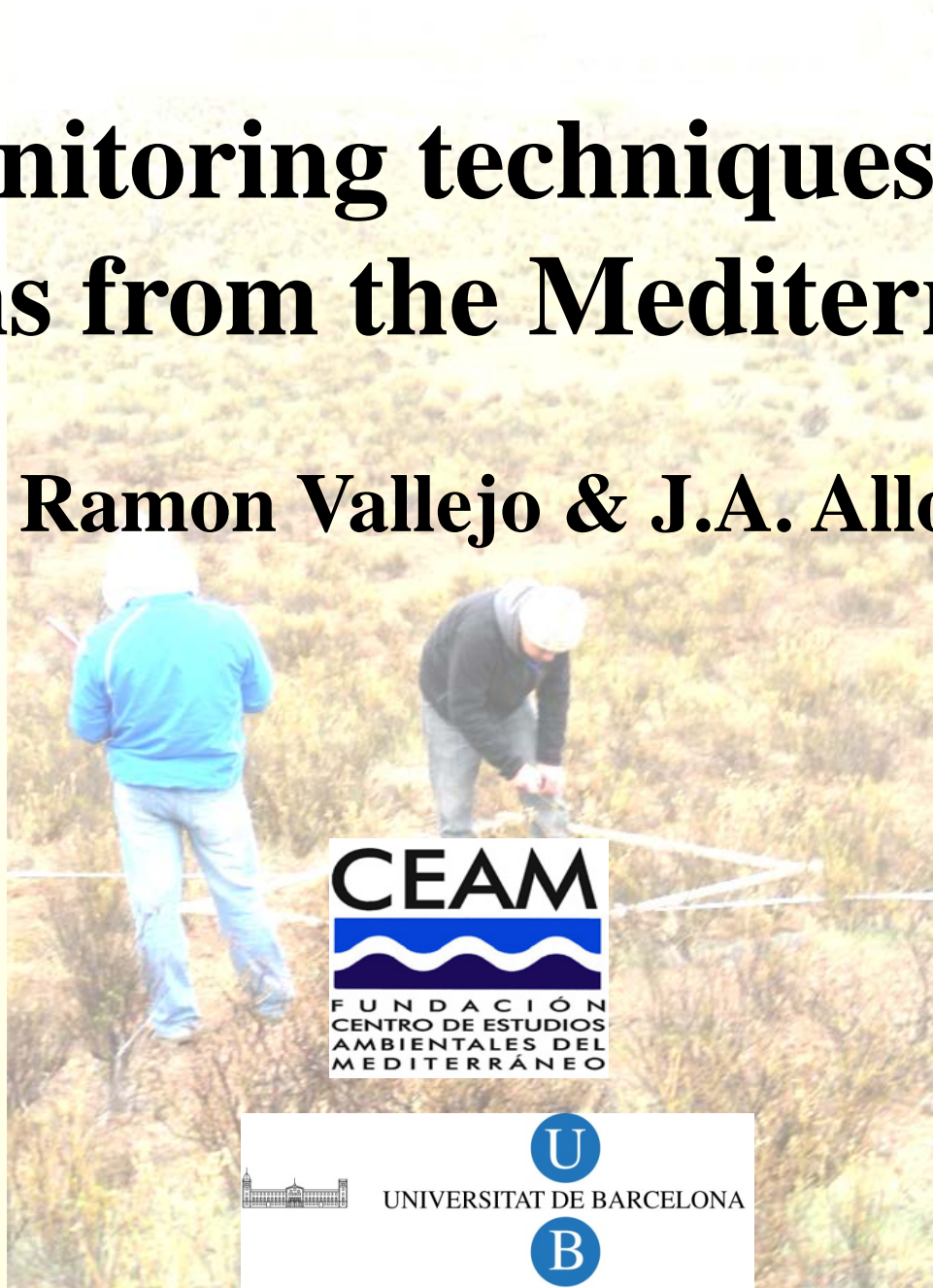


# Monitoring techniques and lessons from the Mediterranean

**V. Ramon Vallejo & J.A. Alloza**



# MONITORING RESTORATION ACTIONS

## OBJECTIVES

## TIME FRAME

## METHODOLOGIES

Field protocol for post-fire impact assessment –  
Baseline data for field monitoring

Field protocol for short/medium-term monitoring

Participatory approaches for long-term monitoring

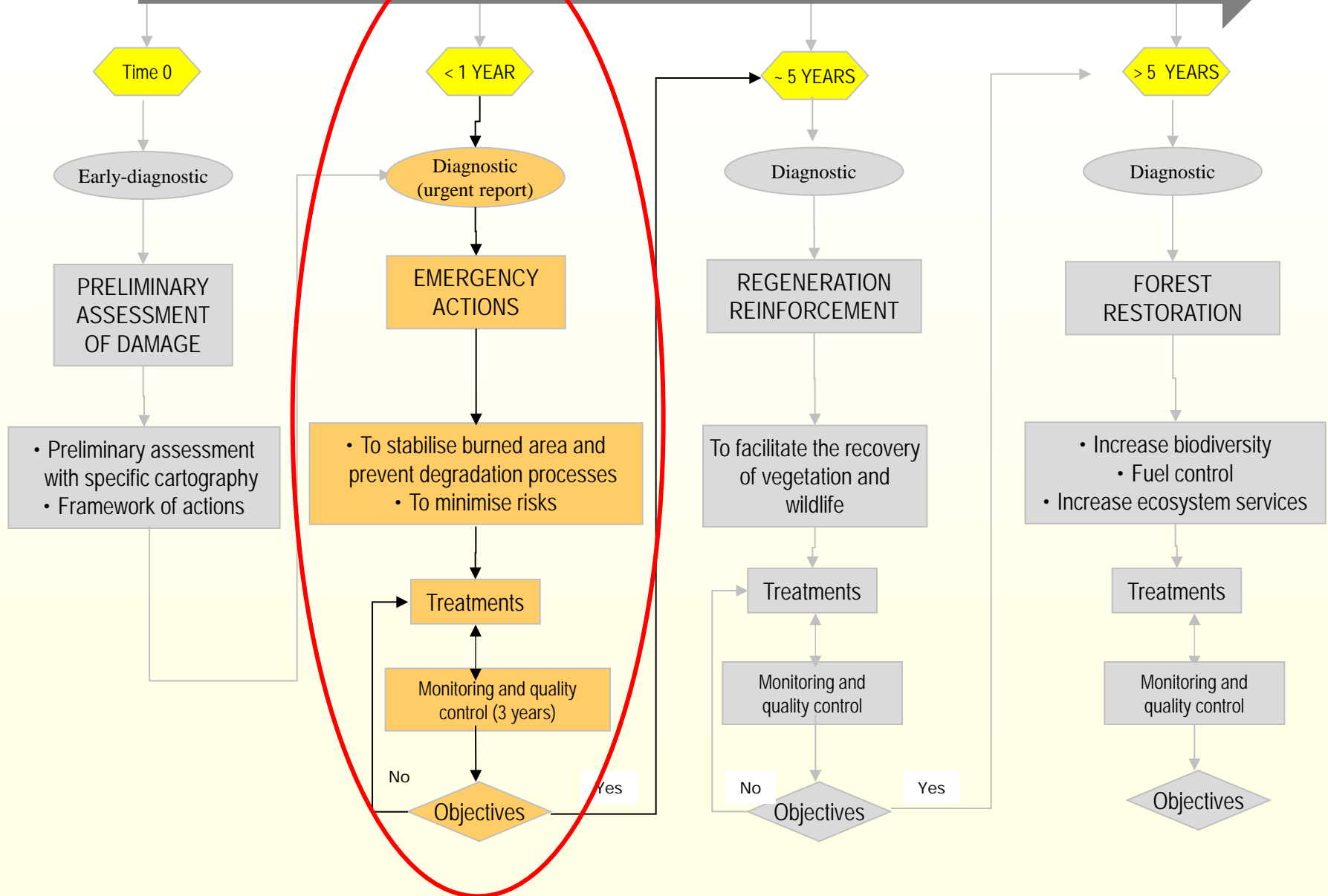
FIELD SURVEY

REMOTE SENSING

GIS and DATA BASE

Evaluation

# PLANNING RESTORATION ACTIONS IN BURNED AREAS



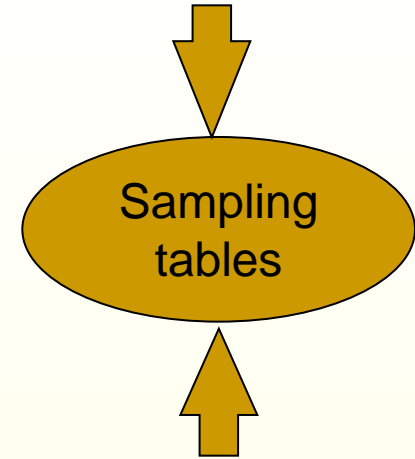
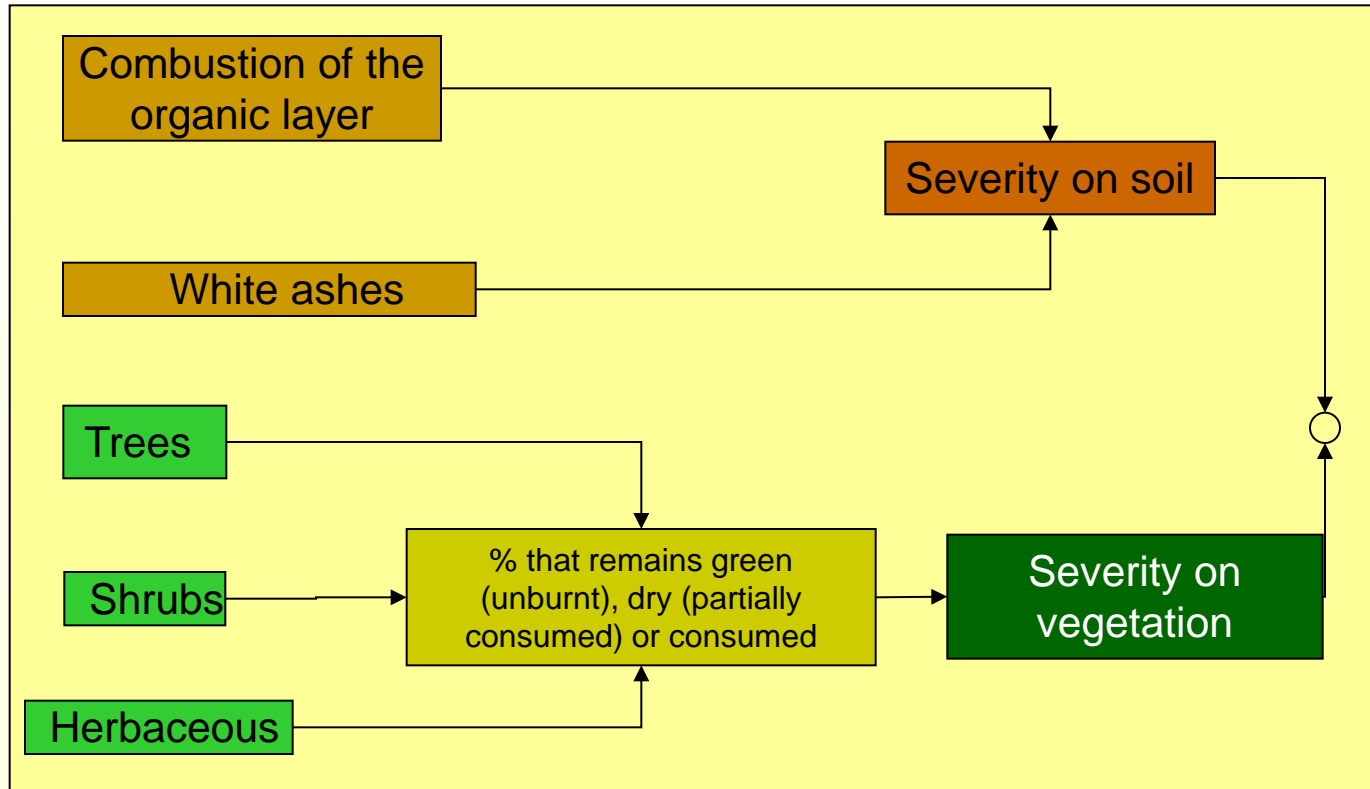
Autosuccession potential

plant cover

Fire recurrence

Risk of pests and diseases

POTENTIAL ABILITY TO REGENERATE AFTER THE FIRE



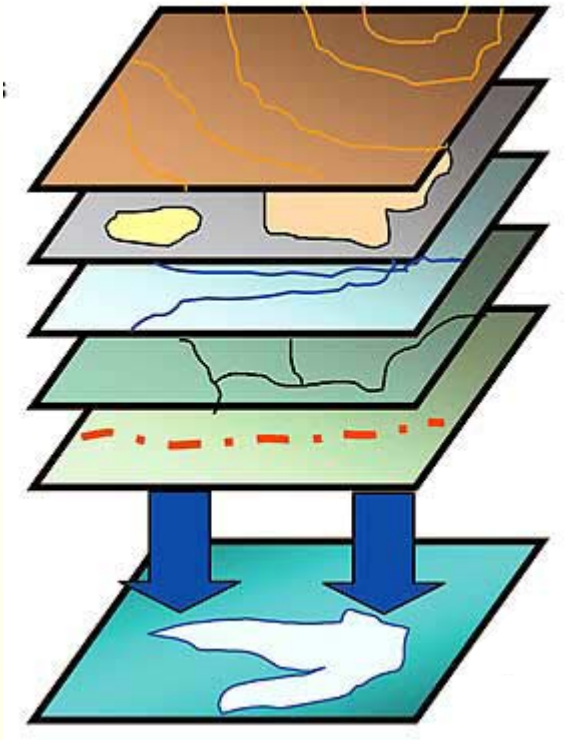
?



