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Wildland fires in the Alpine Region of Italy: What's old, what's new? What's next?

It is still challenging to provide a comprehensive picture of wildfires in Northern Italy. The available information is frequently scarce and heterogeneous (Conedera et al., 2006), basically for the reason that fire management is influenced by social and institutional history. Before 1972, fire management was governed by the National Forest Service (Corpo Forestale dello Stato) and it relied on a long tradition, started by Carlo Felice di Savoia in 1822 when Regie patenti were created[1]. In the last 30 years this tradition has been transferred partially to the regional administrations, and a gap has occurred in the way data have been collected. The Alpine Arc is touched by seven administrative regions sharing only 100,000 km^2 (30% of the Country). Since 1972 the administrative regions are responsible for fire suppression and prevention, resulting in a puzzle of regional responsibilities. Except Aosta Valley and Trentino-Südtirol, the Regions consist of both an alpine and a plain zone, and some of them border with the sea (Veneto, Liguria and Friuli), making the forest composition extremely heterogeneous and leading to a tremendous unevenness of both ecological and social issues.

In Italy, it is generally recognized that landslides, floods and avalanches are the most impacting disturbances affecting the Alps, followed by herbivores grazing and insects outbreaks, as discussed by many authors (Motta et al., 2002; Luino, 2005), while forest fires are perceived as negligible drivers. In spite of this, regional administrations are providing costly fire fighting services and must provide a safe work environment to fire-fighters. This is the reason why it is desirable to understand which is the role of Fire in the Alps. The awareness of what wildfires mean in the ecological cycles of a forest, as well as the concept of "alpine fire culture", has been lost, due to the abandon of the mountains by the young generations and to a gap in the expert knowledge transfer.

This need of improvement has been felt by several Forestry Services who, along the past year, have joined together to share expertises and to find out new technologies, namely the implementation of a common Fire Danger Rating System. This choice is not only about providing fire-fighters and fire managers with a new technology! It is much more about a familiar platform where the Fire Services could compare the application of a common tool to their own wildfires. The Canadian Forest Fire Weather Index (FWI) System was finally chosen, since some Regions were already implementing it (Aosta Valley since 1994, Piemonte since 2005, and Veneto since 2007). The creation of an "Alpine Forest Fire Rating System" has been taken into account, also involving neighbouring Countries. It is clear that the performance of the Canadian FWI should be tested and calibrated to the alpine environment; for the moment, the feedback given by Aosta Valley and Piemonte Fire Services is good enough.

Anyway, the implementation of the Canadian FWI, underlined the environmental differences between Regions, such as the continental gradient increasing from the sea to the internal valleys and affecting local climate and fire severity. This is particularly evident when a calibration of the index has to be performed. In the Eastern side of the Alps, Veneto Region is affording the pioneer phase of implementation (Valese et al., 2008) funded by the European Commission (Reg. 2152/2001 Forest Focus). By now, Aosta Valley threshold table has been used, since it was the best calibration available for the Alpine Region. The threshold values had been derived by using operative personnel expertise and observations (Regione Autonoma Valle d'Aosta, 2005); they vary depending on the month and are divided in 7 danger levels. A pilot study located in the region of Lago di Garda was carried out by University of Padova, to check the reliability of the danger levels in use. Considering both fire days and non fire days, the "extreme" danger level was not represented at all, highlighting the need of a specific calibration for Veneto. Such difference between Aosta Valley and Veneto depends essentially on climate. Veneto is placed close to the Adriatic Sea, while Aosta Valley lies in the internal Western Alps and is also affected by a characteristic fall wind (foehn), increasing greatly fire danger. The forest composition and the fuel characteristics are a function of the climatic trend. In Veneto the proximity to the sea increases the amount of rain and the average level of air humidity, reducing the drying factors.

[1] http://www2.corpoforestale.it/web/guest/ilcfs/storiadelcfs

The presence of fire prone ecosystems (11.2% pinewoods, 0.2% pseudo-maquis) is limited by the clear dominance of broadleaves forests (48.5%) (Forest Cover Map 2003). On the contrary, the presence of pinewoods is relevant in Aosta Valley southern slopes, since the valley is West-East oriented. This vegetation is threatened by strong drying factors, such as high-speed and hot winds from North-West, and continental conditions limiting the annual amount of rain. When weather parameters are favourable, surface fires can shift quickly to the crowns of pines and generate even eruptive fires (Cesti, 2002).

