Adaptive fire management in the Mediterranean Europe

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“Expected Climate Change and Options for European Silviculture”
ECHOES

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For the Mediterranean Europe, under climate change scenarios, it is expected an increase in the number of years with fire risk, an increase in the length of the season with fire risk and an increase of extreme events during the fire season that could result in larger, more intense and more frequent fires

Adaptation options

"*Fire protection will be important in Mediterranean and boreal forests and includes the replacement of highly flammable species, regulation of age-class distributions, and widespread management of accumulated fuel, eventually through prescribed burning*."

Alcamo *et al*. 2007: Europe. Climate Change 2007: Impacts, Adaptation and Vulnerability. IPCC - Fourth Assessment Report.

"….*fire prevention measures such as management of combustible material, establishment and maintenance of fire breaks, forest tracks, water supply points, appropriate choice of tree species, fixed forest fire monitoring facilities and communication equipments to prevent catastrophic fire spread"*

GREEN PAPER On Forest Protection and Information in the EU: Preparing forests for climate change. Brussels, 1.3.2010 COM(2010)66 final.

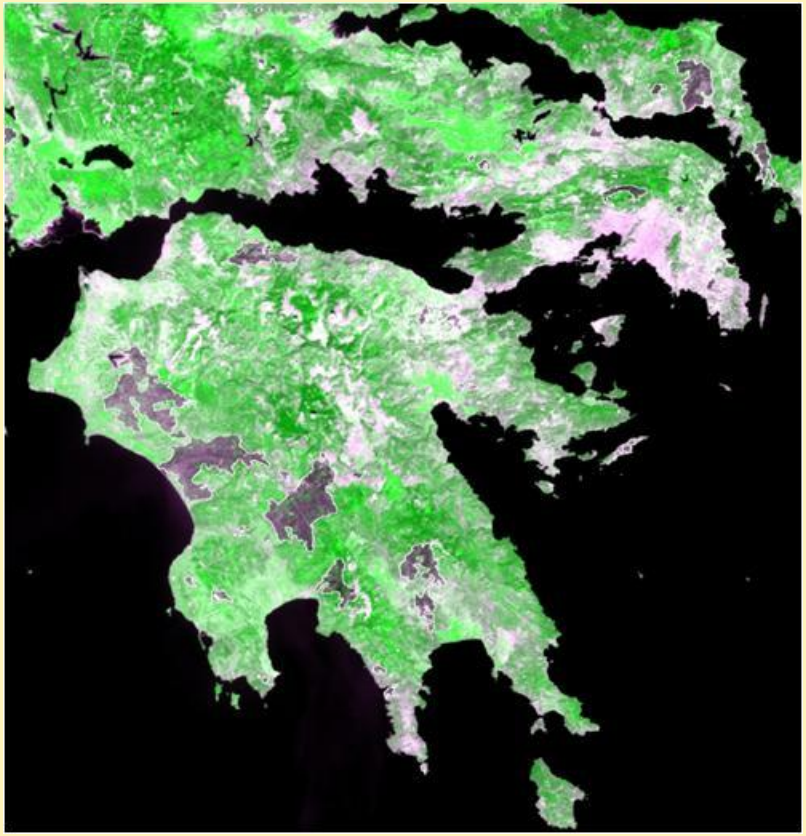
Fire management is consuming a large amount of total investment in forestry, although most of it is dedicated to fire suppression and only a small amount for preventive actions

Fire prevention will require extensive communication networks and monitoring schemes that involve considerable investments in infrastructure, training and equipment.

The traditional fire fighting method of direct attack with water and retardants using aerial means and land brigades has been proved efficient for most forest fire incidents but less successful in the confinement and extinction of large fires

Suggested fire fighting strategies:

new strategies to improve suppression based on the use of fire; indirect attack by joint use of backfire and chemical retardants; intensive use of heavy machinery to define fire perimeters and fighting from the fire flanks during the night.



