

Wildland Fire Analyst: a needed job position and the required education and training¹

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Abstract

Wildland fire regimes are changing dramatically and we can state that safety in wildland fire suppression cannot be accomplished without a proper Wildland Fire Analyst. This is a needed job position and required a specific education and training. In Fire Paradox Project (www.fire.paradox.org) we are producing new training materials (and sharing the existing ones) specifically aimed to this regard. These training documents are an innovative contribution to introducing changes into regional and national forest and fire management services across Europe. These new training systems and practices by addressing European-wide training needs and to fortify European co-operation, develop common principles for informal learning and amplify support at the local service level for the development of qualifications and competences as wildland fire analyst. These training materials will include fire science, fire ecology, fire weather, the social and cultural role of fire in Europe, fire prevention and suppression methods and technologies and the use of prescribed fire in ecosystem management. Additionally, they will cover the state of the art scientific knowledge of fire ecology in the European biota, the impacts of fire on atmospheric chemistry, climate, human health and security. Country “Annexes” providing specific information on particularities of wildland fuels and management options may be included. In this paper, we also show several case studies in which the fire control actions did not match the fire spread pattern because these last one was not perceived properly.

KEYWORDS: Wildland Fire Analyst, prescribed fires, cost effective pre-suppression, simulation, Farsite, FlamMap

Introduction

The fire analyst has to help to plan the suppression action to be carried out. He or she should forecast fire behavior changes in time and space and determine critical point or lines where a greater alignment of factors might put the fire out of suppression capabilities. Personnel safety must be always a priority.

¹ Wildland Fire Analyst: a needed job ..

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Second in line, fire control efficiency has to be re-assessed often. Therefore, the fire analyst must train workers in job hazard abatement actions all year round. In this training, an important role has to be played by careful study of past fire propagation patterns and suppression actions (i.e., Molina et al 2007a, Molina et al 2007b) to allow for a secure and efficient fire control.

What do we expect from a Wildland Fire Analyst?

He (or she) is a fire behavior expert that is employed (ideally all year round) by the agency in charge of wildland fire control (i.e., Forest Service, Emergency & Firefighting Service). Among the duties assigned to him (her) are:

1. to elaborate an advance forecast of fire behavior potential in active fires
2. to elaborate full reviews of major past fires
3. to characterized the different wildland fire propagation patterns from past fires in the region, and therefore, to allow that new fires could be managed as emergencies with know patters of spread (and not as random in their behavior)
4. to assist the fire boss to set up the best fire control strategy for a given fire (based on its specific wildland fires propagation pattern or fire typology). Based on this assumption, our suppression action has a “winning label” from the very beginning. In this way, both resources and efforts are aimed to victory and there is not room for a “unpredictable fire blow-up”.

This job position is filling up a gap that it is too often present when setting up a Local Emergency Command Group. It is very common to see a stressed out fire boss not receiving the best help possible to address how to match resources and effort with actual and future fire behavior. Sometimes, there is too much room for errors like:

1. fires that, at an early stage, do grow very fast (no best control management was accomplished)
2. reluctance to use special tactics (i.e., backfiring) when it is the best option for that case

We want to highlight that the fires analyst is the expert that assess actual and forecast fire behavior to define “safe zones” and “forbidden zones” as a result of assumed fire spread (under a given fire propagation typology). At the same time, he (or she) has the responsibility to define which fire perimeter sectors are bellow (or above) fire suppression capabilities at any given position in time and space.

Other specific duties in suppression tasks are:

1. to assess ignition probabilities from the different fire perimeter sectors
2. to validate any proposed suppression action (in terms of efficiency and personnel safety). It is like an additional checking on those actions taken from standard protocols.
3. to implement or to supervise special actions (i.e., suppression fires or backfiring)
4. to assess on-going suppression actions to improve them if necessary.
5. to document and inform in detail about those wildland fires followed on duty
6. to train personnel
7. to assist on resources acquisitions, selection of personnel, and hiring issues

Other specific duties in planning (or preventive) tasks are:

1. setting up both a fuel management plan and a infrastructure enhancement plan based on
2. assessing or being in charge of the implementation any given fuel management action or any given infrastructure enhancement action.
3. assessing in being in charge of prescribed burning actions

4. best fire safety education
5. to assess Regional Fire Resources Boss about the potential outcome of different on-going fires to ensure that proportional action are taken and that not all available resources go to the first fire to break out.

