

The changing face of wildfires

As we enter a new era of mega-fires, **Marc Castellnou i Ribau** and **Marta Miralles Bover** describe a change in thoughts on wildfire management

CATALONIA IS A REGION OF SPAIN located in the north-eastern corner of the Iberian peninsula. In this region, natural lightning fires do occur, but fire has been an important tool to manage landscapes for more than four millennia. In Catalonia the conversion from a rural self-sustained society to a service-oriented and urban society has resulted in land cover changes that have led to an increased surface available for burning. At the beginning of the 20th century, there was ten per cent forest cover; today, this has increased to 60 per cent, with a ten per cent wildland-urban interface (WUI) area. Today, the amount of fuel for wildfires has increased substantially.

Socio-economic changes have resulted in a new relationship with the landscape. Our society no longer uses wood for heating and large mammals no longer eat and maintain our forests with the help of lightning fires.

This new landscape with its continuous high-fuel loads is changing fire behaviour and creating new types of fires, which can spread faster and across larger areas. And as fire is evolving, society is adapting its response through new prevention and suppression measures.

In the 20th century, we were living with fires and fire intensities that were beyond our capacity to control. With fire perimeters longer than our workforce could cover, and rates of spread owing to spotting moving faster than our lines, the answers to improving the firefighting potential included:

- Fast and forceful response by increasing resources distributed in a network adapted to seasonal and daily fire risk, to allow a fast, powerful initial attack and simultaneous response and people protection;
- Directing prevention efforts to increase suppression efficiency through building firebreaks, roads and water points and improving suppression techniques;
- Reducing ignition risk by prosecuting parties responsible and enforcing laws which prohibit access and activities; and
- Distributing resources, depending on a risk assessment through forecasting dangers (meteorological) and fire hazard (fuel availability). Developing risk indexes of large fires or simultaneity potential, to



The use of fire (backfiring, suppression firefighting) to fight a wildfire in a pine forest

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allow an optimal distribution of resources.

Political attention on fast and forceful attack, reduced ignition risk and distribution of resources depending on risk, was focused in 1988 after a single fire burnt more than 25,000ha. In 1999, tools other than water were reincorporated (fire, hand

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tools). Fire analysis was introduced as a powerful tool to increase the fire suppression potential and to learn our lessons.

But in the late 1990s this strategy of attacking with all available means was overcome, seeing large fires covering massive areas, well above our capacity for suppression. A new and broader view was required.

As we looked abroad, however, we saw that our problems were quite common. Fire services were reacting by sending resources

following fire changes, using a direct-attack philosophy instead of confinement tactics. Firefighters were trying to fight the large flames, leaving the small flames for later. Instead of fighting the fronts when they were easy to control, it was usual to fight fire at its maximum – a waste of resources and efforts.

To solve those problems, a different approach was started in Catalonia in 1999 – fire analysis. Understanding and forecasting fire behaviour can help identify the potential of each fire front and make fighting it possible when it is within our capacity to manage. Much preferable to waiting and wasting resources when the fire front grows above our management capacity.

And it seems to work. In Catalonia, where disastrous fire events occurred in 1986, 1994 and 1998, with flames burning more than 20,000ha and rates of spread of 12kph, a change in the approach was implemented from a resource-based fire service to an experienced firefighter service. Analysts were dispatched to the fire. In the following bad fire years of 2003 and 2005, surface losses were a lot less. In the heat waves of the late 1990s, forests were burning at a pace of 10,000ha during a bad day. In the last decade, however, only around 1,500ha burnt on a bad day. This improvement was achieved by investing in people and knowledge, and we shifted back to the starting point in terms of losses.

GAINING EXPERIENCE

But we are aware that we are not changing the scenario itself; our landscapes are becoming more covered by vegetation, which is increasing fuel loads, and more people are moving around. So the problem will continue.

After extreme fires affected Portugal, France and Spain in 2003, Spain in 2005, Portugal and Spain in 2006, and Greece in 2007, the importance of experience and co-operation were highlighted. However, mega-fire situations are happening infrequently in each country, meaning that during their professional life, a firefighter will face a big problem two or three times, separated by years. The basic three important implications of this are:

- People based in state fire services (both structural and forest service) cannot accumulate enough experience to be



Fire approaching a wildland urban interface (WUI) area in 2007
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prepared for such a big event. This will always be the case, and needs a different response (more anticipation and working in advance) than the usual direct fire attack;

- Resources of a single fire service will not be enough for a mega-fire event; and
- Fire service leadership is often changed after extreme events because people blame them for the large surface burnt instead of understanding the evolution of landscape and its implications in new types of fire scenarios. So, fire services – state fire departments, structural firefighters and specialised forest service firefighters – are not gaining cumulative experience and are thus repeating this failing strategy by attacking fires with all the resources possible.