However, although fire suppression organization has improved, the frequency of occurrence of large fires has been increasing in the last decades and a new approach to fire management is needed

Fire management needs to link fuel management with fire suppression to help reduce the risks posed by fire under climate change

Mechanical fuel reduction is popular but expensive although increase in biomass demand for energy is an opportunity

Grazing is productive but does not remove dead biomass

Prescribed burning is fast and cheap but risks, know-how and narrow conditions for application

Classical linear firebreaks without vegetation are being complimented with or substituted by defensible areas where fuel loads are modified by applying heavy thinning, pruning and understory release with a gradient on intensity

Thinning reduces fuel

but can favor the establishment and growth of a dense understory composed by heliophilous shrubs and evergreen oaks that should be controlled

thinning may exacerbate fire behavior because increases the desiccation of dead and live fuels

Coppiced forests are particularly vulnerable to fire due to their biomass structure

fuel management should focus on thinning and transformation to high forests

Canopy structure affects crown fire behavior

even aged stands give higher intensity crown fires

uneven aged stands increase fire risk

In countries with extended pine plantations there is a management strategy aiming to favor the local broadleaf species which are more resistant and resilient to fire

However, this practice has its limitations because of the strong competitive advantages of pines over most deciduous species especially in a drier climate

After fire, novel mixes of species and spacing can be used in order to reflect likely natural dynamic processes of adaptation using plant nursery stock from warmer, drier locations

Post-fire management should improve ecosystem resilience and take into account risks related to climate change in the long-term ecosystem recovery

Under severe climatic conditions, the influence of climate on fire could override fuel treatments, resulting in high-severity fires even in areas where fuels have been reduced

It may become increasingly difficult for forest managers to treat sufficient areas to significantly affect fire spread and behavior

In the Mediterranean region, the majority of fires are human induced, mostly due to negligence and deliberate lighting.

Working with a diversity of stakeholders on the effects of climate change on fire and forests will develop support for and consistency in adaptation options.

Encouraging communities to become involved with fire management will probably lead to greater sensitivity to risks and less dangerous practices.

Moreover, local knowledge could improve fire management options and reduce wildfire suppression costs.

A key issue for successful fire management is the adaptive capacity to climate change that depends not only on the scientific and technical knowledge available, but also on the social, economical, and political components associated with the implementation of the different adaptation options

There are considerable differences in adaptive capacity within Europe and it is lower in the Mediterranean region where the largest potential impacts are expected and consequently higher vulnerability to climate change
(Lindner et al. 2008).

Forest experts play a critical role in the adaptive capacity of forests to climate change

Documenting the perspectives of foresters could therefore provide useful insights into the state of knowledge and practice on climate adaptation within the forest sector

Questionnaire survey

300 forest experts from 6 Mediterranean countries answered the questionnaire (53 from Croatia, 23 from Cyprus, 39 from Greece, 45 from Italy, 56 from Portugal and 84 from Spain).

Respondents were asked to rate the importance of 23 adaptation options of forest fire management in a changing climate using a scale from 1 to 5 (1=not important, 2=not so important, 3=important, 4=very important, 5=most important).

Adaptation option	Country						
Fire	All	Croatia	Cyprus	Greece	Italy	Portugal	Spain
Improvement of fire fighting coordination	4,3	4,2	4,4	4,6	4,1	4,1	4,5
Increase of surveillance and warning systems	4,2	4,8	3,6	4,2	3,9	4,1	4,0
Improvement of education and training of fire fighters	4,1	3,8	4,2	4,5	4,1	3,9	4,1
Increase of water supply points	3,7	3,5	3,5	4,4	3,9	3,8	3,5
Increase of forest roads and paths	3,6	3,9	3,4	4,2	3,5	3,6	3,2
Increased use of decision support systems	3,5	3,1	3,3	3,9	3,3	3,5	3,8
Increase of fire fighting forces	3,5	3,6	3,7	3,9	3,2	3,3	3,5
People							
Improvement of public education and awareness	4,1	4,2	4,1	3,9	4,1	3,9	4,3
Improvement of patrolling and law enforcement	3,8	4,2	4,1	4,1	3,6	3,7	3,5
Reduction of urban sprawling into forests	3,5	3,3	3,1	3,4	3,4	2,9	4,3
Reduction of human activities in the wildland-urban interface	2,8	3,2	2,9	2,9	2,4	2,4	2,7
Restriction of human activities in forests	2,7	3,4	2,8	2,9	2,1	2,7	2,5
Expansion of protected areas	2,6	2,6	3,1	3,3	2,1	2,5	2,4
Fuel							
Reduction of surface fuels	3,7	3,3	3,2	4,0	3,7	4,1	3,9
Increased use of grazing	3,3	2,7	2,9	3,5	2,3	3,4	4,0
Improvement of reforestation after fire	3,3	3,3	3,0	3,8	2,2	3,7	3,3
Increase of fire breaks	3,2	2,4	3,6	4,2	2,7	3,9	2,9
Reduction of stand density	3,2	3,2	2,7	3,1	3,2	2,9	3,5
Increase of plant cover with species of reduced flammability	3,1	3,0	2,7	3,0	2,8	3,5	3,1
Increased use of prescribed burning	3,0	2,4	2,7	3,2	2,4	3,5	3,5
Removal of standing dead trees	2,8	2,9	2,1	3,8	2,3	2,9	2,5
Transformation of coppiced to high forests	2,7	2,8	1,7	2,5	2,6	2,4	3,1
Conversion of uneven aged to even aged stands	2,1	2,0	1,5	2,0	2,5	2,1	2,0