# FIELD PROSPECTION – DEFINING ENVIRONMENTAL UNITS

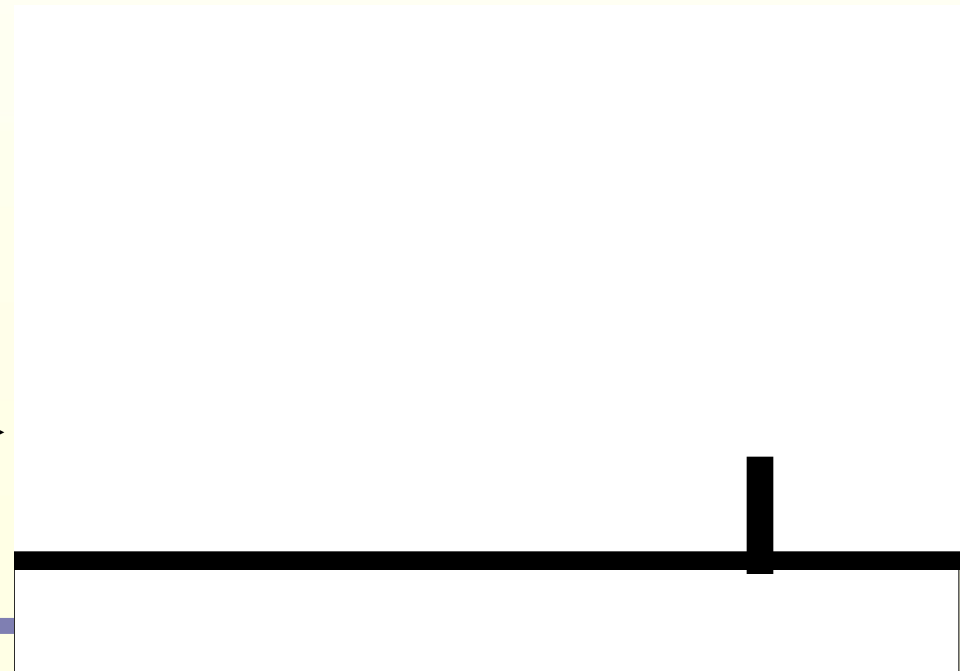
Density sampling points:  $f$  (fire size)

DOCUMENTATION



Fire size (ha)	Sampling point density (points/ha)
100	2
100 - 500	5
500 – 5000	10
> 5000	16

Definitive delimitation  
environmental units  
(at least three points  
per unit)



FICHA 3. PUNTO DE OBSERVACIÓN											
Nº PUNTO DE OBSERVACIÓN:											
Nº PUNTOS ASIGNADOS POR SEMEJANZA											
A) Datos generales											
UTM x:	UTM y:										
Relieve dominante	Altitud (m):										
Orientación dominante	N NE E SE S SW W NW TV										
Pendiente dominante	<table border="1"> <tr> <td>&lt;15%</td> <td>15-30%</td> <td>30-45%</td> <td>&gt;45%</td> </tr> <tr> <td>&lt;7°</td> <td>7-15°</td> <td>15-25°</td> <td>&gt;25°</td> </tr> </table>			<15%	15-30%	30-45%	>45%	<7°	7-15°	15-25°	>25°
<15%	15-30%	30-45%	>45%								
<7°	7-15°	15-25°	>25°								
Modelo de combustible (de 1 a 13)											
Actuaciones realizadas en la zona afectada: <i>replantaciones, tratamientos selvícolas, etc.</i>											
Preparación terreno manifiesta:	Subsolado en curva de nivel Ahoyado										
Subsolado en línea de máxima pendiente	Banquetas Otras										
Causas manifiestas degradación del suelo (sobrepastoreo, movimientos de tierra, arrastraderos, etc.)											
En caso afirmativo reflejar la/s más importantes											
B) ESTADO FITOSANITARIO											
Presencia de plagas, enfermedades o daños por factores abióticos:		NO	SI								
Especie afectada	Agente causante	Grado afectación	Peligro extensión								
Grado afectación 1=leve 2=moderado 3=elevado											
Peligro extensión plaga o enfermedad: 0=inexistente 1=leve 2=moderado 3=elevado											
C) ESTADO DEL SUELO PRE-INCENDIO											
Litología	Suelo										
Profundidad del suelo (dominante)	superficial (<30cm)		profundo (>30cm)								
Efervescencia al HCl	<input type="checkbox"/> no	<input type="checkbox"/> poca	<input type="checkbox"/> viva								
Valor de pH medio	pH del suelo mineral entre 0 y 5cm										
Tipo de erosión/acumulación:											
Erosión laminar	Badlands	Otros									
Regueros	Acumulación										
Cárcavas	Erosión/deposición eólica										
Marcar (Ninguna Leve Moderada Severa)											
Existencia de bancales	No	Pocos	Abundantes								
Vegetación bancales:	Cultivos activos Abandonados pero no colonizados										
	Colonizados vegetación forestal										
Estado de los bancales:											
<input type="checkbox"/> Buen estado <input type="checkbox"/> Desmoronamientos puntuales <input type="checkbox"/> Desmoronamiento generalizado											
D) VEGETACIÓN PRE-INCENDIO											
Arbolado											
% FCC											
DISTRIBUCIÓN	Uniforme	Piés aislados	Discontinua + sotobosque								
			Discontinua + regenerado								
Especie	% Ocupación	% Repoblado	% Monte bravo % Latizal % Fustal								
Origen masa arbórea dominante <input type="checkbox"/> Plantación <input type="checkbox"/> Natural: no evidencias de plantación											
En el caso de especies serotinas <input type="checkbox"/> Masas con abundantes piñas											
<input type="checkbox"/> Masas con poca piña <input type="checkbox"/> Masas sin piñas (generalmente pinar de regeneración)											
Matorral											
% Recubrimiento total matorral	<30%	30-60%	>60%								
Especie	% Ocup	Especie	% Ocup								
Cobertura de especies rebrotadoras escasa bastante dominantes											
	<30%	30-60%	>60%								
Estrato herbáceo											
% Recubrimiento total herbáceo	<30%	30-60%	>60%								
Especie	% Ocup	Especie	% Ocup								
Cobertura sp herbáceas rebrotadoras escasa bastante generalizada											
	10-30%	30-60%	>60%								

General data

Plant health

Soil properties (pre-fire)

Pre fire vegetation composition, canopy cover...

<b>FICHA 4. PUNTO DE MUESTREO</b>					
<b>Nº PUNTO DE MUESTREO</b>					
<b>Nº PUNTOS ASIGNADOS POR SEMEJANZA</b>					
<b>E) ESTADO POST-INCENDIO VEGETACION</b>					
<b>ARBOLADO</b>					
<b>Severidad afeccion</b>					
<b>Especie</b>	<i>Muy baja: parcialmente afectado en base de tronco, copa verde</i>	<i>Baja: tronco parcialmente afectado, &gt;50% copa verde</i>	<i>Media:&gt;50% hojas secas se mantienen en copa; pueden estar en suelo si prospección es semanas después del incendio</i>	<i>Alta:completamente quemado, hojas consumidas</i>	
<b>Se observan piñones en el suelo?</b> no      pocos      abundantes					
<b>MATORRAL</b>					
<b>Severidad afección matorral</b>					
Muy baja	<i>manchas o rodales con matorral prácticamente no afectado</i>				
Baja	<i>son frecuentes las plantas con algunas hojas verdes</i>				
Media	<i>matorral quemado (sin hojas verdes) pero con ramillas finas terminales sin consumir</i>				
Alta	<i>completamente chamuscado (solo permanecen las ramas más gruesas en pie (aprox &gt;6mm))</i>				
<b>Estrato herbáceo</b>					
<b>Severidad afección estrato herbáceo</b>					
	consumido	parcialmente quemado	quedan bastantes restos verdes		
<b>F) COMBUSTIBLE QUEMADO: CARGA Y DISTRIBUCION</b>					
<b>G) ESTADO POST-INCENDIO DEL SUELO</b>					
<b>%Suelo desnudo (sin vegetación ni piedras)</b>		<30%	30-40%	40-60%	>60%
<b>Fragmentos de roca (% cobertura):</b>		<input type="checkbox"/> Pedregoso (20-60)			
<input type="checkbox"/> Desnudo a ligeramente pedregoso (<20)		<input type="checkbox"/> Muy pedregoso (>60)			
<b>Afloramientos rocosos:</b>	no	puntuales	frecuentes	generalizados	
<b>Grado de encostramiento del suelo:</b>	Ninguno	Leve	Moderado	Severo	
<b>¿Presencia significativa de manchas o costra biológica continua?</b>	Si	No			
<b>Horizontes orgánicos</b>					
<b>Hojarasca afectada:</b>	intacta	parcialmente quemada	consumida		
<b>% superficie suelo permanece con hojarasca no consumida</b>		<30%	30-60%	>60%	
<b>Hojarasca caída tras fuego o susceptible de caer pronto (pinocha)</b>		si	no		
<b>% suelo cubierta por hojarasca a corto plazo</b>		<30%	30-60%	>60%	
<b>Profundidad capa hojarasca que permanece tras fuego</b>					
superficial (<1cm)	gruesa (1-3 cm)		muy gruesa (>3 cm)		
<b>Cenizas blancas:</b>	<input type="checkbox"/> ausencia	<input type="checkbox"/> puntual: solo bajo acúmulo combustible	<input type="checkbox"/> generalizada		
<b>Movimientos de cenizas tras las lluvias</b>	no	puntual	generalizada		
<b>Desprendimientos / corrimientos de tierra</b>	no	puntual	generalizada		
<b>Desmoronamiento de muretes en bancales</b>	no	puntual	generalizada		
<b>OBSERVACIONES</b>					