Within Fire Paradox Project (www.fireparadox.org, <http://ec.europa.eu/research/fp6/>) we have addressed three aspects of this job position (Wildland Fire Analyst)

1. How relevant is this job task in each region?
2. What should be its training (and education)?
3. Which kind of experiences can be transfer from some countries (or regions) to others

Wildland Fire Behavior Forecast

The Fire Analyst task is to have an educated, deep look at the wildland fire to assess fire behavior potential changes along time and space and, as a result of this, to develop a fire control plan for the fire boss to approve. This plan would have a strategy, a tactic and an execution window.

Suppression planning (objective and strategy)

This is the process of establishing the best plan to accomplish a secure and efficient fire control when suppression forces arrive to the fire scenario. To do so, it is necessary to forecast fire behavior changes in time and space and determine critical point or lines where a greater alignment of factors might put the fire out of suppression capabilities. The suppression plan will be set of sequential actions to be taken within a time frame. It may be a written document or an oral communication (most agencies record all radio telecommunications today). It is not required that this plan is something too intricate. On the contrary, it has to be simple, easy to understand by those in charge of execute it. The fire analyst has to help the fire suppression boss to set up this plan.

This suppression plan has to be communicated and we must check that it has been properly understood (mandatory checking action). Security issues must always be a major part of the plan. It may be either a written document or an oral communication (most agencies record all radio telecommunications today). Additionally, a drawing in a map should be provided to allow a better understanding of tasks and duties, as well as the fires scenario now and its potential runs (dead man zone concept, see bellow).

In case of failure to control in this suppression plan, its map and drawings will help to set up an alternative plan (figure 1).



Figure 1— In the Field Authority Post, we will have together the leaders of the different agencies involved in the Incident Command System. This is a picture by Canarias 7 press media.

In short, a suppression plan is made up by:

- A. Strategy
- B. Tactic
- C. Execution window

Strategy

This is how to establish the fire control objectives. The Fire Analyst has to help the fire suppression boss to allow for a secure and efficient fire control with the best strategy possible. It is up to the fire boss to decide the strategy in the Field Authority Post after listening to the leaders of the different agencies involved in the Incident Command System.

The objectives have to be communicated to all personal involved in this emergency. Objectives have to be easy to communicate, easy to recognize, and with clear magnitudes. A “bad” objective could be “We want to control the fire as soon as possible”. A “better” objective could be “we want to control the wildland fire within this road, this dirt road, and this creek in less than 30 ha”. The second objective has clear magnitudes (referenced to a map) and could be test latter to see if it was accomplished or not. This is not the case with the first objective.

It is the duty of the fire analyst to justify or validate that the proposed fire control lines are both secure and efficient to established.

Lastly, sometimes, the chosen strategy may be not to address the head fire because it is out of control even with indirect attack. There will be no possible safe and efficient tactic to use. The head fire would be address latter on time and space.

Tactic

The tactic is how to accomplish the strategy. Different tactics are available. The Fire Analyst should propose the best tactic (to allow for a secure and efficient fire control) taking in consideration the resources available, the training, and the forecast fire behavior changes in time and space and determine critical point or lines where a greater alignment of factors might put the fire our of suppression capabilities. Personnel safety must be always a priority.

For a given strategy, several tactics could be possible in order to implement the control goals. Choosing one tactic among others is based on specific training, resources available, suppression protocols, and forest regulations. It is the second step to control the fire. It is the way (how?) to pursue the goals. Strategy is up to the Fire Boss while tactics are up to the fire brigades. The Fire Boss has the leadership, the

planning responsibility, and the management and coordination of resources. However, sometimes, the Fire Boss may be far from a given fire front and, therefore, the chosen tactic to address it properly it is up to the Fire Sector Boss. Let's see an example: the chosen strategy in a fire sector is to hold (control) that front at the road. Then, the Fire sector Boss may choose

- a. to control it with engines and hoses
- b. to have both engines and air tankers
- c. to backfiring from the road

All of them, different possible tactics.

In the next figure 2, we can see the construction of a fire line to be followed by a burnt out action. This is aimed to control (in a parallel attack) a wildland fire out of control capability under direct attack (in a safe and efficient manner). The execution window for this tactic is “while the fire is in the other slope” (space execution window). We have to check (estimate) if we have a proper “time execution window”; this is to say that we can implement the fire line and the subsequent backfiring operation in less time than the wildland fire spread towards the slope we are working in. If the wildland fire touches the bottom of our slope, then we are not longer in a safe place (dead man zone, see later)



Figure 2— Operaciones de flanqueo mediante línea de defensa y posterior quema de ensanche (photo Didac Díaz).