Both fire danger rating and fire behaviour predictions are influenced by the alpine topography and by pronounced differences in snow cover between southern and northern slopes. In the Aosta Valley Cesti and Cerise (1992) observed severe wildfires occurring when snow covered the ground. Snow permanence and distribution can affect fire patterns. It is not rare, when foehn wind flows, that snow melts only in the southern slopes. In this situation, fire can stop in the northern snowy side. Contrary to Canada, where the calculations of Fire Danger are interrupted during the entire winter season, in the Aosta Valley this is not an option, since it coincides with the fire season and with the minimum live moisture content of plants. On the other hand, snow can last even more than 52 days on the ground, which is the threshold value to interrupt the calculations!

The main concern of Aosta Valley Forest Service regards few but severe large fires occurred in pine stands (*Pinus sylvestris*). During three and half years they collected live fine fuels moisture contents to find out prediction models for critical live needles moisture by using the FWI system codes. In fact, Cesti (2003) observed that crown fires occur even when pine needles moisture is quite high (115-130% depending on needle type: old or young needle), while under 95 – 110% (critical live needles moisture) crown fires develop more severe. The results show that the FWI System can be used to predict severe crown fires, even if they must be reinforced (Valese et al., in prep.).

As shown in Table 1 and Figure 1, most of Italian wildfires are human caused (82%, during the period 2000-2007), while natural fires are almost absent (1.3%)[2]. If we consider the average percentages, the situation in Northern Italy does not fit the national statistics. Natural fires (or lightening-induced fires) and human-induced fires occur, respectively, in 3.7% and the 70% of the events. In the utmost Eastern Alps (Friuli) natural fires can be 10% of the total, showing a frequency more similar to Austria (15%), neighbouring Country, than to the rest of Italy. What's more, it has been demonstrated that a natural fire regime exists in the Alps (Tinner et al., 2005; Conedera et al., 2006). On the other hand, in Liguria and Lombardia just 1% of the fires are caused by lightening, while more of 90% are human caused. These numbers mirror quite well the differences between Regions, even if the considered periods are not the same.

Table 1. Fire causes in the Northern Italian Regions compared with the national causes and with the Austrian causes.

	Wildfire Causes (%)				
Region/Country	**Unknown**	**Antropogenic**	**Natural**	**Period**	**Source**
Aosta Valley	50.0	45.1	4.9	1991-2007	1
Piemonte	31.3	66.5	2.2	1997-2005	2
Liguria	8.0	91.0	1.0	1987-2007	3
Lombardia	9.3	90.0	0.7	1996-2005	4
Veneto	17.5	79.0	3.5	1991-2005	5
Friuli	41.5	48.5	10.0	1994-2003	6
Trentino-Südtirol	n.a.	n.a.	n.a.		n.a.
Northern Italy	26.3	70.0	3.7		Average
Italy	16.6	82.1	1.3	2000-2007	7
Austria	50.0	35.0	15.0		8

Sources of data in Table 1: (1) Regione Autonoma valle d'Aosta; (2) Regione Piemonte; (3) Regione Liguria: http://antincendioboschivo.files.wordpress.com/2008/07/sistema-antincendio-boschivo-regione-liguria.pdf;
(4) Regione Lombardia; (5) Valese and Lubello (2007)
(6) http://www.regione.fvg.it/rafvg/export/sites/default/RAFVG/GEN/incendi/allegati/tabelle_incendi.pdf
(7) Corpo Forestale; (8) Gossow (p.c.); n.a. = information not available

