MedWildFireLab: Global Change Impacts on Wildland Fire Behaviour and Uses in Mediterranean Forest Ecosystems, towards a «wall less» Mediterranean Wildland Fire Laboratory

Deliverable: 6.1. State of the art on Wildland Fire Fighting Training in the context of Global Change

Authors: Gavriil Xanthopoulos, Evangelia Daskalakou, George Kazakis

Title	STATE OF THE ART ON WILDLAND FIRE FIGHTING TRAINING IN THE CONTEXT OF GLOBAL CHANGE
Author(s)	Gavriil Xanthopoulos (DEM), Evangelia Daskalakou (DEM), George Kazakis (MAICh-GIEM)
Organization	DEM, MAICh-GIEM
Deliverable Number	6.1
Submission date	4-11-2016

Start of the project: 01/10/2014
Duration: 30 months
Project coordinator organisation: ISA-CEABN

Due date of deliverable: Month 08
Actual submission date: Month 26

Dissemination level

X	PU	Public
	PP	Restricted to other programme participants (including the Commission Services)
	RE	Restricted to a group specified by the consortium (including the Commission Services)
	CO	Confidential, only for members of the consortium (including the Commission Services)

Table of Contents

Executive summary

This report offers a summary view of the current situation in regard to wildland fire training in the Mediterranean countries of Europe. In order for the information to be useful, allowing understanding and supporting comparisons on training, it is tried to document the ways in which wildland fire firefighting and management is organized in each of the countries of Mediterranean Europe.

The information compiled in the report originates from a variety of sources, including internet sites, news reports, bibliography, circulation of a questionnaire and analysis of the responses, and personal contacts and professional knowledge. From all the material collected and selectively presented it can be concluded that:

- The ways in which wildland fire management is organized in each of the countries of Mediterranean Europe differs significantly between regions. Historic reasons, financial reasons and the importance of the wildfire problem for each country can explain these differences to a large extent. There are differences in how wildfire management is organized even between regions of the same country (e.g. Italy, Spain). Furthermore, there are currently changes taking place that may further change the picture presented here.
- Given the differences above, it is not surprising that wildland fire suppression and management training is non homogeneous across the studied countries. There are significant differences in sophistication of training (level of training, specialized facilities, content, etc.). It can be said however, that according to the respondents of the questionnaire, there exists at least one professional firefighting school in each of the countries with Kosovo being the only exception. It is also worth noting that there is quite good availability of training materials in all countries.
- On the other hand, in some of the countries there is neither a certification system nor a national database keeping track of who has been trained and on what aspect of firefighting.
- Seasonal firefighters do receive some training before undertaking their duties but there is a lot of variation in regard to the duration and depth of it.
- Information on wildland firefighter training in the countries of Mediterranean Europe is not easy to collect on the Internet, because there is very little effort on producing web-sites on the subject, let along English versions of related sites. In some cases even within countries the information is unclear or even conflicting. This was reflected even in the replies of the respondents of the questionnaire.
- Given the relative scarceness of information on wildland fire training on the internet, it is not surprising that there is practically no clear reference to climate change as an issue that should be taken into consideration in this training. The majority of internet sites on firefighter training originate mostly in professional all-type firefighter schools. There, emphasis on environmental issues and in wildland firefighting per se seems to be of secondary importance. This may be one of the reasons for lack of explicit references to climate change.
- Further to the above, the responses collected through the questionnaire, confirm that climate change, if at all present, is handled superficially in current wildland fire management training curricula. More specifically, according to the respondents of the questionnaire, the potential effects of climate change are explicitly considered and addressed in current wildland fire management only in Cyprus, Portugal, Kosovo and Spain. It is clear that there is room for improvement on this point.

Acknowledgements

The authors would like to acknowledge the valuable contributions offered by:

- The nineteen (19) respondents of the questionnaire, whose names are not disclosed for reasons of privacy.
- All the MedWildFireLab project partners who provided information and photos about wildland fire management and firefighting training in their countries, and all those who reviewed the report providing useful comments for improvement.
- Commander Christophe Frerson, Disaster Emergency Management, Marseille Area, France (Government Administration)
- Professor Nikola Nikolov, Full Professor on the Faculty of Forestry in Skopje, FYROM.

Introduction

Wildland fire management is the process of planning, preventing and fighting fires to protect people, property and the forest resource. Wildland fires are a natural phenomenon but they are also a significant problem for modern societies. Their management is a very complex issue as it has many environmental, technical, social, financial, and political aspects. This is even more so nowadays with their dynamics changing as a result of climatological, social and political changes, financial and legal constraints, etc. all of them being part of what is referred to as "global change". Actually, global change refers to planetary-scale changes in the Earth system and encompasses: population, climate, the economy, resource use, energy development, transport, communication, land use and land cover, urbanization, globalization, atmospheric circulation, ocean circulation, the carbon cycle, the nitrogen cycle, the water cycle and other cycles, sea ice loss, sea-level rise, food webs, biological diversity, pollution, health, over fishing, and more (https://en.wikipedia.org/wiki/Global_change).

Planning on how to manage fires in the forests and other wildlands is very demanding and requires knowledgeable people and an integrated holistic approach that takes both the people and the resource into consideration. There can be many different approaches in regard to planning and application of fire management but one thing is certain: a capable and effective wildland fire suppression organization is needed to function as the cornerstone on which fire management is built. However, in view of today's financial constraints, effectiveness must also be combined with efficiency.

How can a fire suppression organization become effective and efficient? The issue has been debated broadly by various people including academicians, researchers, operational officers, politicians, etc. in various fora. The developed organizational schemes are many and quite variable, depending on the existing conditions. What is certain, however, and common requirement in all approaches, is the need for high quality training of personnel.

Objective

The objective of this work is to document current wildland fire-fighter training programmes in different Mediterranean countries, identifying gaps and potential improvements, identifying specifically the extent to which Global Change is included in these programs. The material collected and analyzed here is intended as a first step in the direction of preparing, in a follow-up work, a report with "Recommendations for adapting wildland fire training for the future".

Wildland fire-fighters training programs

General

Fighting wildland fires is a risky task. The fires change continuously in space and time and being close to their perimeter in order to extinguish them, always entails a risk of being overrun or surrounded by the flames. Thus, fighting wildfires, in addition to having the specific capability (knowledge of suppression methods, physical condition, equipment), also requires an understanding of how fire behaves and of the topography, vegetation and access roads in the particular area.

Historically, up until the beginning of the 20th century in the USA and up until after the Second World War in Europe, there existed no specialized wildland fire-fighters. The task of putting out fires in the forest lands was carried out by forestry personnel with the help of local workers and the local population, or by the existing urban firefighters. Part of the reason for this arrangement had to do with the organization of the states and the societies in general, being less

sophisticated and of lower cost. However, another part was due to the characteristics of the wildland fires themselves. Although large fires occasionally did occur, especially where huge tracts of land had a very small human population such as in the USA, most of the fires in areas where the people used their agricultural and forest land for the production of goods, were of relatively smaller intensities. This was mainly due to the reduced amount of fuels. Furthermore, in regard to firefighting, what the local populations lacked in organization, equipment and training, was largely compensated by the experience they had, the motivation to protect their land and properties, and their good knowledge of the topography and the fuels.

In the last forty years of the 20th century it gradually became evident that wildfires started becoming more intense. In the USA this was attributed to the influence of active wildland fire suppression on the fuels. More specifically, photographic evidence and scientific studies documented a significant fuel built-up which made fires more difficult to control. The initial reaction of strengthening fire suppression was augmented with the introduction of prescribed burning as a tool for controlling fuel built-up. Both fire suppression improvement and prescribed burning planning and application required major investment in training of personnel.

In the Mediterranean part of Europe a worsening trend in forest fire behavior became evident mainly in the last twenty years of the 20th century. There, the main cause was a rural exodus. Following the aftermath of the Second World War, a significant percentage of the rural population left the countryside and either immigrated abroad or moved to the large cities. The abandonment of agricultural cultivations resulted in fuel load increases as well as in fuel continuity across the landscape. The worsening of the forest fire problem became evident with a delay of roughly 10 to 20 years which was the time needed for vegetation to grow in the open spaces. Again, all south European countries devoted significant effort and funds to forest fire suppression while also trying to control fuel built-up (Xanthopoulos et al. 2006). Prescribed burning has only had a minor role in it in spite of efforts, such as the European Commission funded Fire Paradox research project (Silva et al. 2010), to introduce it as a viable and effective tool. Training of personnel was among the obvious needs for improving fire suppression, but, as there are many countries and organizational frameworks, the way and degree to which it was applied has been variable.

The major political, social and financial changes that took place in Eastern Europe in the 1990s and 2000s are also a testimony to the relation of the issue of forest fires to each country's overall management reality. This holds true from the Balkan region to the south, part of which enjoys a Mediterranean climate, to Ukraine and Russia to the north. Countries such as Croatia, FYROM, Bulgaria, and Romania, have started facing problems with forest fires which did not exist before 1990. This change entails the need for coping with the problem, a task that obviously requires organization changes and training of personnel.

All the changes in regard to wildland fires that were described above, show the dynamic nature of the phenomenon and the multitude of factors affecting it. Nowadays, a further element needs to be considered in its management. This is global warming, which in turn is considered as a form of climate change caused by specific human activities (as opposed to variations in solar radiation received by Earth, volcanic eruptions, etc.). Climate change is a change in the statistical distribution of weather patterns when that change lasts for an extended period of time (i.e., decades to millions of years). Climate change may refer to a change in average weather conditions, or in the time variation of weather around longer-term average conditions (i.e., more or fewer extreme weather events). (https://en.wikipedia.org/wiki/Climate_change).

The requirement to cope effectively and efficiently with the management of wildland fires, a complex ecological phenomenon that is also a natural hazard, makes obvious the need for well trained and sophisticated fire management officers. Furthermore, the need to apply fire management decisions on the ground, especially in regard to fire suppression, requires employment of high quality firefighting personnel. Development of such personnel requires careful recruitment and excellent fire fighter training.

Wildland firefighter training program contents

The question of what should be the content of a wildland firefighter training program is a very important one. It cannot have a unique answer since, given the complexity described earlier, the needs can vary a lot depending on a host of factors that range from tradition to the structure of the organizations, from the vegetation types and fire characteristics to the layout of the land (topography, road density, availability of water, etc), and from the firefighting organization structure to the financial capacity of the countries. Accordingly, in order to identify what should be the firefighter training program content, it makes sense to examine some of the notable examples of advanced existing training systems around the globe.

Training programmes in non-European countries

United States of America

The United States Forest Service (USFS) was probably first to put emphasis on firefighter training, so it is imperative to examine the origins, and the current status and content of their approach.

Before the 1930s forest protection agencies relied on pick-up firefighters that were hired on an "as needed" basis. These men came from every walk of life. In most cases they had very little fire suppression training or experience. The first organized U.S Forest Service fire suppression crew was a "40-man" crew established in 1939, on an experimental basis, and located on the Siskiyou National Forest in southwestern Oregon (Alexander 1974).

In the timeline of fire management development in the USA, the first reference to specialized training is made in regard to the first smokejumpers at the McCall Smokejumper base (West Central Idaho), in 1943, who were trained in Missoula, Montana (https://www.nps.gov/fire/wildland-fire/learning-center/fireside-chats/history-timeline/operational-inventions-and-developments.cfm). There is also reference to the development of the Ten Standard Fire Orders (SFO) and the recognition of the 18 Watchout Situations in 1957, in a USFS commissioned “Report of Task Force To Recommend Action to Reduce the Chances of Men Being Killed by Burning While Fighting Fire”. The same report spurred the interest for research into and use of fire behavior knowledge in wildland firefighting. Starting with 5 Interregional Fire Suppression Crews organized for the 1961 fire season, a new type of highly trained crews, ready to move by airplane between regions, was developed for the first time, making it possible to apply the concept of quick mobilization and dispatching (Alexander 1974). Specialized quality training started becoming a recognized need. This led to development and subsequent improvements in training content, separately for the various organizations. Then, in 1976, the National Wildfire Coordinating Group (NWCG) was established through a Memorandum of Understanding between the Department of Agriculture and the Department of the Interior. The memorandum defined the function and purpose of NWCG as follows (http://www.nwcg.gov/history):

“To establish an operational group designed to coordinate programs of the participating agencies so as to avoid wasteful duplication and to provide a means of constructively working together. Its goal is to provide more effective execution of each agency’s fire management program. The Group provides a formalized system to agree upon standards of training, equipment, aircraft, suppression priorities, and other operational areas. Agreed upon policies, standards, and procedures are implemented directly through regular agency channels.”

Twelve “working teams” and a number of sub-teams, comprised of member agency leaders and experts in various fields, were established in functional areas such as fire equipment, fire weather, incident operations, training, and incident business. These teams led the initial effort to achieve a broad national standardization in key areas of wildland fire management.

Listed in the order of which they joined, current NWCG members are:

U.S. Forest Service
Bureau of Indian Affairs
Bureau of Land Management
National Park Service
U.S. Fish and Wildlife Service
National Association of State Foresters
U.S. Fire Administration
Intertribal Timber Council
International Association of Fire Chiefs

Nowadays, the NWCG continues to provide leadership for a seamless response to wildland fire across the USA. The courses offered today are shown in Table 1 (http://www.nwcg.gov/publications/training-courses). The corresponding training material is freely available.

Table 1. Training Courses offered by the NWCG.

Course Number	Course Title
D-110	Expanded Dispatch Recorder
D-310	Expanded Dispatch Support Dispatcher
D-311	Initial Attack Dispatcher
D-312	Aircraft Dispatcher
D-510	Expanded Dispatch Supervisory Dispatcher
FI-110	Wildland Fire Observations & Origin Scene Protection for First Responders
FI-210	Wildland Fire Origin & Cause Determination
FI-310	Wildand Fire Investigation: Case Development
L-180	Human Factors in the Wildland Fire Service
L-180	Human Factors in the Wildland Fire Service (online)
L-280	Followership to Leadership
L-380	Fireline Leadership
L-381	Incident Leadership
L-480	Organizational Leadership in the Wildland Fire Service
L-481	Advanced Leadership for Command and General Staff
L-580	Leadership is Action
L-580	Leadership is Action
M-410	Facilitative Instructor
P-101	Fire Prevention Education 1
P-301	Fire Prevention Education 2
P-310	Fire Prevention Education Team Member
P-410	Fire Prevention Education Team Leader
RT-130	Annual Fireline Safety Refresher Training
RX-301	Prescribed Fire Implementation
RX-310	Introduction to Fire Effects
RX-341	Prescribed Fire Burn Plan Preparation
RX-410	Smoke Management Techniques
RX-510	Advanced Fire Effects
S-110	Basic Wildland Fire Orientation

S-130	Firefighter Training (Spanish)
S-130	Firefighter Training
S-130	Firefighter Training (Blended)
S-130	Firefighter Training (Self Paced CD)
S-131	Firefighter Type 1 Training
S-133	Look Up, Look Down, Look Around
S-134	Lookouts, Communications, Escape Routes, and Safety Zones (LCES)
S-190	Introduction to Wildland Fire Behavior (online)
S-190	Introduction to Wildland Fire Behavior
S-190	Introduction to Widland Fire Behavior (self-paced CD)
S-190	Introduction to Wildland Fire Behavior (Spanish version)
S-200	Initial Attack Incident Commander
S-203	Introduction to Incident Information
S-211	Portable Pumps and Water Use
S-212	Wildland Fire Chain Saws
S-215	Fire Operations in the Wildland/Urban Interface
S-219	Firing Operations
S-230	Crew Boss (Single Resource) (Blended)
S-230	Crew Boss (Single Resource)
S-231	Engine Boss (Single Resource)
S-231	Engine Boss (Single Resource) (Blended)
S-236	Heavy Equipment Boss
S-244	Field Observer
S-245	Display Processor
S-248	Status/Check-in Recorder
S-258	Incident Communications Technician
S-260	Interagency Incident Business Management
S-260	Interagency Incident Business Management (online)
S-261	Applied Interagency Incident Business Management
S-270	Basic Air Operations
S-271	Helicopter Crewmember
S-273	Single Engine Airtanker Manager
S-290	Intermediate Wildland Fire Behavior
S-290	Intermediate Wildland Fire Behavior (online)
S-300	Extended Attack Incident Commander
S-330	Task Force/Strike Team Leader
S-339	Division/Group Supervisor
S-340	Human Resource Specialist
S-341	GIS Specialist
S-354	Facilities Unit Leader
S-355	Ground Support Unit Leader
S-357	Food Unit Leader
S-358	Communications Unit Leader
S-359	Medical Unit Leader
S-371	Helibase Manager

S-372	Helicopter Management
S-375	Air Support Group Supervisor
S-378	Aerial Supervision
S-390	Introduction to Wildland Fire Behavior Calculations
S-404	Safety Officer
S-420	Command & General Staff
S-430	Operations Section Chief
S-440	Planning Section Chief
S-443	Infrared Interpreter for Incident Mangement
S-445	Incident Training Specialist
S-470	Air Operations Branch Director
S-481	Incident Business Advisor
S-482	Strategic Operational Planning
S-490	Advanced Fire Behavior Calculations
S-491	Intermediate National Fire Danger Rating System
S-495	Geospatial Fire Analysis, Interpretation and Application
S-520	Advanced Incident Management
S-590	Advanced Fire Behavior Interpretation
S-620	Area Command
X-900	Investigation of Powerline Caused Widland Fires

The Pack Test

The “Pack Test” is an indispensible element of firefighter training aiming to ensure wildland firefighter safety. The term “Pack Test” refers to work capacity tests used to qualify individuals for the three levels of wildland firefighting duty: Arduous, moderate, and light (http://www.fs.fed.us/fire/safety/wct/2002/pack_test_info_sheet.pdf). The Pack Test measures the aerobic capacity, the muscular strength and the muscular endurance of the individual. Testing prospective wildland firefighters for work capacity is very important because it aims at improved operations (better performance), personal safety and health of the individual, and coworker safety.

All wildland firefighters must meet minimum levels of fitness requirements for the type of duties they are assigned:

- Arduous: involves field work calling for above - average endurance and superior conditioning. All firefighters are required to perform arduous duty.
- Moderate: involves field work requiring complete control of physical faculties and may include considerable walking, standing and lifting 25-50 lbs. Safety officers and fire behavior analysts are examples of moderate duty positions.
- Light: involves mainly office -type work with occasional field activity. Examples include managers of fire camps and of helicopter bases.

Firefighters are strongly encouraged to train for the pack test, especially if they aim to qualify for the arduous duty level which means that they must be prepared to work in steep terrain; and in extreme temperatures, altitude, and smoke- while maintaining reserve work capacity to meet unforeseen emergencies. It is recommended that firefighters should start exercising 4-6 weeks before they are scheduled to take the test. The test criteria for arduous, moderate, and light duty performance are as follows:

Fitness Requirement	**Test**	**Description**
Arduous	Pack Test	3-mile hike with 45-pound pack in 45 min.
Moderate	Field Test	2-mile hike with 25-pound pack in 30 min.
Light	Walk Test	1-mile hike in 16 min.

Canada

In Canada, most of the fire crews are seasonal. Positions are filled following open calls, made by each Province, to which interested candidates apply. For example, according to their call, the "Manitoba Conservation Fire Program is a seasonal employer of trained initial attack forest fire fighters at various locations throughout Manitoba. These employment opportunities would be of interest to both local residents of remote communities, as well as college/university students particularly those studying natural resource management" (https://www.gov.mb.ca/conservation/fire/Fire-Fighter/firefighter.html). Previous experience in outdoor work involving manual labour is an essential qualification. It is also required for the candidate to possess a valid full stage Class 5 Drivers Licence, and to maintain current certification in First Aid and Cardiopulmonary resuscitation (CPR). This latter requirement also holds true for British Columbia firefighter recruitment (http://bcwildfire.ca/employment/).

Another example is Ontario where, in order to be employed as a FireRanger, candidates have to be trained and certified at the Type I crew level, which is the highest level. This means they can carry out all aspects of firefighting, including initial attack, sustained attack and mop-up. In addition to being 18 years or older and speak English, the candidates need to successfully complete the following training:

- Canadian Physical Performance Exchange Standard for Type 1 Wildland Firefighters (WFX-FIT)
- SP100 Forest Firefighter Training Course
- Standard first aid (St. John's, Red Cross or equivalent)

Since 1997 the Ontario Ministry of Natural Resources has out-sourced their Entry Level Training, i.e. the SP-100 Forest Firefighter Training Course, which is a forty hour course taught over a period of five days. The training is administered by private agencies accredited and recognized by the MNR to offer the SP-100 course. The training is approximately 60 % field work of which a Performance Based Assessment is conducted on each individual by the instructors. The remaining 40 % of the training is theory. Full attendance is required and a final exam is conducted at the end of the course. The following is an outline of the course content (http://www.wildfirespecialists.ca/sp100.htm):

- Mod. 1 - Fire Suppression Basics
- Mod. 2 - Health, Safety and Wellness
- Mod. 3 - Teamwork and Human Factors on the Fireline
- Mod. 4 - Introduction to the Incident Command System (ICS)
- Mod. 5 - Fire Behaviour
- Mod. 6 - Hand Tools
- Mod. 7 - Fuel Handling and Safety
- Mod. 8 - The Power Pump
- Mod. 9 - Hose Handling, Retrieval and the Application of Water
- Mod.10 - Heavy Equipment
- Mod.11 - Fireline Patrol and Mop-Up
- Mod.12 - Bush Orientation
- Mod.13 - Aircraft Operations
- Mod.14 - HT1250 Handheld Radio Use
- Mod.15 - Camp Operations
- Mod.16 - Equipment Management

An SP-100 Forest Fire Fighter Certification is valid for one full season from the successful completion of the course, i.e. if trained in 2015 the firefighter's training is also good for the 2016 fire season. A firefighter would be recertified and

qualify for the next fire season if he/she obtained work in the forest fire fighting field and with the completion of a maintenance package by a qualified Crew Boss (http://www.wildfirespecialists.ca/sp100.htm). Otherwise he/she would have to pass competency testing (an eight hour field session testing the candidate's knowledge of fire fighting techniques and the use of suppression equipment) from an accredited agency.