Figure 3 — Falling embers downhill in La Palma (Canary Islands, Spain). A safety issue (Daniel García)

Execution window for the tactic

It is the third part of the wildland fire control plan. It is the limits in time and space of the tactic that we have decided to use. As we mentioned above, any possible tactic has to be validated by checking if we have a proper “time execution window” and “space execution window”

Sometimes, there is a starting restriction in the “execution window”; i.e., a backfiring operation may require steady wind suction in our fire line to conduct a efficient suppression fire. Therefore, we cannot light the fire line till we distinguish that suction from the main fire. Another example could be when a wind change (i.e., timed with day / night topographic changes, or land /sea breeze) is required to allow a safe and efficient tactic to be performed.

Somehow adding new dimensions (others than time and space), the Fire Analyst should talk in a way like this: “our execution tactic would be effective (and therefore, it would be still in shape) if we are within these weather parameter intervals and within these fire behavior parameter intervals.

Wildland Fire Analyst: a needed job position

This chapter is aimed to justify this job position and to overview if (and how) this position is filled in different fire suppression agencies in Europe. In the words of some Forest Fire Suppression Bosses we have interviewed, “to have fire analyst as an assistant staff to the chief of the suppression forces is like to have the peaceful feeling that our efforts will end up in success or that we are not just playing around the fire spread to justify our salary”. In sum, safe and efficient wildland fire suppression cannot be accomplished without a proper Wildland Fire Analyst on duty.

Going into the details, a Fire Analyst vision do differs from the Fire Boss perspective (a manager of resources). Specifically, the Fire Analyst has to know a bout fire behavior and fire effects, and therefore, could decide when some efforts are either meaningless (inefficient to control the fire perimeter) or unsafe for the workers

Agencies in which this position is explicitly recognised

We are going to mention two sites in which there are WFAs (Wildland Fire Analysts)

Catalonia (NE Spain): there are 8 full-time WFA (although not all of them explicitly recognized as such in their hiring contract). Some 4 to 6 additional assistant WFAs are hired every summer.

Gran Canaria (insular SW Spain): There are 2 full-time WFA (explicitly recognized as such in their hiring contract). An additional full WFA is hired every summer.

To the best of our understanding, a WFA is required if either of this two situations happen to occur: i) that at least 2% of the fires escape from initial attack, ii) there is a fire larger than 150 ha at least one every other year.

Agencies in which this position is not recognised

This qualification is not explicitly recognized in other Spanish Regional Agencies: Aragón (Bardají 2007), Tenerife (Lopez-Ruano, 2007), Castilla-LaMancha (García 2007). However, in some of them (i.e., García 2007) with the on-going administration changes may end up with the new job position of fire analyst. In Aragón, five forest fire managers have taken specific training towards filling this position as WFA. In Tenerife (Canary Islands) there is a move towards this new job position but there is a complex protocol (in large wildland fires) that accommodates several different tasks for up to 4 forest fire managers on duty. This could eventually allow for a more specific WFA position.

Agencies in which this position is somehow recognised

In Castilla La Mancha (García 2007) there is an on-going administration changes that may end up with the new job position of fire analyst.

Wildland Fire Analyst: the required education

The required level of education should include a university degree in Forestry (or related degree), and an additional specific postgraduate or master degree in Forest Fire Management. Several years in fire fighting operations are sure important to qualify as a wildland fire analyst. However, we want to highlight that we should be able to transfer experience through high quality case studies.

This is a needed job position and required a specific education and training. This specific degree in Forest Fire Management must include credits in prescribed burning techniques, fire behavior, fire effects, fire analysis, strategies and tactics, and the use of prescribed fire in ecosystem management. Fire Analysts may enhance their performance if knowledgeable about the body of works by Campbell (1995) and Cheney et al (2001)

In Fire Paradox Project (www.fire.paradox.org), we are producing new training materials (and sharing the existing ones, www.etsea2.udl.es/~UFF/2_courses/pages/wfmmmd.htm) specifically aimed to this regard. These training documents are an innovative contribution to introducing

changes into regional and national forest and fire management services across Europe. These new training systems and practices by addressing European-wide training needs and to fortify European co-operation, develop common principles for informal learning and amplify support at the local service level for the development of qualifications and competences as wildland fire analyst. These training materials will include fire science, fire ecology, fire weather, the social and cultural role of fire in Europe, fire prevention and suppression methods and technologies and the use of prescribed fire in ecosystem management. Additionally, they will cover the state of the art scientific knowledge of fire ecology in the European biota, the impacts of fire on atmospheric chemistry, climate, human health and security. Country “Annexes” providing specific information on particularities of wildland fuels and management options may be included.