The Mediterranean region, where wildfire suppression has traditionally been based on regional fire services, is arriving at a fire scenario that is shaped by the change in our socio-economic model and our landscapes, creating situations that overcome their capabilities. The only long-term solution is at the socio-economic level, far away from the firefighter.

Knowledge of fire behaviour and fire spread has been implemented as a tool to fight fires, with reasonably successful results. But this will not be enough. To build up a fire experienced service, to have knowledge and experience of fires in all different conditions, is as important as good training. And that means investing in exchanging experienced crews and fire analysts during large events and investing in tools to increase and share knowledge and experience.

During the mega-fires in Europe, this investment in fire-experienced fire services was not in place. In fact, the politics of

the European Union are still focussed on asking for big aeroplanes and helicopters as a co-operation, instead of well-trained crews and experienced fire analysts.

To achieve this shift, we must:

- Introduce continuous training. We need to educate everybody about each fire in order to create common experience;
- Use analysis to determine where to attack and when, so as to use our resources at maximum capacity;
- Use our knowledge in prevention, not just during a fire; and
- Send our people outside our fire service area, so they can acquire more experience to be used back home.

Our fire services have been evolving with the fire generations and they are coming into a new era with the emergence of mega-fires. We are beginning to observe this new era, with the intention of sharing experiences to create more robust firefighters who can better use available resources.

In addition, and taking the magnitude of the land management problem into account, both fire service and forestry officers (with other land managers) need to work towards overcoming the prejudices against the use of fire as a tool. It will take a courageous approach to strike matches and light fires early in the season in order to strengthen the prevention aspect in the fire management system, yet now it is time to think of the big picture.

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GENERATIONS OF LARGE FIRES CLASSIFIED BY DECADE FROM THE 1950s ONWARDS

Generation	Explanation	Types of fires	Firefighting response
First 1950s and 1960s	Continuity of fuel over the landscape allows large perimeters. No farmlands anymore as fuel breaks, so no anchorages.	Fires, that burn 1,000ha to 5,000ha. Surface fires and mainly wind-driven	Traditional fire response based on local resources, and reinforced with seasonal firefighters. Building water points, firebreaks and linear infrastructures as anchorage, and roads to increase accessibility.
Second 1970s and 1980s	Rate of spread. Fuel build-up allowing faster fires and spotting. The speed of fires overruns the holding lines.	Fires from 5,000ha to 10,000ha. Wind and topography driven	Dense detection and suppression net distribution, to ensure a fast powerful arrival of fire engines and helicopters. More efforts on a forceful direct attack. Water appears to be ideal tool. Aerial resources increasingly involved.
Third 1990s	Fire Intensity. Fuel build-up allows crown continuity, resulting in active crown fires and convective plumes, out of control capacity. Each fire offers very few opportunities to control. Fire changes behaviour faster than the information can move through the chain of command.	Crown fires and long spotting. Fires from 10,000 to 20,000ha. Extreme heat waves are supporting high-intensity fires.	Fire risk models are introduced to adapt resource availability to the probability of large fires. Fire analysis is identified as a tool to plan in advance and not only to react to fire. Improving efficiency by using a broad range of opportunities, widening the suppression techniques: reintroducing fire and manual and mechanical tools, reinforcing aerial attack, improving efficiency with combined tools. Introduction of logistic units and lowering the decision level for a faster response to changes in fire behaviour.
Fourth since 2000	The Wildland-Urban Interface (WUI) becomes involved in the forest fire environment. Residential and industrial areas are increasingly affected by wildland fires	Fires that can start and be stopped inside WUI and burn more that 1,000ha.	New landscape situation forces a change from attacking the fires to defending houses and people in a new defensive situation. Fire analysis as a tool grows. Simulators, GPS and mapping technologies to follow resources on time appears.
Fifth since 2000	Mega-fires. Zones at risk are faced with simultaneous large, fast and extremely intense wildfires.	Simultaneous crown fires involving urban-interface zones, mainly during heatwaves.	The current situation. New skills are needed to respond to simultaneous large fires. The answer is resource sharing, but new types of knowledge co-operation and exchange of information and experience are also needed.

Generations of large fires classified by decade from the 1950s onwards, along with prevention and firefighting response during these epochs. In the 21st Century, Catalonia is confronted by fires of the First to Fourth generations