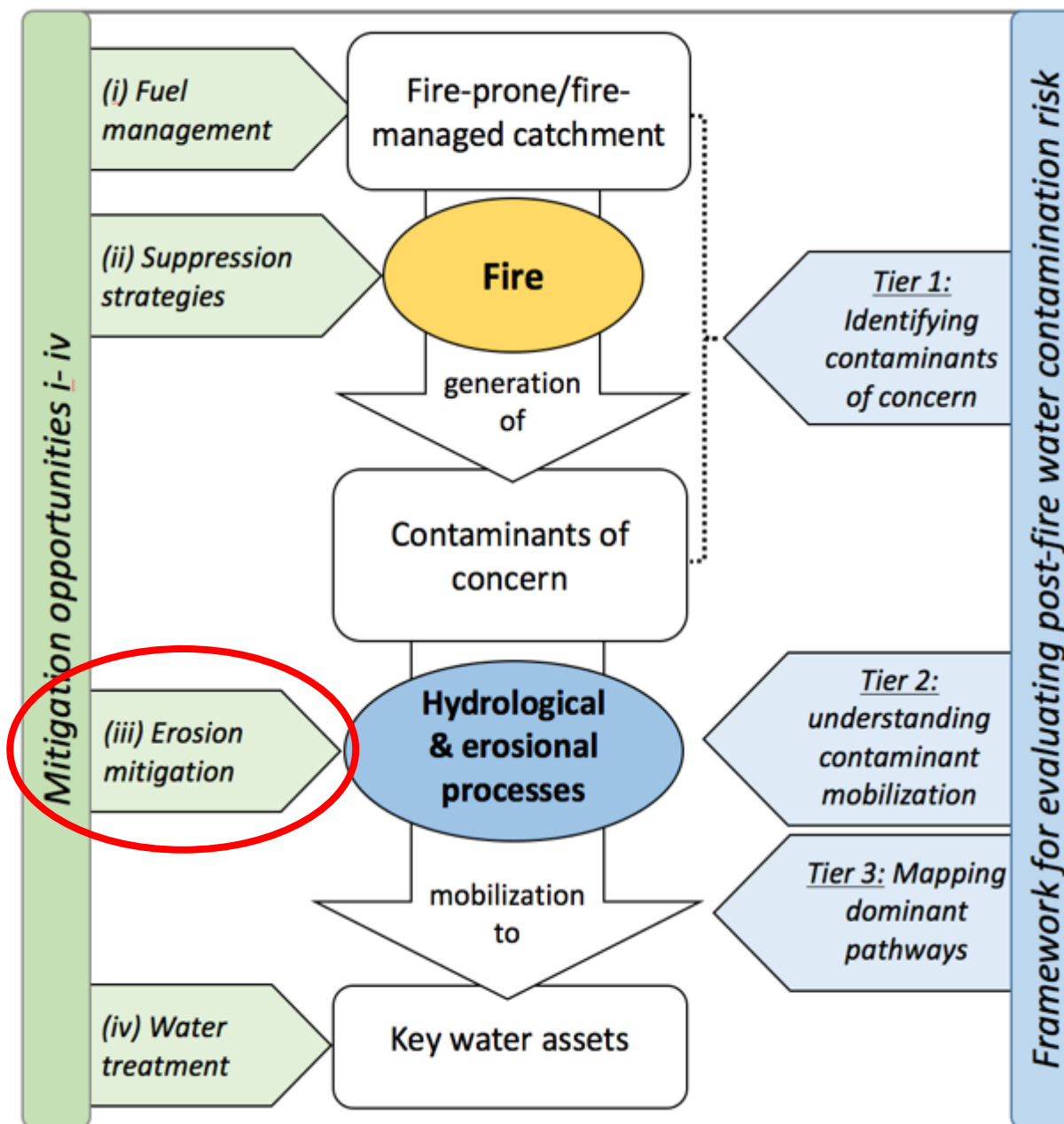
## Assessing water contamination risk from vegetation fires: challenges, opportunities and a framework for progress

[Joao P. Nunes](#), [Stefan H. Doerr](#) , [Gary Sheridan](#), [Jonay Neris](#), [Cristina Santín](#),  
[Monica B. Emelko](#), [Uldis Silins](#), [Peter R. Robichaud](#), [William J. Elliot](#),  
[Jacob Keizer](#)

Accepted manuscript online: 3 January 2018 [Full publication history](#)

DOI: [10.1002/hyp.11434](https://doi.org/10.1002/hyp.11434) [View/save citation](#)


# Framework?




Contaminants of concern

Original Paper  
 European Journal of Forest Research  
 November 2012, Volume 131, Issue 6, pp 1889-1903  
 First online: 07 July 2012