An Ontario FireRanger must pass the "Canadian Physical Performance Exchange Standard for Type 1 Wildland Fire Fighters (WFX-FIT)" test every year to maintain his/her certification (https://www.ontario.ca/page/fireranger-wfx-fit-testing). The same test is required in the other Provinces (e.g. for British Columbia http://bcwildfire.ca/employment/FireFighter/Pre-Employment%20Fire%20Crew%20Fitness%20Standard%20WFX-FIT%20Feb%2027%202013.pdf, Alberta (figure 1, etc.).

Figure 1. Fitness testing in Alberta in early May 2016.

There are 5 parts to the WFX-FIT (https://www.ontario.ca/page/fireranger-wfx-fit-testing): 1 pre-screening component and 4 performance components. The candidate must pass the pre-screening component before moving on to the performance components.

Pre-screening includes:

- PAR-Q+ (Physical Activity Readiness questionnaire)
- PARmed-X+ (online survey of medical readiness and medical referral)
- Resting blood pressure equal to or less than 144/90 mmHg
- Informed Consent and Release of Results documents
- Photo identification

The 4 performance components simulate the tasks and physical demands of firefighting. It is a timed circuit, conducted continuously, over a 40 meter course. The firefighter is required to:

- Carry a medium pump on his/her back
- Hand carry a medium pump
- Perform a hose pack lift and carry it on his/her back
- Perform a charged hose advance

To qualify as an Ontario FireRanger he/she needs to complete the circuit in 17 minutes and 15 seconds. To qualify nationally he/she must meet the national exchange standard of 14 minutes and 30 seconds. In that case he/she can fight forest fires anywhere in Canada.

WFX-FIT testing is administered by a series of testing agencies (e.g. certain colleges) approved by the Ministry of Natural Resources and Forestry. Testing begins in early February and runs through March, depending on the candidate's location choice. There is a six week training program to prepare for the WFX (http://bcwildfire.ca/employment/FireFighter/Pre-Employment%20Fire%20Crew%20Fitness%20Standard%20WFX-FIT%20Feb%2027%202013.pdf)

Australia

In Australia, volunteers form the backbone of wildfire (bushfire) protection, so the whole mechanism is organized accordingly. For example, West Australians (WA) in rural and pastoral areas rely heavily on Bush Fire Brigades (BFB) for protection against the threat of fire (http://www.d\fes.wa.gov.au/aboutus/operationalinformation/pages/bushfireservice.aspx). Over 22,000 bush fire service volunteers protect WA from bushfires through fire prevention and risk management, fire suppression and fire safety education. These volunteers operate through 579 BFB's, which are administered and trained by respective Local Governments and supported by the Department of Fire and Emergency Services (DFES). BFB volunteer firefighters are trained to operate equipment, vehicles and appliances used in fire suppression operations. BFB volunteers are trained in:

- Personal and team safety
- Fire suppression methods
- Vehicle driving on and off road
- Communications
- First aid
- Leadership and emergency management procedures

At the south east side of Australia, in the state of New South Wales (NSW), the lead combat agency for bushfires is the NSW Rural Fire Service (RFS). The NSW RFS is considered as the largest volunteer fire service in the world. Members of the NSW RFS are trained to very high levels of competence to ensure they know what to do in an emergency. Working closely with other agencies they respond to a range of emergencies including structure fires, motor vehicle accidents and storms that occur within rural fire districts.

Training in the NSW RFS is designed to treat volunteers and staff as equal members of the organization and to provide training pathways from the most basic new recruit member through to the senior management of the organization. It is organized at several levels (http://www.rfs.nsw.gov.au/volunteer/training):

- The Learning and Development (L and D) section at the NSW RFS Headquarters has overall responsibility for how all training, assessment and associated activities are run in the NSW RFS.

- Most of the training for volunteers is provided at a local district level using programs and materials developed by L and D Systems. Brigades may often be involved in post-course practice training, ongoing refresher training (competency maintenance) and exercises.
- Four NSW RFS Regional Offices support and audit the training provided by the districts. The regions also train trainers and provide other training that is not possible to deliver at a local level.
- Some specialized sections (e.g. Community Safety, Aviation and Fire Investigation) also provide training directly to volunteers and staff in their specialized fields.

In the Australian Capital Territory (ACT), which is a self-governing territory enclaved within New South Wales, the ACT RFS training packages come from the National Public Safety Training Package. All Service training is nationally recognized within the Australian Quality Training Framework and is generally recognized across all fire services in Australia (http://esa.act.gov.au/actrfs/get-involved/training-package/). The Service provides training from Certificate 2 in Fire Fighting Operations through to Certificate 4 in Fire Fighting Supervision. ACT Rural Fire Service members complete the following training pathway:

Basic Fire Fighter

This training provides all the necessary skills to equip the individual to work in a team under direct supervision on the fire ground. This training is required for all ACT RFS fire-fighters and is generally delivered over 4 evening theory sessions, and 2 days practical work on weekends. Completion of this training course results in the following units of competence being awarded:

- PUAOHS001A Follow Defined Occupational Health and Safety Policies and Procedures
- PUAFIR201A Prevent Injury
- PUAOPE013A Operate Communications Systems and Equipment
- PUATEA001A Work In a Team
- PUATEA004A Work Effectively in a Public Safety Organization
- PUAFIR204A Respond to Wildfire
- PUAEQU001B Prepare, Maintain and Test Response Equipment


Figure 2. Village fire-fighting in action


Figure 3. Gas prop training at training center

Village Fire-Fighter

This training builds on the Bush Fire-fighter training above. The course enables participants to undertake motor vehicle fire-fighting Figures 2 and 3), as well as defensive structural fire-fighting (not entering buildings). This course is delivered in a 2 and a half day format. Completion of this training course results in the following unit of competence being awarded:

- PUAFIR202A Respond to Isolated/Remote Structure Fire

Advanced Fire Fighter

This training is broken into 2 parts – Technical and Principles. This allows members to develop their technical skills (Fire-fighting) and then develop their leadership and safety skills at their own pace. Advanced fire-fighters take on a mentor role with newer fire-fighters and are expected to work with limited supervision. These units are delivered separately. All training at this level requires commitment over weeknights and weekends. Members must hold all Bush Fire-fighter units of competence to be eligible to complete this training. Completion of this training course results in the following units of competence being awarded:

AF Technical:

- PUAOPE014A Navigate to an Incident
- PUAFIR309B Operate Pumps
- PUAEQU001B Prepare, Maintain and Test Response Equipment

AF Principles:

- PUAOHS002B Maintain Safety at an Incident Scene
- PUATEA002B Work Autonomously
- PUAFIR319 Take Local Weather Observations

Crew Leader

This training is designed to develop members who wish to take on leadership roles within their Brigade. The crew leader package is delivered in three sections. The courses are designed around different sections of fire-fighting. Members must hold all Advanced Fire-fighter units of competence to be eligible to complete this training. Completion of this training course results in the following units of competence being awarded:

- PUAFIR303A Suppress Wildfire
- PUAOPE012A Control a Level 1 Incident
- PUAOPE0015A Conduct Briefings/Debriefings
- PUAOPE020A Lead a Crew
- PUAFIR319 Take Local Weather Observations

Group Leader

This training is for senior field fire management officers. It is a four and a half day course. This course develops the individual's crew management, fire behavior, and incident management skills. Members must hold all Crew Leader units of competence to be eligible to complete this training. Completion of this training course results in the following unit of competence being awarded:

- PUAOPE016A Manage a Multi-Team Sector

Training programmes in European countries

Albania

In Albania the number of volunteer firefighters (seasonally) is between 2,500 and 3,000. These volunteers are integrated into firefighting operations and trained by the Forestry Service and the Fire and Rescue Training Centre. There is a lack of professionally trained firefighters (in both the Forestry Service and the emergency services). There is also a lack of equipment, especially off-road vehicles. There are no legal insurance mechanisms and the volunteers are equipped only with hand tools (Nemeth 2015a).

There are no qualification standards for personnel involved in firefighting. The Forestry Service provides training for staff involved in forest fire suppression. This training covers basic knowledge and firefighting techniques, but there is no professional training. Several study tours have been organized to Italy and Turkey, but these have been ad hoc and not part of an official training programme, nor are there any official training materials for forest fire protection. The Ministry of the Interior has, however, produced a National Civil Emergency Training Curriculum, comprising eight training manuals on disaster management, disaster response, disaster relief logistics and emergency preparedness (Nemeth 2015a).

Bosnia and Herzegovina

Bosnia and Herzegovina has a unique political structure that influences the functioning of public institutions and all areas of life, including forestry and forest fire protection. The country is divided into two entities: Republika Srpska and the Federation of Bosnia and Herzegovina (BiH) which have significantly different administrative structures. On the third level, FBiH is subdivided into 10 cantons, each having its own cantonal government. Then there is a fourth level of political division, the municipalities which also have their own local government. There are 74 municipalities in FBiH and 63 in Republika Srpska.

In regard to forestry, the issues related to the forest sector are only occasionally subjects of public political agendas (e.g. forest fires). In reality, forest policy is almost nonexistent. Although some strategic documents (e.g. the National Environmental Action Plan) propose clear goals related to the forest sector, an overall commitment to sustainable forest management in BiH is at doubt (FAO 2015).

In total there are approximately 2770 professional and volunteer firefighters in the country, and they are mainly equipped for the suppression of urban fires. There is a relative ignorance about forest fire risks and prevention measures. The local population and the tourists are generally careless with fire. There is no active forest fire management. Firefighting capacity is quite low due to poor fire-fighting equipment and lack of training. There is a dependency on support from neighboring countries (e.g. from Croatia). A special problem is the existence of areas in BiH which are contaminated by landmines. These areas cover about 2.3 percent of the BiH territory and include about 130,000 ha of forest or forest land. This represents a particular problem for forest fire protection, both in regard to fuel management and in relation to forest fire suppression activities, either on the ground or from the air. Special training is required for fighting fires, focused mainly on using indirect attack methods and taking all necessary precautionary measures (Nemeth 2015b).

Given the complexity of the political structure of the country and the equally complex legal structure for its implementation, it is not surprising that the system of forest fire protection in BiH is not as efficient as it should be. It is clear that laws and regulations should be reduced and the functioning of the various state entities should be harmonized. This is true in regard to firefighter training as well. Although personnel from BiH regularly cooperate and

participate in international exercises and training schools, there is a need for training centers at entity level, having the same (i.e. harmonised) training programs (Nemeth 2015b). This would clearly improve cooperation in the field when firefighting.

Croatia

Croatia has highly professional and operational protection and rescue capacities at the central government level. The dominant crisis management approach became civilian-based rather than military-based after the war of independence (1991-1995). The legal and institutional structures were reformed in 2005. Currently there is an "all hazards approach" and the national coordinating body is the National Protection and Rescue Directorate (NPRD). The NPRD is divided into five sectors which include the Fire-fighting Sector and the Fire-fighting Protection and Rescue School (Figure 4). The authority and responsibility for crisis preparedness and response first and initially rests on the local level. However, in the case when a crisis overwhelms local capacity, all necessary measures are taken by the NPRD which is in charge of crisis preparation and response at the state level (Samardzija et al. 2014).

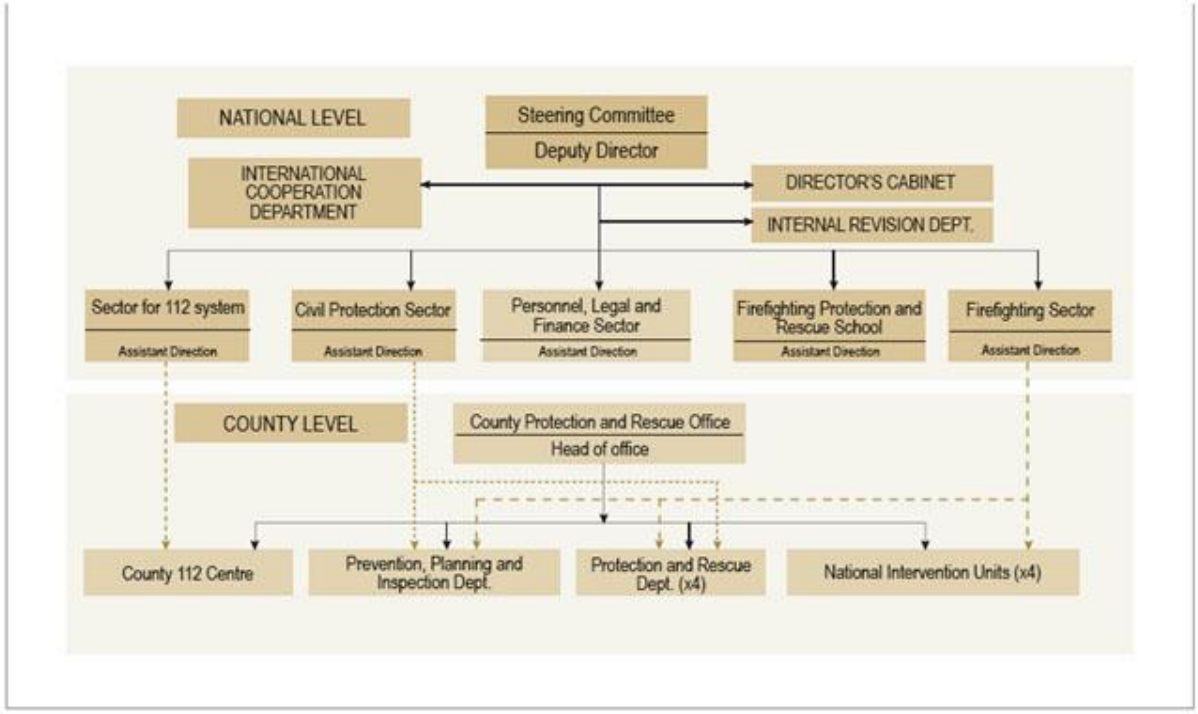

Figure 4. The structure of the NPRD command and control chain (http://seekms.dppi.info/national-protection-and-rescue-directorate/)

The firefighting service in Croatia

The Law of Fire-prevention, the Law of Fire-fighting and the Law of protection and safety as well as their sub-regulations and corresponding acts and orders of districts, cities and municipalities regulate all matters of fire-prevention and fire-fighting in Croatia. According to the Croatian constitution, fire-fighting is a matter of local municipalities. Professional and volunteer fire-fighters are equal regarding the fulfilling their duties, but the professional fire-fighting units work on bases of the Law of Public Institutions, and the volunteer fire-fighting units on bases of the Law of Associations of Citizens. Additional 4 fire-fighting intervention-units work in 4 coastal counties in Dalmatia, and all fire-fighting units are commanded during the summer by the Center in Divulje near Split, all part of the National Directorate for Protection and Safety. Specific for Croatia is also the engagement of 1.000 seasonal fire-fighters and

additional fire-fighting units on islands to protect them from wildland fires in the summer. Each fire-fighting unit and fire-fighting association has a commander, who is responsible for interventions, preparedness and education of fire-fighters on his territory. Each volunteer fire-fighting unit and fire-fighting association has a president, who is representing it and who is responsible for its development and its promotion. On state level within the National Directorate for Protection and Safety the main fire-fighting commander is responsible for interventions, preparedness and education of fire-fighters in Croatia, and one of his helpers is the Head of the Croatian Firefighting Association. The main fire-fighting commander takes over the command while commanding directly the intervention-units, if the intervention is covering 2 or more counties, or if aircrafts are involved.

Fire-fighting interventions are carried out by:

1835 volunteer fire fighting units in municipalities and cities
56 volunteer industrial fire fighting units
61 public city fire fighting units (professional)
34 professional industrial fire fighting units
4 intervention units of the Ministry of internal affairs

Special fire-fighting forces and forces of the anti-fire escadrille of the Ministry of Defense (6 Canadair CL-415, 6 Air-tractor 802A Fire Boss and helicopters of the type Mi-8 and 117-Š of the Croatian army).

Within the National Directorate for Protection and Safety operates the Education Center for Protection and Safety and the Fire-fighting School, where fire-fighters and rescue-personnel are educated. Also equipment is being checked and normed there, and Croatian standards regarding protection and safety are being suggested.

Of the 61.421 Croatian operative fire-fighters, 56.415 of them are volunteer fire-fighters of towns and municipalities, 1.621 are volunteer fire-fighters in industrial fire-fighting units, 2.371 are professional fire-fighters in public fire fighting units, 236 are professional fire-fighters in volunteer fire-fighting units and 778 are professional industrial fire fighters.

Fire-fighters in Croatia record between 35 and 40 thousand interventions in a year, in average consisting of 13 thousand interventions on fires, 12 thousand technical interventions and 14 thousand other interventions.

All fire fighting-units are united in fire-fighting associations of municipalities, towns, districts and counties, and 20 fire-fighting associations of counties and the Fire-fighting Association of Zagreb are unified into the Croatian Firefighting Association.

The volunteer fire-fighting units and the fire-fighting associations are financed by local municipalities (up to 5 % of their source-incomes), and the Croatian Firefighting Association is financed by the state budget. The territorial professional fire-brigades are financed additionally through the state-budget based on minimal financial standards. Important incomes of fire-fighting associations are 5% of fire-ensurances of buildings. Additional incomes for fire-fighters are special governmental programmes (for example from 2002-2009 210 fire-fighting vehicles were financed mainly by the government), percentages of forest-taxes and additional financing from local municipalities for fire-fighting equipment.

The Croatian firefighting association

The Croatian Firefighting Association is the top fire-fighting-organisation that integrates all fire-fighting organisations and units in Croatia. 1896 professional and volunteer fire-fighting units with 61.421 operative fire-fighters are unified in 252 fire-fighting associations of municipalities, towns, districts and counties. Additional the volunteer fire-fighting units have about 75.000 supporting members, from which 20.815 are cadet fire-fighters, with approximately 30 % female members. Volunteer fire-fighting units have in their ownership 1.119 fire fighting centres, 952 fire-fighting warehouses, 3.108 fire-fighting vehicles and round 2.200 portable motor-pumps.

The tasks of the Croatian Firefighting Association are: organizing and carrying out of fire-protection measures; fire extinguishing and rescue of people and their belongings threatened by fire, explosion, technical accidents, natural and technical-technological accidents; helping in disaster relief during accidents and catastrophes, terrorist attacks and war; development and improvement of firefighting-skills, according to technical-technological achievements; environmental protection; achievement of a higher level of protection of people and their belongings against fire and against natural disasters and civilization catastrophes; protection and promotion of interests of its members; realization of the primary role of the fire-fighting service in the entire protection and rescue system; care of rejuvenation of fire-fighting units and promotion of the dignity of the fire-fighting branch.

The National Committee for Prevention and Extinction of Fire, seated within the office of the Croatian Firefighting Association, is an advisory body of the Croatian Parliament, coordinates national fire-prevention and fire- fighting activities and is member of the International Committee for Prevention and Extinction of Fire (ctif). Bodies of the Croatian Firefighting Association are the Presidency and the Operative-technical headquarter. The Croatian Firefighting Association has a Council for cadet fire-fighters, and 10 committees, e.g. committees for fire-fighting equipment and technique, standardization, education and training, competitions, research of the Croatian fire-fighting history, and the association of fire-fighting units in hospitals and the association of professional fire-fighting units in the industry.

Special attention is given to education and training of fire-fighters. The Croatian Firefighting Association (co)finances all specialized trainings and educations of fire-fighting officers, as well as regional exercises. For this purpose the Croatian Parliament gave the Croatian Firefighting Association an ex Army-center in Slatina near Donja Stubica, and at this moment is in process the constitution of a fire-fighting school of the Croatian Firefighting Association.

To ensure the rejuvenation of the fire-fighting units, the Croatian Firefighting Association organizes many activities for cadet-fire-fighters, among others a cadet fire-fighting-camp in Fažana near Pula, with participation of nearly 1.500 cadet-fire-fighters in a year.

An important activity regarding training and cohesion of the fire-brigades are competitions. The Croatian Firefighting Association organizes annually on 10 locations competitions for the Croatian Fire-fighting Cup, as well as elimination competitions for international competitions of the CTIF.

The Croatian Firefighting Association organizes annually at least 2 seminars, and takes part on national (Interprotex) and international (Interschutz) exhibitions, with the aim of exchange and leveling knowledge.

The Croatian Firefighting Association publishes annually in average 5 handbooks for fire-fighters, and fire-fighting news are followed by the monthly fire-fighting magazine “Vatrogasni Vjesnik”“, published also by the Croatian Firefighting Association (Source: the Croatian Firefighting Association; http://www.hvz.hr/english/).