What should be the suitable education, training, experience and certification of a WFA?. This questions is the next step if we accept that WFA is a required job position. We are working on this in Fire Paradox

In terms of suitable education, training, experience, we believe that should be similar to what it is required to be a fire suppression boss. And additionally, three more subjects are required:

1. Familiar with Wildland Fire Typologies in the region and capable to forecast and assess fire behavior changes under changing topography and wather.
2. Familiar with prescribed burning techniques. This helps to understand minor changes in fire behavior and hoe to address them. We truly believe that expertise (both education and extensive training) in the wise use of fire (prescribed burning as well as backfiring operations in suppression actions) is a must to shape up and mature an efficient Wildland Fire Analyst.
3. Fire ecology and fire effects (this may be obtained partially in prescribed burning actions)

Wildland Fire Analyst: the required training

The required extensive training may include:

1. a manager level position in Forest Fire Management during at least two fire seasons.
2. a close up participation in recreation of fire spread in different past fires. In this paper, we also show (in the discussion chapter) several case studies in which the fire control actions did or did not match the fire-spread pattern because these last one (fire-spread pattern) was not perceived properly.
3. a sharing learning experiences in Fire Propagation research field (i.e., www.fireparadox.org)
4. a deep knowledge of fire ecology (fire effects liked to fire behavior) (this is something not required for a Fire Boss but a must for a Fire Analyst).

Wildland Fire Analyst: an acreditation system

We truly believe that this important job position (Fire Analyst) deserves recognition and a proper certification system to ensure that the most qualified are hired for that job.

Discussion

We want to show here several case studies in which the fire control actions did not match the fire spread pattern because these last one was not perceived properly. We want to highlight that having an expert wildland fire analyst on duty in those cases could have made a significant difference in the fire perimeter and in the human safety (including job hazard abatement actions).....

Las posibles funciones del analista (acreditado) las puede desempeñar en prevención o pre-extinción tanto en la redacción de planes de prevención, planes de quema como en la ejecución misma de quemas. Y por supuesto como hemos visto mas arriba en extinción. A lo mejor no es necesario ser analista para alguna de esas funciones pero viene bien y son funciones posibles a desempeñar.

El analista debe definir zonas seguras para iniciar las maniobras de control y “zonas prohibidas” en función del patrón de propagación del fuego así se evitarían errores que se plasmen en heridos o en ineficacia en la extinción

Es necesario recordar que cada vez que hay un fracaso grande en la lucha contra incendios forestales (i.e., Guadalajara 2005), los gobiernos recurren a respuestas populistas que ya se han demostrado poco efectivas. Más inversión en la extinción sólo supone retrasar el gran fracaso en la gestión de la extinción. Tener una superflota aérea que no puede volar el día de mucho viento, mientras los combustibles forestales sin gestionar eficazmente propagan el fuego sin cesar. Por el contrario, tener analistas bien capacitados pueden permitirnos evitar muchos de estos fracasos. Esta es nuestra gran apuesta. En el conocimiento, en la innovación, en las sólidas estrategias es donde puede estar la diferencia entre éxito o fracaso. No aumentar en recursos sino economizar los que se tiene, saber gestionarlos de una manera eficiente y segura gracias a un conocedor (el Analista) tanto del comportamiento actual, como futuro del fuego y sobre todo de cómo “Gestionar el Incendio” dentro de un punto de vista beneficioso en temas de ecología forestal.

Conclusion

We believe that to have a Wildland Fire Analyst on duty pays off. Therefore, it is necessary to address how to certify the required qualifications to ensure we could fill those job positions with the best workers available. And lastly, how this as a standard job position in wildland suppression actions. It is as important, in our view, as (and therefore as required as) helicopters, airplanes, logistic experts, etc.

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text will come from team including Catalonia Fire Fighter Service, Castilla-La-Mancha Forest Service, Andalucia Forest Service, different Canary Islands Forest Services and National Park Services

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