# Assessment of the toxicity of ash-loaded runoff from a recently burnt eucalypt plantation

I. Campos  , N. Abrantes, T. Vidal, A. C. Bastos, F. Gonçalves, J. J. Keizer



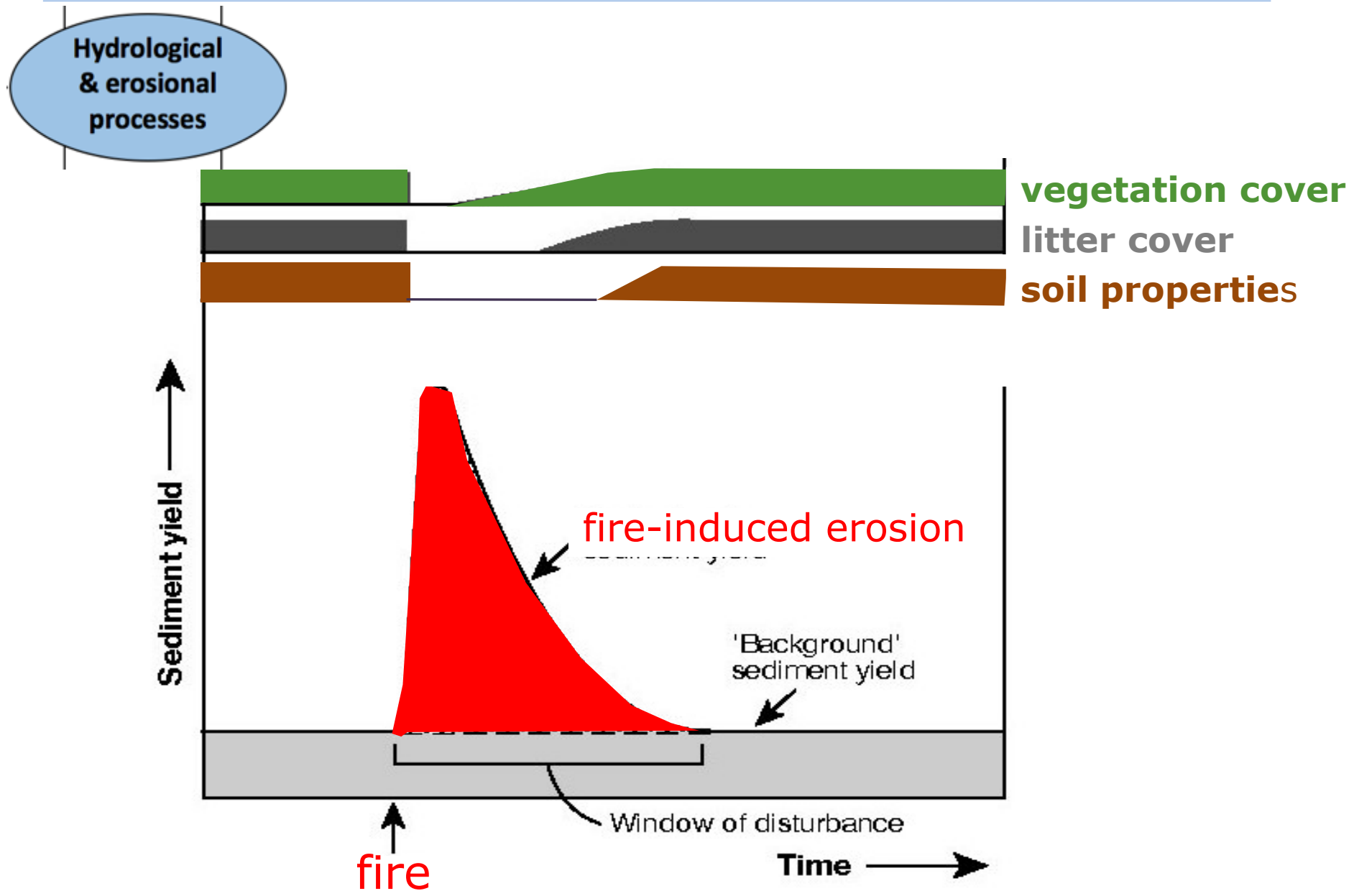

**METAIS:**

**HAPs:**

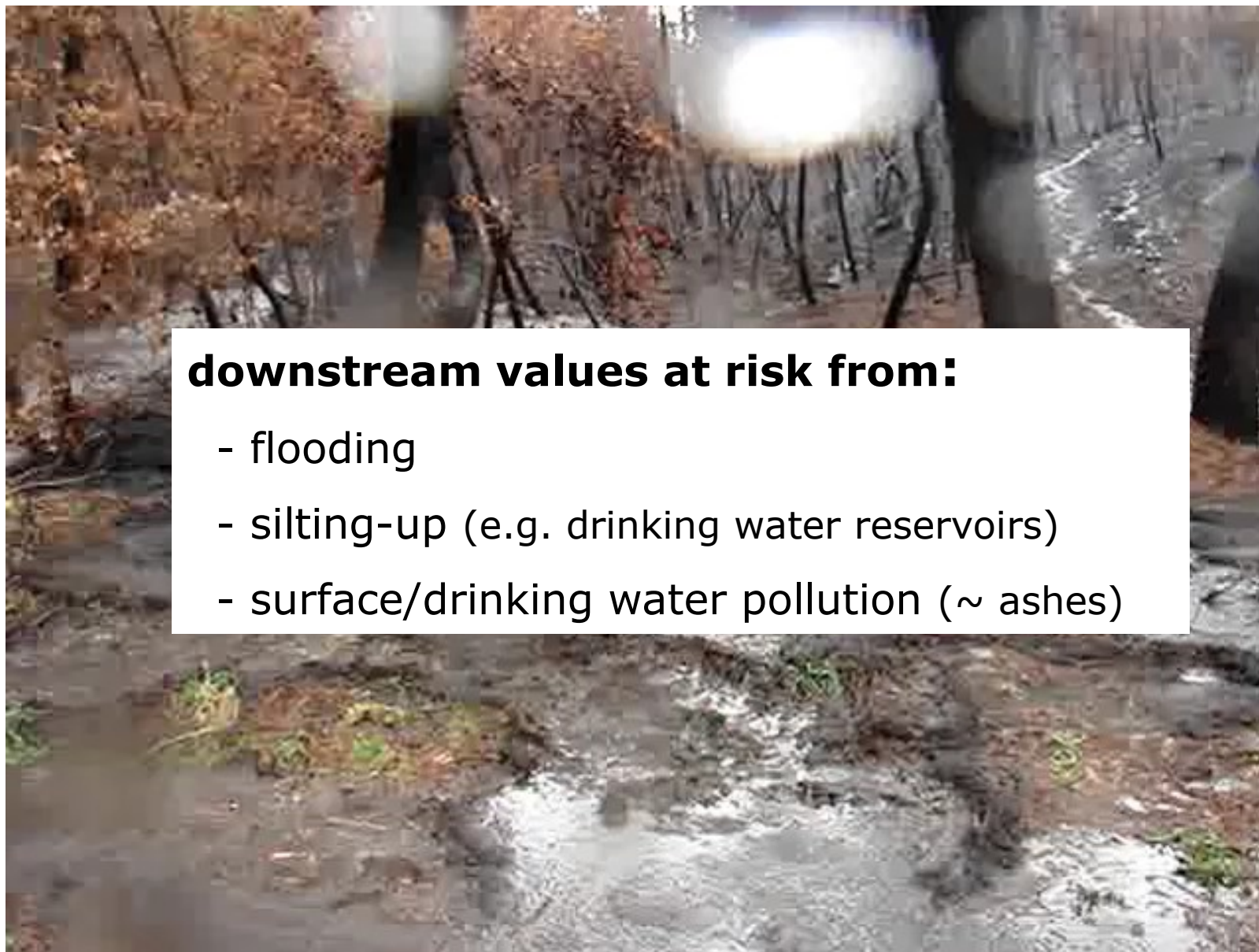
Toxic  
Mutagenic  
Carcinogenic

Environmental persistence

Bioaccumulation through the food chain







**downstream values at risk from:**

- flooding
- silting-up (e.g. drinking water reservoirs)
- surface/drinking water pollution (~ ashes)