All fire-fighting personnel, professional and volunteer, go through extensive education and training which includes urban fire-fighting and rescue activities and open area fire-fighting and rescue activities with special emphasis to forest fire fighting. Fire-fighting in Croatia has a 140 year old organized history and is continuously developing. However, so far, there are no training and education materials produced in English as the trainees are all native Croatian speakers.

Cyprus

During the fire season around 460 firefighters are recruited to form the fire fighting squad. The fire-fighting body is split up into groups of 10 - 15 persons and is distributed in various forest stations, which are considered as key points for quick intervention and effective fighting in case of fire. Each group is provided with one or more 4-wheel drive vehicles, at least with one fire engine and other fire fighting tools and equipment.

The Fire Protection section of the Department of Forests every year at the beginning of the fire season (May – June), organizes and performs a specialized training course in which all the firefighters participate. The annual fireline safety training focuses in the following topics:

- Fundamentals of forest firefighting
- Proper and safe use of the firefighting tools and vehicles
- Safety of the personnel involved in forest firefighting

The training takes place in all the forest stations separately. The Forest Officer in charge for the firefighting squad of each station participates in the training as well. The duration of the training is one day. Afterwards for the rest of the fire season, the basics of the training are repeated by the Forest Officer in charge for the Fire fighting squad on a weekly basis. This training course is currently being upgraded and it will take place in the Cyprus Forest College grounds. It's duration will be five training working days.

In the future in order for someone to be employed as a forest firefighter he / she will have to be qualified with the certificate in "Professional Forest Fire Fighting". A "Professional Forest Fire Fighting Training Program" is being organized as by October 2016 by the Department of Forests in order to provide the chance to civilians to acquire the certificate. It's duration will be five training working days and after the training there will be an examination.

Forest Officers are also trained. In 2010 a number of 80 forest officers were trained by an external expert in forest fire fighting. A new training program, specialized in the forest officer's role in forest fire fighting, is being organized which also will be held in the Cyprus Forest College grounds and the duration will be five working days.

Another group which participates in forest fire fighting are the Aircraft Coordinators. These are Forest Officers trained especially to communicate and cooperate with the aerial mean's pilots in order to advice them during the aerial firefighting operations. The Flight Unit of the Department of Forests organizes and performs every year a one day training course in order for these officers to be keen every year.

Former Yugoslav Republic of Macedonia (FYROM)

In FYROM, the management of state-owned forests with economic and protective assignments is carried out by the Public Enterprise for Macedonian Forests (PEMF) which has 30 subsidiaries. Among other tasks, the subsidiaries are responsible for protecting and taking care of the forests. Forest fires are a relatively significant problem for the forests of FYROM. PEFM subsidiaries form the first line of defense against forest fires. According to the law they need to have and maintain a basic capacity of firefighting equipment.

A Directorate for Protection and Rescue (DPR), established in 2005, also has a mandate to participate in the activities of forest fire suppression. It has 35 teams (around 700 people in total), mainly equipped with hand tools, which are engaged in the event of large forest fires. There is also the Macedonian Fire Protection Union (MFPU) which is an NGO that carries out measures for the prevention, pre-suppression and suppression of fires, including forest fires. The engagement of its volunteer firefighters in forest fire suppression is coordinated and carried out by the DPR (at state and local level). Today, there are around 154 voluntary fire protection societies within the MFPU, organized in 35 regional fire protection unions (RFPUs) (Nemeth 2015c).

As a rule, the PEMF via its regional subsidiaries is responsible for initial attack on starting forest fires. If a fire cannot be suppressed by the PEMF, they must call on the local fire service for support, although the PEMF is still in charge of the fire suppression operation. If the fire remains beyond their capacities, the DPR will contribute its resources. From

this point the DPR is in charge of all operations, even if the MFPU (volunteers) and the army are involved (Figure 5) (Nemeth 2015c).

Many forest sites in FYROM are contaminated by unexploded ordnance (UXO) that has its origins in the First World War. Official maps do not exist but the danger is clearly something that needs to be taken into consideration especially in the areas where the problem is more intense.

In regard to training, currently there are neither specialized nor well trained forest firefighters in the country, nor is there an institution for educating and training such personnel. A special training programme is clearly needed for already active firefighters and new personnel, aimed primarily towards the forestry sector (the PEMF, national parks etc.), the DPR and the territorial fire protection units. So far, some relevant trainings have been organized occasionally within certain projects, including a TCP/FAO project in 2012 and 2013 (train-the-trainers sessions), and a OSCE/ENVSEC project titled "Enhancing National Capacity in Fire Management and Wildfire Disaster Risk Reduction in the South Caucasus-Antalia" in 2010 and 2014 (Nemeth 2015c).

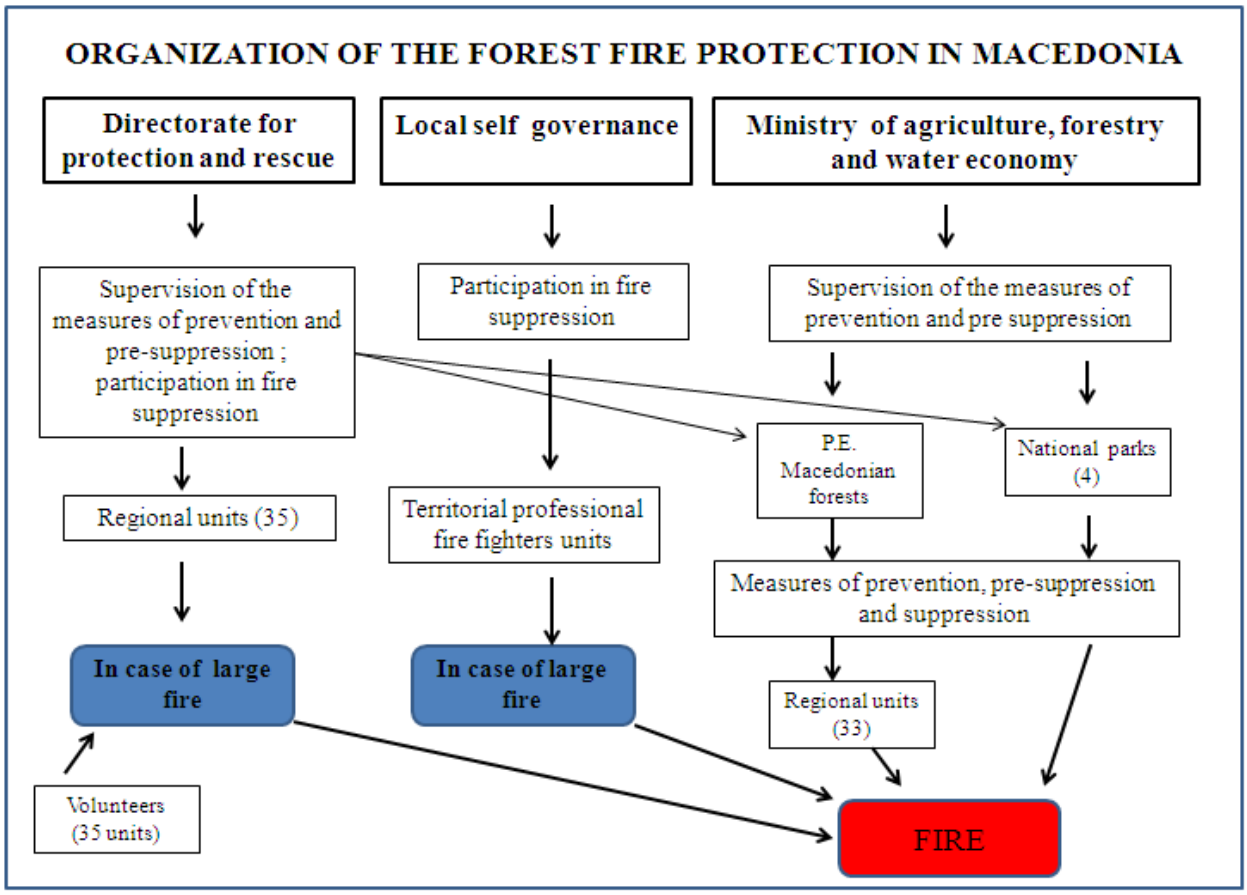

Figure 5. Organization of forest fire protection in FYROM (Nikolov 2013).

The training course foreseen for volunteer firefighters, when offered, is 42 hours long. Its content is shown in table 2.

Table 2. The program of the course for volunteer firefighters in FYROM, covering 42 hours (Prof. Nikola Nikolov, Personal communication)

Topic	Hours
Regulations in regards of the fire protection	4
Basics of the combustion and fire protection	6
Fire protection tactic	10
Fire protection means (tools, equipment, vehicles etc)	10
Exercises (trainings)	8
First aid to injured people	4

In regard to University level education, in the study program for the forestry engineers at the Faculty of forestry in Skopje (VIII semester) there is the subject "Forest protection" including Forest fire protection. As a result, all graduated students - forestry engineers have theoretical and practical knowledge in terms of forest fire protection.

France

The Fire and Rescue Service in France is responsible among others for forest firefighting, although this is mostly required in the south part of the country, that enjoys a Mediterranean climate, and in the southwest. The basic training of the French firefighters (level 1) is carried out at the department level, focuses on their core activity, and includes structural firefighting and first response (for example, medical response). Level 2 training, which prepares the trainee to undertake basic leading responsibilities (e.g. leader of a truck), is also carried at department level.

Specialized training and high level training are carried out at the NTS that operates in Valabre, at the south of France. There, firefighters who have to work in the south of France get trained in forest firefighting. Similarly those who have to work near the sea and may be involved in search and rescue operations there (e.g. Atlantic coast) are trained in swimming, scuba diving, rescue operations in water, etc.

Training of a team leader (who may have to command up to two other team leaders) requires Level 3 training which is offered at the NTS. This course includes a first level of simulation training because the trainee must become able to command effectively many fire trucks in a quite complex situation. One week is devoted on the training platform and then follows one week in the field.

The next level of training is Level 4 which is carried out for two weeks on the virtual reality platform and focuses on the command of many helicopters, aircraft and firetrucks on large event. One day in the field can also be part of this training. Finally, Level 5 is specialized on complex situations and is a requirement for those who want to become incident commanders or heads of an emergency operations center.

The National Training School (NTS) at Valabre

The NTS is a very modern school that includes facilities for all hazards and specializations. It has been developed in the last few years as a next step to the pre-existing firefighter training facilities that were operating in Valabre. There, they moved from the "sand table" for organizing field simulation exercises, to computerized training. in the late 1990s. The first virtual training platform (simulator including fire spread simulation, aerial resources and flight simulation, firefighting simulation, etc.) on forest fires was developed in Valabre about 16 years ago. That set-up and the overall forest firefighting training, in the training facility called "the Castle" are still operational: They are maintained and they are readily available.

The initiative for developing the NTS for all hazards started about 3 years ago with the aim of achieving leadership in Europe in the particular field. Thus the new center offers training on the command of forest fires, floods, riots, search and rescue, scuba diving, etc. The School was established with European Commission co-funding. Its operation is funded mostly through its training activities (reaching 80% of its budget) while the rest 20% comes from subsidies. Funding comes from the French, Ministry of Agriculture, Ministry of Interior, Fire and Rescue services, Collective funding (e.g. local authorities), European funds (including funds for participation in European research projects) and payment by other countries for various services (e.g. training courses, consulting by the School's experts, etc.).

The NTS does not have an operational mission in firefighting. Operational mission lies with the "fire and rescue department" and coordination there is done by a regional emergency operation center. However, the teaching staff of the NTS consists of experts with strong operational background and high qualifications. The NTS chooses carefully and employs experts in each field. For example, it employs experts in urban and sea search and rescue, floods, drones (new technology), etc. (Figures 6-9). In the field of forest fires, all the experts are operational e.g. for the "operations section chief" subject is employed an expert with expertise as "head of operations branch", for the "planning section chief" subject works a head of a fire and rescue department, while training at the cockpit of Canadair & helicopter is carried out by experienced Civil Protection pilots.

Figure 6. Firefighting coordination training at NTS.

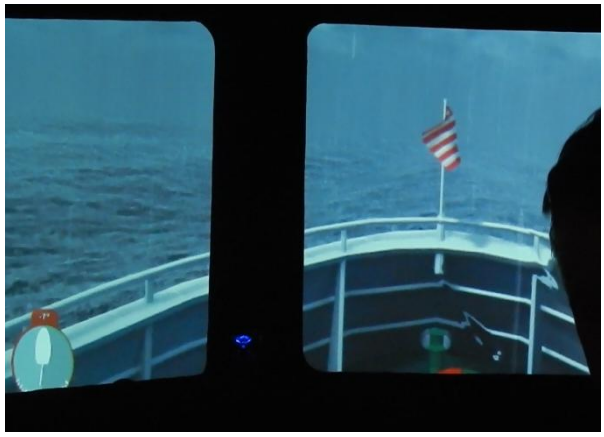

Figure 7. Sea rescue training at NTS.

Figure 8. Helicopter pilot training in firefighting at NTS.

Figure 9. Helicopter pilot training in firefighting at NTS.

The NTS is organized in four departments:

1. Communication and prevention (aims to teach people, kids at schools, production and dissemination of publications/booklets, etc.)
2. Technology (develops, maintains and operates simulation systems, GIS facilities, training rooms, etc.)
3. Research (through CEREN) which addresses French interests (e.g. firefighter equipment testing, evaluation and development of Personal Protective Equipment (PPE) for firefighters, etc.) and also participates in EU funded projects (Figure 10).
4. Training of French firefighters but also of personnel from other countries. Ad-hoc training is also offered for both domestic and international customers. Furthermore, the facilities are made available for other types of meetings and ad-hoc training not necessarily involving disaster training with large corporations being potential customers (Figure 11).

Figure 10. Firefighter clothing testing by CEREN.

Figure 11. The NTS auditorium for training and meetings.

In general, six years of official training is required in order to become Head of fire & rescue services. Becoming a Captain, training of one year at the NTS is required. One more year is necessary to become Major, and one additional year at the NTS is needed to become Colonel. Among the subject taught in those years is management, organization and the fire structure, operation according to the concept of High Reliability Organization (HRO), budgeting, etc. All these are offered at the corresponding levels e.g. to become head of fire station, head of service, etc.

The French Academy for Fire, Rescue and Civil Protection Officers (ENSOSP)

The French Academy for Fire, Rescue and Civil Protection Officers (ENSOSP) (http://www.ensosp.fr/SP/pages-ENSOSP/uk/ensosp-french-academy-fire-rescue-and-civil-protection-officers) is a national public administration. It depends upon the Interior Ministry that is in charge of civil protection. It comprises a teaching centre located in Aix-en-Provence, an operational training centre located in Vitrolles, and also has a site in Paris which is devoted to fire safety (http://www.ensosp.fr/SP/pages-ENSOSP/uk/ensosp-sites-and-infrastructures). The Academy does not specialize on forest fires. It is worth mentioning however that it offers international training, in line with the general policy of the French Civil Protection organization (http://www.ensosp.fr/SP/sites/default/files/pdf-ENSOSP/download/uk-ENSOSP/ENSOSP-International-Courses-DUC-2012.pdf)

A simulated "forest" for firefighter training exercises

A recent addition to the field training of forest firefighters in south France is the development of a simulated "forest" for carrying out live training exercises. This training facility consists of a stand of iron "trees" each of them including outlets from an underground network of propane carrying tubes (Figures 12-13). A large pressurized tank and a special pump provide continuous supply of fuel to the trees (Figures 14-15). An observation tower allows observation and direction of the exercises (Figures 16). In this facility firefighters may be exposed to high temperatures and various lengths of

flame and can face the simulated spread of an intense crown fire. They can test and realize the value of PPE and the importance of timing, and they can practice escaping from dangerous situations. The facility is not fully operational yet as technical details need to be taken care of for achieving complete safety and effective training. This is not surprising as this is the first training facility of this kind in the world.

Figure 12. The “simulated burning forest” training facility in France (general view).

Figure 13. The “simulated burning forest” training facility in France

Figure 14. The pressurized tank providing fuel for the “simulated burning forest”

Figure 15. The piping/pumping system for distributing the propane to the “forest”

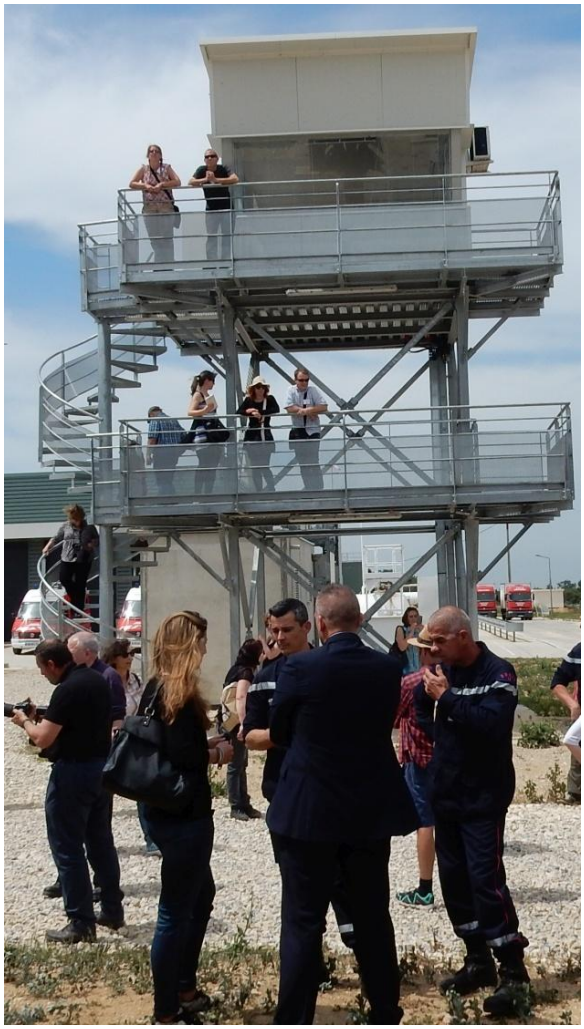

Figure 16. The observation tower for controlling exercises in the “simulated burning forest”.

Greece

The responsibility for forest fire suppression in Greece belongs to the Hellenic Fire Corps (HFC) which is also responsible for responding to all other types of fires and natural hazards. This responsibility was transferred from the Forest Service to the HFC in 1998. Since then, and after facing a series of disastrous fire seasons, the HFC started looking for ways to improve its performance. Among them has been an effort to upgrade the training of its personnel. The current situation in regard to training and the plans for the future are outlined below.

The HFC was formed in 1926 and has a military structure. The first "Firefighting School" was established in 1936 at Sarri Street (an outpost of the 1st Fire Station) in Athens. Then, in 1968, training was upgraded through the establishment of the Firefighting Academy (Pyrosvestiki Akademia) in Kato Kifissia, Athens (https://en.wikipedia.org/wiki/Hellenic_Fire_Service). In late 1990s an annex to the Firefighting Academy was established in the town of Vilia in Attica (Figure 17), mainly used for training of firefighters and for field training work (Figure 18).

Currently, training in the HFC is managed by the Department of Education & Further Training of the Directorate of Human Resources at the HFC Headquarters in the center of Athens. The School of Firefighters of the Firefighting Academy, operates in Kato Kifisia (Athens) (Figure 19) and in Vilia, Attica and Sindos (Thessaloniki). Studies last for two and a half years and its degree is considered as equivalent with post-secondary education degrees. The students enter the School after an open call which specifies the number of students according to the planned needs of the HFC. The students have to meet certain criteria including age (up to 26 years of age in general, but up to 35 years for experienced seasonal firefighters), height (1.70 m for males and 1.65 m for females), education (secondary education degree), health, physical condition, etc.. The curriculum includes both theoretical and practical/physical training (Figures xx and xx). Forest firefighting is only part of the overall program. Graduates can work in the HFC reaching the rank of pyronomos (roughly equivalent to sergeant).

Figure 17. The School of Firefighters in the town of Villia, Attica.

Figure 18. Greek firefighter training at the School of Firefighters in Villia, Attica. Source: https://el-gr.facebook.com/pages/%CE%A3%CF%87%CE%BF%CE%BB%CE%B7-%CE%A0%CF%85%CF%81%CE%BF%CF%83%CE%B2%CE%B5%CF%83%CF%84%CF%89%CE%BD-%CE%B2%CE%B9%CE%BB%CE%B9%CE%B1-%CE%B1%CF%84%CF%84%CE%B9%CE%BA%CE%B7%CF%82/244417772316512

The Firefighting Academy also operates an ad-hoc School of Firefighter Leaders (School of Archipyrosvestes) which offers a six-month training program (3 months theoretical education and three months of field training) to serving firefighters, aiming to create leaders of crews. Graduates can reach the rank of pyronomos (sergeant) but the path is accelerated compared to “simple” firefighters.

The School of Second-Lieutenant Firefighters (School of Anthypopyragoi) is the branch of the Firefighting Academy that prepares officers for a career up to the highest ranks of the HFC. It is a Higher Education School with an eight semester curriculum. Admission is competitive, following participation in national exams. There is also provision for acceptance of (a limited number of) graduates of other relevant University Schools who have to follow two years of studies. Additionally, serving HFC firefighters with degrees from Universities and Higher Technical Education Schools, as well as graduates of the School of Firefighter Leaders who have reached the rank of Pyronomos, can be admitted in the second year of the School.

The curriculum of the School includes 53 different courses, most of them with 75 teaching hours. However, although there are two courses on “The Art of Firefighting” and one course on “Firefighting Strategy and Tactics”, there is no course with “forest fires” in its title. A course on fire meteorology is also missing.

