Interreg Sudoe
EUROPEAN UNION

Transnational plans for
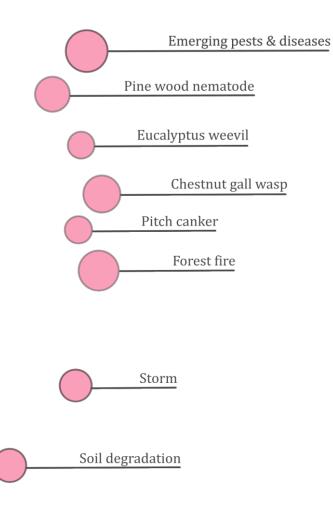the management of
forest risks
PLURIFOR
European Regional Development Fund

Deliverables 3.2.1. and 3.2.2.

EVALUATION OF THE FOREST FIRE RISK MANAGEMENT PLAN

Workshop and economic assessment

Emerging pests & diseases

Pine wood nematode

Eucalyptus weevil

Chestnut gall wasp

Pitch canker

Forest fire

Storm

Soil degradation

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EVALUATION OF THE FOREST FIRE RISK MANAGEMENT PLAN.

To evaluate the Forest Fire risk plan we followed two methodologies. The first one based on the "Expert cross-viewing", where during a workshop, the participants (experts and stakeholders) become aware of the contents of forest fire risk plan, discuss their strengths and their weaknesses (deliverable 3.2.1). The second followed the "Forecast Comparison" methodology, where an economic assessment was done for two different scenarios: i) no fuel management intervention for fire prevention in a rural area (business as usual); ii) fuel management intervention for fire prevention in a rural area using fire behaviour simulators (deliverable 3.2.2.).

1. Workshop

The workshop "Challenges in the Management of Fuels in Forest Masses and the Urban-Forest Interface" took place in the facilities of the *Centro de Investigación Forestal de Lourizán* - Galicia on 9th November 2018. The number of attendees was 60, most of them from Forest Services, Municipalities, Universities and Institutes of Secondary Education.

Figure 1 – Poster with the information of the workshop ""Challenges in the Management of Fuels in Forest Masses and the Urban-Forest Interface"".

The presentations of the Workshop were the following:

- Russell Parsons (USDA Forest Service. Missoula Fire Sciences Laboratory): Assessment of the effect of the spatial patterns of fuel treatments on fire behaviour at landscape level

- Alfonso Barreiro (Jefe del Servicio de Programación y Planificación Preventiva. Subdirección de prevención y defensa contra incendios forestales. Consellería de Medio Rural, Xunta de Galicia). Wildfire prevention in Galicia.

- Ana D. Ruiz (Universidad de Santiago de Compostela. Unidad de gestión forestal sostenible). Crown fuels modelling of main forest communities in Galicia.

- Sandra Sánchez (Centro Tecnológico Forestal y de la Madera). Employment of new tools for forest fuels characterization in Principado de Asturias (PLURIFOR member).

- Manuel Francisco (Servicio provincial de Prevención y Defensa contra Incendios Forestales de Pontevedra, Xunta de Galicia). The importance of the management of wildland-urban interface. Organization of the fire suppression system in Galicia in the risk level 2.

- Francisco Rodríguez y Silva (Universidad de Córdoba. Laboratorio de defensa contra incendios forestales. ETSIAM). Global change and wildland-urban interface fire. Reflections to reduce vulnerability and operational uncertainty.

- Javier Madrigal (Centro de Investigación Forestal del INIA. Laboratorio de Incendios Forestales). Flammability of the wildland-urban interface vegetation: Proposals for the improvement of risk indexes in the peninsular Northwest.

- José M. Fernández Alonso. (Centro de Investigación Forestal de Lourizán. Xunta de Galicia). Fuel treatment effects on fire behaviour in biomass management strips.

- Enrique Jiménez (Centro de Investigación Forestal de Lourizán. Xunta de Galicia). Criteria for the development of fuel treatment plans in forest and wildland-urban interface areas in the framework of the Sudoe project PLURIFOR (PLURIFOR member).

All the presentations were related to the scope of the PLURIFOR project, in its fire risk section. In addition, two of them presented results obtained in the PLURIFOR project by members of the project consortium. Sandra Sánchez presented the different existing classifications of forest fuels and how new technologies (LiDAR, UAVs) are being applied for the mapping of these fuels. Enrique Jiménez presented the results of the review and recommendations for the improvement of forest fire risk plans carried out for Portugal, Galicia, Asturias and the Basque Country and the "Guide of Good Practices" to support the development of prevention plans for forest fires. Both works have been developed within the framework of the PLURIFOR project. He also showed a practical case at a landscape scale in which elements of the Good Practices Guide were used to determine the priority areas for the execution of fuel treatments.