Secure | <https://zap.aeiou.pt/pedrogao-depois-do-fogo-as-inundacoes-165832>

Início > Notícias > Nacional > Pedrógão: depois do fogo, as inundações

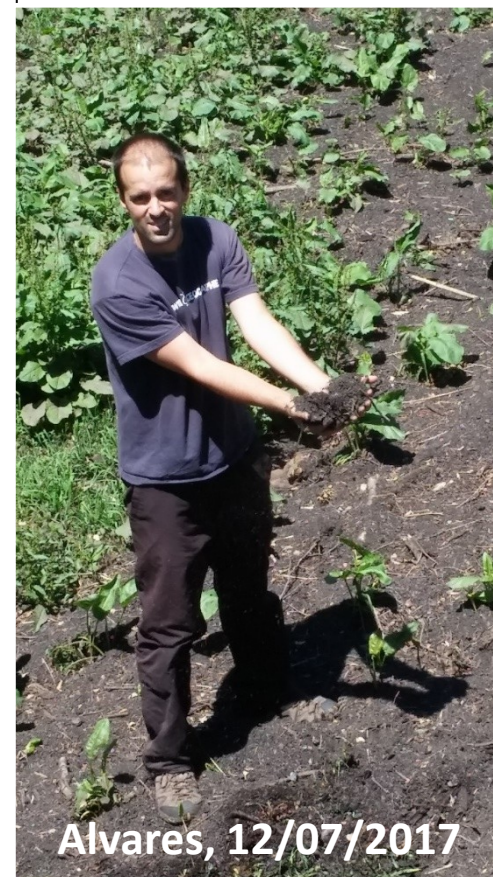
Notícias Nacional Clima

# Pedrógão: depois do fogo, as inundações

Por ZAP - 7 Julho, 2017



António Cotrim / Lusa



Alvares, 12/07/2017





# **Cochiti Canyon Flood Dixon's Apple Orchard**

**August 22, 2011**



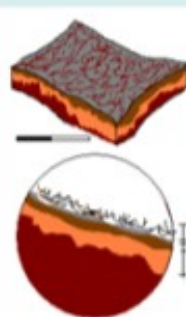
same event



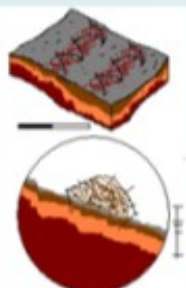
tackle the problem at its source, on hillslopes