In addition to the above Schools, the Firefighting Academy operates a School for Continuing and Further Education , aimed at its own officers as well as at private citizens. The minimum duration of each course is 2.5 months. Attending the School the students receive a certificate for the training they received

Finally the Firefighting Academy also operates the National School of Civil Protection. It covers subjects of the whole spectrum of Civil Protection. It is aimed mainly for personnel of local authorities (e.g. municipalities) and other employees of the public sector. Normally studies last for at least two months and no more than six months. Occasionally shorter courses, especially for personnel of the local authorities, are organized. This same School also

offers training to the Volunteers who work with the HFC or belong to Volunteer groups of the General Secretariat of Civil Protection, being the only organization in Greece providing the required certification.

Figure 19. The main building of the Firefighting Academy where the School of Second-Lieutenant Firefighters is located, in Kato Kifisia, Athens.

The future

Currently, certain weaknesses in the firefighting doctrine of the HFC, such as overreliance on water from fire trucks and indiscriminant massive aerial attack on fires, have started being identified. Suggestions for the future include development of helicrews for initial attack, adoption of new tactics, management tools and structures in the field, which in turn will require improvements in training. Such training will focus among others on (Panagiotakis 2015):

- Understanding the relationship between weather and fire behavior
- Understanding the relationship between weather and crew safety and comfort
- Ability to observe and report weather conditions

Furthermore, current thinking includes planning for training of personnel at the National Coordination Center in fire behavior modeling and on the use of Geographic Information Systems (GIS). The new addition to the Firefighting Academy which will be offering advanced studies is the “School of post graduate studies and further training”. This School is being created in cooperation with the Eastern Macedonia and Thrace Institute of Technology (Pikouli 2015). The studies will have a duration of 18 months and will be leading to a Postgraduate (Master’s Degree) Program in “Analysis & Management on Manmade and Natural Disasters”.

Italy

In Italy, the National Civil Protection (NCP) is not a structure, but an integrated system that allows the coordinated use of all available state and private resources. The operational structure set-up in case of major disasters takes into account the administrative organisation of the country (http://ec.europa.eu/echo/files/civil_protection/vademecum/it/2-it-1.html). Within the system, the responsibility in the activities of forecasting, prevention, relief and overcoming emergency situations are assigned to several Bodies and operative structures. The complexity of the domestic situation of risks actually requires coordinated and synergic use of all the skills and resources available (http://www.protezionecivile.gov.it/jcms/en/componenti.wp).

Over the years, mainly after 1975, most civil protection competences have been progressively handed from the State to regional administrations and local autonomies. Thus forest fire suppression and prevention in Italy is mainly managed at regional level (Mollina et al. 2009). In case of forest fires, the Fire Department makes available resources, equipment and personnel necessary to the regions to carry out active fight and promote the study and testing of measures and standards to prevent fires or limit their impact.

In 2008, a Framework Agreement between the Fire Department (Vigili del Fuoco) and the State Forestry Commission was signed, establishing guidelines for coordination and intervention on the territory. According to the agreement, the staff of the National Fire Department (Corpo Nazionale dei Vigili del Fuoco) takes over direction and coordination of fire-fighting operations, when fires involve geographic locations where the urban-rural and forest areas are close, as there is a greatest risk for the population. The National Forestry Service (Corpo Forestale dello Stato (CFS)), however, directs and coordinates the operations and is responsible for the intervention of the National aerial resources, wherever the protection of the environment is of primary importance, whereas the firefighters are involved in the defense of civil and industrial settlements, infrastructure and people. The coordination of the two structures during a wildfire risk is addressed by the Permanent Unified Operational Center (Sale Operative Unificate Permanenti – SOUP), in which there are both representatives of the Forest, and those of the Fire Department (http://www.protezionecivile.gov.it/jcms/en/vvf.wp?request_locale=en). A very recent development, however, has changed the above system further. Starting in September 2016, in an effort to reduce costs, the Italian government decided to close-down the CFS after about 200 years of operation. Its personnel was given the option of transferring to the Carabinieri (Police), thus losing their specific forest protection duties.

Forest fire management is mostly carried out by Public Administration (Regional/Local Authorities, Civil Protection, State Forestry Service, Fire Service). Each Region coordinates both fire management and training of the different actors involved locally in the most adequate way. The NCP also oversees the application of the law that requires that municipalities and regions prepare adequate fire prevention and safety plans, especially for Wildland-Urban areas. Given the complexity of the overall system, it is clear that there is significant need for quality training in regard to forest fires.

Academic Education

Many Italian universities offer courses on “Forestry Sciences” as shown in table 3. The University of Bari (Politecnico) offers a specific PhD programme in “Fire Prevention Engineering” (Ingegneria della Prevenzione Incendi). Other Universities, such as the University of Torino, the University of Padova, the University of Napoli and the University of Basilicata, also offer to students the opportunity to work on forest fire subjects for their Ph.D. dissertations.

Table 3. List of the Italian universities where a course on "Forestry Sciences" is activated. It has been indicated if lessons on the fire issue are also included (y = yes; n = no) (Mollina et al. 2009).

University	y/n	Website
Ancona	n	http://www.agr.univpm.it/Engine/RAServeFile.php/f//sfa.pdf
Mediterranea	y	http://www.agraria.unirc.it/corsi_laurea.php?cdl=73
Bari	y	http://web.uniba.it/orientamento/newmatric/agraria/Corsi/ScienzeFor_e_Ambientali.htm
Firenze	y	http://www.unifi.it/clsfam/CMpro-v-p-15.html
Padova	y	http://www.unipd.it/regolamento_didattico/LM73_Scienze_forestali_ambientali.pdf
Torino	y	http://forestalecdl.campusnet.unito.it/cgi-bin/home.pl http://www.unito.it/agroselviter/dettaglio_sezione-12.htm
Tuscia	y	http://www.unitus.it/dipartimenti/disafri/dida.html
Sassari	y	http://agrariaweb.uniss.it/php/proiettoreTesti.php?cat=322&item=3&xml=/xml/testi/testi15661.xml&pagina=9
Palermo	y	http://www.agrariaunipa.it/it/didattica/corso.jsp?idC=4
Molise	y	http://serviziweb.unimol.it/pls/unimol/consultazione.mostra_pagina?id_pagina=6010
Milano	n	http://www.cosp.unimi.it/offerta_didattica/418.htm
Bologna	n	http://www.agraria.unibo.it/Agraria/Didattica/Lauree/2009/PaginaCorso20090870.htm?tab=Presentazione
Napoli	y	http://www.scienzeforestali.unina.it/
Basilicata	y	http://www.agrariaunibas.eu/index.php?option=com_content&view=article&id=70&Itemid=96

Professional Education

In Italy, the fire management professional education and training falls in the following categories:

- National courses for DOS (*Direttore Operazioni Spegnimento*, Operations Chief);
- Regional courses for DOS (*Direttore Operazioni Spegnimento*, Operations Chief);
- Basic training for fire personnel on a local basis;
- Continuous training.

National courses

During the period 1984 - 1986, the National Forestry Service (CFS, Corpo Forestale dello Stato) organized the first fire management professional courses at national level, mainly focused on CFS personnel training. Between 1986 and 2007 only some seminars and meetings were planned, out of a regular calendar.

Since 2007, the fire management professional education and training has been reshaped by a joint effort driven by both Civil Protection and CFS. In order to bring up to date professional qualification and to enhance operative standards, four initiatives have been carried out (Milazzo 2008):

1. Participation of CFS to the Force d'Intervention Rapide Europèenne 4 Project, on European cooperation. The objective has been to share expertise and to acquire international based procedures;
2. Civil Protection Department DOS course (one week long), focused on aircrafts coordination;
3. Internal Investigation Courses for N.I.A.B. (Nucleo Investigativo Antincendi, http://www3.corpoforestale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/330) within Corpo Forestale. N.I.A.B. activity started in 2000 and, since then, it provides personnel with one week intensive course per

year. The course is based on the "physical evidence" method. After 2007, when Italy was threatened by a terrible summer season, N.I.A.B. intensified actions and training;

4. CFS DOS Course (Corso per formatori DOS), in fellowship with the University of Basilicata. The course has been addressed to more than 150 people belonging to high professional positions (officials, inspectors and experts), who should transfer the experience and learning to the DOS at regional level. The course was divided in two modules: 1) technical-operative module, with teachers from CFS, Fire Service, Civil Protection and aircraft pilots; 2) theoretic-scientific module, under the supervision of University of Basilicata, in association with University of Turin and the Forest Fire Service of Aosta Valley Region. The teachers have been at the same time authors of a brand new Technical Handbook for Professionals (Leone et al. 2008), namely Manuale tecnico del Direttore delle Operazioni di Spegnimento (http://www.aisf.it/manifestazioni/congresso%20selvicoltura/FILE%20ABSTRACT_finale[1].pdf).

Regional courses, basic training and continuous training

Since Regional Authorities are in charge of wildfires suppression and prevention, regional DOS courses are organized in most of the Italian territory. In the following paragraph some examples are shown.

In 2004 - 2005 Lombardy Region started the first programme of fire-training in association with Aosta Valley Region. At the present time, Trento Province Firefighters School (Scuola Provinciale Antincendi di Trento) has been committed for the training of LombardyDOS (http://www.protezionecivile.tn.it/frame.asp?Site=8&Area=14&Sect=250; http://www.protezionecivile.regione.lombardia.it). At the end of the fourth edition (2009), approximately all DOS people of Lombardy, enabled to lead fire suppression, had attended this course. In the last edition, the course has been enriched by new tools such as digital cartography (Google Earth, etc.) and fire behaviour exercises.

In Sardinia, professional courses are provided to Corpo Forestale (Corpo forestale e di Vigilanza ambientale della Sardegna - CFVA, http://www.regione.sardegna.it/servizi/cittadino/corpoforestale.html), in charge of wildfires suppression. The other bodies involved in fire management, such as Ente Foreste (Forest Service) and Civil Protection volunteers are provided with basic training, given by private operators. At Regional level, the main courses organized for CFVA has been: a) P.O.R. course (founded by UE in 2001-2003), for 100 DOS and 100 air-team people (100 hours long); b) a Fire Analyst Course, organized by Giuseppe Delogu in fellowship with University of Lleida and GRAF-DGPEIS, in may 2009, at University of Sassari (50 people trained); c) Investigation courses, started in 1994-95 and then spread at National level; they are based on the Penal Code and on field surveys, leading to the creation of a "Regional Catalogue of the Arsonist Devises".

Furthermore, each Region provides fire fighters with basic training courses, held at local level and promoted by the Institutions dealing with the fire issue (Local Authorities, Provincial Forest Service Offices, Provincial Civil Protection Offices, State Forestry Service Stations, Fire Service Stations).

At the present time, three Training Centres are providing continuous training in Italy. They are placed in Tuscany, Piedmont and Trento Province (http://www.protezionecivile.tn.it/frame.asp?Site=8). A new centre is aimed to be created in Emilia-Romagna also, where the experimental municipal property of Montebello offers a interesting forestry area for training (http://www.comunita-montana-acquacheta.fc.it/c/document_library/get_file?folderId=1380&name=DLFE-3302.pdf). Also in Sardinia, a recent law has created the "Scuola Forestale della Sardegna" to develop continuous training for forest guards of Sardinia and the rest of Italy, mainly in forest fires prevention and suppression. A description of Tuscany Training Centre follows up, as representative.

Firefighter training in Tuscany started in 1991 in the centre called "San Giovannese". A new training Centre (La Pineta di Tocchi) opened in 2007, at Monticiano (Siena), and it is equipped with multimedia technology. It can guest 30 people

by night, feed 120 people and it is provided with both equipments and heliport for fire fighters and fire managers training, and specific tracks for safe off-road driving training. In 2007 it hosted a thousand people and 53 courses, organized by Tuscany Region, around DOS training, fire-fighter basic training, off-road driving training, firewise days, highschools days, etc. (Arsia 2007; http://www.compagniadelleforeste.it/INNOVAZIONE-FORMAZIONE-e-RICERCA/rapporto-sullo-stato-delle-foreste-in-toscana.html).

As regards private training, at La Pineta di Tocchi Centre most of the courses are given by DREAm Italia (http://www.dream-italia.it/), a certificated agency (standard ISO 9001/2000) providing training services in 14 Italian Regions. Most of the courses are based on Multimedia Training and very much focused on personnel safety and health. Other private agencies are active in Italy, such as the North West Service in Lombardy (http://www.nwservice.it/), launching in 2009 combined training for:

1. Pilots. Theoretic and practical lessons on ground and air manoeuvre, based on standard procedures. Several levels of training are provided, from basic to advanced, and annual updating. Fire behaviour and fire fighting strategies are taken into account, namely coordination with ground operative teams.
2. Helicopter-brigades. The course is coupled constantly with the pilots training, in order to develop standard shared procedures for suppression action involving helicopter use.
3. Lookout analyst (Osservatore/Avvistatore). The objective is to train personnel to identify, to report and to analyze wildland fire behavior.
4. Consultancies and services provided by the Private Sector (both national and international) seem to get importance in the future of Italian fire management.

Portugal

In Portugal, the activities related to forest fires includes the public and private sector. All relevant institutions cooperate with each other following the guidelines given by the National Plan for Forest Defense against Fire (PNDFCI – http://www.icnf.pt/portal/florestas/dfci/planos/PNDFCI). These institutions include the National Forest Authority, which is responsible for structural prevention, including the promotion of public awareness, planning, silviculture and infrastructures, the National Republican Guard which carries out forest surveillance and fire detection, and the National Authority for Civil Protection which has the responsibility for coordinating the fire fighting efforts.

The professional personnel that works with forest fires can be classified as follows (Mollina et al. 2009):

1. Forest engineers / technicians: These professionals have a university graduation and can work with fire not only in prevention but also in firefighting. Their education regarding fire management starts at their higher studies, followed by professional training, and by formal continuous training, like conferences and seminars;
2. Forest Sappers / Brigades (professional training): These professionals usually don't have a university degree, and their specific fire training is given by means of professional training with several actualization modules. They work especially in prevention, first intervention and in firefighting as a complement of the fire-fighters;
3. Fire-Fighters (professional training): The majority of the Portuguese firefighters are volunteers. Their level of education can vary from the basic to the university level. However, concerning the specific use of fire, there's a National School of Firefighters which gives them the required professional and continuous training.

Fire management education and training in Portugal

There are several institutions and professionals that work in a direct or indirect way with forest fires. To acquire competences on the use and management of fire, these professionals look for specific training that can be provided by universities, institutions like the school of fire-fighters or the National Forest Authority or by some Portuguese Forest Associations. In many cases, several of these institutions cooperate with each other in order to optimize the use existing resources and offer better curricula.

Fire management training in Portugal is inserted both in the educational formal context as a forest engineering graduation discipline (university level) and in the lifelong learning, more specifically at the continuous professional training.

Table 4. Structure of the Forest Fire Management course of the Agrarian School of Bragança at IBP.

Year	Sem	Type	Course Unit	Scientific Area	ECTS Credits
1	-	Annual	Informatic tools	INF	2.5
1	-	Annual	Losses assessment	LAS	1.5
1	-	Annual	Botany	LSC	1.5
1	-	Annual	Fire behaviour	FHT	1.5
1	-	Annual	Environmental Education and Awareness	ENP	1.5
1	-	Annual	Project	AFF	17.0
1	-	Annual	Controlled fire	FHT	3.0
1	-	Annual	Occupational Safety and Health	OSH	1.5
1	-	Annual	Inventory of Forest Resources	FHT	1.5
1	-	Annual	Investigation of Causes	FHT	1.5
1	-	Annual	Legislation	LAW	1.0
1	-	Annual	Machinery and equipment	FHT	4.5
1	-	Annual	Weather and Climate	ESC	2.0
1	-	Annual	Civil protection	PPP	2.0
1	-	Annual	Regeneration of Burned Areas	FHT	1.5
1	-	Annual	Preventive silviculture	FHT	2.0
1	-	Annual	Range science	FHT	1.5
1	-	Annual	Geographic Information Systems	ESC	1.5
1	-	Annual	Forest soils	ESC	1.5
1	-	Annual	Erosion Control Techniques	ESC	1.5
1	-	Annual	Information and Communication Technologies	INF	2.5
1	-	Annual	Surveillance, detection and fire fighting	FHT	5.5

Post-secondary not higher studies (CET)

In Portugal there are two post-secondary approved CET programs on Forest Protection against Fires. They are offered by the Agrarian School of Coimbra (http://portal.esac.pt/portal/portal/sobreESAC/apresentacao) that belongs to the Polytechnic Institute of Coimbra (PIC) (http://portal.ipc.pt/portal/portal/international/Introducing), and by the Agrarian School of Bragança (http://portal3.ipb.pt/index.php/en/guiaects/schools/school-of-agriculture) that belongs to the

Polytechnic Institute of Bragança (IBP) (http://portal3.ipb.pt/index.php/en/guiaects/polytechnic-institute-of-braganca). In the latter, this training is included in the list of Technological Specialization Courses.

The Forest Fire Management course at IBP has a duration of 1 year (full-time) which means 1620 total hours. It offers 60 ECTS Credits (1 credit corresponds to 27 hours) and includes an internship comprising 17 credits (http://portal3.ipb.pt/index.php/en/guiaects/degree-programmes/technological-specialization-courses/course?cod_escola=3041&cod_curso=7162)

Similarly, at PIC, this technical course has the duration of two semesters including 600 hours of training in a work context. The course includes General and scientific training (8 ECTS credits), Technological training (35 ECTS credits) and training in a work context (17 ECTS credits).

Both Agrarian Schools admit, for these courses, individuals who have finished the secondary school, or that have professional experience and are employed. As an example, the course structure at IBP (60 credits) is listed in Table 4.

Forestry education (Higher studies)

There are five higher education Institutions that offer degrees in Forestry science. They are two universities, the University of Trás-os-Montes and Alto Douro (UTAD) in Vila Real and the Technical University of Lisbon with the Institute of Agronomy (ISA/UTL), and three polytechnic Schools, the Agrarian School of Bragança (ESAB), the Agrarian School of Viseu (ESAV) and the Agrarian School of Coimbra (ESAC) (table 5) (Mollina et al. 2009).

Table 5. Higher studies in Forestry Science in Portugal.

	1st cycle	**Master (2nd cycle)**	**PhD (3rd cycle)**
ESAB	Forest Engineering	Forest resources management	-
ESAC	Forest Resources engineering	Forest Resources	-
ESAV	Forest Engineering	-	-
ISA/UTL	Forest Engineering	Forestry and Natural Resources	Forestry
UTAD	Forest Engineering	Forest Engineering	Forestry

All the schools of higher studies follow the directives of Bologna's graduations, so at the end of the 3rd year the students become engineers. Due to that all the schools have the subject of forest fires included in the program of the last year (3rd year). The subject of forest fires (ecology and management) is also taught on the 2nd cycle (master) with the exception of ESAV that does not offer a master in forestry, and of ESAB which does not focus on this subject again.

A Ph.D. degree is offered by ISA/UTL and UTAD, however in this cycle there isn't any discipline that focuses specifically on forest fires and there are no special courses offered, although the subject can be the topic of the student's dissertation.

Education and Training for Youth and Adults

In Portugal by law, only an accredited technician can make a prescribed fire. Due to that obligation, the Forest National Authority (AFN) certifies the technicians and also certifies the technicians training in this area by the "Portaria nº 1061/2004 of 21st August".

Simultaneously, to perform a prescribed burning the "Burning plan" must be evaluated by the municipalities and forest services. The technicians in these organizations also receive specific training to acquire the necessary knowledge to evaluate the burning plans.

A technician certified to burn, works directly with the support of a sappers team which also has to have specific training with AFN. Thus, there are three types of training related to each target audience, with the following contents (Mollina et al. 2009).

Prescribed burning training for technicians accreditation

1. Theoretical modules (duration: 21 hours)

A. Guidelines for use of fire. Prescribed fire concept and objectives. Portuguese legislation.
B. The fire behaviour. Introduction: ignition, combustion, processes of heat transfer. Description of fire behaviour: Speed of propagation, flame characteristics; released energy and intensity. Fuel: Total and available; classification of fuel; structural description; accumulation of fuel, the fuel moisture. Meteorology: Importance of the meteorology within the fire weather control; climatic cycles (long-term, seasonal, diurnal) and its effects; measurement equipment. Topography: Slope and exposure, altitude.
C. Fire impacts.
Introduction: Effects of fire in the first and second order; concept of severity of fire. Effects on soil: chemical changes, biological and physical. Effects on vegetation: effects on plant tissues, mechanisms of persistence, recovery and post-fire growth, effects on fuel, impact on air.
D. Prescribed burning operational implementation.
Planning: Strategic plan and planning of a burning operation.
Performance: Preparation, ignition techniques, and fire conduct, time of ignition; burning support team: tasks, responsibilities and size, control and mop-up; equipment and tools of ignition. Assessment and monitoring: immediate and medium term.

2. Theoretical-practical modules (duration: 35 hours)

A. Prescribed burning plan preparation (PFC).
B. Use of decision tools for support in the estimation of the load and the fuel moisture, the fire behaviour characteristics, fuel reduction and effects on trees. Meteorological fire risk interpretation.
C. Preparation of the Operational Burning Plan (POQ).