Vegetation: fire severity

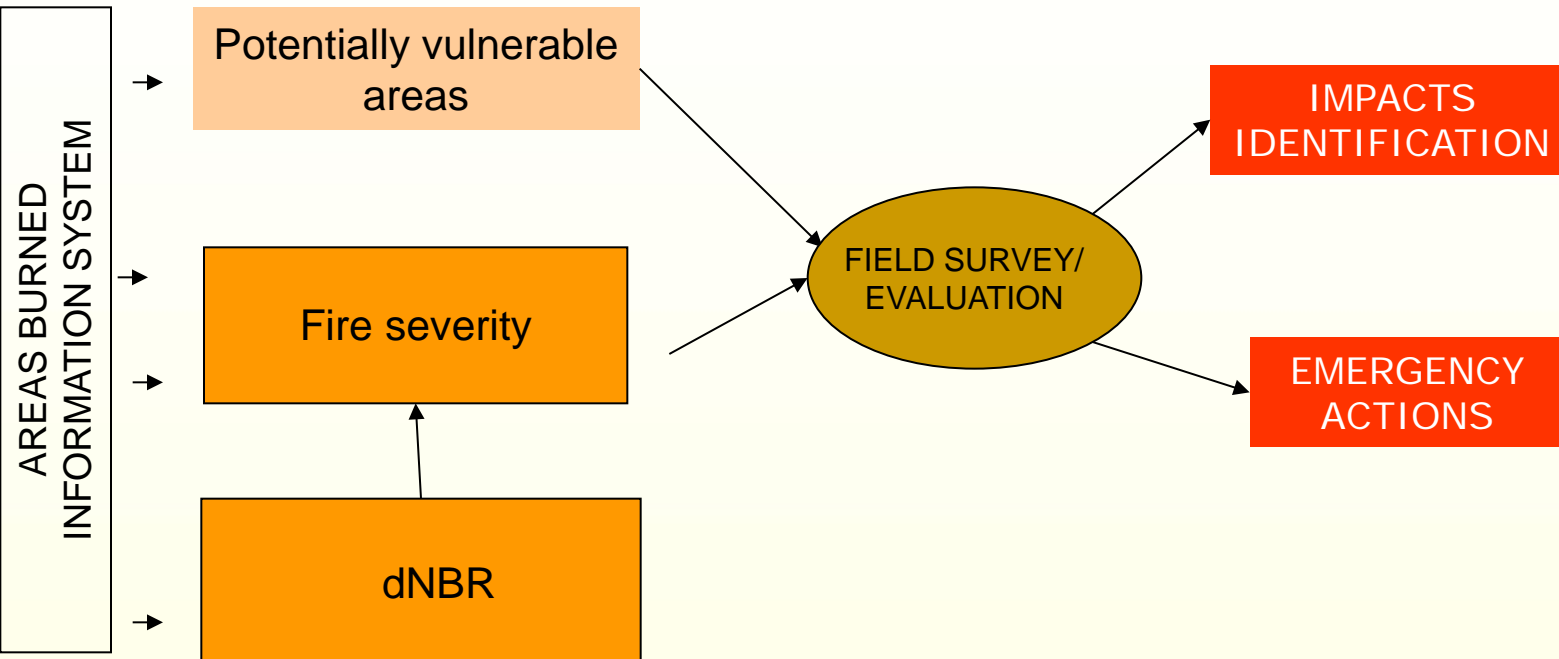
Soil and organic matter: fire severity

# RATING SCALE

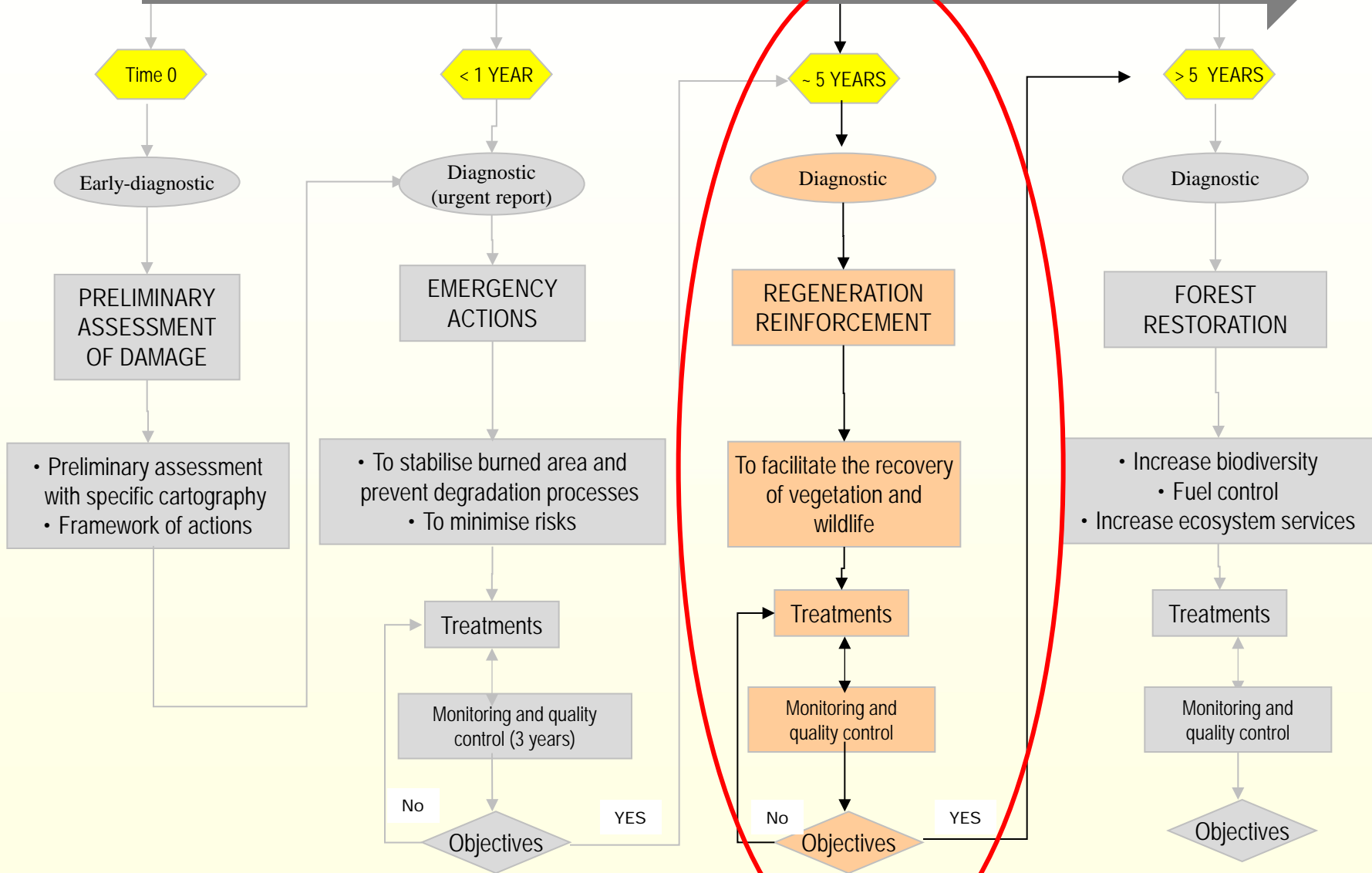
<b>VULNERABILITY</b>		<b>LOW</b>	<b>MEDIUM</b>	<b>HIGH</b>	<b>VERY HIGH</b>	
<b>SOIL VULNERABILITY</b>	TOPOGRAPHY (SLOPE)		<15%	15-30%	31-45%	>45%
	BED ROCK		TYPE I	TYPE II	TYPE III	TYPE IV
	PREVIOUS SYMPTOMS OF EROSION	EROSION	NONE /LOW	MODERATE	HIGH	SEVERE
		TERRACES CONSERVATION	NO TERRACES/ GOOD CONDITION	SCATTERED LANDSLIDES	WIDESPREAD LANDSLIDES	
		DEGREE OF CRUSTING	SLIGHT	MODERATE	SEVERE	
	SOIL PROTECTION	% BARE SOIL	<30%	30-60%		>60%
		THICKNESS OF LITTER LAYER	>3 cm	1-3 cm	<1 cm	
<b>VEGETATION VULNERABILITY</b>	VEGETATION REGENERATION CAPACITY	CANOPY COVER OF MATURE <i>Pinus halepensis</i> / <i>Pinus pinaster</i> OR RESPROUTER TREES (OAKS)	>60	30-60		<30
		RESPROUTER SHRUB COVER	>60	30-60		<30
		RESPROUTER HERBACEOUS COVER	>60	30-60		<30
	FIRE HISTORY	Nº FIRES IN THE LAST 20 YEARS	0	1	2	>2
	PEST/DISEASE RISK	PRESENCE OF PESTS, DISEASE AND / OR PRESENCE OF ABIOTIC DAMAGE	SLIGHT OR NONE	MODERATE	HIGH	



<b>SEVERITY</b>		LOW	MEDIUM	HIGH	VERY HIGH
<b>SOIL SEVERITY</b>	LITTER AFFECTED (DEGREE)	NOT AFFECTED	PARTIALLY BURNED	CONSUMED	
	WHITE ASH (PRESENCE)	NO		PUNCTUAL	GENERALISED
<b>VEGETATION SEVERITY</b>	TREES	STEM PARTIALLY AFFECTED >80% CROWN GREEN	80- 50% CROWN GREEN	>50% BROWN CROWN	LEAVES CONSUMED
	SHRUBS	STANDS ALMOST NOT AFFECTED	PLANTS WITH SOME GREEN LEAVES	SMALL BRANCHES NOT CONSUMED	ONLY THICK BRANCHES LEFT (>6 mm)
	GRASS	GREEN LEAVES REMAINING	PARTIALLY BURNED	CONSUMED	



# PLANNING RESTORATION ACTIONS IN BURNED AREAS



# SPECIFIC MONITORING DATA FOR MEDIUM-SHORT/TERM (1/2)

<b>FICHA (5) PUNTO DE SEGUIMIENTO</b>		Fecha de muestreo: ____/____/____					
<b>Nº PUNTO DE MUESTREO</b>							
¿Este punto fue muestreado tras el fuego? Sí / No (En caso negativo, rellenar la ficha de muestreo)							
<b>A) ESTADO DEL SUELO</b>							
Tipo de erosión/acumulación: Marcar gravedad (Ninguna Leve Moderada Severa)							
Erosión laminar _____	Badlands _____	Movimientos en masa _____					
Regueros _____	Acumulación _____	Desmoronamiento muretes _____					
Cárcavas _____	Erosión/deposición eólica _____	Otros _____					
% suelo desnudo (sin vegetación, piedras, hojas, restos quemados)	<30%	30-60%	>60%				
% suelo cubierto por hojarasca, incluyendo restos quemados y selvíc.	<30%	30-60%	>60%				
Profundidad capa hojarasca	superficial (<1cm)	gruesa (1-3 cm)	muy gruesa (>3 cm)				
Grado de encostramiento del suelo	Ninguno	Leve	Moderado Severo				
¿Presencia significativa de manchas o costra biológica continua? Si No							
<b>B) ESTADO DE LA VEGETACIÓN</b>							
% RECUBRIMIENTO TOTAL DE LA VEGETACIÓN VIVA	<30%	30-60%	>60%				
<b>B.1. Regeneración de arbolado post-incendio</b>							
Especie	Modo de Regeneración <sup>1</sup>	Densidad <sup>2</sup>	Viabilidad de los rebrotes	Vigor rebrotes	Altura media		
			alto / bajo	alto / bajo			
			alto / bajo	alto / bajo			
<sup>1</sup> Semilla/Rebote cepa/Rebote raíz.							
<b>B.2. Regeneración del matorral post-incendio</b>							
% recubrimiento total	<30%	30-60%	60%	% recubrimiento rebrotadoras	<30%	30-60%	>60%
Especie	Ocupación	Altura media		Especie	Ocupación	Altura media	
¿Existe alguna especie germinadora formadora de matorrales de alta combustibilidad?							
Especie	Densidad <sup>1</sup>						
<sup>1</sup> Escasa (<1 individuo/16 m <sup>2</sup> ); Moderada (1 ind/16 m <sup>2</sup> -1 ind/4 m <sup>2</sup> ), abundante (1 ind/4 m <sup>2</sup> a 1 ind/m <sup>2</sup> ) muy abundante (>1 ind/ m <sup>2</sup> )							
<b>B.3. Regeneración de herbáceas</b>							
% recubrimiento total	<30%	30-60%	>60%				
% recubrimiento por especies rebrotadoras	<30%	30-60%	>60%				
Especie	Ocupación						
<b>B.4. Otras observaciones sobre el estado de la regeneración: ¿daños por fauna/ganado?</b>							

Erosion

Vegetation regeneration

**FICHA (6) PUNTO DE SEGUIMIENTO (continuación)**

**Nº PUNTO DE MUESTREO:**

**B.5. Vegetación que se vio afectada con severidad baja y sobrevivió al fuego**

**Fracción de cabida cubierta del arbolado superviviente:**

No existía arbolado antes del fuego    0%    <20%    20-40%    40-60%    >60%

Especie	Ocupación	Distribución de los pies <sup>1</sup>	% Estado desarrollo			%Mortalidad post-incendio	Vigor de los pies
			MB	Latiz	Fust		
							alto / bajo
							alto / bajo

<sup>1</sup> Continua / Bosquetes / Pies aislados

Si después del incendio hay plagas, enfermedades o daños abióticos, valorar el grado de afección

Especie arbórea	Agente causante mortalidad/debilitamiento	Grado afección
		Ninguno/Leve/Modera/Severo
		Ninguno/Leve/Modera/Severo

**% recubrimiento del matorral superviviente**    0%    <30%    30-60%    >60%

Especie	Ocupación	%Mortalidad post-incendio	Vigor de los pies
			alto / bajo
			alto / bajo
			alto / bajo

**B.6. Arbolado muerto en el fuego**

Especie	Densidad*	Estado desarrollo			% pies caídos de forma natural*	Estabilidad física de los árboles en pie
		%MB	%Lat	%Fus		
						alto / bajo
						alto / bajo

\*En el caso de que los árboles se hayan talado refleje el tratamiento en el aptdo C, y deje vacía la columna % pies caídos

**C) GESTIÓN FORESTAL POST-INCENDIO**

**¿Se ha realizado alguna actuación de restauración post-incendio? Sí / No    ¿Cuál?**

Tratamiento madera quemada	Siembra	Plantación	Hidrotécnicas	Control combustible
Restauración muros	Mulch	Otras.....		