After the presentations there was a time to discuss the different issues raised.

At the end of the workshop a survey was given to the assistants for the evaluation of the risk prevention plans presented, and of the workshop in general. Below are the questions and the main results obtained.

Figure 2 – Pictures from the workshop

Questionnaire results

1. Which is your institution?

65% of the surveys came from personnel belonging to the Forest Service. To a lesser extent, we obtained responses from the staff of Municipalities and Universities.

2. What are the advantages of the application of the criteria for the development of fire risk prevention plans?

For 75% of the respondents, one of the advantages of applying the criteria presented would be the improvement in the location of the areas to be treated to minimize possible damage. Other advantages of the application of the presented criteria would be: increase of the risk knowledge; reduction of costs and uncertainty; reduction of fire intensity, facilitating fire suppression; development of rural world; damage reduction to the population and to the natural environment; and optimization of extinction means in crisis situations.

3. What elements do you think should be incorporated into fire risk prevention plans?

As for the elements that should be incorporated, several ideas were cited, all at the same level of importance. The elements mentioned are: inclusion of the climate change effect; land tenure; identification of vulnerable zones; take into account climatic and demographic factors; in suppression activities, increase the coordination and communication of all the agents involved; gather and share the information by extinction technicians with researchers to validate the already existing models of fire behaviour; promote the participation all the sectors affected by fire; integrate silvopastoral activities; consider the effects of fire regime.

4. What elements do you consider priority to protect in a forest fire risk management plan?

According to the responses to the survey, the priority elements to be protected by a forest fire risk management plan are citizens and population centres (for 75% of the respondents) followed by areas of high forest and landscape value (27%). Other elements that also have been considered are the communication routes, the mosaic landscape and the fauna.

5. What would be the main economic losses in the event that a forest fire risk management plan was not applied?

The main economic losses in case of not applying a fire risk plan would be those related to the affectation of property and infrastructures (43%), loss of the forest mass (35%), loss of ecological values (28%) and loss of human lives (15%). Other losses considered in the surveys are related with fishing and shell-fishing activities, agriculture damage and restrictions on grazing and hunting after forest fires.

6. What has been your overall impression of the workshop? Do you think it has been useful?

For 85% of respondents the impression of the workshop has been good or very good, and even demanded a longer duration of the same.

2. "Forecast Comparison" for the Economic Assessment (Deliverable 3.2.2)

For the economic evaluation of the application of the forest fire risk plan, it was created two scenarios (with fuel treatment and no fuel treatment) following the methodology written in the "Guide to Good Practices" (PLURIFOR product) that has been developed within the framework of the PLURIFOR project. To this end, a case study has been developed in which the potential fire behaviour in an area is evaluated for the development of a spatial plan for fuel treatment with the objective of reducing the negative impact of forest fires that occur in the area. Subsequently, a sample of the area was chosen and the effect of a fire and its behaviour in case of preventive treatments or not was evaluated.

The big study area on which it was selected a sample covered a total of 132.004 hectares. In it, the total forest area covers 65.25% of the territory, dominated mainly by eucalyptus (26.9%), bushes (18.8%), mixed masses of pine and eucalyptus (17.9%) and pine (13.1%).

The samples area used for scenario purposes covers 13.690 hectares and the area to be treated by fuel management will be 637 hectares. To determine the strategic areas to intervene in fuel management, both *Flammap* and *Landscape Treatment Designer* (LTD) programs were used.

Next tables will show the assumptions, the fuel management activities and the economic assessment.

PLURIFOR PLANS ECONOMIC ASSESSMENT

Workshop	Dates	
	Venue	
Scenario used to assess the plan	1. Game role	
	2. Forecast comparaison	x
	3. Expert cross-viewing meeting	
Assumptions made for the assessement NO FUEL INTERVENTION		
Scenario total area	13690	hectares
Area damages	2227	hectares
Forest area affected	1585	hectares
Houses burned	35	
Number of months from the first expenses to the last one		
...		
Assumptions made for the assessement FUEL management		
Scenario total area	13690	hectares
Area damages	1713	hectares
Forest area affected	1266	hectares
Area treated with Shrub cutter	132,7	hectares
Area treated with prescribed burning	410	hectares
Harvest of Eucalyptus timber with profit for the owner	94	hectares
Houses burned	19	
Number of months from the first expenses to the last one	4	

Figure 3 – General assumptions for the 2 scenarios.