3. Practical modules (duration: 49 hours)

A. Prescribed burning planning, implementation and evaluation in shrub and tree formations.

Training for technicians able to evaluate the Prescribed burning plan

1. Theoretical modules (duration: 9 hours)

A. Guidelines for use of fire. Prescribed fire concept and objectives. Portuguese legislation.
B. Fire behavior and its impacts. General concepts: a fire behavior description; effects of fuel, meteorology and topography, the fire severity and its determinants.
C. Prescribed burning operational implementation. Planning: strategic plan and a burning operation planning. Performance: preparation, ignition techniques, and fire conduct, time of ignition; burning support team: size; control and mop-up. Assessment and monitoring: immediate and medium term.

2. Theoretical-practical modules (duration: 19 hours)

A. Prescribed burning plan preparation (PFC).

B. Use of decision tools for support in the estimation of the load and the fuel moisture, the fire behaviour characteristics, fuel reduction and effects on trees. Meteorological fire risk interpretation.
C. Preparation of the Operational Burning Plan (POQ).

Forest Sapper

1. Theoretical modules (duration: 4 hours)

- Guidelines for use of fire. Prescribed fire concept and objectives. Portuguese legislation.
- Fire behaviour and its impacts. Effects of fuel, meteorology and topography. Assessment and fire measurement and of the influencing factors and its impacts.
- Operationalization. Ignition techniques, containment, surveillance and suppression.
- Prescribed burning operational implementation. Planning: strategic plan and a burning operation planning. Performance: preparation, ignition techniques, and fire conduct, time of ignition; burning support team: tasks, responsibilities and size, control and mop-up; equipment and tools of ignition. Assessment and monitoring: immediate and medium term.

2. Simulated practice modules (duration: 31 hours)

- Fire behaviour and its impacts. Effects of fuel, meteorology and topography. Assessment and fire measurement and of the influencing factors and its impacts.
- Prescribed burning actions: Ignition techniques, behaviour, practical implementation and the impacts. Containment, surveillance and suppression. Operational Burning Plan (POQ)

Fire-fighters National School

The National School for Fire-fighters offers training to men and women, both volunteers and professionals (Mollina et al. 2009). The courses related to fire management are:

A. Firefighter Initial Instruction Course;
B. Training Course for Elements of the Command Board and for Entering the Firefighter Officer Career;
C. Promotion Course in the Firefighter Career:
   - Promotion to 2nd Class Firefighter
   - Promotion to 1st Class Firefighter
   - Promotion to Chief Firefighter

The curricular contents for each of these courses are presented below:

Fire-fighter Initial Instruction Course

This basic course consists of six (6) modules, the last one being on the subject of forest fires:

1. Introduction to the fire-fighters services ,
2. First aid techniques,
3. Equipments, vehicles and manoeuvres,
4. Rescue and disincarcerate techniques,
5. Urban and industrial fire extinction operations, and finally
6. Forest fire extinction operations.

Details on Module 6 - Forest fire extinction operations (Table 6):
General objective: provide to the trainees technical-operational skills to act in a forest fire.
Audience: new members or trainees to the fire-fighter career.
Duration: 75 hours

Table 6. Training units of the module "Forest Fire extinction operations".

Module 6	**Training units**	**Theoretical**	**Practical**
Forest fire extinction operations	Start and propagation of a fire	1	
	Factors that affect forest fire behavior	3	1
	Forest fire behavior	2	
	Forest fire fighting	4	4
	Safety in forest fire fighting	3	13
	Introduction to the reading of military maps	3	6
	Communication procedures in forest fires	1	2
	Physical Fitness	1	2
	Evaluation	2	2
	Practice in the workplace		25

Training Course for Elements of the Command Board and for Entering the Fire-fighter Officer Career

This course consists of four modules as follows:

1. Laws
2. Forest fires
3. Urban and industrial fires
4. Command post organization.

Details on Module 2 - Forest fires (Table 7)
General objective: provide to the trainees skills in the forest fire-fighting organization area.
Audience: new members or trainees to the Fire-fighter Officer Career. Members nominated to the Command Board
Duration: 25 hours

Table 7– training units of the module "Forest Fire"

Module	**Training units**	hours
Forest Fires	Forest fire behavior	6
	Extinction terrestrial means	2
(QC 802)	Aerial means	2
	Methods and tactics	2
	Topography	3
	Extinction maneuvers	2
	Mop-up and surveillance maneuvers	1
	Evidence preservation	1
	Safety procedures	3
	Physical fitness	1
	Evaluation	2

Promotion Courses in the Firefighter Career

There are several courses that allow the firefighters to be promoted to a higher rank. The ones that include fire management are: i) Promotion to 2nd Class Fire-fighter with a module about Forest Fires fighting for 1st intervention teams; ii) Promotion to 1st Class Fire-fighter, module Forest fire fighting Team Leader; and iii) Promotion to Chief Fire-fighter, module Forest Fire fighting Group Chief.

Promotion to 2nd Class Fire-fighter

Module - Forest Fires fighting for 1st intervention teams (Table 8)
General objective: Provide to the trainees skills to enter to a 1st intervention team
Audience: Elements of the Fire-fighter Career.
Duration: 50 hours

Table 8 – Training units of the module "Forest Fire fighting for 1st intervention teams."

Module	**Training units**	hours
Forest Fires fighting for 1st intervention teams. (FE112)	Factors of forest fire spread.	3
	Safety in operations with vehicles and equipment	1
	Safety in combat with aerial means	1
	Radio communications procedures	4
	Forest fire combat techniques	2
	Safety practices in operations with vehicles	1
	Safety practices in operations with hand tools	1
	Safety practices in operations with chainsaws,	4
	Safety practices with personal equipment protection / fire shelter	1
	Opening of safety lines with hand tools.	2
	Organization concepts of the Operations Theater	1
	Utilization of extinction agents	1
	Evidence preservation	1
	Reading of military maps at the scale of 1:25.000	4
	Cartography: orientation trials	5
	Vehicle and equipment maintenance	1
	Physical Fitness	6
	Fighting exercises	9
	Evaluation	2

Promotion to 1st Class Fire-fighter.

Module - Forest fire fighting Team Leader (Table 9)
General objective: provide to the trainees skills to lead a forest fires team
Audience: Elements of the Fire-fighter Career.
Duration: 25 hours

Table 9 – Training units of the module "Forest Fire fighting team leader."

Module	**Training units**	hours
Forest fire fighting Team Leader (FC204)	Safety in forest fire fighting	2
	Safety in forest fire fighting with aerial means	1
	Interpersonal relationships	2
	Leadership and command	2
	Forest fire fighting methods	2
	Reading of military maps at the scale of 1:25.000	4
	Equipment usage and maintenance	2
	Physical Fitness	7
	Evaluation	3

Promotion to Chief Fire-fighter

Module - Forest fire fighting Group Chief (Table 10)

General objective: provide to the trainees skills to lead a forest fires team or group of teams in a larger fire

Audience: Elements of the Fire-fighter Career.

Duration: 75 hours

Table 10 – Training units of the module "Forest Fire fighting Group Chief".

Module	**Training units**	hours
Forest Fire fighting Group Chief (FC208)	Forest fire fighting group procedures	1
	Order board	1
	Cartography use in forest fire fighting	3
	Theater of operations organization (SIOPS)	2
	Forest fire fighting group maneuvers	1
	Graphical utensils	1
	Airborne means characterization	1
	Airborne means procedures	1
	Radio communication system	1
	Intervention zone analysis	1
	Case studies, simulations and practical exercises	59
	Evaluation	3

Serbia

Forest fires in Serbia are not a very serious problem. However, although the average burned area is relatively low (in the period between 2004 and 2013, the annual average burned area was 3,828 ha, of which 2,252 ha were forests), some years stand out with much higher burned area totals (e.g. in 2007, 34,830 ha of forests burned; in 2012 the total burned area reached 10,653 ha (Schmuck et al. 2013)). Thus, forest fire suppression is considered seriously and there exists an appropriate organization for forest firefighting (Figure 20).

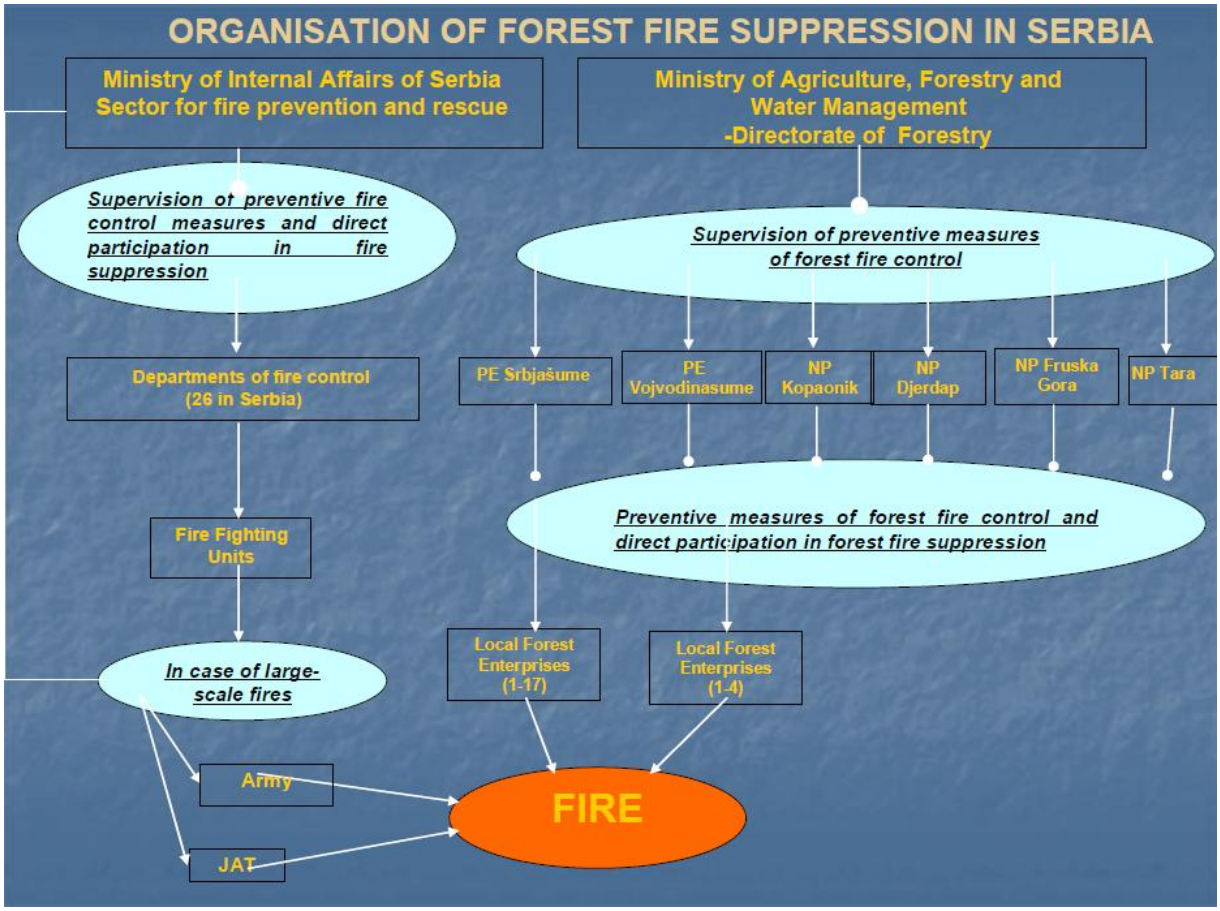

Figure 20. Organization of forest fire suppression in Serbia (Nikolov 2013).

Forest firefighting is carried out by personnel of forestry public enterprises, the 3,000 “rescuers” on the Sector for Emergency Management of the Ministry of Interior and the approximately 3,500 volunteers of the Firefighting Association of Serbia. The volunteer qualification standards are compatible with those of professional firefighters.

The professional wildfire fighters in Serbia are specially trained and equipped. The National Training Centre for Emergency Management, which belongs to the Sector for Emergency Management, is responsible for training. In addition Serbia has signed agreements with many neighboring countries and has participated in international shared fire management training through terrain simulation exercises in these countries. However, this training is not sufficient, taking into consideration the fact that the forestry sector (public enterprises, national parks etc.) is responsible for forest fire protection, including fire suppression. The forestry sector is obliged to organize the initial response and to participate in fire suppression so its personnel also needs appropriate training (Nemeth 2015d). In general the way the training is handled now is not satisfying. The National Strategy for Protection and Rescue in Emergencies has

recognized that conducted training sessions are outdated and non-functional and, as such, not in accordance with the needs of an integrated system of crisis management, so they have to be enhanced, modernized and improved through creating appropriate curricula (Kešetović 2013).

Of special concern for Serbian forest firefighters is that in many parts of the country bombs containing depleted uranium were used during the 1999 conflict. Nowadays, there are still areas contaminated with such unexploded ordnance. Land contaminated by radioactivity poses serious problems for firefighters who should not remain in these areas for long time during fire suppression due to the harmful radioactive radiation, and because the gas emissions caused by forest fires in these areas may also be radioactive (Nemeth 2015d). Obviously, firefighters must be appropriately trained to identify and avoid the danger.

Spain

In Spain there are 17 autonomous communities and two autonomous cities that are collectively known as "autonomies". Each one is organized differently in regard to forest fire management and in general to preparedness for all natural hazards. As a result a country-wide coordinating authority is needed.

The Directorate General of Civil Protection and Emergencies

The Minister of Interior holds the highest authority in civil protection. It acts through the Directorate General of Civil Protection and Emergencies which has the structure shown in Figure 21. (Directorate General of Civil Protection and Emergencies 2010).

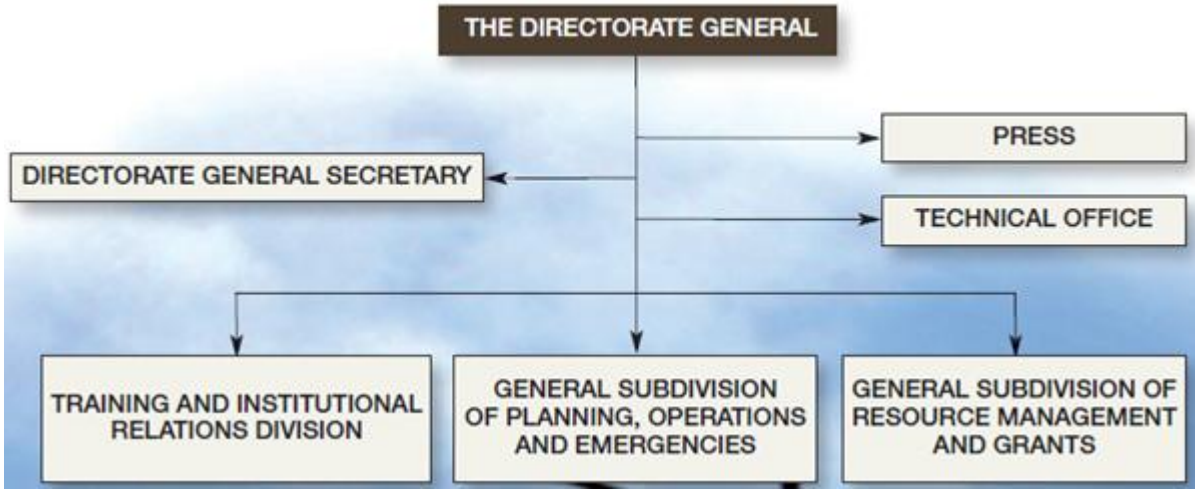

Fig. 21. The structure of the Directorate General of Civil Protection and Emergencies.

The Division of Training and Institutional Relations has many functions the main one being theoretical and practical training in risk and emergencies management.

The National School of Civil Protection was established by Royal Decree in 1990. It belongs to the Directorate General of Civil Protection and Emergencies and, in accordance with the Royal Decree 1181/2008, it has the following functions:

- To train theoretical and practically the staff of the different services and organizations involved in people and goods protection in emergency cases.

- To serve as a technicians and specialists forum in the matters related to the risks and emergencies management.
- To promote the development of the prevention social culture and the citizen self-protection.

In short, some forest fires related training can be offered by the School but it is clearly not focused on the training of firefighters.

The BRIF

Another organization working on forest fires over Spain is the Forest Fire Service which belongs to the Ministry of Agriculture, Food and Environment. They operate a large fleet of national aerial resources21http://www.magrama.gob.es/es/desarrollo-rural/temas/politica-forestal/incendios-forestales/extincion/medios_aereos.aspx) but they also make available they offer reinforcement of local ground resources, where needed, through their Reinforcement Brigade for Forest Fires ("Brigadas de Refuerzo en Incendios Forestales" (BRIF)) (http://www.magrama.gob.es/es/desarrollo-rural/temas/politica-forestal/formacionyentrenamientobrif_tcm7-215630.pdf). This unit was created in 1994. Since then it has grown into 10 bases all over Spain staffed by 600 firefighters (Gabbert 2015). From there they are dispatched, often by helicopter, to the fires (Figure 22).

Figure 22. Members of the BRIF wait to be airlifted by helicopters to a forest fire (image by Pedro Armestre at http://pedroarmestre.photoshelter.com/gallery-image/2012-08-22-Forest-fire-Castrocontrigo-Tabuyo-del-Monte-Leon/G0000FdyxTo_WHpc/I00003ironGVPcH8/C0000STrGJvAHr9Y)

The BRIF were originally patterned after the hotshot crews of the U.S. Forest Service and received the same type of training by former members of U.S. hotshot crews.The BRIF are highly specialized crews, whose members receive

excellent initial and then continuing training that enables them to act in situations of maximum demand. The BRIF firefighters have to meet high standards for entering and their training hours exceed one third of the total hours of work during a fire season.

The training is organized in three levels:

- The first basic level puts emphasis on safety in fighting operations. Besides the compulsory basic training for new personnel, there is security-related content which must be reviewed obligatorily by all BRIF personnel at the beginning of the campaign as an indispensable prerequisite to go to a fire.
- At a second level, ongoing training is based mainly in the analysis of past performance in fire, in which in a participatory manner all members of the crew reconstruct a previous performance, trying to find mistakes and successes, as a tool for improvement.
- Finally, the third level refers to those training activities specifically aimed to deepen knowledge and skills on subjects which are not immediately tied to firefighting. Thus, in periods without involvement in firefighting, courses are organized for specialization in many subjects that are necessary for professional improvement such as: handling machinery, fire behavior, off-road driving, first aid, leadership and team leadership, etc.

Training covers all those skills that may prove necessary during fighting operations and is repeated systematically to achieve the desired efficiency. Examples are loading and unloading a helicopter (Figure 23), handling equipment and tools, etc. Training also puts an emphasis on achieving and maintaining very good physical condition as this is considered the basis for crew safety and efficiency (Figure 24).

Figure 23. Helicopter related training of BRIF firefighters

Figure 24. Physical training of BRIF firefighters

Training across Spain

As mentioned earlier, the Regional Authorities (Autonomies) are responsible for Wildland Fire Management in their territory. As a result, there is a lot of variation. In some of the Autonomies the responsibility for fire management systems lies with the forest service whereas in others with the fire-fighting departments (Rifà and Castellnou 2007). The responsibility on wildland fire education, training and accreditation (for both professional and academic training) is from the National Authority (The Spanish Ministry of Education). There is a great diversity in professional categories and professional profiles who work in wildland fire management. Wildland fire instruction varies significantly between forestry schools and universities. Additionally, there is another education, not credited studies, that is being offered by Public Administrations, Civil Services, Forestry Associations, Trade Unions and private companies (Enríquez Alcalde and Rodríguez López 2007). This training is intended to fill the gaps that exist in wildland fire education in forestry. As a result of all this, until today, in Spain, there exists no standard wildland fire qualification system (Mollina et al. 2009).

Professional training (PT)

In general there are three types of Professional Training in Spain:

- Specific or formal PT belongs to the formal educational system. It stands between secondary education and college education (university education);
- Occupational PT, addressed to persons unemployed in order to acquire the necessary skills to enter the productive system.
- Continuous PT, addressed to active workers in order to improve their skills and qualifications.

In regard to fire management, there are two distinct professional branches: fire-fighters (professional branch: Security and Environment) and forest workers (professional branch: Agriculture). These two branches are treated differently in terms of official academic recognition of their specific training. Whereas the profession of forest fire-fighter is not included specifically within any of the profiles of the Professional Qualifications National Catalogue, forestry workers carry the title (and rights) of the "forestry and conservation of the natural environment technician" (Mollina et al. 2009). Professional firefighters are trained in firefighter's academies belonging to each of the different fire departments. Courses which are taught in these academies have no academic recognition beyond the respective administration or agency (Mollina et al. 2009).

Catalonia Academy of Firefighters (CAF)

A good example of firefighter training in Spain is the Catalonia Academy of Firefighters (CAF). It was the first in the country and has now been integrated in a larger academic center on security along with the regional police, prison keepers and forest rangers. The CAF offers courses on wildland fires at different levels: basic, advance, and specifically address to diverse working categories (i.e., basic fire-fighter, engine boss, sergeant and supervisor) within the fire department of Catalonia. Currently forest fire training in Catalonia is structured as shown in Table 11 (Miralles 2015).

Table 21. Fire training requirements for various positions in the fire fighting mechanism.