## Slope treatments

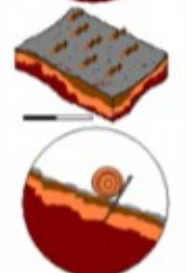
**Mulching,  
mulching + seeding**



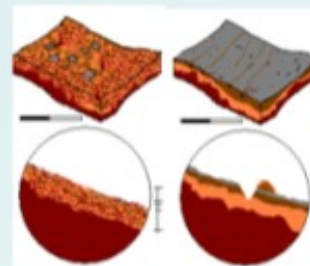
**Contour felling**



**Log erosion barriers**



**Ploughing, scarifying**



+  
Effectiveness

-

## ACCIONES URGENTES CONTRA LA EROSIÓN EN ÁREAS FORESTALES QUEMADAS GUÍA PARA SU PLANIFICACIÓN EN GALICIA

Vega et al., 2013  
Centro de Investigación Forestal  
Xunta de Galicia



José A. Vega, Teresa Fontúrbel, Cristina Fernández, Antonio Arellano,  
Montserrat Díaz-Raviña, M<sup>a</sup> Tarsy Carballas, Angela Martín,  
Serafín González-Prieto, Agustín Merino, Elena Benito

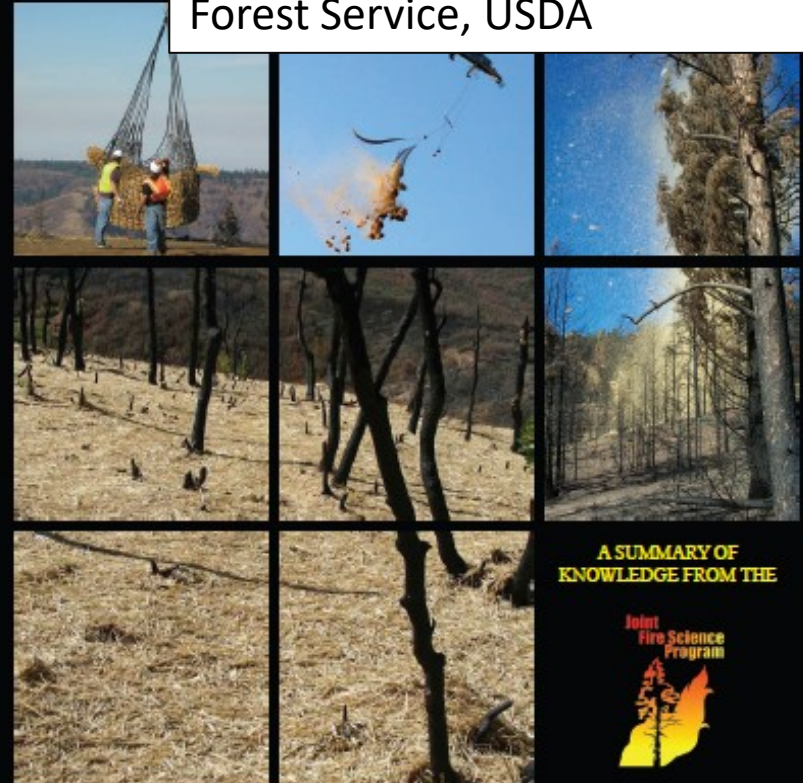


USDA  
United States  
Department  
of Agriculture  
Forest Service  
Rocky Mountain  
Research Station  
General Technical  
Report FMRB-GTR-240  
August 2010



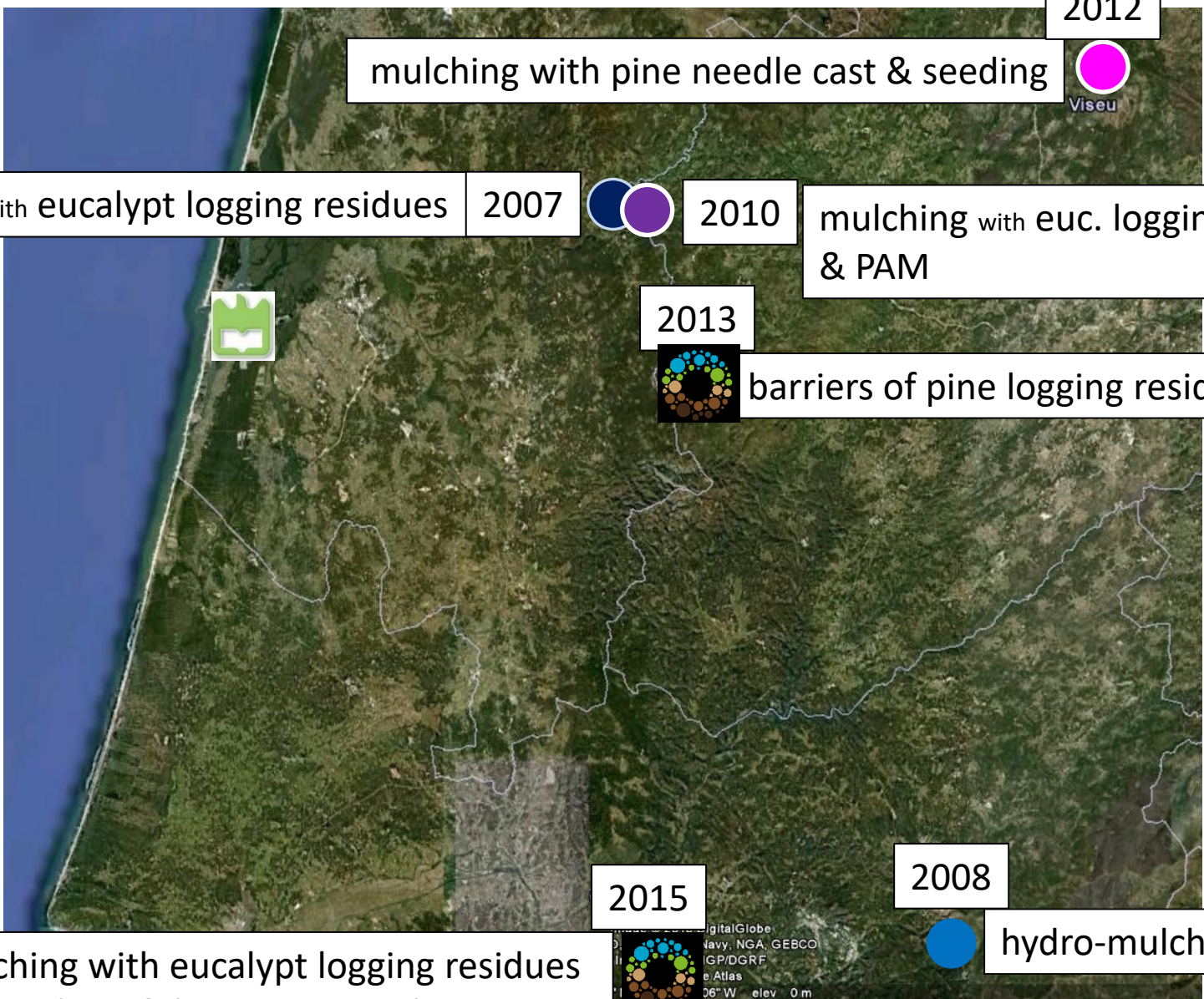
## Post-Fire Treatment Effectiveness for Hillslope Stabilization