**Describir actuación:**

**Describir impactos (negativos/positivos) asociados a la actuación:**

Vegetation cover

Post fire treatments



# Example of application: Benicolet fire

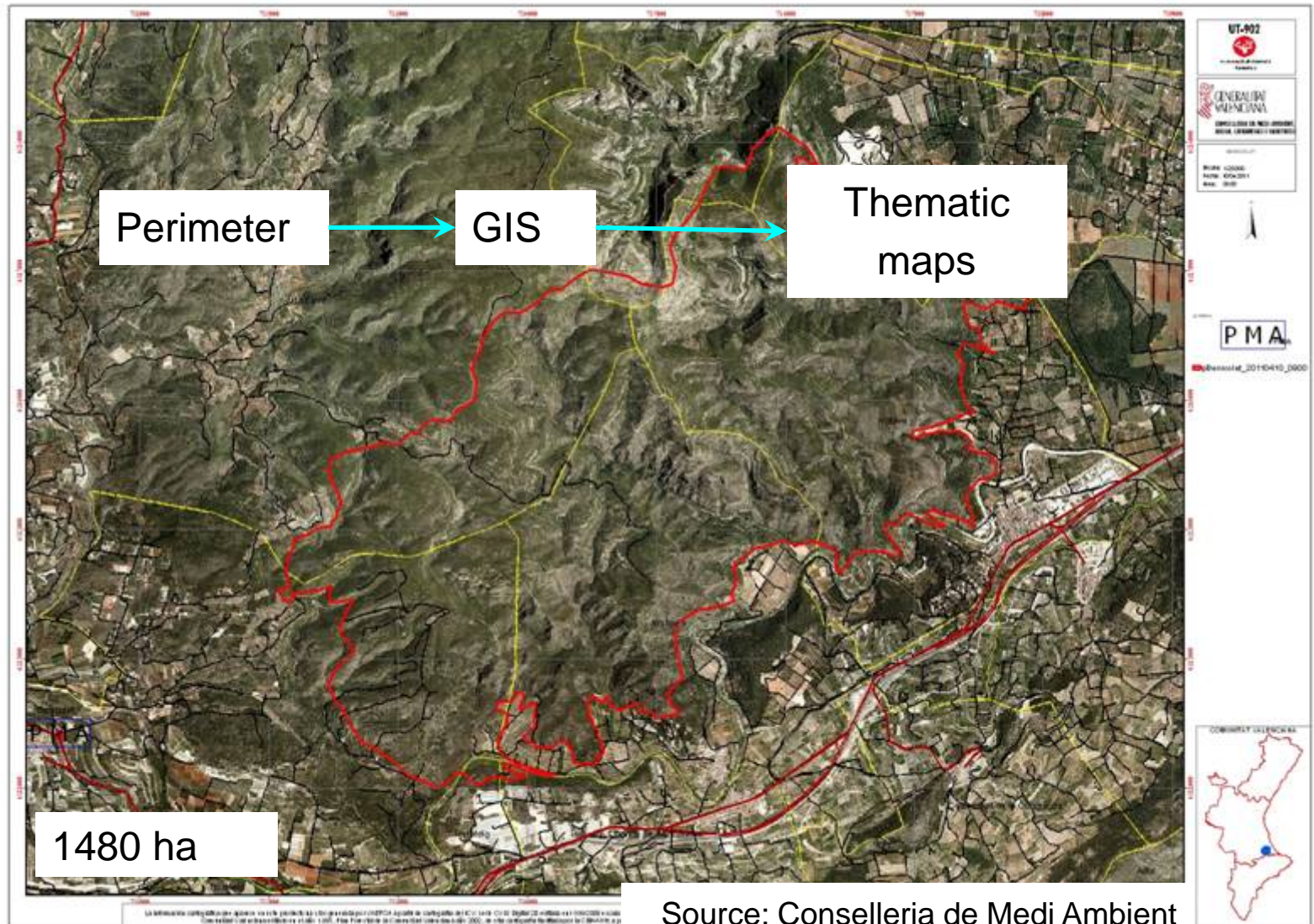


Forest fire: 6 September 2010

Evaluation Report: 16-17 September 2010

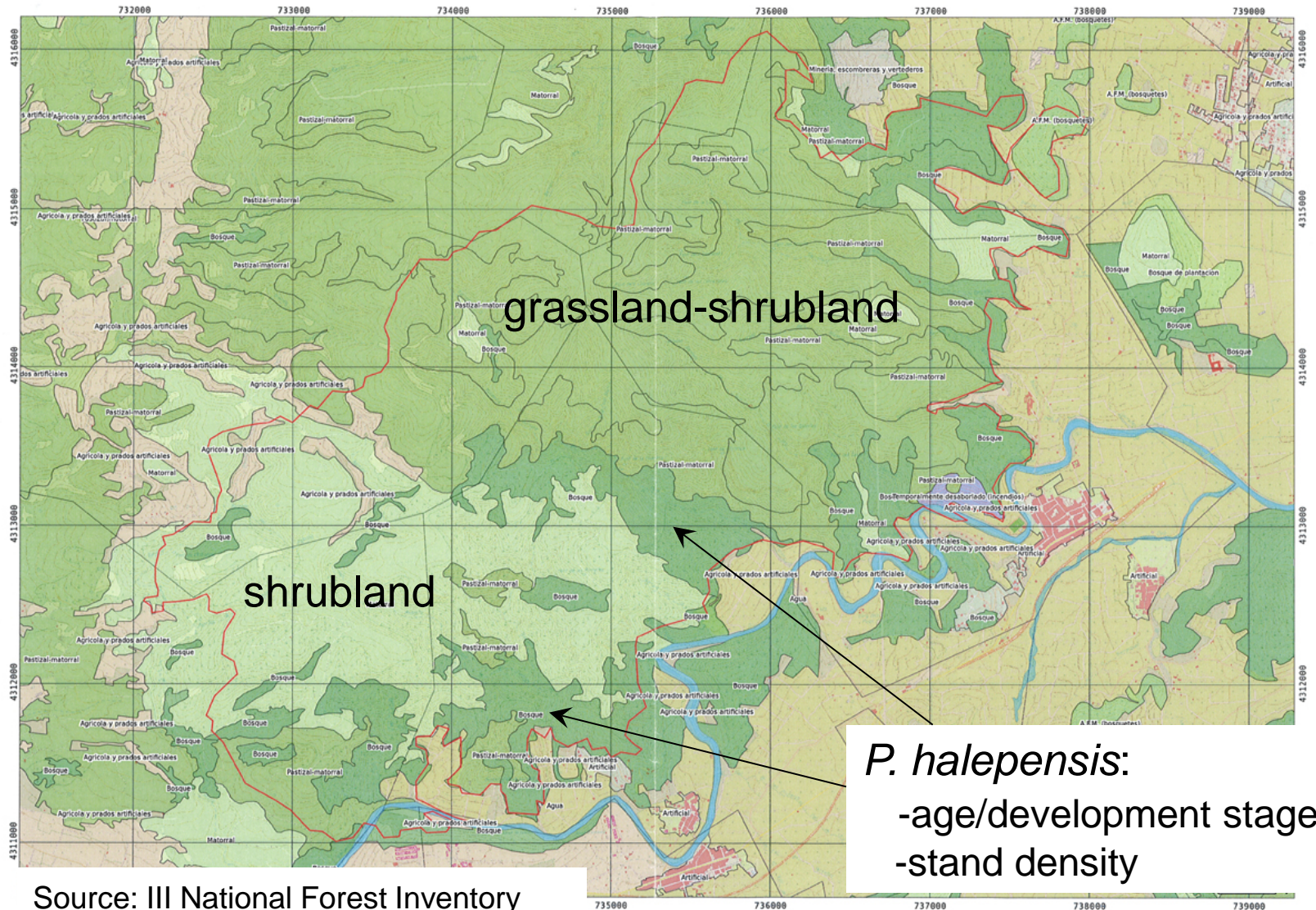


# 1.1. Collecting information about the area affected and about the fire





# 1.1. Collecting information about the area affected and about the fire

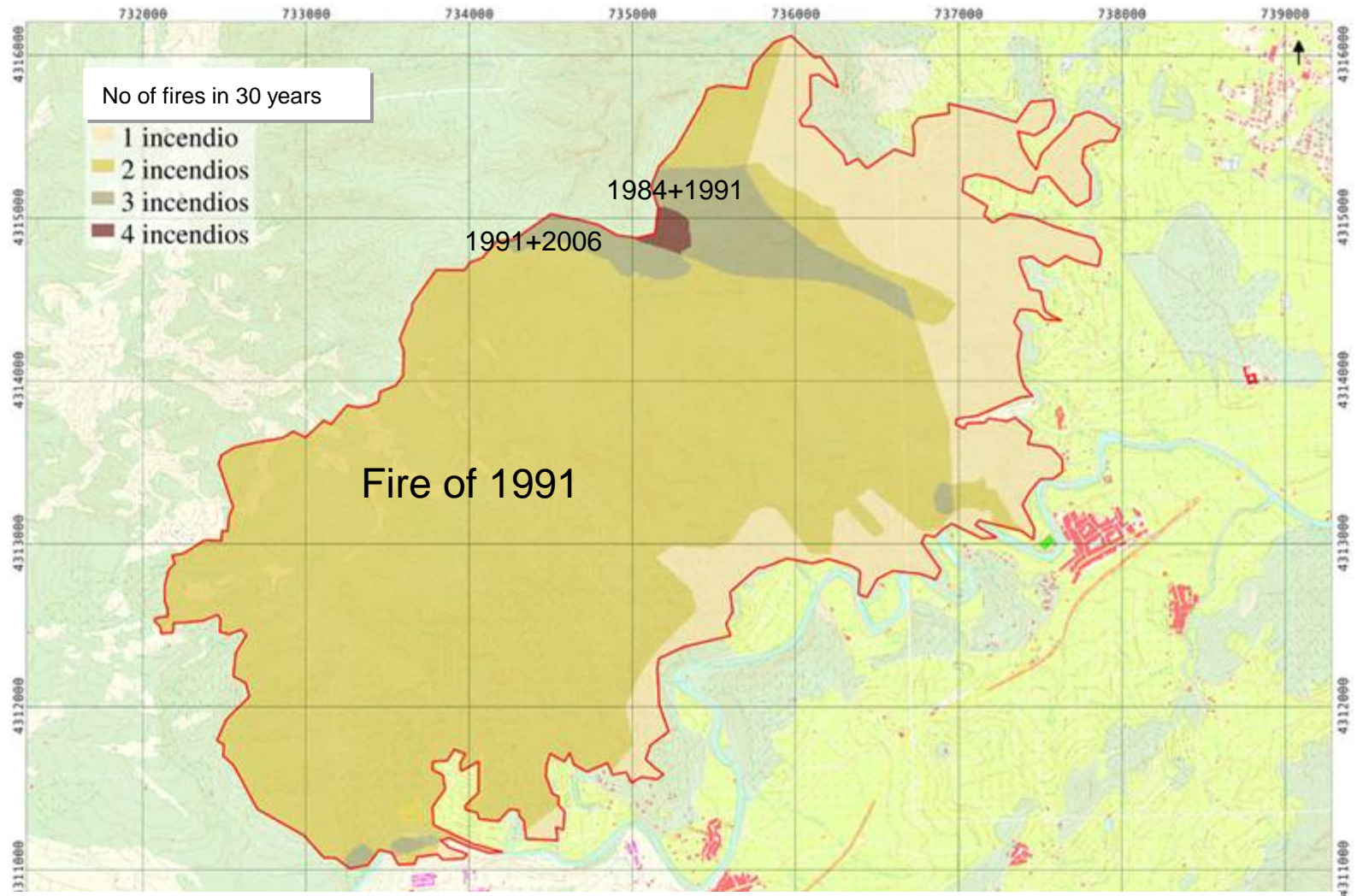


Source: III National Forest Inventory

*P. halepensis*:  
-age/development stage  
-stand density

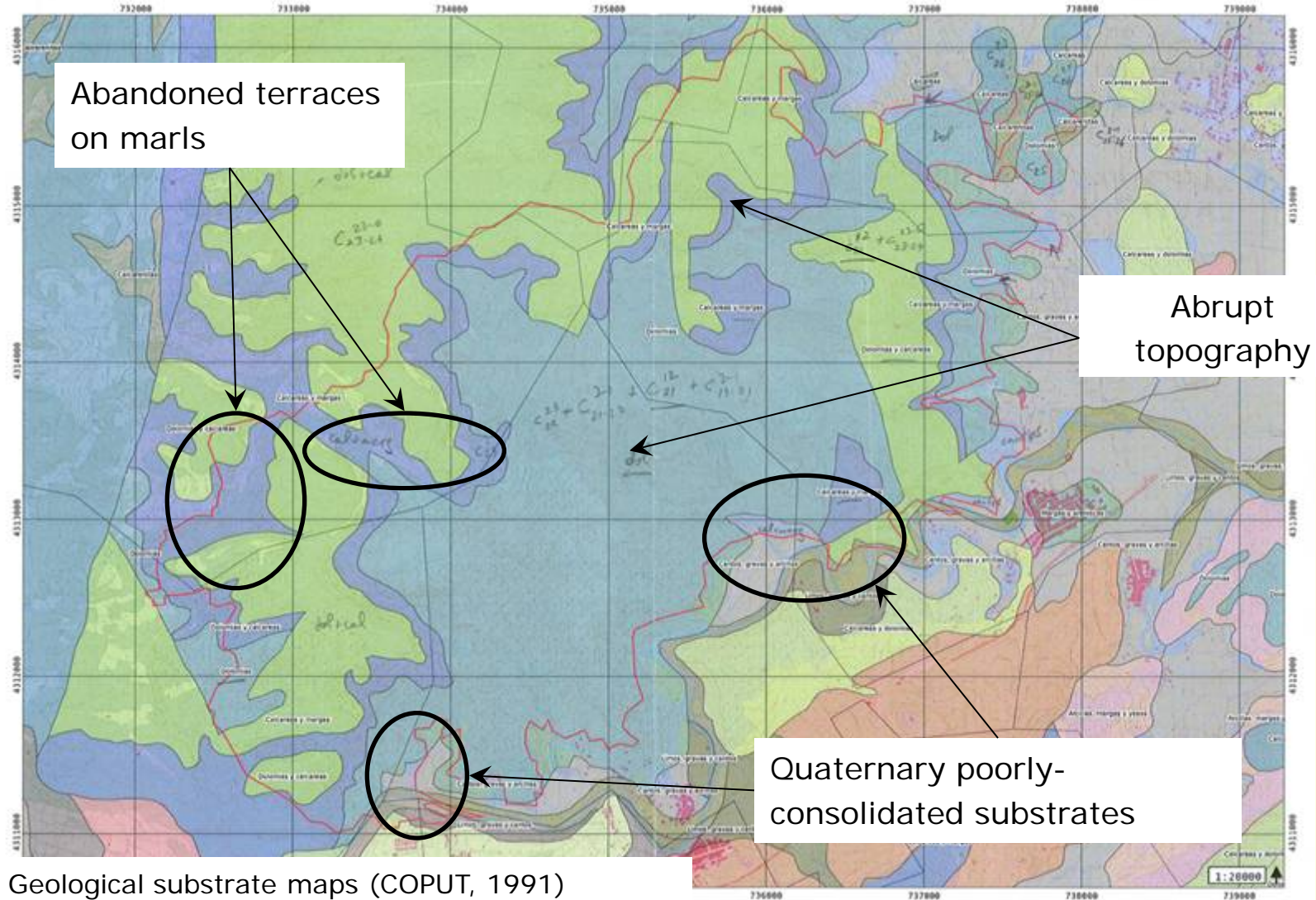


# 1.1. Collecting information about the area affected and about the fire



From data of the Conselleria de Infraestructuras, Territorio y Medio Ambiente

# 1.2. Identifying potential priority areas for rehabilitation





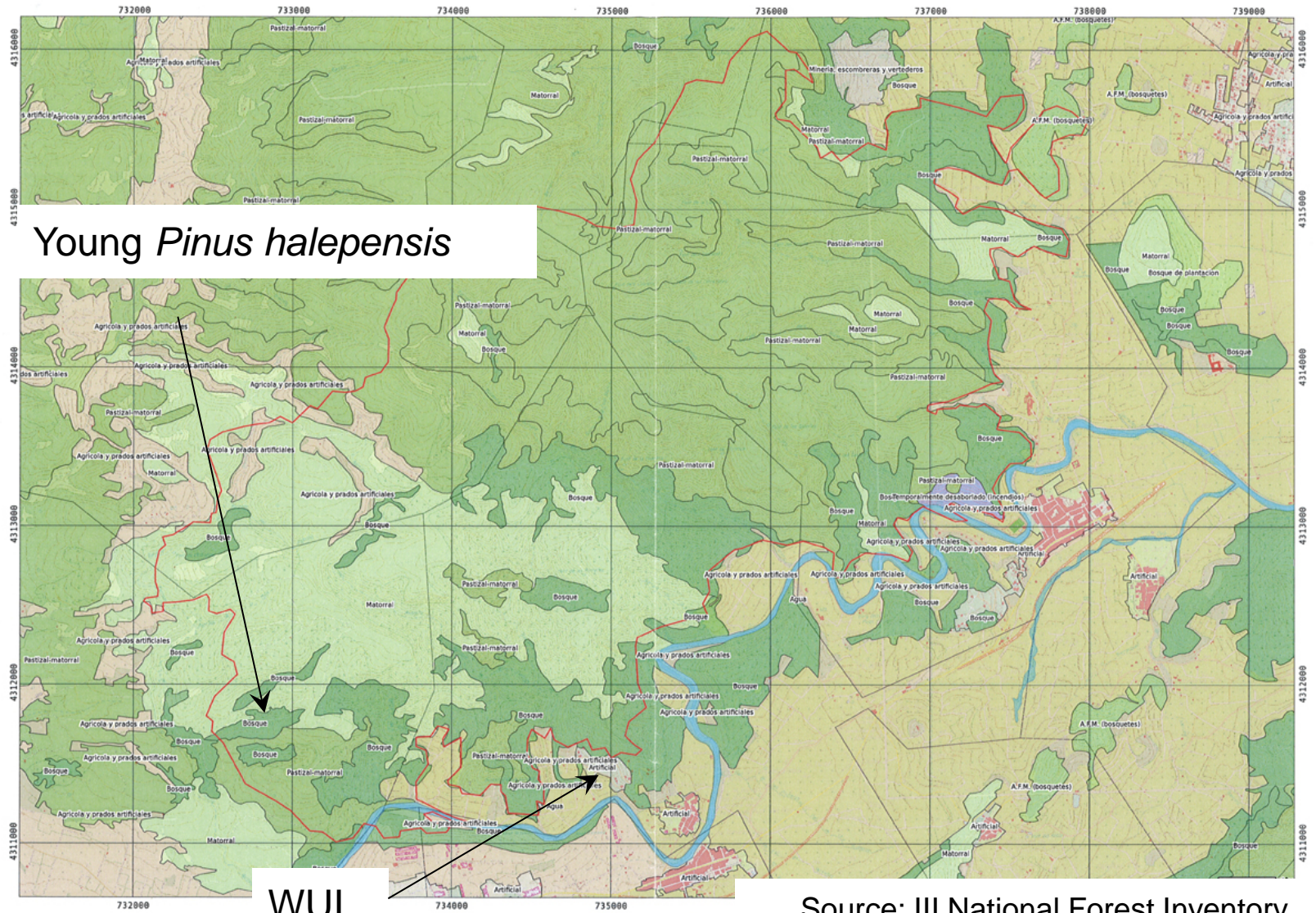
# Abandoned terraces on marly soils



*two weeks after fire*



# 1.2. Identifying priority areas



Young *Pinus halepensis*

WUI

Source: III National Forest Inventory



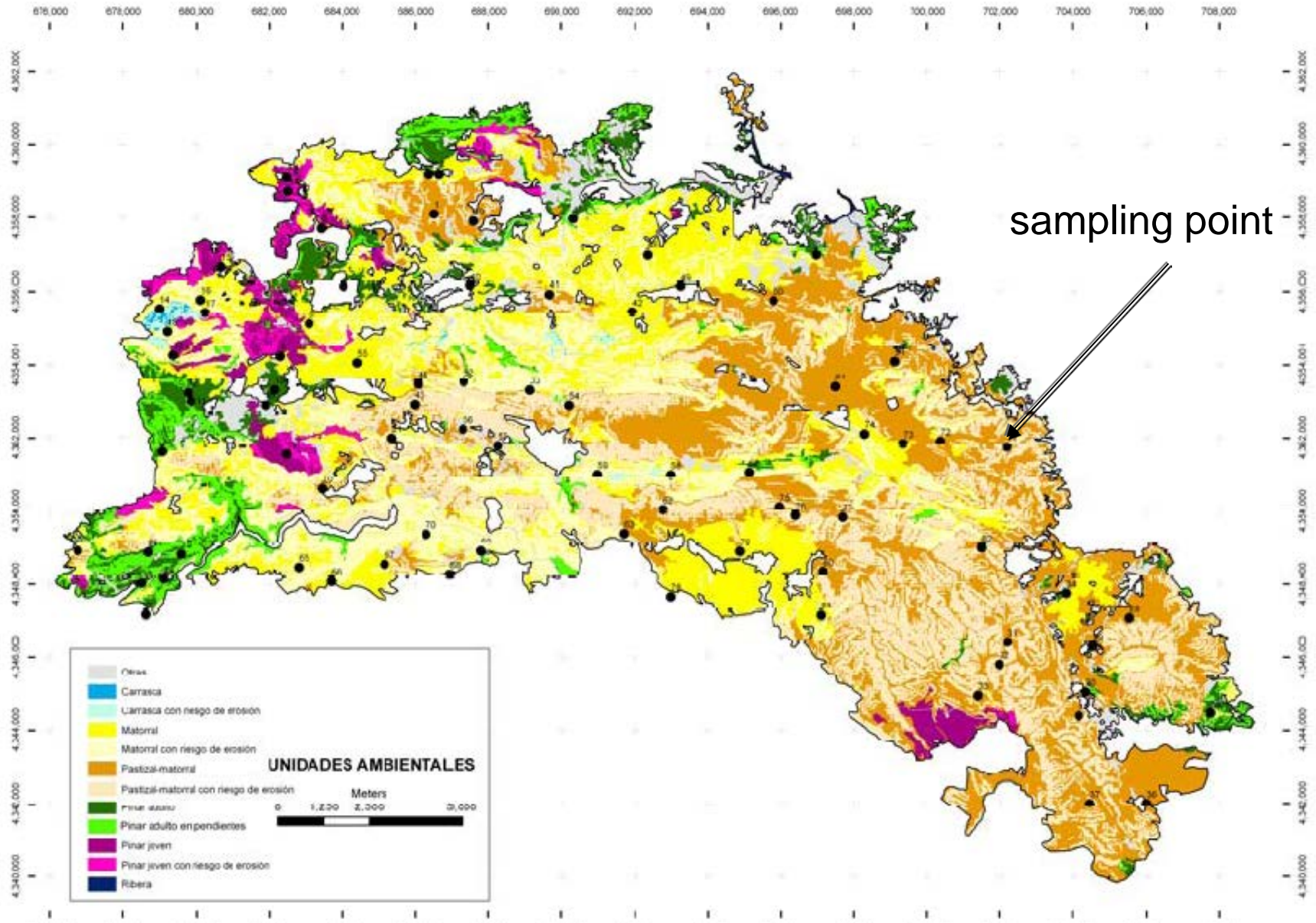


Not identified in the cartography ....

Gallery forests in creeks



# PLANNING FIELD PROSPECTION: ENVIRONMENTAL-SAMPLING UNITS





# Resprouting shrubland with high potential cover



*two weeks after fire*



**Sparse resprouting** shrubland with low potential cover



*two weeks after fire*



# Mature *Pinus halepensis*



two weeks after fire



# Young *P. halepensis*



two weeks after fire

# RESULTS OF THE FIELD SURVEY

<b>VULNERABILITY</b>		<b>LOW</b>	<b>MEDIUM</b>	<b>HIGH</b>	<b>VERY HIGH</b>	<b>NO DATA</b>	
<b>SOIL VULNERABILITY</b>	TOPOGRAPHY (SLOPE)		28	36	12	24	0
	BED ROCK		64	36	0	0	0
	PREVIOUS SYMPTOMS OF EROSION	EROSION	96	0	4	0	0
		TERRACES CONSERVATION	92	8	0	0	0
		DEGREE OF CRUSTING	100	0	0	0	0
	SOIL PROTECTION	% BARE SOIL	100	0	0	0	0
		THICKNESS OF LITTER LAYER	0	0	100	0	0
<b>VEGETATION VULNERABILITY</b>	VEGETATION REGENERATION CAPACITY	CANOPY COVER OF MATURE <i>Pinus halepensis</i> / <i>Pinus pinaster</i> OR RESPROUTER TREES (OAKS)	21	5.3		73.7	0