	Firefighter	Crew boss	Division chief	Tactical analyst (ff)
Basic fire	X	X	X	X
Operations 1	X	X	X	X
Operations 2	X	X	X	X
Analysis 1		X	X	X
Analysis 2: line		X	X	X
Analysis 3			X	X
Analysis 4: sector			X	X
Fire use 1			X	X
Fire use 2				X
Commanding 1		X	X	X
Commanding 2			X	

It should also be mentioned that forest fire management in Catalonia pays special attention on the problem of very large fires that develop quickly under extreme conditions. Thus, their training puts an emphasis on decision capacity on fast moving fire exhibiting extensive changes, on the capacity to focus efforts under those conditions and on the capacity to foresee and use opportunities (Miralles 2015). These capacities are achieved by promoting people with appropriate personalities, with the right skills which are improved through lifelong training, through courses, exercises and accumulation of experience.

In addition to the efforts above, the GRAF has been trying, through its proposals and its participation in research projects, to create an impetus towards the development of a standardized system for the training of fire professionals. More specifically, in the frame of the recent European “Fire Paradox” research project, started working towards a unified training system, based on the "European Qualification Framework" (Miralles 2010).

Higher level training of forest fire managers and other professionals

At a higher level, the Wildland Fire Area (WFA) (*Área* de Defensa Contra Incendios Forestales) at the Ministry of Agriculture Food and Environment, organizes every year a series of courses to educate and train the higher ranking managers of the suppression agencies in the Autonomies (Comunidades Autónomas or CAs). These courses are intended to transfer and to share expertise. This education is organized on a national level in an effort to maintain uniform as uniform training as possible.

In general, although the courses are offered yearly, the subjects may change in order to match the existing needs and scientific and technological advances. For example, in 2008, the WFA organized the following courses (Mollina et al. 2009).

- Advanced Course of Trends in Extinction: Taught to fire managers from CAs to allow them to qualify as: incident commander (IC), or planner assistant to IC, or logistic assistant to IC. Course duration: 5 weeks.
- Advanced Course in Wildland Fire Prevention: Taught to fire managers but also to forest rangers. Course aimed to prepare qualified people to address the mitigation of fire initiation causes (i.e., arsonist and negligence) and to implement best management actions in “Wildland Fire Prevention”. Course duration: 5 weeks.
- Advanced Course in Fire Behavior: The syllabus was fire behavior forecast, and fire spread simulation with GIS to address past fire events. Course duration: 2 weeks.
- Advanced Course about security and investigation of accidents: A course designed by WFA, aiming to train those who would participate in both security and investigation of accidents. Course duration: 1 week.
- Advanced Course on Fire Initiation Causes and Investigation Techniques: A course aiming to train regional forest rangers (members of the cause-investigating crews) and SEPRONA (Police units with focus on Environmental Law Enforcement), as well as some regional police department units. Thanks to this course, that has been offered since 1996, the percentage of fires with an unknown cause dropped from 50% (in 1996), to 20% (in 2009).
- Course about Techniques for Controlled Burning: A course for the UME (Spanish Army Forces’ Emergency Unit) crews to address the side effects of wildland fire spread as a result of standard Army shooting exercises.
- Course about Wildland Fire Suppression Techniques: A course aiming to train Forester managers (rangers) and alike, to work in extinction squads.

In 2016, the courses offered by the General Sub-directorate for Forestry and Mountains of the General Directorate for Rural Development and Forestry Policy of the Ministry of Agriculture Food and Environment, included (Dirección General de Desarrollo Rural y Política Forestal 2016).

- Prescribed burning course: Intended for the firefighting crew members that make regular use of fire (technicians, operators, foremen), and members of specialized technical units and officers in coordinating positions (heads of fire, etc.) with decision-making in introducing the use of fire in forest fire management. Course duration: 2 weeks.

- Emotional intelligence and stress management course in forest fire emergencies: Intended for staff of the various administrations that is involved in forest management and forest fire suppression, as well as technical staff of public entities that manage firefighting units. Course duration: 20 hours.
- Chief of section of planning and head of the section of logistics course: Intended for staff of the various administrations that is involved in forest management and forest fire suppression, as well as technical staff of public entities that manage firefighting units. Course duration: 40 hours.
- Hi-level course on safety and accident investigation in wildfire: Intended for technical staff of the various administrations that is involved in forest management and forest fire suppression, as well as technical staff of public entities that manage firefighting units. Course duration: 30 hours.
- ICS 200- ICS 300 course: Intended for technical staff of the various administrations that is involved in forest management and forest fire suppression, as well as technical staff of public entities that manage firefighting units. These courses are patterned after the US National Incident Management System (NIMS) courses with the same name. The ICS 200 course is designed to enable personnel to operate efficiently during an incident or event within the Incident Command System (ICS). ICS-200 provides training on and resources for personnel who are likely to assume a supervisory position within the ICS, while ICS-300 provides training and resources for personnel who require advanced application of the ICS and is intended for individuals who may assume a supervisory role in expanding incidents (https://www.training.fema.gov/emicourses/crsdetail.aspx?cid=E300&ctype=R). Course duration: 30 hours.
- Certification course for prescribed burning positions: Intended for technical staff of the various administrations that is involved in forest management and forest fire suppression, as well as technical staff of Public Entities that manage mechanisms of fire suppression and that have the capacity to certify their staff in the positions for prescribed burning in the mechanisms. The candidates for this course are proposed by members of the Autonomous Communities represented on the Committee to Combat Forest Fires. Course duration: 2 weeks (1 week theoretical training and 1 week in the field). Course duration: 2 weeks.
- Technical director of extinction course: Aimed at staff of the various administrations which is intended to work in fire suppression and το act as technical directors of fire extinction. Course duration: 80 hours.
- Course on actions of hydrological-forestry conservation of natural resources and mitigation of desertification and climate change: Aimed at university graduates with interests in actions and programs of restoration and hydrological-forestry, preferably staff of public administrations and conservation companies, but also at other groups such as universities and NGOs, or young professionals who wish to improve their training in these matters. The course focuses, among others, on erosion control, desertification prevention and post-fire restoration. Course duration: 30 hours.
- Post-fire restoration in the general state administration: experiences and future prospects: One day (8-hour) workshop (retransmitted online), intended for Public Administration personnel involved in actions and programs related to restoration and hydrological and forest conservation, as well as companies, NGOs, teachers and researchers in universities and research centers and professionals who want to improve their training on the subject.

Higher Education

Training on forest fire management is also included in the curriculum of Forest Engineering Schools at University level (Mollina et al. 2009). The first or technical degree (3 full academic years of study, leading to “Deputy Forestry Engineer in forest management”) includes 120 hours of instruction for the course on “Natural Resources Protection" which includes forest fires among its subjects. The second degree (which requires 5 years of study and leads to the Forestry

Engineer degree) includes forest fire management training within the mandatory course "Natural Systems Management & Protection", which requires 240 hours of instruction.

A deeper involvement with forest fires is achieved by students pursuing post graduate studies (M.Sc, or Ph.D.) on the subject. Furthermore, some universities, such as the University of Lleida, University of Cordoba, and Polytechnic University of Madrid, offer some "wildland fire management" short courses (3-5 credits). For example the Lleida University offers the following ones at the Wildland Fire Management Master Degree level:

- Prescribed burns (3.5 credits)
- Fire ecology (or Piyroecology) and wildfire simulation (5 credits)
- Helitack crew officer (3.5 credits)
- Farsite I (3 credits): Long term fire analyst
- Long term fire analyst and fire behavior analyst (3.5 credits)
- Farsite II: fire behavior analyst (3.5 credits)
- Wildfire ecology and management international meeting (3 credits)
- Wildland/Urban interface fire management (3 credits)
- Wildfire training course: Basic Level (3.5 credits) Recognized and developed under the sponsorship of the National Authority
- Job hazard abatement actions in wildland firefighting and wild fire use

Students can enroll in any of these courses and get credit and a diploma for it. However, a "Wildland Fire Management Master" degree (issued by University of Lleida) can be obtained if the student completes a final thesis or project and a total of 45 credits.

Informal Training in Fire management

In Spain, until the 1990s, apart for the exposure of Forestry students to the basics of forest fire science during their Forest Engineering studies and some short training courses (1-4 days) for (mainly local) workers who would be hired as firefighters during the summer. As the knowledge on forest fire management evolved and the demands of firefighting increased with the forest fires becoming more difficult to control and dangerous, the need for more training became obvious.

The large number of Autonomies, each with its own approach in fire management organization, and the increasing demand for fire management, created an obvious gap. Some of the Autonomies that lacked a strong organization, deep knowledge and tradition in the field of fire management, chose to cooperate with private companies that played the role of subcontractors in forest fire suppression. The gap included increasing needs for training. Various private companies, NGO's, trade unions and public institutions came to fill this gap by implementing courses of varying lengths and levels. Some of them are informative and are aimed mainly for volunteers, naturalists or stakeholders. Furthermore, some of the private companies that operate as subcontractors of public institutions in forest fire suppression, also organize various fire management courses (Mollina et al. 2009).

These courses can be divided into three broad categories:

- Forest fires prevention and fuel management
- Forest fire suppression
- Investigation of fires and environmental recovery

Examples of leading companies that offer forest fire management services including fire management training are:

FOREX: http://www.incendiosforestales.com/formacion

EIMFOR: http://www.eimfor.com/

(The program for 2016: http://www.eimfor.com/index.php/programa-formativo-2016/)

EURAL: http://www.euralweb.es/ and http://www.euralweb.es/defensa.html

TRAGSA: http://www.tragsa.es/

Of special interest is the Centro de Tecnología y Conocimiento Aeronáutico (CTCA) – "SEILAF Training - Simulation – Research" (http://www.seilaf.com/en/about-us/what-is-seilaf) which specializes in training through simulators. More specifically it offers flightw simulation training and firefighting simulation training (http://www.seilaf.com/en/firefighting). The SEILAF training center is located in the modern facilities that Faasa group owns in the Aerospace Technological Park of Andalusia, Aeropolis, Seville.

Turkey

In Turkey the forest fire problem has become more significant in the last few decades. This has resulted in increased efforts in the field of forest fire management by the General Directorate of Forestry, including increased efforts on training of firefighters. Central in these efforts is the development of the International Forestry Training Center (IFTC) (Figures 25 and 26).

Figure 25. The International Forestry Training Center (IFTC) in Antalya, Turkey.

The IFTC was founded in 2012 by the General Directorate of Forestry in Antalya mainly for in forest firefighting but also for offering training in other forestry subjects. The Center is active at international level with theoretical and practical training having modern facilities such as two 18 person capacity classrooms for theoretical courses, two 18 person capacity classrooms equipped with PCs (Figure 27), an auditorium (Figure 28), a wildfire simulator, field training facilities (Figure 29) and accommodation building (30).

Training has been organized in three different categories: 1) Training on forest fire for technical persons (forest engineers), 2) Combatting forest fires for rangers and 3) Training on driving in the forest for operators of water tanks.

Figure 26. The International Forestry Training Center (IFTC) in Antalya, Turkey.

Figure 27. One of the classrooms at IFTC

Figure 28. Auditorium at the IFTC having interpretation facilities with 120 seats capacity.

Figure 29. Field training facilities at IFTC

Figure 30. Accommodation facility (Lounge) with 100 person capacity, 7 suite and 39 rooms with double bed.

Figure 31. Classroom training at IFTC

By the end of 2015, 692 forest engineers, 865 rangers and 789 operators had been trained (Figure 31). In 2016, 360 forest engineers, 576 rangers and 85 operators were trained. The wild fire simulator started being used in 2016 and so far (July 2016) 32 forest engineers have been trained.

Additionally at international level, 36 technicians from Bosnia were trained in 2013; 50 technicians from 14 different countries were trained in the Center, under the coordination of OSCE (Organization for Security and Co-operation in Europe) in the framework of training program of "Regional Wildfire Management of South Caucasia and Balkans", in 2014 (Figures 32 and 33). In 2016, arrangements have been made for hosting training of technicians from Ukraine, Kirgizstan, Azerbaijan, Kazakhstan, Turkmenistan, Tajikistan, Pakistan, Philistine, Bosnia and Macedonia, at the Center.

Figure 32. Regional wild fire management training for South Caucasus and Western Balkan Countries was organized by the coordination of 'Organization for Security and Co-Operation in Europe' (OSCE), on 13-17 October 2014 with the participation of 14 different countries.

Figure 33. Training in firefighting with handtools at IFTC.

The EuroFire project

A significant effort in firefighter training has been made in the frame of the EuroFire project. EuroFire was an international partnership, funded by EU Leonardo da Vinci Programme, that focused on developing a competency based training system, for wildfire and prescribed fire management. The project was initiated in response to the recognition that there was a critical gap in knowledge, skills and training provision for wildfire and forest fire situations in some European countries. The EuroFire team, being a collaborative, trans-European partnership of research and training institutions, fire service employees, employers, and rural and land based businesses, addressed this issue by producing new fire management training resources. EuroFire brought together people with expertise and experience in fire management and training to develop a new EU wide training resource.

At the heart of the EuroFire system is a set of competency standards that describe the learning outcomes. The skills, knowledge and competencies, that people operating at wildfires or prescribed burning activities might need. The system includes examples of good practise from Europe and around the world. The key target user groups for the EuroFire training materials are: fire-fighters, the rural and land-based sector, industry organisations and education and training institutions. The training materials are multi-lingual, and are freely available on-line at the project's website (http://www.fire.uni-freiburg.de/eurofire/about_intro_en.html).

EuroFire Training Modules

The EuroFire partnership team developed fire training materials to support the development of similar fire management skills across the European Union. The fire training materials were developed to support fire training and assessment for a Level 2 work environment. That is for members of a tanker crew, hand crew, or prescribed burning crew, who are instructed to do tasks and who work under direct supervision.

Four training modules to support firefighters self-learning were completed and made available. The training modules are:

EF1 Ensure that your actions in the vegetation fire workplace reduce the risks to yourself and others.
EF2 Apply techniques and tactics to control vegetation fire.
EF4 Apply hand tools to control vegetation fire.
EF6 Apply vegetation ignition techniques.

A survey of firefighter training programmes in Europe

In addition to collecting documentation on firefighter training in Europe from various sources, it was tried to develop a deeper understanding in regard to the reality of this training, its targets and its effectiveness. The tool for this effort was a questionnaire that was built in 2015 and was circulated to fire professionals in the southern European countries. The questionnaire is included in the appendix.

A total of 19 responses were received. Figure 34 shows the distribution of the respondents by country. The respondents generally stated that they were very experienced. On a scale of 1 (little experience) to 5 (Very experienced) the average score was 4.47. Twelve (12) of them characterized themselves as 5 in regard to experience, four (4) of them as 4, and three (3) of them as 3.

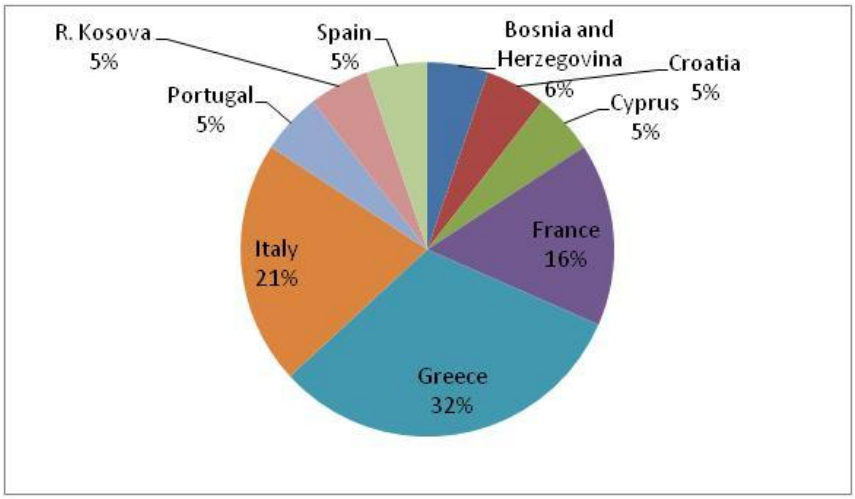

Figure 34. Representation of countries among the respondents of the questionnaire.

In regard to their profession, most respondents were professional firefighters (7) or higher ranking forest fire management officers (4) (Figure 35).

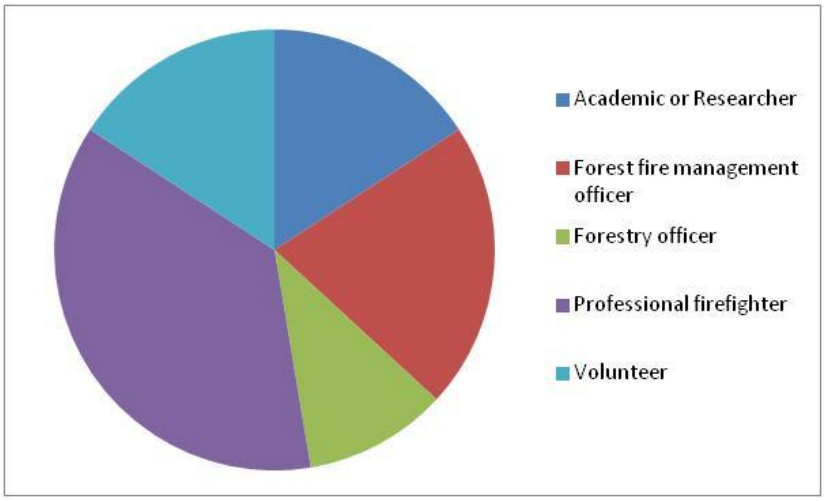

Figure 35. Field of work of the 19 questionnaire respondents.

Involvement in forest firefighting and training received

Urban firefighters

According to the questionnaire respondents, urban firefighters are involved in forest firefighting in 11 out of the 19 replies. Professional urban firefighters are involved in forest firefighting in Bosnia-Herzegovina, Croatia, Cyprus, the south of France, Greece, Italy and Spain, while they are not involved in Kosovo and in the area of Aveiro in Portugal. Only one of the 11 respondents, an officer from Greece, replied that the urban firefighters who are involved in forest fire suppression do not receive specialized training for this task, probably taking into consideration the fact that none of the courses offered at the Firefighting Academy has the subject "forest fires' in its title. In all other cases the urban firefighters who are involved in forest firefighting receive relevant training.

Wildland firefighters

Professional wildland firefighters do not exist in all south European countries. Only nine out of the nineteen respondents indicated that there are professional wildland firefighters fighting fires in their countries. The positive replies included Cyprus, Croatia, Italy and Spain. In France and Greece there was only one positive reply (in a total of three and six responses for each country respectively), probably referring to the involvement of Forest Service employees in various aspects of the fire management task (e.g. prevention, incident commander support during a fire, etc.). It should be noted that the four positive replies for Italy are probably not valid anymore, since the Corpo forestale dello Stato, a civilian police force, specializing in the protection of natural heritage and landscape, and in the prevention and prosecution of offenses in environmental and food matters, following legislative directive n. 177/2016 that was voted on July 28, 2016, is being absorbed by the Police (Carabinieri), a process that will be completed by January 1st, 2017 (https://it.wikipedia.org/wiki/Corpo_forestale_dello_Stato). In all cases, according to the respondents, wildland firefighters receive training in the field of their specialization.

Professional all-type firefighters

All-type firefighters who fight wildfires exist in Croatia, Cyprus, France, Greece and Spain. Negative replies were given for Bosnia and Herzegovina, Kosovo and the region of Aveiro in Portugal. In all cases of involvement in forest fire suppression, the firefighters receive relevant training.

Professional employees of municipalities (not firefighters)

Involvement of this category of employees in wildfire suppression has been acknowledged in Cyprus and partially in Greece (two of the six respondents replied positively) and in Italy (two positive replies out of four). In Cyprus they also receive relevant training.

Seasonal firefighters

Wildfires in the Mediterranean are a seasonal phenomenon and as a result it is quite common to strengthen professional organizations with seasonal forest firefighters for their suppression. However, according to the responses, it seems that this not always the case. Positive responses were recorded for Bosnia and Herzegovina, Croatia, Cyprus, Italy and Spain. For France there was one positive response and two negative ones, while in Greece the replies were split (three positive, three negative). The latter is surprising since the Hellenic Fire Corps have traditionally been employing seasonal firefighters every year as well as a special class of personnel on a five year contract that could be extended. However, according to a recent law (2016) this latter personnel has been offered the opportunity to apply for

a permanent position, ending the yearly employment of seasonal firefighters. In all countries that use seasonal forest firefighters, they receive relevant training. An exception is Italy where two of the four respondents replied that such training is provided while the other two replied negatively.

Volunteer firefighters

Volunteer firefighters are involved in all countries with the exception of Bosnia and Herzegovina. In regard to Greece, there were two positive and four negative replies, creating some confusion. Investigating these conflicting replies it became evident that there are two types of volunteers: Those who volunteer with the Hellenic Fire Corps, acting as general purpose firefighters supporting operations, and those who belong to volunteer groups that act under the auspices of the General Secretariat for Civil Protection, many of them acting in forest fire suppression. Some relevant training is offered to both of these categories of volunteers. Wildfire suppression training is also offered to all volunteers in the other countries who participate in such operations.

Armed forces

In regard to the participation of personnel of the armed forces of each country in forest fire suppression the responses were conflicting. They were positive for Bosnia and Herzegovina, and Spain and negative for Croatia, Cyprus, Portugal and Kosovo, each of the countries above represented by one response. However, for France there were two positive and one negative response, for Greece three positive and three negative, and for Italy two (in Apulia region) versus two (in Sardinia). These conflicts may be due to the fact that it was not specified in the question if participation of the armed forces is on a regular basis or they get involved occasionally when special needs arise. Furthermore, the respondents may have had in mind the operation of aerial resources by the military. According to the respondents, the armed forces personnel that is involved in fire suppression in Bosnia and Herzegovina and in Spain receives relevant training, while the replies are negative in Greece (involved but no training) and mixed in France and Italy.