[2] http://www2.corpoforestale.it/web/guest/serviziattivita/antincendioboschivo

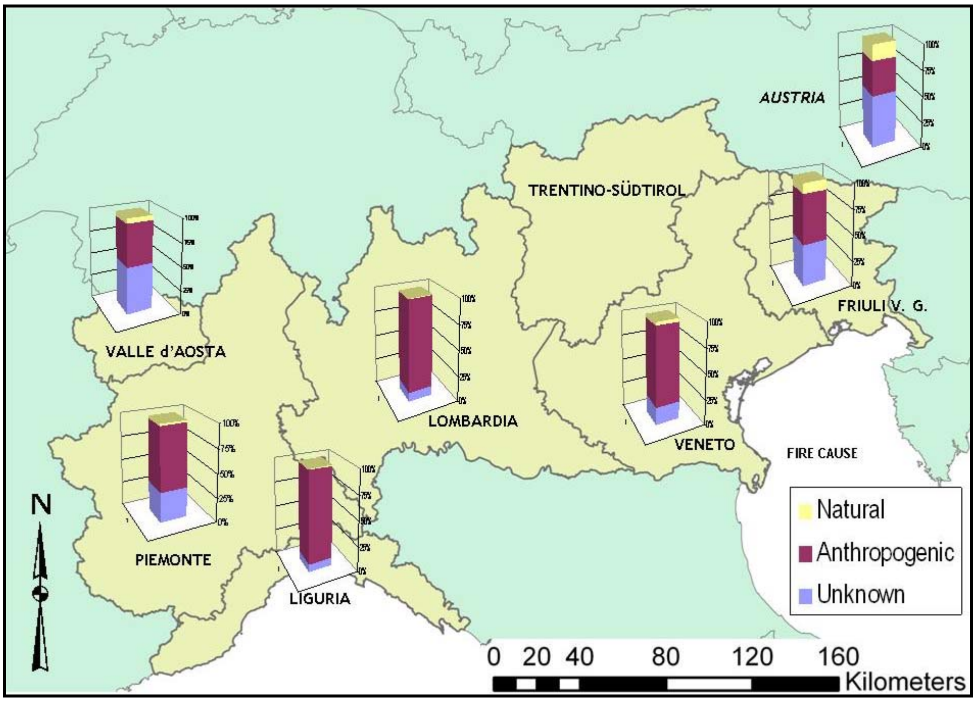

Figure 1. Fire causes in the Northern Italian Regions compared with Austria

Although it is widely believed that the fire season coincides with the winter – early spring months (December – April), in the Italian Alps there are some exceptions and irregularities, particularly when summer events are considered. Liguria Region, placed in front of the Tyrrhenian Sea, experiences both a winter and a summer fire season. In the Eastern Limestone Alps of Friuli (Carso), close to Slovenia and in front of the Adriatic Sea, summer wildfires are frequent and the behaviour of these fires can be severe when *Pinus nigra* is present. The fact that Friuli represents the rainiest region of Italy is not a guarantee of non-fire! The karst bedrock leads to underground water flows, not available to the plants, at least till they come out again. Similar to Carinthia (Austria), the neighbouring Carnia (Friuli) experienced especially severe conditions in 2003 and 2006 (Gossow et al. 2008), considered the worst of the past 10 years.[3] Problematic wildfires occurred also in those regions that are generally not involved in summer fires. In Veneto, a wildfire of just 40 ha caused by a lightening needed more than one month to be extinguished (August 2003). With the exception of first days, when flames reached the crowns, the fire propagated underground; the persisting smouldering rate was damaging respect to the tourism activities of Pieve di Cadore and put the Fire Service in a very critical position, without considering the cost paid for the aerial fighting. In the Aosta Valley, during 2006 summer, serious events took place, proving that summer fires can be very damaging when the meteorological conditions fit. In one week approximately 80 ha (more than 70 ha of *Pinus sylvestris*) burnt and fire behaviour was especially wild in 50% of the burnt area.

It would be auspicious, as a future study, to analyse the summer trend of the alpine fires, and to investigate the irregularity and the potential (?) increase of this phenomenon, especially in relation with summer lightening-induced fires. Prohibitive steepness characteristic of these fires put fire-fighters in dangerous places or make ground teams unable to work. What's more, the fall of glowing material can cause the restart of the fire at the bottom of hillsides, where fuel accumulation is generally higher. If one looks upon these hot spots, a reflection on global change is not negligible: in contrast to the extensification of agriculture and forestry in the Alps, an intensification of tourism is taking place (CIPRA, 2006) and the frequency of extreme summer conditions (droughts and extreme temperatures) are supposed to increase (Schär et al., 2004) along with characteristic disadvantages, such as the smoke issue.