Fire fighting and infrastructures

Adaptation option	All		Country					
			Croatia	Cyprus	Greece	Italy	Portugal	Spain
Improvement of fire fighting coordination	**4,3**	A	4,2	4,4	4,6	4,1	4,1	4,5
			ab	ab	a	b	ab	ab
Increase of surveillance and warning systems	**4,2**	AB	4,8	3,6	4,2	3,9	4,1	4,0
			a	b	b	b	b	b
Improvement of education and training of fire fighters	**4,1**	B	3,8	4,2	4,5	4,1	3,9	4,1
			b	ab	a	ab	b	ab
Increase of water supply points	**3,7**	C	3,5	3,5	4,4	3,9	3,8	3,5
			b	b	a	ab	b	b
Increase of forest roads and paths	**3,6**	CD	3,9	3,4	4,2	3,5	3,6	3,2
			a	ab	a	ab	ab	b
Increased use of decision support systems	**3,5**	CD	3,1	3,3	3,9	3,3	3,5	3,8
			b	ab	a	b	ab	a
Increase of fire fighting forces	**3,5**	D	3,6	3,7	3,9	3,2	3,3	3,5
			ab	ab	a	b	ab	ab

Public education and management

Adaptation option	All		Country					
			Croatia	Cyprus	Greece	Italy	Portugal	Spain
Improvement of public education and awareness	**4,1**	A	4,2	4,1	3,9	4,1	3,9	4,3
			a	a	a	a	a	a
Improvement of patrolling and law enforcement	**3,8**	B	4,2	4,1	4,1	3,6	3,7	3,5
			a	ab	ab	ab	ab	b
Reduction of urban sprawling into forests	**3,5**	C	3,3	3,1	3,4	3,4	2,9	4,3
			b	b	b	b	b	a
Reduction of human activities in the wildland-urban interface	**2,8**	D	3,2	2,9	2,9	2,4	2,4	2,7
			a	ab	ab	b	b	ab
Restriction of human activities in forests	**2,7**	D	3,4	2,8	2,9	2,1	2,7	2,5
			a	abc	ab	c	bc	bc
Expansion of protected areas	**2,6**	D	2,6	3,1	3,3	2,1	2,5	2,4
			abc	ab	a	c	bc	bc

Fuel management

Adaptation option	All	Country					
		Croatia	Cyprus	Greece	Italy	Portugal	Spain
Reduction of surface fuels	**3,7** A	3,3	3,2	4,0	3,7	4,1	3,9
		c	bc	ab	abc	ab	ab
Increased use of grazing	**3,3** B	2,7	2,9	3,5	2,3	3,4	4,0
		c	bc	ab	c	b	a
Improvement of reforestation after fire	**3,3** B	3,3	3,0	3,8	2,2	3,7	3,3
		a	ab	a	b	a	a
Increase of fire breaks	**3,2** B	2,4	3,6	4,2	2,7	3,9	2,9
		c	ab	a	c	a	bc
Reduction of stand density	**3,2** B	3,2	2,7	3,1	3,2	2,9	3,5
		ab	b	ab	ab	b	a
Increase of plant cover with species of reduced flammability	**3,1** B	3,0	2,7	3,0	2,8	3,5	3,1
		ab	ab	ab	b	a	ab
Increased use of prescribed burning	**3,0** BC	2,4	2,7	3,2	2,4	3,5	3,5
		c	abc	ab	bc	a	a
Removal of standing dead trees	**2,8** CD	2,9	2,1	3,8	2,3	2,9	2,5
		b	b	a	b	b	b
Transformation of coppiced to high forests	**2,7** D	2,8	1,7	2,5	2,6	2,4	3,1
		ab	c	b	ab	bc	a
Conversion of uneven aged to even aged stands	**2,1** E	2,0	1,5	2,0	2,5	2,1	2,0
		ab	b	ab	a	ab	ab

Questions and research needs

- Know-how
- Environmental effects
- Effectiveness
- Costs
- Risks
- Adaptive capacity

Thank you for your attention

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