		RESPROUTER SHRUB COVER	0	4		56	40
		RESPROUTER HERBACEOUS COVER	12	16		16	56
	FIRE HISTORY	N° FIRES IN THE LAST 20 YEARS	20	80	0	0	0
	PEST/DISEASE RISK	PRESENCE OF PESTS, DISEASE AND / OR PRESENCE OF ABIOTIC DAMAGE	100	0	0	0	0

Distribution of sampling points (%) by impact category for every environmental factor

<b>SEVERITY</b>		LOW	MEDIUM	HIGH	VERY HIGH	NO DATA
<b>SOIL SEVERITY</b>	LITTER AFFECTED (DEGREE)	0	63.6	36.4		
	WHITE ASH (PRESENCE)	36.4	54.5	9.1		
<b>VEGETATION SEVERITY</b>	TREES	0	33.3	16.7	41.7	8.3
	SHRUBS	0	0	72.7	27.3	
	GRASS	0	36.4	63.6		

# Stage 3 Evaluation 3.1. Evaluation of revegetation ability

- Shrubland: resprouters dominate → good and rapid revegetation
- Mature *P. halepensis*: abundant seed dispersal → good recovery of the pine stand
  - At mid-term *P. halepensis* density will likely be excessive (overstocking)
- Young *P. halepensis*: insufficient seed release → poor recovery of the pine stand





*Quercus coccifera* resprout two weeks after fire  
(*Chamaerops*, *Daphne*, *Clematis*, *Brachypodium*, etc.  
also resprouted quickly)











8 months after fire, in the environmental units Mature shrubland, Mature and young *P. halepensis*, the resprout of shrubs and grasses covered more than 30% of the surface



Two weeks after fire

Low-cover shrubland

Mature shrubland, pines





8 months after fire

Low-cover shrubland

Mature shrubland, pines





## Week 2: short-distance movement of ash





No active erosion post-fire (month 8)





Month 8: mineral layers without erosion symptoms





# Summary

- Eight months after fire, predictions of the urgent report regarding shrubland recovery and short-term erosion risk were confirmed
- Temporal framework for confirming predictions: two years after the fire
- The Forest Administration undertook several of the prescribed urgent actions
  - Monitoring pests (bark beetles)
  - Management of burned wood along paths
  - Avoiding management of burned trees in areas with vulnerable soils to erosion until plant cover reached >40%