Robichaud et al., 2010  
Rocky Mountain Research Station  
Forest Service, USDA





# Effectiveness field trials (<2017)



2012

mulching with pine needle cast & seeding



Viseu

mulching with eucalypt logging residues

2007



2010

mulching with euc. logging residues & PAM



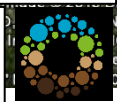
2013



barriers of pine logging residues

2015

mulching with eucalypt logging residues & ploughing & logging + wood extraction



2008

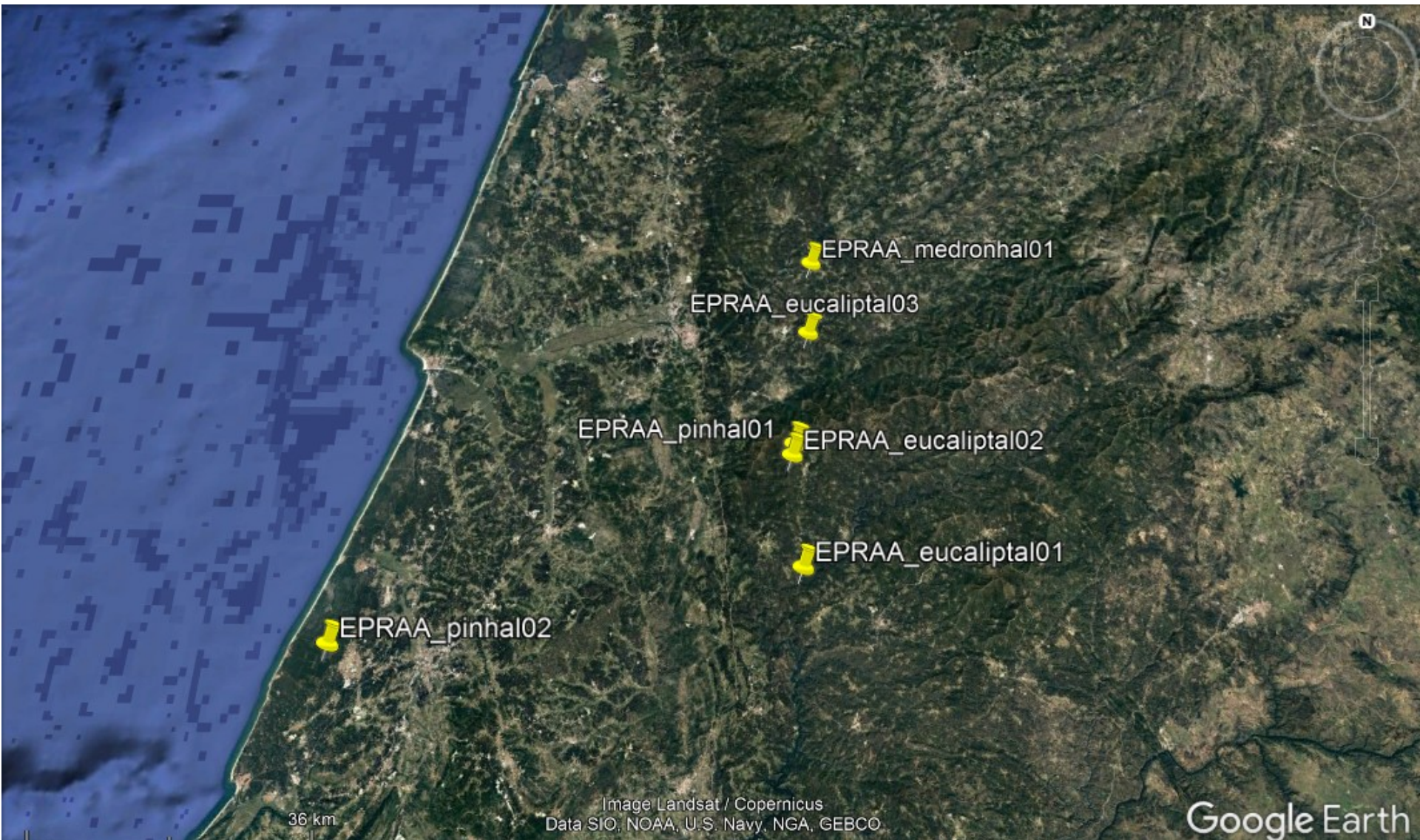


hydro-mulching

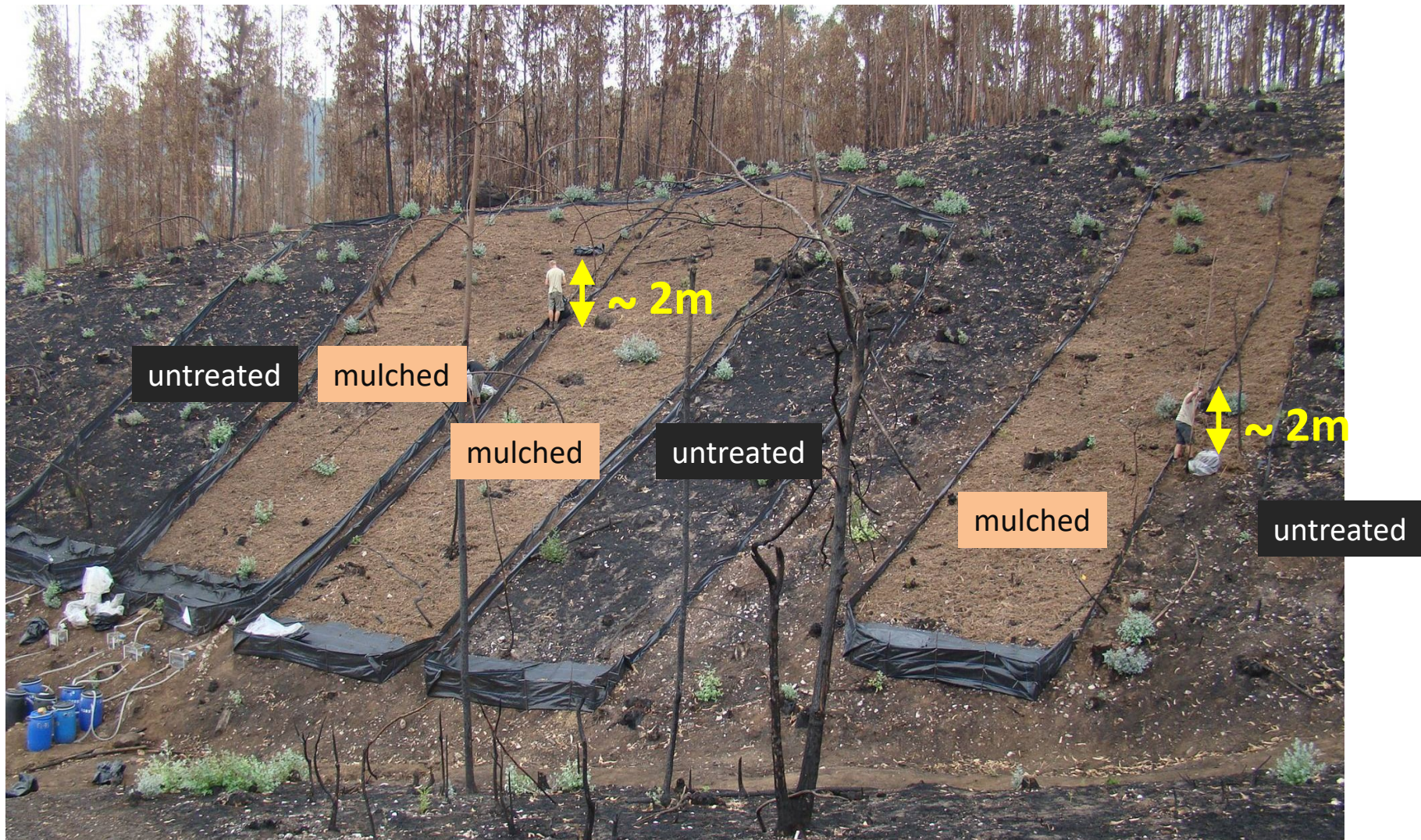
DigitalGlobe  
Aerial, NGA, GEBCO  
SRTM30 PLUS  
Map Data © OpenStreetMap contributors, Imagery © Mapbox  
06°W elev. 0 m