In conclusion to this brief and preliminary overview on alpine wildfires, a answer to the initial question shall be given. What's next? The newly established UNISDR Euro-Alpine Wildland Fire Network[4]

[3] http://www.regione.fvg.it/rafvg/export/sites/default/RAFVG/GEN/corpoforestale/allegati/RelazioneIncendi2007.pdf
[4] http://www.fire.uni-freiburg.de/GlobalNetworks/EuroAlpine/EuroAlpine.html

offers promising chances to draw a exhaustive picture of alpine fires' specificities and problems. The evaluation should be done by place side by side researchers, managers and operative officers. Large fires patterns and summer lightening-induced fires are recommended to be part of next investigation, with a special attention paid to the safety of personnel involved in the extinction campaign. Maybe by looking at wildfires from a landscape perspective we will discover something useful to manage alpine ecosystems in the better way and to have an idea about which will be the future fire regime.

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References

Cesti, G. 2002. Tipologie e comportamenti particolari del fuoco: risvolti nelle operazioni di estinzione. In: Il fuoco in foresta: ecologia e controllo. Atti del XXXIX corso di cultura in ecologia. Università di Padova pp. 125-173

Cesti, G. 2003. Individuazione delle condizioni dei combustibili in ambito regionale. Relazione tecnica. Direzione corpo forestale Valdostano Nucleo antincendi boschivi. Regione Autonoma Valle d'Aosta

Cesti, G., Cerise, A. 1992. Aspetti degli incendi boschivi. Musumeci Ed., Quart (Aosta). 295 p.

CIPRA. 2006. Vulnerability of the Alps – a preliminary assessment of biodiversity and ecosystem services. CIPRA, Peyresq, Alpes de Haute-Provence, France

Conedera, M., Cesti, G., Pezzatti, G.B., and Zumbrunnen, S. 2006. Lightning-induced fires in the Alpine region: An increasing problem. Forest Ecology and Management 234 (Supp 1), S68. 9 p.

Gossow, H., Hafellner, Vacik, H., and Huber, T. 2008. Major Fire Issues in the Euro-Alpine Region – the Austrian Alps. UNECE/FAO int. Forest Fire News No. 38, 101-110.

Luino, F. 2005. Sequence of instability processes triggered by heavy rainfall in the northern Italy. Geomorphology 66, 13-39.

Motta, R., Nola, P., and Piussi, P. 2002. Long-term investigations in a strict forest reserve in the eastern Italian Alps: spatio-temporal origin and development in two multi-layered subalpine stands. Journal of Ecology 90, 495-507.

Regione Autonoma Valle d'Aosta. 2005. Piano per la prevenzione e lo spegnimento degli incendi boschivi. Servizio Selvicoltura, Difesa e Gestione del Patrimonio Forestale, Assessorato Agricoltura, Foreste e Ambiente naturale

Regione Veneto. 2006. Carta Regionale dei tipi forestali: documento base. Direzione Foreste ed Economia Montana in collaborazione con l'Accademia Italiana di Scienze Forestali.

Schar, C., Jendritzky, G. 2004. Climate change: Hot news from summer 2003. Nature 432, 559-560.

Valese, E., Cesti, G., Anfodillo, T. (In progress paper). Models to predict critical Live Fine Fuels Moisture Content and potential eruptive fires in the Italian Alps (Aosta Valley).

Valese, E., Lubello, D. 2007. Economic estimation of forest fire damage in N-E Italy. In: Proceedings 4th International Wildland Fire Conference, May 14-17, 2007, Sevilla.

Valese, E., Anfodillo, T., Rossi, S., Carraro, V., Deslauriers, A., Carrer, M., Monai, M., Lemessi, A. and Ramon, E. 2008. Realizzazione di un sistema di calcolo e di spazializzazione dell'indice canadese di pericolo d'incendio boschivo FWI (Fire Weather Index) per la Regione Veneto [Implementation and spatialisation of the Canadian Fire Weather Index in the Veneto Region], Forest@, 2008, 5, 176-186.

Tinner, W., Conedera, M., Ammann, B., and Lotter, A.F. 2005. Fire ecology north and south of the Alps since the last ice age. The Holocene 15, 1214-1226.

Websites:

- http://antincendioboschivo.files.wordpress.com/2008/07/sistema-antincendio-boschivo-regione-liguria.pdf

- http://www.regione.fvg.it/rafvg/export/sites/default/RAFVG/GEN/incendi/allegati/tabelle_incendi.pdf

- http://www.regione.fvg.it/rafvg/export/sites/default/RAFVG/GEN/corpoforestale/allegati/RelazioneIncendi2007.pdf

- http://www2.corpoforestale.it/web/guest/ilcfs/storiadelcfs

- http://www2.corpoforestale.it/web/guest/serviziattivita/antincendioboschivo