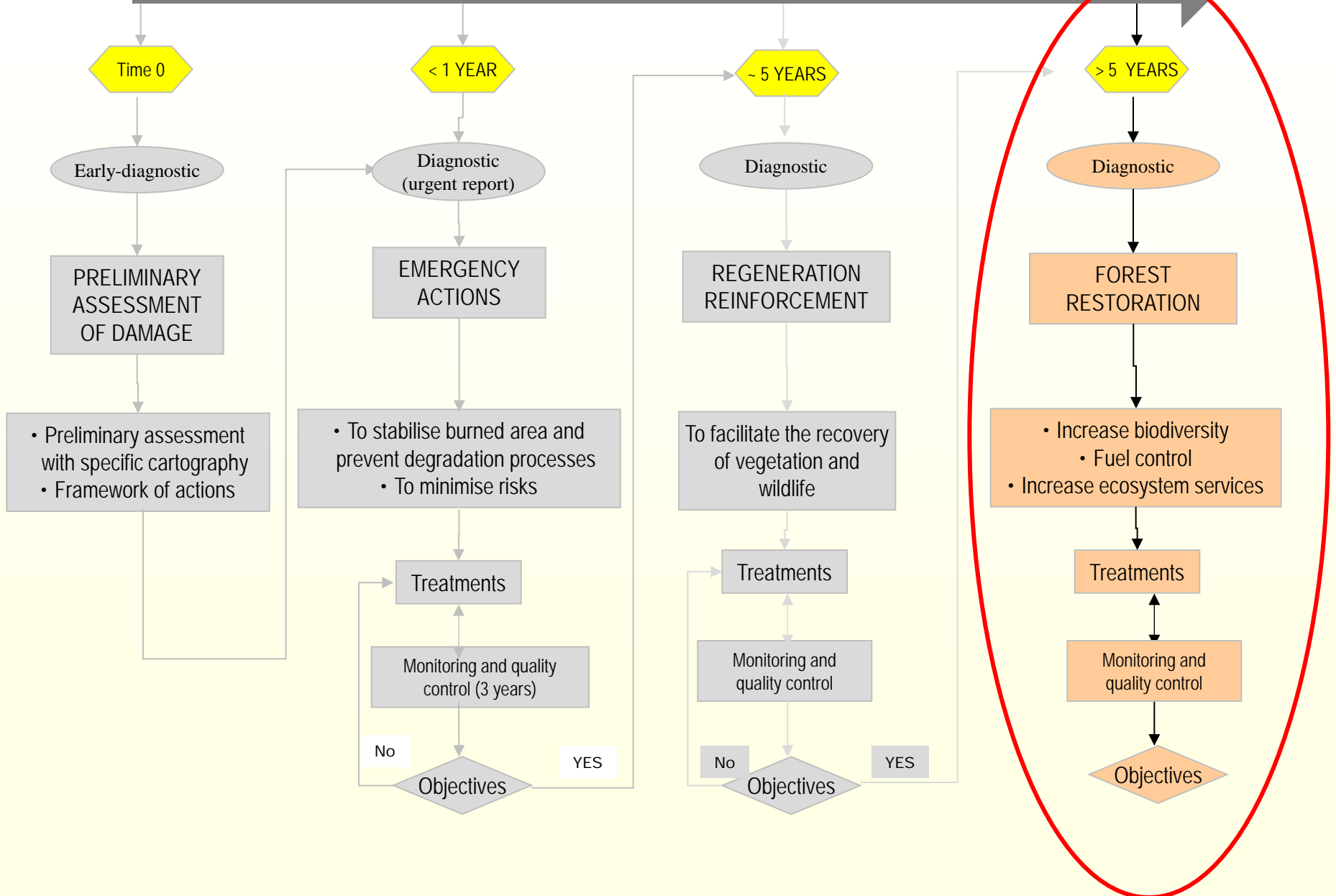


# Stage 3. Evaluation

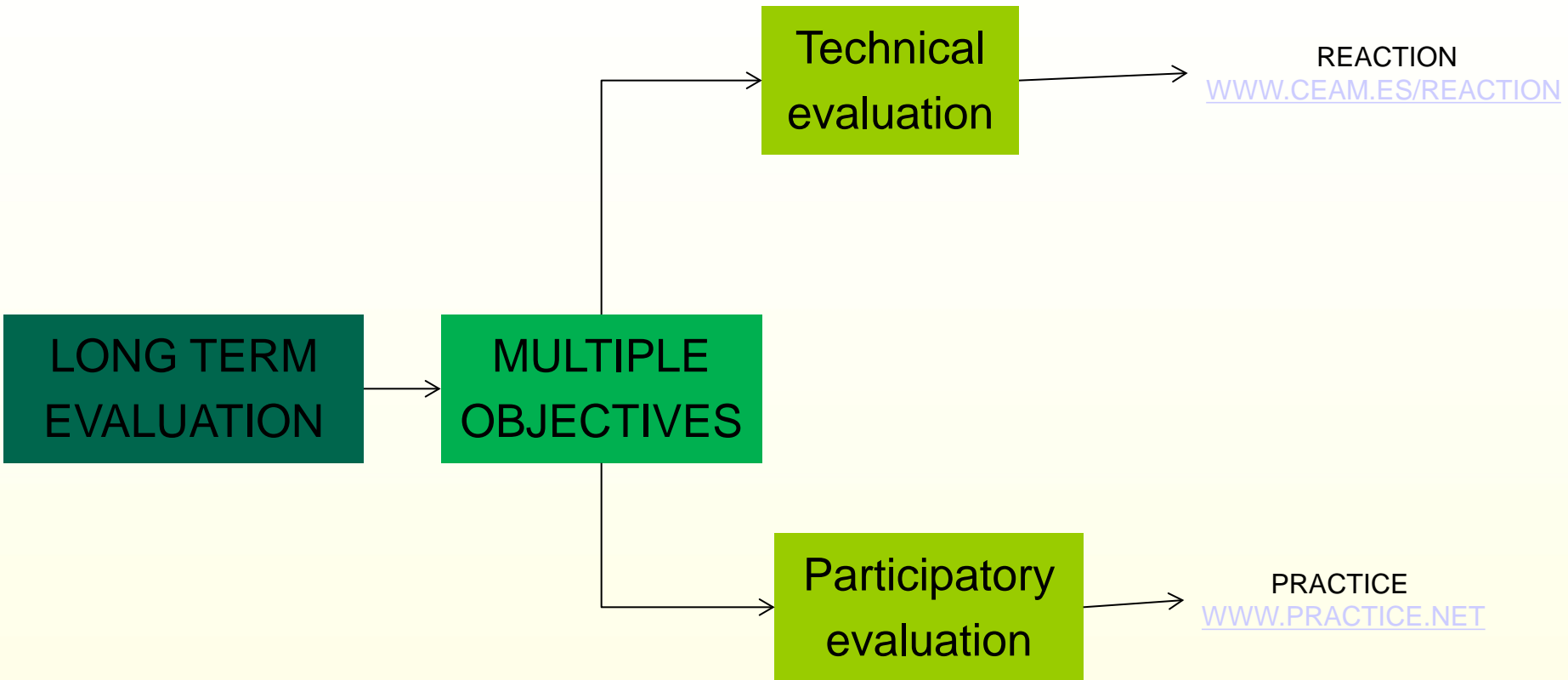
## 3.4. Recommendations on the mid/long term

- Increase the resilience of vegetation in abandoned terraces → establishing resprouters
- Increase the abundance of forests: *P. halepensis* and *P. pinaster*

# PLANNING RESTORATION ACTIONS IN BURNED AREAS





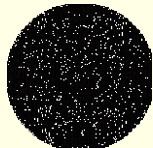


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# REACTION

Restoration Actions to Combat Desertification  
in the Northern Mediterranean

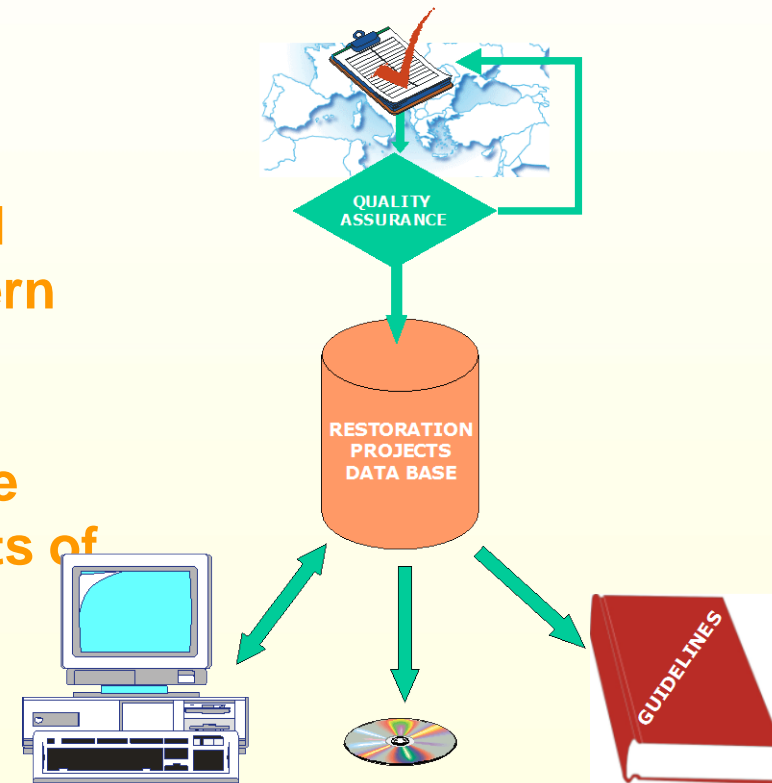




## REACTION OBJECTIVES

Facilitate access to high quality information establishing a database on land restoration to fight desertification:

- **Inventorizing well-documented restoration projects in the northern Mediterranean**
- **Selecting the most appropriate methodology to evaluate the results of restoration projects**



## II. SITE DESCRIPTION

(This block is for indicating the more general characteristic for the project. Please indicate the singularities in the stand description).

### II.1. CLIMATE

#### 1. Reference weather station:

Location (coordinates) of the reference weather station:

Distance (straight line) from the project area (centre point) (km):

Elevation (m):

Period considered for rainfall data:

Period considered for temperature data series:

	Annual average	S.D.	j	f	m	my	j	jl	a	s	o	n	d
2. Rainfall (P, mm)													
3. ETP (mm)													
4. Mean temp (t, °C)													
5. Mean of minimums of coldest months (°C)													
6. Mean of maximums of warmest months (°C)													

7. a) Max. rainfall in 24 hours (mm) recorded during the period considered for rainfall data:

Return period (years):

b) Maximum monthly rainfall (mm) recorded during the period considered for rainfall data:

8. Duration (months) dry period (2t > P):

9. Duration (months) vegetative period (t > 5°C):

10. Bioclimatic classification (e.g. type: semiarid; classification: Emberger)

Type:

Classification:

11. Microclimates :  Yes  No  Unknown

(If present, describe):

12. Please indicate any notable singularities of the site (exceptional winds, unusual weather, ...):

### II.2. TOPOGRAPHY

If provide maps indicate it in point 2.3.

1. General Topography: Flat  Hilly   
Undulating  Mountainous

2. Elevation range (m): Max Min Most representative

3. Slope (%): <10% 10-25% 25-50% > 50%  
(% of area)

4. General aspect : N NE E SE S SW W NW  
(% of area)

Most representative aspect:

5. Reference catchment (which includes the restored area):

Name: Catchment area (km<sup>2</sup>):

Perimeter (km): Total length of main water course (km):

6. Location of project area within the catchment area:

upper watershed  middle  lower  river banks/riparian  others (describe):

Project area (%) in relation to total catchment area:

Does the project area directly drainage to a reservoir?  Yes  No

## V. ASSESSMENT BY RESTORATION UNITS

acronym/code:

2. Unit number/code:

### ANTATION/SEEDING RESULTS

ate the average or the most representative data for each variable (when applicable) & for each species  
ce date:

e performance standards for the seeds/seedlings been attained? (Only if there are quality standards)

No  Partly  Unknown

e performance standards been attained for the work (site preparation, plantation,...)?

No  Partly  Unknown

ver (%) Total: Tree species: Shrub species: Herbaceous species:

ound  
g/ha) Total: Tree species: Shrub species: Herbaceous species:

ced species e)	Introduced by planting	Introduced by seeding	a. Survival (%)	b. Density (individuals/ha)	c. Cover (%)	d. Height (m)	e. Diameter at breast height (cm)	f. Basal diameter (cm) (only for young plants)	g. Wood volume (m <sup>3</sup> /ha)	h. Natural regeneration? (yes/no)	i. Average age (years)	j. Age distribution		
												Mixed – young	Mixed – old	Mono
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<b>Project</b>	<b>Sierra Espuña</b>
<b>Objectives</b>	Soil erosion control
<b>Surface (ha)</b>	625
<b>Year</b>	1890
<b>Species</b>	<i>Pinus halepensis</i> , <i>Pinus nigra</i> , <i>Quercus ilex</i>
<b>Soil preparation technique</b>	Manual hole



(Today Regional Park)



## EVALUATION:

### Achievement of project goals

Most projects achieved structural goals, but only half of them achieved Functional, Landscape or Socioeconomic goals

### Structural Quality

Most projects conserved/increased diversity

### Functional Quality:

Only part of the restored areas regenerate naturally

No clear increase of resistance or resilience to perturbations

All increased erosion/flood control



## Landscape Quality

Half of the projects increased connectivity and few projects increased integration or habitat diversity.