# Effectiveness field trials (2017)

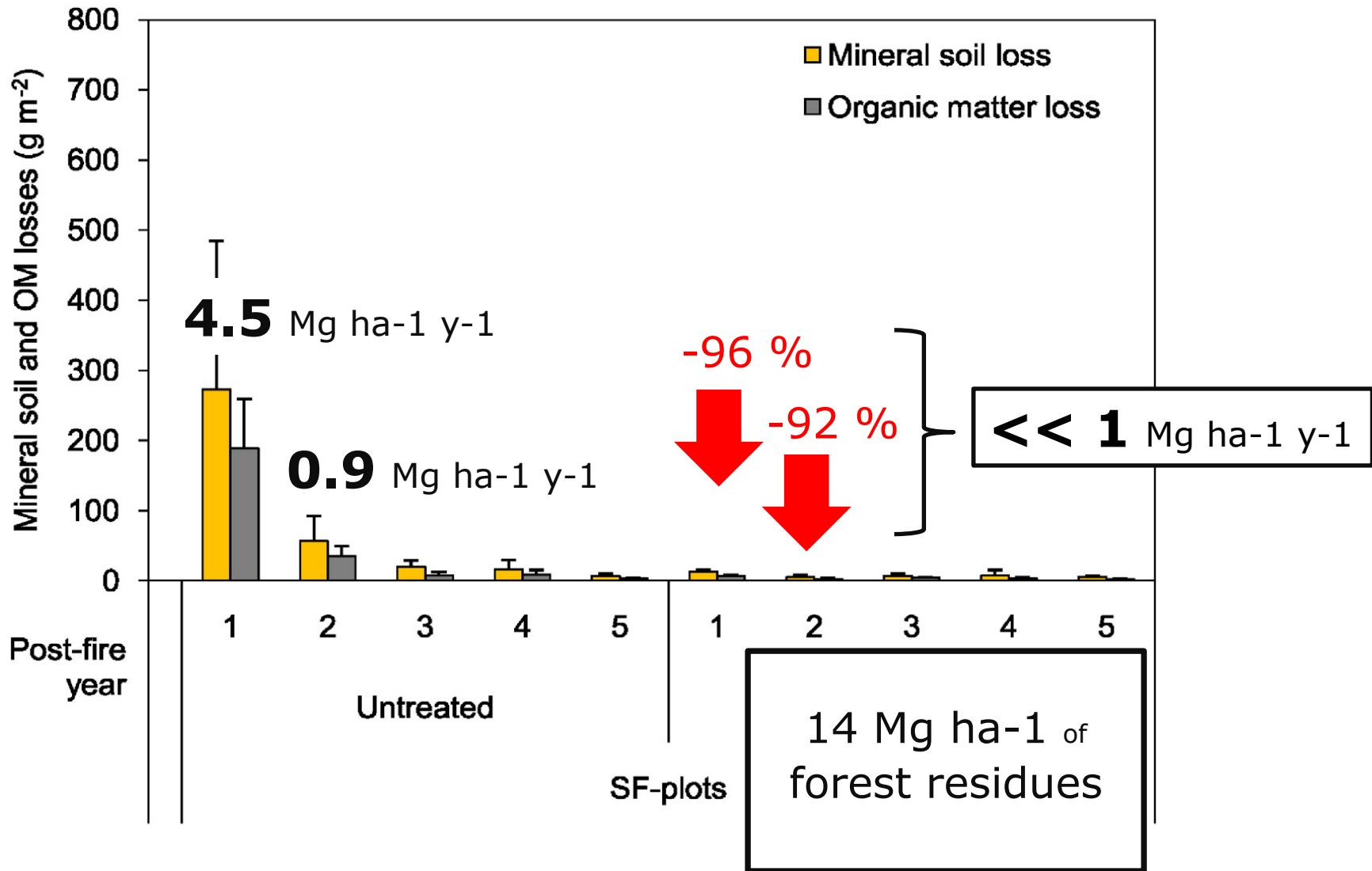


● **example (2010): mulching with eucalypt logging residues**





**example (2010): mulching with eucalypt logging residues**



## How little mulch still does the trick?



field trial in 2015-burnt area



6 preselected potential post-fire erosion mitigation measures

2 selected by 15-25 stakeholders for testing/demonstrating

- private forest owners
- private forest companies
- water energy company
- GOs and NGOs
- scientist