Information on training

New professional firefighters training

In regard to new firefighters starting a professional career, none of the respondents indicated lack of training. Positive replies for “on the job training” were received for Cyprus, Greece (three out of six), Sardinia in Italy (one of the two replies from this region) and Kosovo. New professional firefighters in Croatia receive training of 12 months in formal firefighter school that does not include intense physical training, while in France the duration of training is such a school is half month. On the other hand, in the rest of the countries, new professional firefighters are trained in a formal firefighter school that includes intense physical training. The replies, in regard to the duration of training in such schools varied significantly (12 months in Bosnia and Herzegovina, 1 to 24 months in Greece, 3 to 6 months in Italy, while no indication of duration was given for Cyprus and Spain).

In general, the respondents indicated that there exists a professional firefighting school in each of the countries with Kosovo being the only exception.

Physical testing

In regard to the question “Are NEW professional firefighters tested for physical fitness before getting hired” the reply was positive for all countries except Bosnia and Herzegovina, Cyprus, and Kosovo. This testing, however, is not repeated at regular time intervals in Greece. In Italy repetition was only indicated for the area of Ogliastra in Sardinia.

Training materials, tools and methods

Table 22 summarizes the information provided by the respondents about the materials tools and methods used for firefighter training in their countries. The replies for the countries with more than one respondents (France, Greece and Italy), in case of disagreement, reflect the majority of the responses.

Table 22. Availability of specific training materials, tools and methods in firefighting training in the South European countries (Y=availability, N= no availability)

Country	Books	Visual aids	AV System	Web Apps	Use of Tools in the field	Simulated field firefighting exercises	Field experimental & prescribed burning	Real firefighting in the field
Bosnia and Herzegovina	Y	Y	Y	N	Y	Y	Y	Y
Croatia	N	N	N	N	N	N	N	N
Cyprus	Y	Y	N	N	Y	Y	N	N
France	Y	Y	Y	Y	Y	Y	Y	N
Greece	Y	Y	N	N	Y	Y	N	Y
Italy	Y	Y	Y	Y	Y	Y	Y	Y
Portugal	Y	Y	Y	N	Y	Y	Y	Y
R. Kosova	Y	Y	N	N	Y	Y	Y	N
Spain	Y	Y	Y	Y	Y	Y	Y	N

Continuing training

Initial training of firefighters starting their career is important but may not be enough in today's world of evolving knowledge and technologies. In the question about availability of additional training throughout a firefighter's career, positive replies were given by the respondents from Bosnia and Herzegovina, France, Portugal, Kosovo and Spain and negative from Croatia and Cyprus. In Greece the replies were split equally, and the same was true for Italy (positive for the region of Apulia but negative for Sardinia).

Of at least equal importance is the existence of a certification system and database for keeping track of the training of each firefighter/officer. According to the respondents, a certification system exists and a database is maintained in France, Portugal, Kosovo and Spain, but the replies were negative for Bosnia and Herzegovina, Croatia, Cyprus, and Greece. It Italy, the replies were negative for Apulia but positive for Sardinia.

Training level

The education level at which fire management officers are trained is generally high. According to the respondents this training is at university level in Bosnia and Herzegovina, Greece, Italy and Spain. The respondent from Croatia did not indicate an education level, while the response from Cyprus was that a fire management officer may have an education background of any level. In regard to France one response was missing. One of the two valid responses indicated "university level" while the second "high school level" of 1 year studies. Taking into consideration the description of the French training system, the first respondent truly refers to fire management officers, while the second respondent replied having basic firefighter training in mind. The reply for Portugal was "technical school level" while for Kosovo was "high school level".

Seasonal firefighters training

According to the respondents in none of the countries seasonal forest firefighters undertake their duties without receiving some form of training. There was no reply for Portugal (Aveiro) which is in line with the earlier reply that no seasonal firefighters are used there. In Bosnia and Herzegovina the seasonal firefighters receive only "on the job" training. In the rest of the countries they receive some formal training. In France this refers to the South of the country (only one of the three respondents replied positively about the use of seasonal firefighters and indicated that they receive half month of formal training without a physical training component). Seasonal firefighters in Croatia and Cyprus receive some training at a firefighter school but without getting intense physical exercise. On the other hand such exercise is part of the training of seasonal firefighters at a firefighter school in Greece, Italy, Kosovo and Spain.

In regard to physical condition, seasonal firefighters are tested before getting hired in Cyprus, France, Kosovo and Spain.

Finally, seasonal firefighters are given preference for employment in the following year in all countries. However, this question was not answered by the respondents from Croatia and Kosovo.

Training by special topic for each personnel category

Firefighting with engines

Fire engines are the main firefighting apparatus in practically all of the Mediterranean countries of Europe. Thus, professional firefighters receive training on firefighting with such engines. There was only one negative reply in regard to this, coming from Kosovo where none of the four personnel categories (professional wildland firefighters, seasonal wildland firefighters, volunteers and wildland fire officers) receive such training.

Seasonal firefighters receive training on firefighting with engines in Cyprus, Greece, Italy and Spain, but not so in Bosnia and Herzegovina, Croatia, France, and Kosovo. It is reminded that in Portugal (Aveiro) no seasonal firefighters are employed. On the other hand, volunteer firefighters receive such training in Croatia, France, Greece, Italy, Portugal and Spain, but not in Bosnia and Herzegovina and Cyprus.

In regard to wildland fire management officers training on firefighting with engines, negative replies came from Bosnia and Herzegovina, Croatia, Cyprus, Sardinia in Italy and Kosovo. The respondents from Greece, Apulia in Italy, Portugal and Spain replied positively, while there was a positive and a negative reply for south France, and a missing reply.

Firefighting with handtools

According to the respondents, professional firefighters in Croatia and Kosovo are not trained in firefighting with handtools. In all other countries the reply was positive (with some disagreement between the respondents from France, Greece and Italy).

Seasonal firefighters are trained in the use of handtools in Cyprus, Greece, Italy, Kosovo and Spain. Negative replies were given by the respondents from Bosnia and Herzegovina, and Croatia, while there were one positive and two negative replies form France. In regard to volunteers, the respondents from Bosnia and Herzegovina, and Croatia, also replied negatively for training in the use of handtools.

Wildland fire management officers are generally not trained in the use of handtools with the exception of Spain and the region of Apulia in Italy.

Firefighting in Wildland-Urban interface

Fighting fires in the wildland urban interface (WUI) is in many aspects different than usual wildland fighting. Training specifically for this task means that this difference is explicitly recognized and that the need (in regard to the occurrence of such fires) really exists. In regard to training of Professional wildland firefighters on this, the reply was a clear "yes" for Bosnia and Herzegovina, Croatia, Italy, Portugal, and Spain. The replies were negative for Cyprus and Kosovo, while they were also negative for France and Greece by majority of the respondents. In regard to seasonal firefighters, positive replies were only from Croatia, Italy and Spain, while for volunteers Portugal was added to the these three countries.

Wildland fire management officers receive special training for WUI fires in France (two out of three replies), Italy, Portugal and Spain.

Use of fire in firefighting

This special topic is controversial in parts of southern Europe. In regard to training of professional wildland firefighters to the use of fire in firefighting positive replies were given for Bosnia and Herzegovina, Croatia, Italy and Portugal, while of the three French respondents one replied positively, one negatively and the third did not give an answer. In regard to seasonal firefighters and to volunteers, the only positive replies were from Croatia.

Wildland fire management officers receive special training on the use of fire in firefighting only in France, Italy and Portugal.

Fire behaviour prediction

Professional wildland firefighters receive training in fire behavior prediction in Bosnia and Herzegovina, Croatia, Cyprus, Portugal, and Spain. The replies were mixed for France (two positive, one negative), Greece (three positive, three negative), and Italy ((two positive (Sardinia) and two negative (Apulia)). A negative reply was given for Kosovo.

The replies for training of seasonal firefighters in fire behavior prediction were generally negative, except for Cyprus, Kosovo and Spain. On the other hand, positive replies in regard to volunteer training on this subject were given for Croatia, Cyprus, Portugal, Kosovo, and Spain. In regard to wildland fire management officers, positive replies were given for Cyprus, France, Italy, Portugal, and Spain, negative for Bosnia and Herzegovina, Croatia and Kosovo, while for Greece there were three positive and three negative replies.

Fire Suppression tactics/ planning

According to the respondents, professional wildland firefighters receive training in fire suppression tactics in Bosnia and Herzegovina, Croatia, Italy, Portugal, and Spain but not in Cyprus and Kosovo. The replies for France and Greece were mixed (two negative and one positive for France, three positive and three negative for Greece). Seasonal firefighters receive such training in Croatia, Italy, Kosovo, and Spain, but not in Cyprus, France, and Greece (no seasonal firefighters in Aveiro, Portugal). The same replies hold true for the volunteer firefighters in these countries. In regard to wildland fire management officers, positive replies were given for Cyprus, France, Italy, Portugal, and Spain, but negative for Bosnia and Herzegovina, Croatia, Greece, and Kosovo.

Cooperation with aerial resources

Professional firefighters are trained on how to cooperate with aerial resources in Bosnia and Herzegovina, Croatia, France, Greece, Italy, Portugal, and Spain, but not in Cyprus, France, and Kosovo. Fore Greece there were for negative and two positive replies. In regard to seasonal firefighters, positive replies on this subject were given only for

Kosovo and Spain, while for volunteers the results were identical with the exception of France for which there were two positive and one negative reply. On the other hand, with the exception of Bosnia and Herzegovina, Croatia, and Kosovo, in all the other countries wildland fire management officers receive special training on ground to air cooperation.

Communications in firefighting

Professional firefighters are trained in communications in firefighting, with the exception of Kosovo. Seasonal firefighters receive such training in Greece, Sardinia in Italy, Kosovo and Spain. In regard to volunteers, positive replies were given for Croatia, Sardinia in Italy, Portugal, Kosovo, and Spain, negative for Apulia in Italy and mixed for France (two positive and one negative reply) and Greece (three positive and three negative).

Wildland fire management officers receive training in firefighting communications in all countries except Bosnia and Herzegovina, Croatia, and Kosovo.

Cooperation with other organizations

Professional firefighters learn how to cooperate with other organizations in Bosnia and Herzegovina, Croatia, France (two positive and one negative reply), Sardinia in Italy, Portugal, and Spain. Such training is not provided to seasonal firefighters except for Spain, while volunteers receive training in Croatia and Spain. In regard to wildland fire management officers, replies were negative for Bosnia and Herzegovina, Croatia, and Kosovo.

Handling the mass-media and the public

Handling the mass media and the public is not an easy task, especially under the stressful conditions associated with large fires. Professional firefighters get trained on this in Bosnia and Herzegovina, Sardinia in Italy, Portugal, and Spain. All replies were negative for seasonal firefighters. The same was true for volunteers with the exception of Portugal. Finally, wildland fire management officers do get training on this subject in Cyprus, France, Greece, Apulia in Italy, Portugal and Spain.

Fire prevention

According to the respondents, professional firefighters receive training in forest fire prevention in Bosnia and Herzegovina, Croatia, France, Portugal, and Spain. Seasonal firefighters only receive such training in Croatia, Kosovo and Spain, while, in regard to volunteers France is added in the positive replies. Wildland fire management officers are trained in prevention in Cyprus, France, Italy, Portugal, and Spain.

Firefighter safety

Safety is a key topic for forest firefighters. Professional firefighters are trained on this subject in Bosnia and Herzegovina, Croatia, Cyprus, Greece, Italy, Portugal, and Spain. Notably, for France two of the three replies were negative.

Safety training is offered to seasonal firefighters in Croatia, Cyprus, Italy, and Spain. For France two of the three replies were negative while for Greece the replies were split (three positive and three negative). In regard to volunteers, replies were positive for Croatia, Cyprus, Greece, Italy, Portugal, and Spain. Again, for France two of the

three replies were negative. Finally, wildland fire management officers get firefighting safety training in Cyprus, Greece, Italy, Portugal, and Spain, while for France two of the three replies were negative.

International wildland firefighting training exchanges

One of the ways to improve firefighter training is by learning from the examples and the experience of firefighters in other countries. Ad-hoc international seminars and exercises are one of the ways to achieve this. According to the replies of the respondents such training exchanges exist on many topics for professional firefighters and wildland fire management officers, while, with very few exceptions, they are not available to seasonal firefighters and volunteers.

In Bosnia and Herzegovina, professional firefighters (but not wildland fire management officers) have benefited from international training exchanges in all the subjects that were included in this particular question, namely ground firefighting, aerial firefighting, firefighting in wildland-urban interface (WUI), use of fire in firefighting, fire behaviour prediction, fire suppression tactics/planning, firefighting training in simulators, fire prevention, and firefighter safety.

In Croatia, positive replies were given for professional firefighter and volunteer training in fire behaviour prediction and firefighting training in simulators. Professional firefighters also have the opportunity for international training exchanges in fire prevention, while pilots get such opportunity in aerial firefighting.

In Cyprus, positive replies were given for professional firefighters and wildland fire management officers' international training exchanges in ground firefighting, firefighting in wildland-urban interface, use of fire in firefighting, and firefighter safety. Additionally the officers have the opportunity for international training exchanges in fire behaviour prediction, fire suppression tactics/ planning, and fire prevention. Positive replies were also given for seasonal firefighters and volunteers in regard to safety and for pilots in regard to aerial firefighting.

In France the replies of the three respondents were conflicting to a large extent. This may be due to the coincidental knowledge of each of them about international training exchanges that have taken place in recent years. In analyzing their responses a positive reply is counted when two of the three replied positively. Thus, in regard to ground firefighting and aerial firefighting positive replies were given for professional firefighters, volunteers, wildland fire management officers, and pilots, but not for seasonal firefighters. In regard to the next five subjects, namely firefighting in WUI, use of fire in firefighting, fire behaviour prediction, fire suppression tactics/ planning, firefighting training in simulators, positive replies were only given for fire management officers. Finally, there were only negative replies on international training exchanges in fire prevention, and firefighter safety.

In Greece, there were also some conflicts in the replies of the respondents, so the majority approach has been followed in regard to the results. Seasonal firefighters and volunteers have not been included in international training exchanges. Professional firefighters and wildland fire management officers have participated in such exchanges on ground firefighting and on firefighting in the WUI, while for aerial firefighting positive replies were split (three vs three) for officers and for pilots. In regard to the use of fire in firefighting, positive replies were split for professional firefighters. Negative replies for all were received for fire behavior prediction. In regard to fire suppression tactics/planning the replies were positive for wildland fire management officers and equally split for professional firefighters, while in regard to firefighting training in simulators they were positive for both. All replies were negative for fire prevention. Finally, in regard to firefighter safety, wildland fire management officers have participated in international training exchanges but for professional firefighters the replies were split.

In Italy, international training exchanges are scarce, if any, for all personnel categories.

In regard to Portugal, positive replies were given for international training exchanges of professional firefighters, wildland fire management officers and pilots on the subjects of ground firefighting, aerial firefighting, and firefighting in

the WUI. Pilots were not included with the other two categories for the rest of the topics: use of fire in firefighting, fire behaviour prediction, fire suppression tactics/ planning, firefighting training in simulators, fire prevention, and firefighter safety

The situation is quite different in Kosovo. There were no positive replies for professional firefighters, wildland fire management officers. On the other hand, it was indicated that seasonal firefighters and volunteers have been involved in international training exchanges on the subjects of ground firefighting, aerial firefighting, firefighting in the WUI, fire behaviour prediction, fire prevention, and firefighter safety

Finally, in Spain, professional firefighters and wildland fire management officers have been involved in international training exchanges on all the subjects, namely, ground firefighting, aerial firefighting, firefighting in wildland-urban interface, use of fire in firefighting, fire behaviour prediction, fire suppression tactics/ planning, firefighting training in simulators, fire prevention, and firefighter safety.

Climate change

The first question in regard to climate change was general and not related to training: “Are the potential effects of climate change (CC) explicitly considered and addressed in current wildland fire (WF) management in your country/region?“. Replies were positive for Cyprus, Portugal, Kosovo and Spain, and negative for Bosnia and Herzegovina and Croatia. They can also be considered as negative for France (2 negative and one positive replies) and for Italy (three negative and one positive), while for Greece the responses were split (three positive and three negative).

Climate change considerations in wildland fire training

According to the replies of the respondents, climate change is not considered in wildland fire training in Bosnia and Herzegovina, Croatia, Cyprus, France, Greece (five negative and one positive replies), and Italy (three negative and one positive reply from Sardinia).

According to the Portuguese respondent (from the area of Aveiro), wildland fire (WF) training of professional firefighters and wildland fire management officers includes consideration of climate change in the following topics: Expected climate change (CC) effects, WF management priorities identification, WF prevention planning, WF presuppression planning, fire behaviour under CC, fighting of extreme fires, fighting in WUIs in the future, safety considerations, and financial considerations. In regard to volunteers, three topics are mentioned: Expected climate change (CC) effects, fighting of extreme fires, and safety considerations.

In Kosovo, the replies refer only to seasonal firefighters and volunteers. The training topics with climate change related content include expected CC effects, WF management priorities identification, WF prevention planning, fighting of extreme fires, and safety considerations.

Finally, the respondent from Spain, in spite of replying positively about CC consideration in training, he did not provide any specifics about the topics. He only noted that this CC related training must be improved.

Personal assessment of respondents

The last part of the questionnaire asked the respondents for their (optional) personal assessment of the adequacy of current training in their countries, on the term of confidentiality. As a result, the analysis of the replies is general and not by country.

In regard to a general assessment of the adequacy of current WF firefighters training there were five positive and thirteen negative replies, while one respondent answered "Yes and No", judging that in his country "Too much emphasis is given on techniques (use of resources) and not enough on fire behavior".

In regard to if gaps and weaknesses exist the replies are summarized in Table 23, where YES means that a weakness exists, NO that it is currently OK and N/A indicates a missing reply.

Table 23. Summary of responses in regard to the existence of gaps and weaknesses in WF

Weakness	YES	NO	N/A
Outdated or poor training	10	7	2
Incomplete coverage of topics (gaps)	9	8	2
Poor training material	6	11	2
Poor application of training (emphasis on paperwork and not on effective training)	8	9	2
Training does not guarantee a good result (e.g. no evaluation)	9	8	2
No field training	7	9	3

Conclusions of the survey

The survey of firefighter training programmes in Europe presented here suffers from the relatively small number (N=19) of completed questionnaires that were received, coming from nine countries: Bosnia and Herzegovina, Croatia, Cyprus, France, Greece, Italy, Portugal, Kosovo, Spain. Thus there are limitations in regard to the strength of the conclusions that can be drawn. However, the results reveal a number of issues that can be taken into consideration in regard to firefighter training.

First point is that the organization of fire management in the surveyed countries differs between countries and in some cases between regions in a country. The first part of the questionnaire offers some information about the existence and involvement of professional firefighters, seasonal firefighters, volunteers and wildland fire management officers. Accordingly, there exist significant differences between countries in regard to firefighter training approaches. In addition to reflecting development history and sophistication level, these differences also reflect dissimilarities in the structure of the fire management organizations.

In regard to training, a positive finding is that new firefighters receive some form of training at the start of their professional career. Also, it was found that there exists at least a professional firefighting school in each of the surveyed countries with Kosovo being the only exception. The length of training varies tremendously, from half a month up to 24 months, but this is not necessarily limited to forest firefighting.

In regard to physical condition, with the exception of Bosnia and Herzegovina, Cyprus, and Kosovo, professional firefighters are tested for physical fitness before getting hired for the demanding job of firefighting. However, Greece and Italy are added to the three countries above in regard to lacking a system that regularly checks the physical condition of firefighters throughout their career.

Another finding is that with the notable exception of Croatia, there is quite good availability of training materials in all countries. The firefighters have the opportunity to seek additional training throughout their career only in some of the countries. The education level at which fire management officers are trained is generally high, being that of "university" in Bosnia and Herzegovina, Greece, Italy and Spain and probably in France. A certification system and database for keeping track of the training of each firefighter/officer exists only in France, Portugal, Kosovo, Spain, and some regions of Italy.

In regard to seasonal firefighters, they do get some training in all countries, which however ranges from “on the job” training to some longer formal training. Also, they are tested for good physical condition before getting hired in Cyprus, France, Kosovo and Spain. Finally, they are given preference for employment in the following year in all countries.

In regard to the specific topics of training there is some variability between countries and by firefighter category depending on their wildfire realities. A summary is hard to produce due to the quantity of details, but the information helps to assemble a puzzle of the current situation, as a basis for suggestions for improvements.

Of particular significance is the finding that the potential effects of climate change are explicitly considered and addressed in current wildland fire management only in Cyprus, Portugal, Kosovo and Spain. It is clear that there is room for improvement on this point.

Of special value is the personal assessment of the respondents on the existence of gaps and weaknesses in the existing training schemes. The majority said that such weaknesses exist. Specific issues identified by more than half of the respondents include “outdated or poor training”, “incomplete coverage of topics (gaps)” and “training does not guarantee a good result (e.g. no evaluation)”.