## Socio-economic benefits

All projects has enhanced ecosystem services, but none contributed to fix/support/increase rural population



**PRACTICE**

Prevention and Restoration Actions to Combat Desertification  
An Integrated Assessment

# Prevention and Restoration Actions to Combat Desertification – An integrated Assessment

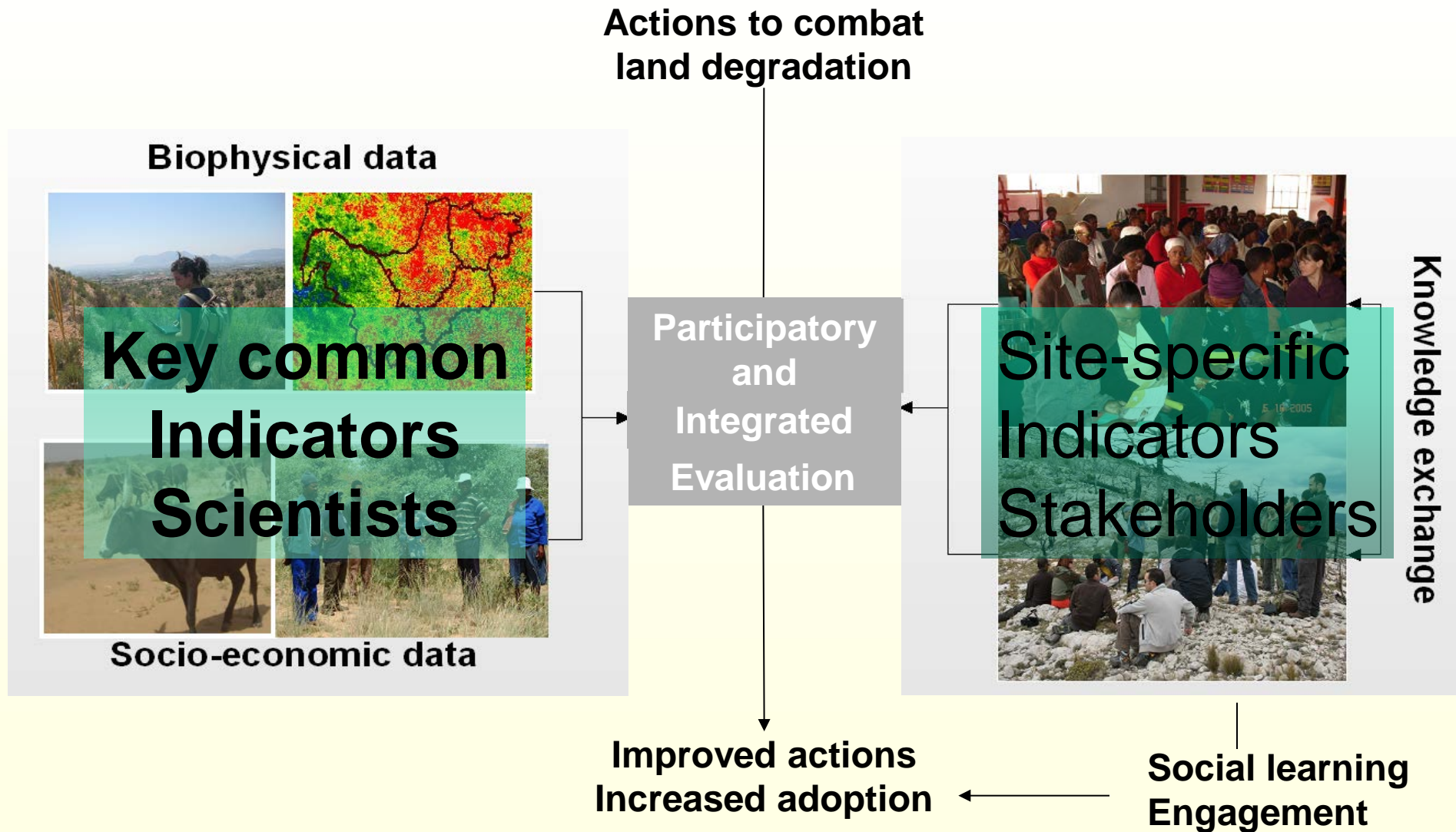
**Ramón Vallejo**

<http://www.ceam.es/practice>

<http://practice-netweb.eu>



# A Framework for Evaluation of Actions and Indicator Selection



# Worldwide Platform of Long Term Monitoring Sites (LTEMs)



**LTEMs: 18 sites in 12 countries.**

Mediterranean Europe (Greece, Italy, Spain, and Portugal),  
Africa (Morocco, Namibia, South Africa), Middle East (Israel), China, and  
South and North America (Chile, Mexico, and USA)

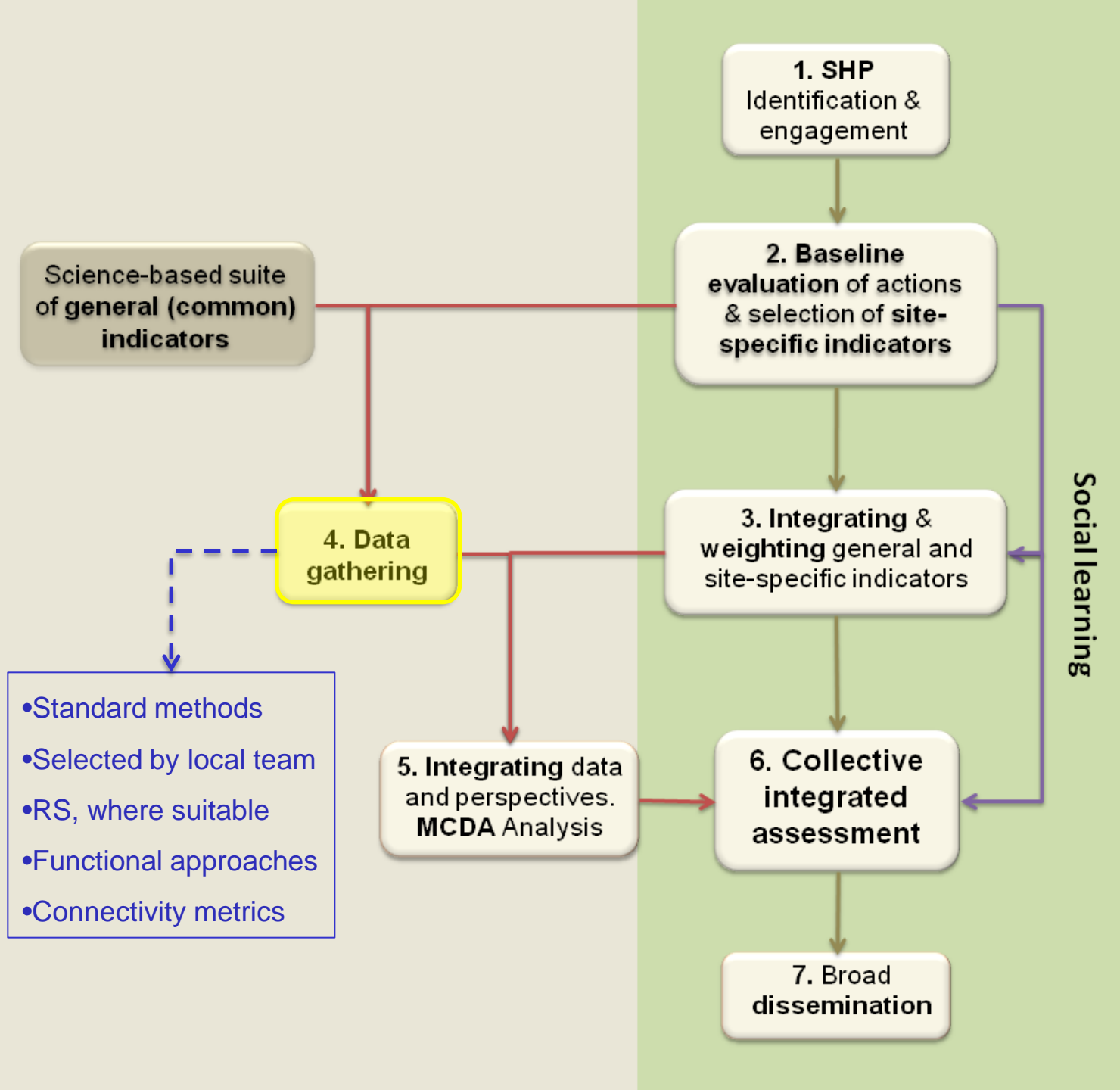




# Indicator Selection

*Millennium Ecosystem Services Approach, UNCCD (CST- Impact Indicators)*

Criteria		Indicators / Proxies
<b>Economy</b>	Income, personal wealth	Site-specific
<b>Provisioning Services</b>	Goods (food, fiber, timber, fuel wood...)	Productivity Productivity value
<b>Regulating &amp; Supporting Services</b>	Water and soil conservation	Plant cover & pattern Soil surface condition
	C sequestration	SOC Above-ground biomass
<b>Cultural Services</b>	Landscape and cultural heritage	Site-specific
Biodiversity		Diversity of vascular plants