i.e.: i) mulching

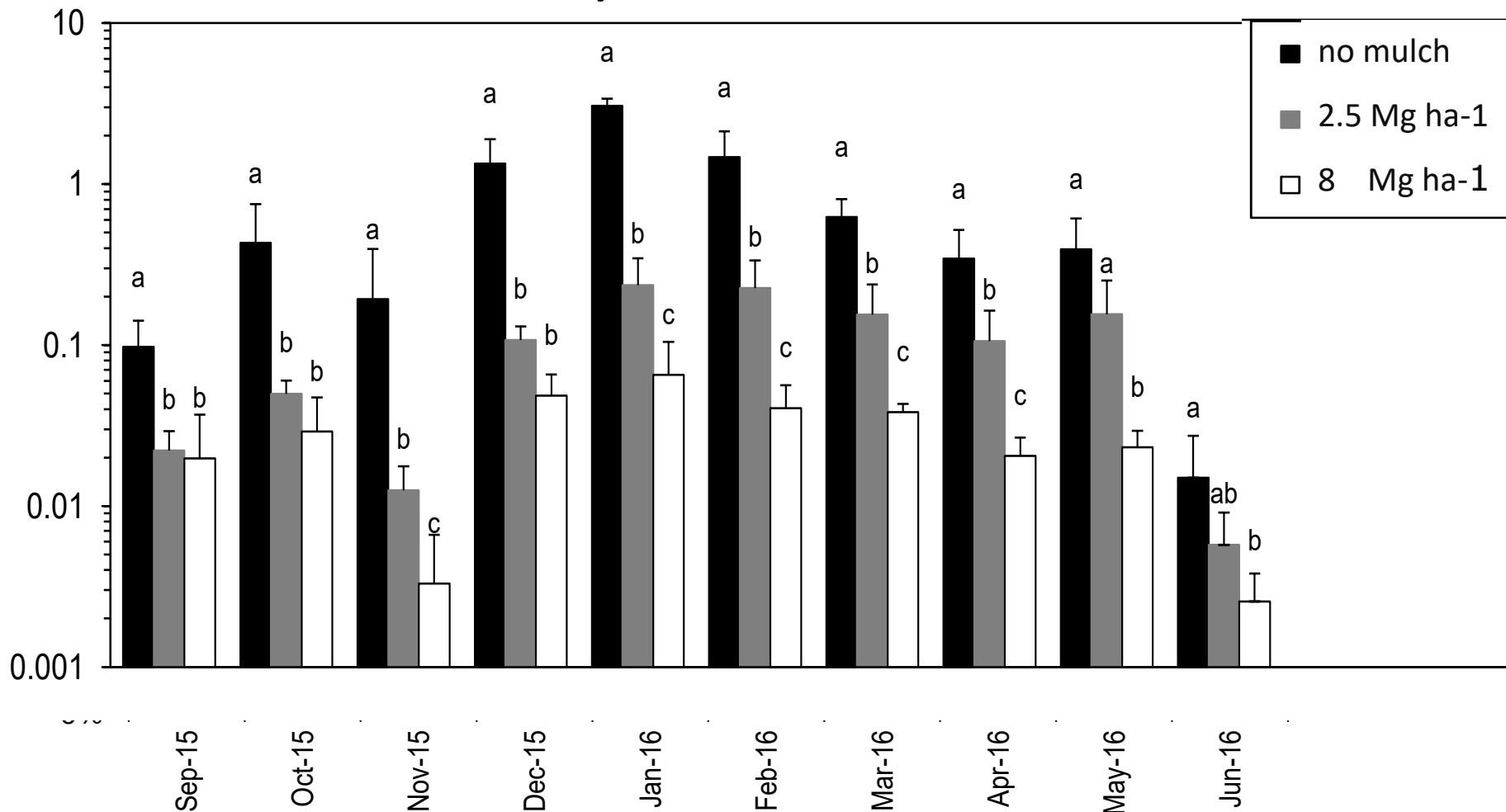
ii) countour ploughing





field trial in 2015-burnt area

sediment losses (Mg ha<sup>-1</sup>) **1st year after fire**



sediment losses?	year 1	year2
doing nothing	8 Mg/ha	0.5 Mg/ha
<b>much</b> mulch	<b>-98 %</b>	<b>-96 %</b>
<b>little</b> mulch	<b>-86 %</b>	<b>-68 %</b>

cost per benefit? how much € to avoid 1 Mg/ha erosion

	year 1	year2
<b>much</b> mulch	236€	<b>4102€</b>
<b>little</b> mulch	<b>92€</b>	<b>1491€</b>

# Messages for policy (1)

- mulching is **highly effective** to reduce enhanced erosion risk following wildfire, also using forest logging residues at low application rates
- this effectiveness **depends heavily** on the **timing** of the mulching, ideally taking place before the first autumn rains
- the private forest land owners and managers among RECARE's stakeholders in the Portuguese case study will **not easily adopt** mulching after wildfire



## Messages for policy (2)

- post-fire erosion mitigation measures have been applied in Portugal since 2009, using ERDP funds
  - but their implementation typically:
    - takes place **after the 1st rainy season**
    - suffers from **ill-defined criteria** and **limited expertise** in deciding which measures to apply where and when
    - **lacks a broad stakeholder involvement**, not involving private forest owners/managers or actors with a stake in downstream water resources management
    - is **not** accompanied by any kind of **monitoring**, so that little is learned from mistakes



universidade de aveiro  
theoria poiesis praxis



# Thank you for your attention

Earth Surface Processes Team <http://www.cesam.ua.pt/teamsite/>  
Centre for Environmental and Marine Studies <http://www.cesam.ua.pt/>  
University of Aveiro <http://www.ua.pt>

## acknowledgements

- fct-funded projects      FIRE-C-BUDs (2016-2019; PTDC/AGR-FOR/4143/2014)  
                                    FIRETOX (2013-2015; PTDC/AAG-GLO/4176/2012)  
                                    FIRECNUTS (2010-2013; PTDC/AGR-CFL/104559/2008)  
                                    FORESTAKE (2010-2013; PTDC/AGR-CFL/099970/2008)  
                                    FIREREG (2010-2013; PTDC/AGR-CFL/099420/2008)  
                                    ERLAND (2010-2014; PTDC/AAC-AMB/100520/2008)  
                                    HIDRIA (2009-2012; PTDC/CTE-GEX/71651/2006)  
                                    EROSFIRE II (2007-2011; PTDC/AGR-CFL/70968/2006)  
                                    PHOENIX (2005-2008; POCI/AGR/58896/2004)  
                                    EROSFIRE (2005-2008; POCI/AGR/60354/2004)
- other national projects    Recuperação de Áreas Ardidias (2005-2011; IFADAP)
- eu-funded projects        RECARE (2013-2018; FP7 grant agreement no 603498)  
                                    CASCADE (2012-2017; FP7 grant agreement no 283068)
- fct-funded IF contracts (3), post-doctoral grants (12) and PhD grants (12)