Personnel costs

Organisation	Status	Type	Category	Month cost	Code
Fire prevention manager	private	non permanent	Ingenieur *	1500	
Fire prevention manager	private	non permanent	Ingenieur**	1200	
All the other personnel costs related to field work are included in the cost for each action					All - -
TOTAL				2700	

Figure 4 – Personnel costs (*Assessment of the correct areas to do fuel management. Follows the works in the field; **Elaboration of the Prescribed burning plan.)

Expenses associated to the plan execution

STEPS	Categories	Actions	Cost description	Direct cost description	Direct cost E/unit	Units	Total cost
Without fuel management	Firefighting	Civil Protection and firefighters	All costs are included in the Losses and damages	4100 euros/hectare*	4100	2227	9.130.700,00 €
	Post-fire recovery	Post-fire recovery	Costs for recovery	1000 euros/hectare*	1000	2227	2.227.000,00 €
		Houses burned	Damage in houses	60000 euros/house**	60000	35	2.100.000,00 €
	Total						13.457.700,00 €
With Fuel management	Planning	Fire prevention manager	Assessment of the correct areas to do fuel management. Follows the works in the field.	1500 euros / month	1500	4	6.000,00 €
		Fire prevention manager	Prescribed burning plan	1200 euros	1200	1	1.200,00 €
	Fuel treatment	Area treated with Shrub cutter	Includes equipment and human resource	455 euros / hectare ***	455	132,7	60.378,50 €
		Area treated with prescribed burning	Includes equipment and human resource	from 94 euros to 374 euros / hectare ***(1)	374	410	153.340,00 €
	Eucalyptus harvest (2)	Standing Eucalyptus selling	Clear a stand that will give profit to the owner	30 euros / m3	1617	94	- 151.998,00 €
	Firefighting	Civil Protection and firefighters	All costs are included in the Losses and damages	4100 euros/hectare*	4100	1713	7.023.300,00 €
	Post-fire recovery	Post-fire recovery	Costs for recovery	1000 euros/hectare*	1000	1713	1.713.000,00 €
		Houses burned	Damage in houses	60000 euros/house**	60000	19	1.140.000,00 €
	total						9.945.220,50 €
TOTAL							3.512.479,50 €

*source: Portuguese National Forest Strategy
** Source: Mean value for the State Public support to recover the houses (Portugal)
***Source: Portuguese values in CAOF
(1) these prices will decrease with more area treated with prescribed burning. It can reduce until 94 euros or 120 euros / hectare.
(2) assumption of a usefull volume of 53,9 m3/hectare (HT - 14,5; BDH - 10 cm; 8 years; 1250 trees/hectare)
http://www.celpa.pt/melhoreucalipto/avaliacao-da-produtividade/

Figure 5 – Expenses associated to the plan execution

Losses avoided by the plan

STEP	Description damages avoided	Direct cost E/unit	Units	Total cost saved
With fuel management	Area burned - decrease of 514 hectares	5100	514	2.621.400,00 €
	Decrease of the number of houses burned (from 35 to 19)	60000	16	960.000,00 €
				- €
TOTAL				3.581.400,00 €

Figure 6 – Losses avoided by the plan

Final remarks

Although it can give the idea that the area protected by the fuel management is small, please remember that the simulation does not count with firefighting activities, something that in Europe would be almost impossible to happen. Nonetheless, we see that has a result of the fuel treatments, damages and impacts in the vegetation decrease in comparison with the 1st scenario, and also in infrastructures like houses.

The results from the simulation shows that while the flame length in 1st scenario was 1,26 meters, with fuel treatment, in average it will decrease to 0,82 meters. As a consequence, not only decreased the area affected by also decreased of fire intensity with very positive ecological consequences, like trees survival, less impact of soil, fauna and indirect health impacts on humans. Simultaneously it creates firefighting opportunities for extinction crews, to act in a more efficient and safe way.

A final remark is that this economic assessment doesn't pretend to study the economic impacts in depth (like analysing the impacts in soil, carbon footprint, etc.) but to give a general quantitative view of the importance to promote forest fire prevention to avoid big economic losses and ecological damages.