# Debate on the results

- 1-small groups discussion
- 2-reporting from small groups
- 3-open discussion



## Step 3: Actions

### Shrubland natural regeneration



### Pine reforestation



### Pine natural regeneration

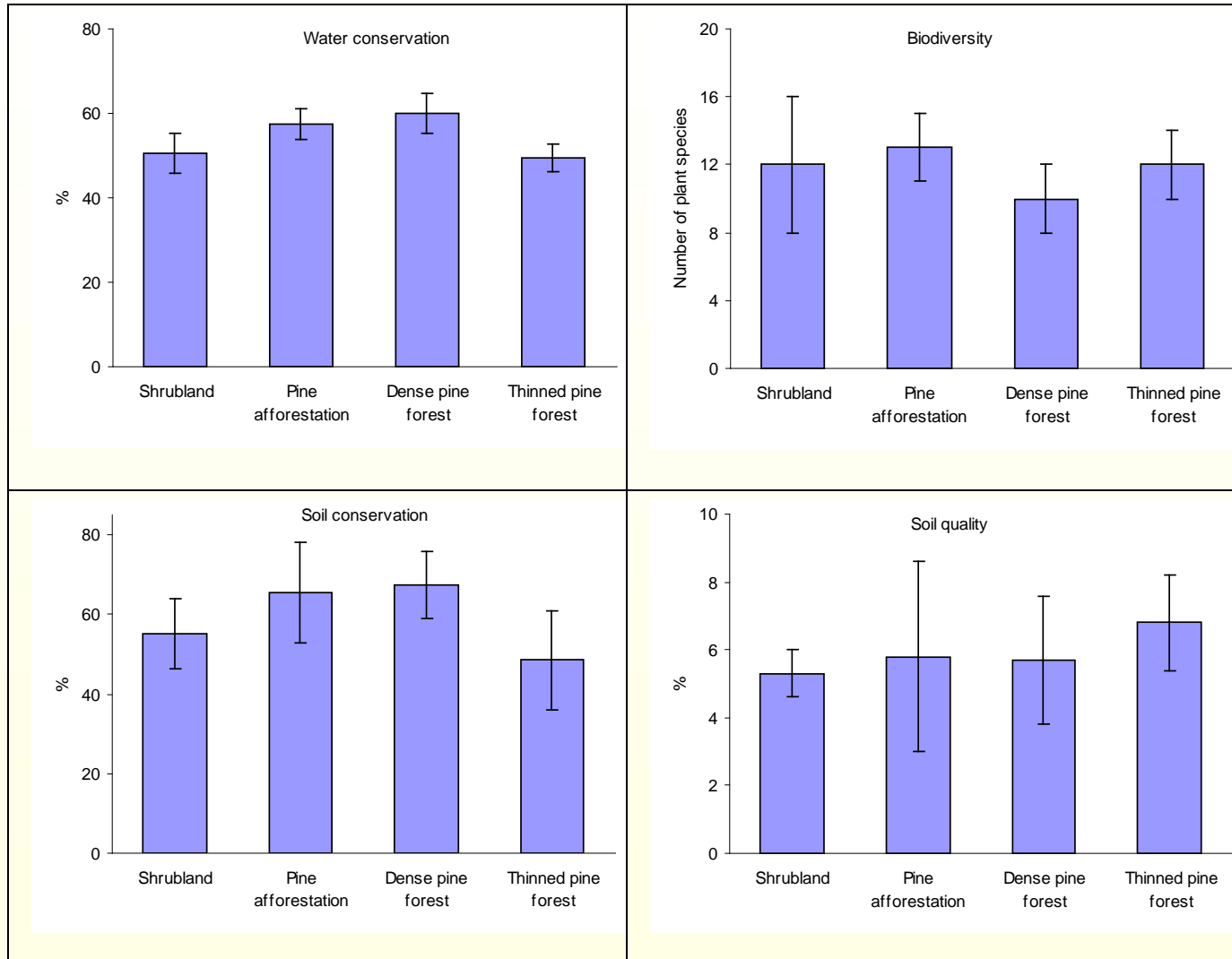


### Assisted natural pine regeneration

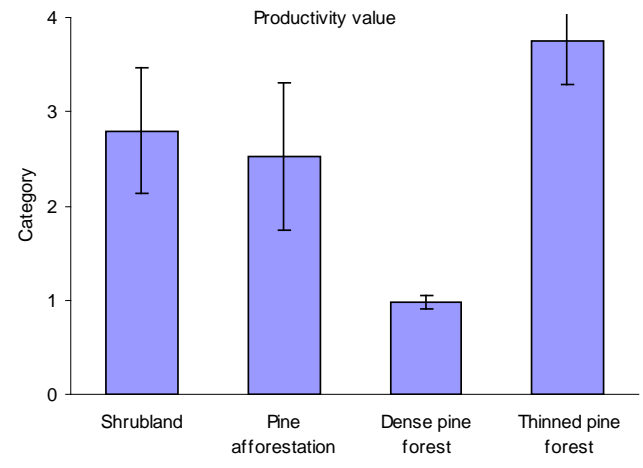
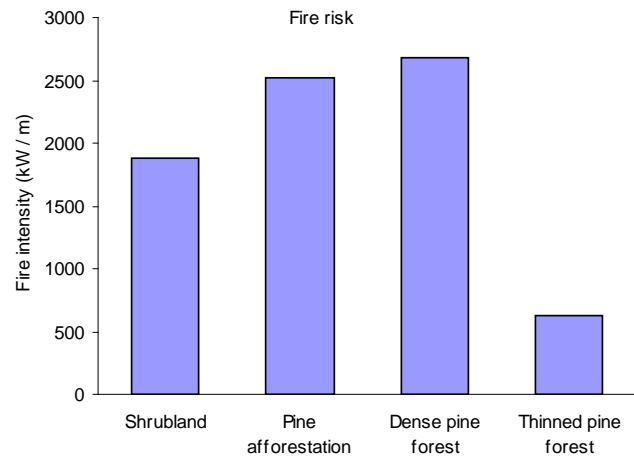
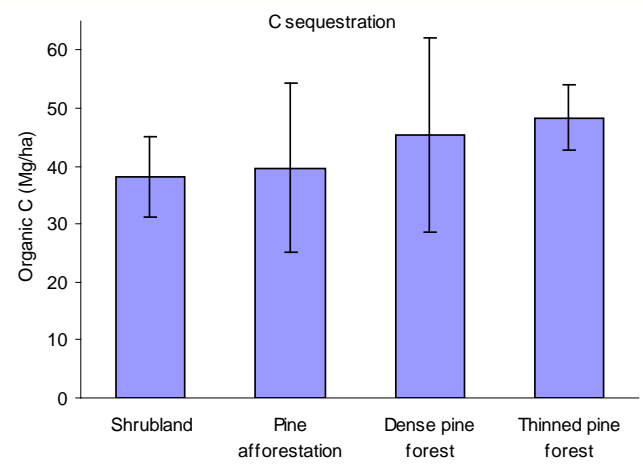
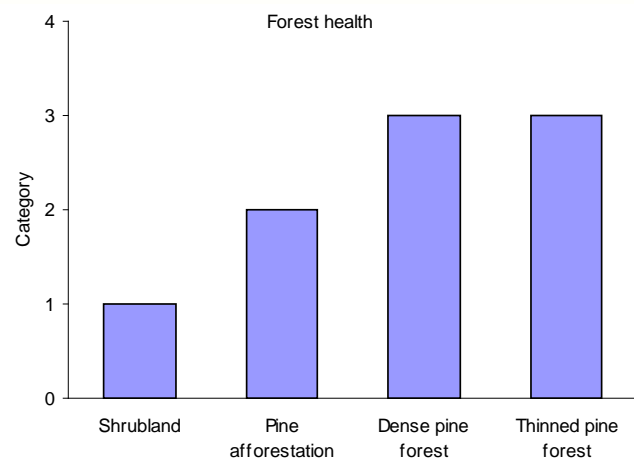




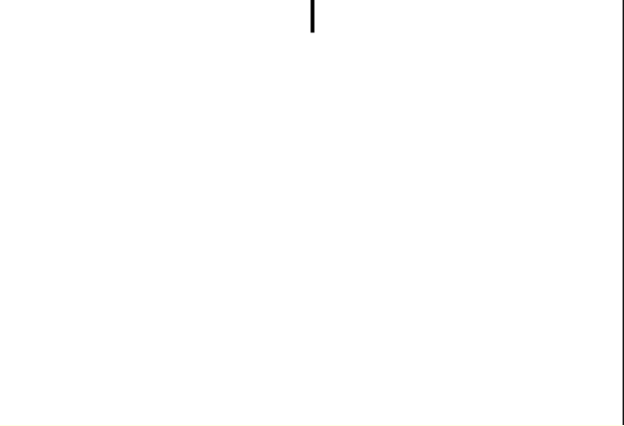
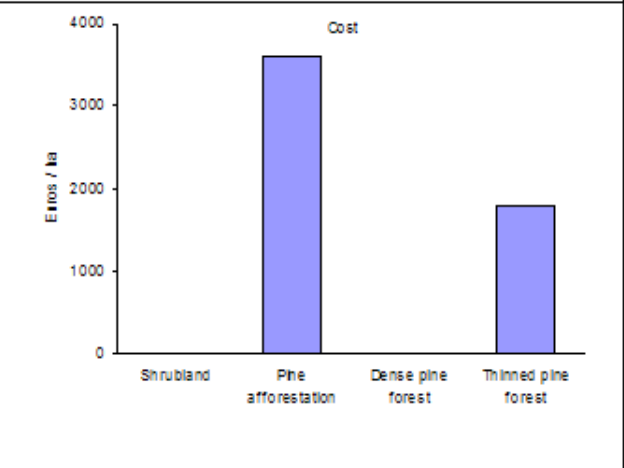
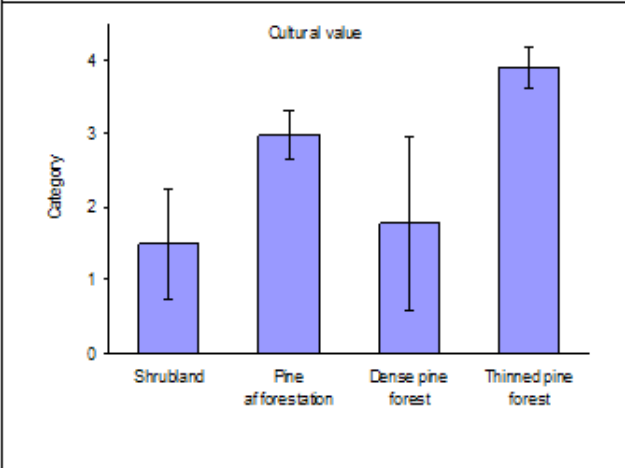
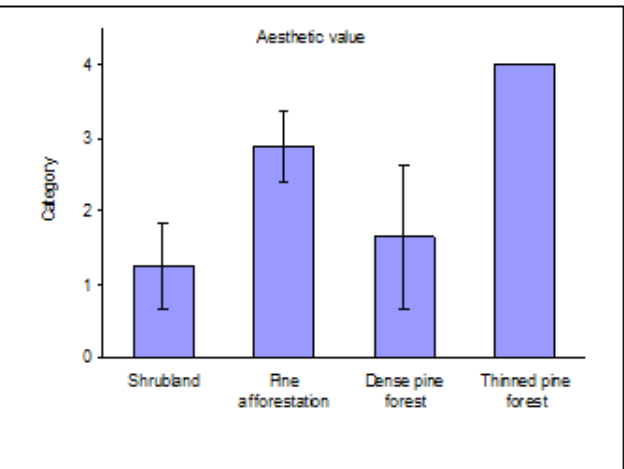
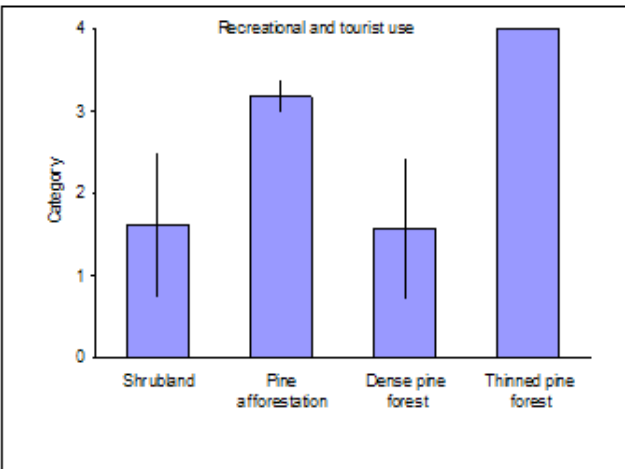
# Data on (common) indicators



LFA METHOD (adapted from Tongway, D.J. and Hindley, N. 2004)

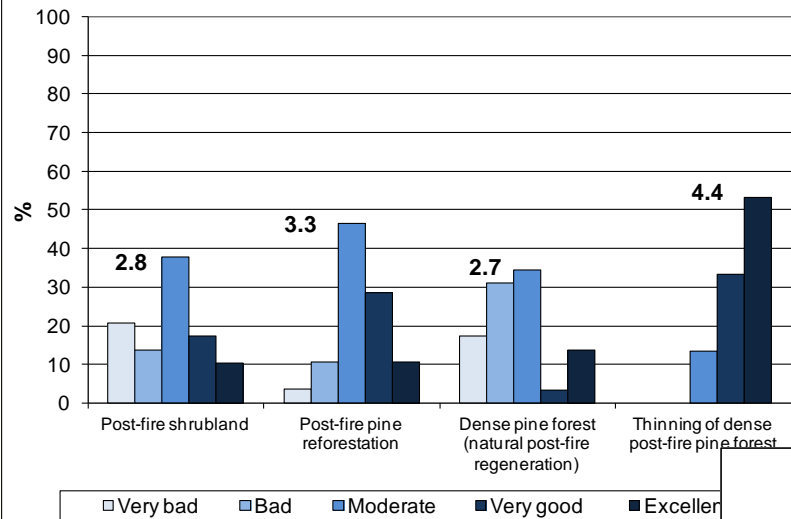




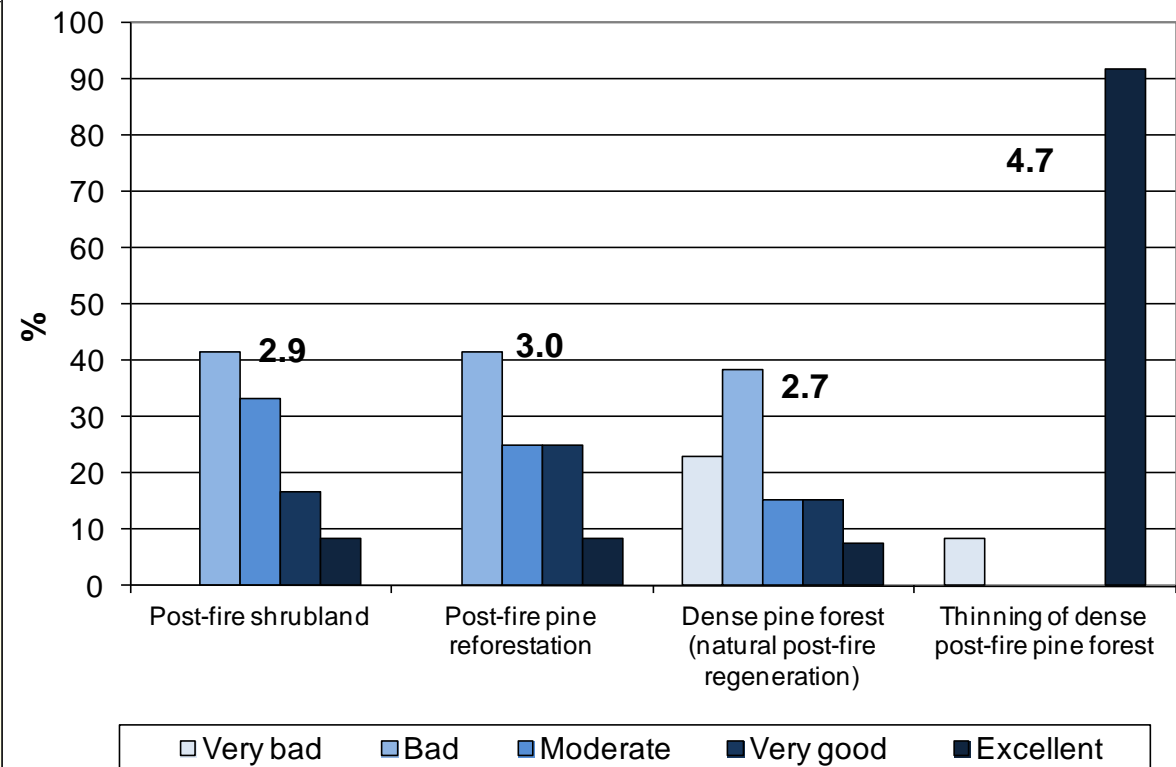




### Initial Evaluation by Stakeholders



### Final Evaluation by Stakeholders





# LESSONS?

- We can predict at sufficient resolution (for management) vegetation response to fire
- Planning post-fire management should be carried out very early after fire, considering long-term as well
- Poor preparedness to take emergency actions → spectacular, often ineffective actions are applied instead (e.g. branch barriers slopes with low erosion risk )
- Managing vegetation (fuels) for prevention is more effective than making large investments in post-fire restoration – minimize catastrophe-driven investment