Overall conclusions

The information compiled is this report originates from a variety of sources, including internet sites, news reports, bibliography, circulation of a questionnaire and analysis of the responses, and personal contacts and professional knowledge. From all the material collected and selectively presented it can be concluded that:

- The ways in which wildland fire management is organized in each of the countries of Mediterranean Europe differs significantly between regions. Historic reasons, financial reasons and the importance of the wildfire problem for each country can explain these differences to a large extent. There are differences in how wildfire management is organized even between regions of the same country (e.g. Italy, Spain). Furthermore, there are currently changes taking place that may further change the picture presented here.
- Given the differences above, it is not surprising that wildland fire suppression and management training is non homogeneous across the studied countries. There are significant differences in sophistication of training (level of training, specialized facilities, content, etc.). It can be said however, that according to the respondents of the questionnaire, there exists at least a professional firefighting school in each of the countries with Kosovo being the only exception.
- In some of the countries there is neither a certification system nor a national database keeping track of who has been trained on what.
- Seasonal firefighters do receive some training before undertaking their duties but there is a lot of variation in regard to the duration and depth of it.
- Information on wildland firefighter training in the countries of Mediterranean Europe is not easy to collect on the Internet, because there is very little effort on producing web-sites on the subject, let along English versions of related sites. In some cases even within countries the information is unclear or even conflicting. This was reflected even in the replies of the respondents of the questionnaire.
- Given the relative scarceness of information on wildland fire training on the internet, it is not surprising that there is practically no clear reference to climate change as an issue that should be taken into consideration in this training. The majority of internet sites on firefighter training originate mostly in professional all-type firefighter schools. There**,** emphasis on environmental issues and in wildland firefighting per se seems to be of secondary importance. This may be one of the reasons for lack of explicit references to climate change.
- Further to the above, the responses collected through the questionnaire, confirm that climate change, if at all present, is handled superficially in current wildland fire management training curricula.

Bibliography

AFN 2004. Normativo do Fogo Controlado. Pdf Document.

Alexander, M. E. 1974. The Interregional Fire Suppression Crew. Fire Management Notes. 35(3):14-17

Arsia 2007. Rapporto sullo stato delle foreste in Toscana - Anno 2007.

Colaço, M.C. 2008. Avaliação da formação inicial e permanente dos técnicos florestais em Portugal desde a perspectiva da prevenção e a extinção de incêndios florestais, in Formación e Investigación en Educación Ambiental. Novos escenarios e enfoques para un tempo de cambios. MEIRA, P. e TORALES, M. (Edrs.) , CEIDA, A Coruña, España. pp 167 – 174.

Colaço, M.C., Rego, F.C., Meira, P. 2006. Forest fire prevention: A study about the forest technician´s training In: Viegas, D.X. (Ed.); Proceedings of the 5th International Conference on Forest Fire Research. CD Rom (13 pp.). ADAI, Figueira da Foz.

Diakakis, M., and G. Xanthopoulos. 2016. Analysis of forest fire fatalities in Greece: 1977-2013. International Journal of Wildland Fire (in press).

Dirección General de Desarrollo Rural y Política Forestal (2016). Plan de formación del año 2016. 111 p. (Available at http://www.magrama.gob.es/es/desarrollo-rural/formacion/cursos/nuevo-planformacion2016-actualizacion16dejuniode2016_tcm7-424735.pdf).

Directorate General of Civil Protection and Emergencies (2010). The Directorate General of Civil Protection and Emergencies. On line number 126-10-017-2. 35 p. (Available at http://www.proteccioncivil.es/documents/11803/22691/The+Directorate+General+of+Civil+Protection+and+Emergencies.pdf).

Enríquez Alcalde, E., and J. Rodríguez López. 2007. La formación en defensa contra incendios forestales en España. p. 353. In book of abstracts of the “IV International Wildland Fire Conference”, May 13-17, 2007, Seville, Spain. Full paper on the CD accompanying the book of abstracts (Available at: http://www.fire.uni-freiburg.de/sevilla-2007/contributions/doc/cd/SESIONES_TEMATICAS/ST7/Enriquez_Rodriguez_SPAIN_DGB.pdf).

FAO. 2015. Analysis of the Forest Sector in Bosnia and Herzegovina. FAO Regional Office for Europe and Central Asia. Budapest, Hungary. 146 p.

Gabbert, B. 2015. Spain’s BRIF. Wildfire Today (online) (http://wildfiretoday.com/tag/spain/).

Grum, D. 2005. The Republic of Croatia National Report on Forest Fires. Regional Balkan Wildland Fire Network/Global Wildland Fire Network International Technical and Scientific Consultation “Forest Fire Management in the Balkan Region”, 4-5 April 2005, Ohrid, FYROM.

Kešetović, Z. 2013. Country study: Serbia. Report for the “Analysis of Civil Protection Systems in Europe” (ANVIL) project. Faculty of Security Studies, University of Belgrade, Serbia. 60 p.

Leone V, Bovio G, Cesti G, Lovreglio R (2008) Il Direttore delle Operazioni di Spegnimento degli Incendi Boschivi: Manuale tecnico. MIPAF, CFS, Università della Basilicata, 510 p.

Milazzo A. (2008) Lo spegnimento degli incendi boschivi: la formazione dei DOS. In: Riassunti delle relazioni e dei poster, III Congresso Nazionale di Selvicoltura, Taormina (ME), 16-19 ottobre 2008. Available on: http://www.aisf.it/manifestazioni/congresso%20selvicoltura/FILE%20ABSTRACT_finale[1].pdf

Leone V, Bovio G, Cesti G, Lovreglio R (2008) Il Direttore delle Operazioni di Spegnimento degli Incendi Boschivi: Manuale tecnico. MIPAF, CFS, Università della Basilicata, 510 p.

Milazzo A. (2008) Lo spegnimento degli incendi boschivi: la formazione dei DOS. In: Riassunti delle relazioni e dei poster, III Congresso Nazionale di Selvicoltura, Taormina (ME), 16-19 ottobre 2008. Available on: http://www.aisf.it/manifestazioni/congresso%20selvicoltura/FILE%20ABSTRACT_finale[1].pdf

Miralles, M. 2010. Standardized systems for the training of fire professionals. Fire Paradox project (Available at: http://www.fireparadox.org/training_professional_manager.php).

Miralles, M. 2015. Experience of the Catalan Fire Service – GRAF in Catalonia. Presentation delivered at the "MedWildFireLab" Project Workshop on "Current and future training on wildland fire management", May 14th, 2015, Athens, Greece. (Available at http://www.fria.gr/files/7_miralles_-_firefighter_training_in_catalonia.pdf).

Molina, D., M. M. Cabré, E. Pous, E. Valese, C. Colaço, F. Rego, A. Sesbou, C. Kunst, G. Defossé, A. Lazaro, G. Herrero, J. Solana, E. Rigolot, D. Kraus, G. Delogu. 2009. Survey of the existing academic and professional training materials related to forest fire. "Fire Paradox" project Deliverable 10.1-1a-28. 52 p. (Available at: https://www.google.gr/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwjY0fLo3NTOAhVJthQKHdmHCXkQFggjMAA&url=http%3A%2F%2Ffireintuition.efi.int%2Frep%2Fofficedocument%2Ftextdoc%2Fdoc%2Fd10.1-1a-28-1000-164645905685%2Fd10.1-1a-28-1000-1.doc&usg=AFQjCNGLI_CKzytDDkTLwAO9875541dnMg&bvm=bv.129759880,d.d24&cad=rja

Nemeth, A. (editor). 2015a. Forest Fire Country Studies: Republic of Albania. Working paper of the "Addressing the risks of forest fires in South Eastern Europe" project. Regional Environmental Center for Central and Eastern Europe, Szentendre, Hungary. 26 p.

Nemeth, A. (editor). 2015b. Forest Fire Country Studies: Bosnia and Herzegovina. Working paper of the "Addressing the risks of forest fires in South Eastern Europe" project. Regional Environmental Center for Central and Eastern Europe, Szentendre, Hungary. 29 p.

Nemeth, A. (editor). 2015c. Forest Fire Country Studies: Former Yugoslav Republic of Macedonia. Working paper of the "Addressing the risks of forest fires in South Eastern Europe" project. Regional Environmental Center for Central and Eastern Europe, Szentendre, Hungary. 35 p.

Nemeth, A. (editor). 2015d. Forest Fire Country Studies: Republic of Serbia. Working paper of the "Addressing the risks of forest fires in South Eastern Europe" project. Regional Environmental Center for Central and Eastern Europe, Szentendre, Hungary. 25 p.

Nikolov, N. 2013. Organization of Forest Fire Protection in the Southeast European/Caucasus Region. pp. 78-83. In Proceedings of the International Symposium on Strategy Development of Forest Fire Policy and Organization. January 15-17, 2013, Seoul Education Cultural Center, Seoul, Republic of Korea. Korea Forest Research Institute. Seoul. 301 p., Seoul

Panagiotakis, A. 2015. Future training in wildfires suppression. Presentation delivered at the MedWildFireLab Workshop on on "Current and future training on wildland fire management", May 14th, 2015, Athens, Greece. (Available at http://www.fria.gr/files/5_panagiotakis_-_future_training_in_wildfires_supp.pdf)

Pikouli, T. 2015. Current Training on Wildland Fires. Presentation delivered at the MedWildFireLab Workshop on on "Current and future training on wildland fire management", May 14th, 2015, Athens, Greece. (Available at http://www.fria.gr/files/4_pikouli_-_current__future_training_on_wildland_.pdf).

Rego, F., P. Fernandes, and E. Rigolot. 2010. Towards integrated fire management: outcomes of the European project Fire Paradox. European Forest Institute. 229 p.

Rifà, A., and M. Castellnou. 2007. El modelo de extinción de incendios forestales catalán. p. 120. In book of abstracts of the "IV International Wildland Fire Conference", May 13-17, 2007, Seville, Spain. Full paper on the CD accompanying the book of abstracts (Available at: https://www.researchgate.net/profile/Marc_Castellnou2/publication/228619083_El_modelo_de_extincin_de_incendios_forestales_cataln/links/544178620cf2a76a3cc7f19f.pdf)

Samardzija, V., S. Knezovic, S. Tisma, and I. Skazlic. 2014. Country study: Croatia. Report for the "Analysis of Civil Protection Systems in Europe" (ANVIL) project. Institute for Development and International Relations, Zagreb, Croatia. 69 p.

Schmuck, G., J. San-Miguel-Ayanz, A. Camia, T. Durrant, R. Boca, G. Libertà, and E. Schulte, 2013. Forest Fires in Europe, Middle East and Norh Africa 2012. Technical report EUR 26048 EN. European Commission, Joint Research Centre, Institute for Environment and Sustainability. 109 p.

Simos, M., and G. Xanthopoulos. 2014. Assessment of the effectiveness of the forest fire fighting ground forces in Greece. pp. 665-672. In proceedings of the 7th International Conference on Forest Fire Research on "Advances in Forest Fire Research", November 17-20, 2014. Coimbra, Portugal. Viegas D. X., (editor). ADAI/CEIF, University of Coimbra, Portugal. 1919 p.

Xanthopoulos, G., D. Caballero, M. Galante, D. Alexandrian, E. Rigolot, and R. Marzano. 2006. Forest Fuels Management in Europe. pp. 29-46. In proceedings of the Conference on "Fuels Management—How to Measure Success", March 28-30, 2006, Portland, Oregon, USA. Andrews, P. L, and B. W. Butler, compilers. USDA Forest Serv., Rocky Mountain Research Station, Fort Collins, CO. RMRS-P-41. 809 p.

Xanthopoulos, G. 2007. Forest fire policy scenarios as a key element affecting the occurrence and characteristics of fire disasters. p. 129. In book of abstracts of the "IV International Wildland Fire Conference", May 13-17, 2007, Seville, Spain. Full paper on the CD accompanying the book of abstracts.

Xanthopoulos, G. 2015. Fire Management in Greece in Financially Troubled Times. Book of abstracts of the 6th International Wildland Fire Conference, 12-16 October 2015, Pyeongchang, S. Korea.

Internet sources (sites)

Greece

http://academy.fireservice.gr/

Italy

http://agrariaweb.uniss.it/php/proiettoreTesti.php?cat=322&item=3&xml=/xml/testi/testi15661.xml&pagina=9

http://forestalecdl.campusnet.unito.it/cgi-bin/home.pl

http://serviziweb.unimol.it/pls/unimol/consultazione.mostra_pagina?id_pagina=6010

http://web.uniba.it/orientamento/newmatric/agraria/Corsi/ScienzeFor_e_Ambientali.htm

http://www.agr.univpm.it/Engine/RAServeFile.php/f//sfa.pdf

http://www.agraria.unibo.it/Agraria/Didattica/Lauree/2009/PaginaCorso20090870.htm?tab=Presentazione

http://www.agraria.unirc.it/corsi_laurea.php?cdl=73

http://www.agrariaunibas.eu/index.php?option=com_content&view=article&id=70&Itemid=96

http://www.agrariaunipa.it/it/didattica/corso.jsp?idC=4

http://www.compagniadelleforeste.it/INNOVAZIONE-FORMAZIONE-e-RICERCA/rapporto-sullo-stato-delle-foreste-in-toscana.html

http://www.comunita-montana-acquacheta.fc.it/c/document_library/get_file?folderId=1380&name=DLFE-3302.pdf

http://www.cosp.unimi.it/offerta_didattica/418.htm

http://www.dream-italia.it/

http://www.nwservice.it/

http://www.protezionecivile.regione.lombardia.it

http://www.protezionecivile.tn.it/frame.asp?Site=8

http://www.protezionecivile.tn.it/frame.asp?Site=8&Area=14&Sect=250

http://www.regione.sardegna.it/servizi/cittadino/corpoforestale.html

http://www.scienzeforestali.unina.it/

http://www.unifi.it/clsfam/CMpro-v-p-15.html

http://www.unipd.it/regolamento_didattico/LM73_Scienze_forestali_ambientali.pdf

http://www.unito.it/agroselviter/dettaglio_sezione-12.htm

http://www.unitus.it/dipartimenti/disafri/dida.html

http://www3.corpoforestale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/330

Portugal

www.dgrf.min-agricultura.pt/portal - National Forest Authority
www.enb.pt – National School of Fire-fighters
www.esa.ipb.pt - Agrarian School of Bragança
www.esac.pt - Agrarian School of Coimbra
www.esav.ipv.pt - Agrarian School of Viseu
www.isa.utl.pt – Institute of Agronomy
www.utad.pt – University of Trás-os-Montes e Alto Douro

Spain

http://www.magrama.gob.es/es/desarrollo-rural/temas/politica-forestal/incendios-forestales/extincion/medios_aereos.aspx)
http://www.incendiosforestales.com/formacion - FOREX

http://www.eimfor.com/ and http://www.eimfor.com/index.php/programa-formativo-2016/ - EIMFOR

http://www.euralweb.es/ and http://www.euralweb.es/defensa.html - EURAL

http://www.tragsa.es/ - TRAGSA

Appendix

The questionnaire used for surveying firefighters and fire management officials

HELLENIC MINISTRY OF RURAL DEVELOPMENT AND FOOD
HELLENIC AGRICULTURAL ORGANIZATION "DEMETER"
Institute of Mediterranean Forest Ecosystems
Laboratory of Forest Fires
Terma Alkmanos, Ilisia, 11528, Athens, Greece
P. O. Box: 14180
Phone: +30 2107793142, Fax: +30 2107784602

MedWildFireLab project

Questionnaire on

Wildland Firefighter Training in the Context of Global Change

The questionnaire below has been prepared and is administered in the frame of the MedWildFireLab project. Its purpose is to collect and organize information on wildland firefighter (WF) training in the countries around the Mediterranean Sea including those of South East Europe, in order to develop a complete picture of the current reality, to pinpoint gaps and to identify opportunities for potential improvements. Adaptation of this training to global change is of special importance.

We ask you, as an expert in the field, to contribute to our effort. Please fill in the questionnaire, which will take less than 20 minutes, and return it to Dr. Gavriil Xanthopoulos by e-mail (gxnrtc@fria.gr) or fax (+30 210 7784602), preferably by June 10, 2016. Thank you in advance for your contribution.

Respondent's profile

Name (optional): _____ Age: ____ Gender: M/F ____

Country: _____ e-mail (optional): _____

Profession: (Please select by "X" in the left column. Indicate experience by a number (1-5))

Check	Profession	Fire Experience: Enter a number from 1(low) to 5 (High)
	Civil Protection officer	
	Forest fire management officer	
	Urban fire management officer	
	Forestry officer	
	Professional firefighter	
	Seasonal	
	Volunteer	
	Academic or Researcher	
	Other (explain) _____	

Your replies refer to: The whole country _____ A specific region (specify): _____

Please indicate by and "X" which of the following personnel categories are involved in firefighting (check all that apply), and if they receive at least some official training (Y/N):

Check	Personnel category	Training (Y/N)
	Professional Urban firefighters	
	Professional Forest Firefighters	
	Professional all-type firefighters	
	Professional employees of municipalities (not firefighters)	
	Seasonal firefighters	
	Volunteer firefighters	
	Armed forces personnel	
	Other (explain):	
	Other (explain):	

PROFESSIONAL FIREFIGHTERS AND OFFICERS

Type of training that professional NEW firefighters **must** receive:

Check	**Type of training**
	No training
	On the job training by experienced colleagues
	Formal firefighter school of ___ months (does not include intense physical training)
	Formal firefighter school of ___ months (includes intense physical training)

Comments (optional):_____

_____

Is there a professional firefighter school established (Y/N) _____

If YES, please provide title, address of school, and contact information: _____

_____

Are NEW professional firefighters tested for physical fitness before getting hired? (Y/N): ___

If YES is testing repeated at regular time intervals along their career? (Y/N) _____

If YES, please provide information on testing methodology and performance thresholds or provide an internet link for this info: _____

_____

Training materials/tools/methods: Please put an "X" to all that apply:

Check	Methods		Check	Methods
	Books and notes			Use of tools in the field
	Visual aids (presentations, videos...)			Simulated field firefighting exercises
	Dedicated audiovisual training system			Field experimental & prescribed burns
	Web-based applications for training			Real firefighting in the field

Comments (optional):_____

_____

Is additional training available throughout the firefighter's career (?) (Y/N) _____
Is there a certification system and database in place for keeping track of the training of each firefighter/officer? (Y/N) _____ . If YES please provide details: _____
_____

Fire management officer training is at (please check all that apply):

Check	Type of training	Years
	High school level	
	Technical school level	
	University level	
	Post-graduate level	
	Other (explain):	

SEASONAL FIREFIGHTERS

Type of training that seasonal firefighters **must** receive:

Check	Type of training
	No training
	On the job training by experienced colleagues
	Formal firefighter school of ___ months (does not include intense physical training)
	Formal firefighter school of ___ months (includes intense physical training)

Are NEW seasonal firefighters tested for physical fitness before getting hired? (Y/N): ___
If YES, please provide information on testing methodology and performance thresholds or provide an internet link for this info: _____
Are the same firefighters given preference for employment in the following year? (Y/N) ___

SPECIAL TOPICS

Please indicate by "X" if special attention is given in training on the following special topics by personnel level:

Topic	Professional WF	Seasonal WF	Volunteer	WF Officer
Firefighting with engines				
Firefighting with hand-tools				
Firefighting in Wildland-Urban interface				
Use of fire in firefighting				
Fire behaviour prediction				
Fire Suppression tactics/ planning				
Cooperation with aerial resources				
Communications in firefighting				
Cooperation with other organizations				
Handling the mass-media and the public				
Fire prevention				
Firefighter safety				
Other (explain):				

Please indicate by "X" if there are international WF training exchanges in place by topic and personnel level:

Topic	Professional WF	Seasonal WF	Volunteer	WF Officer	Pilot
Ground Firefighting					
Aerial Firefighting					
Firefighting in Wildland-Urban interface					
Use of fire in firefighting					
Fire behaviour prediction					
Fire Suppression tactics/ planning					
Firefighting training in simulators					
Fire prevention					
Firefighter safety					
Other (explain):					

CLIMATE CHANGE

Are the potential effects of climate change (CC) explicitly considered and addressed in current wildland fire (WF) management in your country/region? (Y/N) ___

Are climate change considerations included in WF training? (Y/N) ____

If YES, please indicate by "X" on which topic (all that apply) and at which training level:

Topic	Professional WF	Seasonal WF	Volunteer	WF Officer
Expected CC effects				
WF management priorities identification				
WF prevention planning				
WF presuppression planning				
Fire behaviour under CC				
Fighting of extreme fires				
Fighting in WUIs in the future				
Safety considerations				
Financial considerations				
Other (explain):				

YOUR PERSONAL ASSESMENT (Optional, will be kept confidential)

Do you consider current training of WF firefighters adequate? (Y/N) _____

If NOT please identify gaps and weaknesses:

Weakness	Check	Explain
Outdated or poor training		
Incomplete coverage of topics (gaps)		
Poor training material		
Poor application of training (emphasis on paperwork and not on effective training)		
Training does not guarantee a good result (e.g. no evaluation)		
No field training		
Other:		
Other:		

Please, suggest potential improvements (if any): _____

_____

_____

_____

Please indicate potential sources of additional information:

Training Schools (Please provide, name, address and contact information)

1. .
2. .
3. .

Please provide internet sources about firefighter/fire management training in your country (including training materials)

1. -
2. -
3. -
4. -

Please indicate your availability for additional contact for clarifications: (Y/N) _____

Please indicate if you want to be kept informed about the results of MedWildFireLab: (Y/N) _

THANK YOU FOR YOUR COOPERATION