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Conseil de l' Europe

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Forest Fire Net

Special Issue with the proceedings of the Teleconference:

"Recent Developments and Needs for Wildfire Fighting on the Ground: Tactics and Technologies"

Athens, 10 June 2010

Forest Fire Net is published by

European Center

for Forest Fires (ECFF)

Athens 2010

Forest Fire Net is a publication of the European Center for Forest Fires (ECFF)

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European Center for Forest Fires

(ECFF)

More information available at:

http://www.gscp.gr/ggpp/site/home/independent/ECFF.csp

Forest Fire Net

Volume 7

"Recent Developments and Needs for Wildfire Fighting on the Ground: Tactics and Technologies"

10 June 2010

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Athens 2010

Contents **page**

Editorial

Fighting forest fires entails aerial and ground means. Equipment for ground forest fire fighting includes pumps, hoses, vehicles, water tankers and hand tools. Hoses are key elements in ground forest fire fighting and are primarily used for forest fire suppression; they can also be used for water transfer to water tankers. Important parameters for forest fire hoses from operational point of view are size (diameter, length), flexibility, heat resistance, abrasion and chemical resistance, weight, maintenance, storage and cleaning capacity. However, ground forest fire suppression has its own strategies and tactics. Ground means can be effective in fire suppression during all phases of a forest fire; pre-ignition, flaming, smouldering and glowing phases. FFNet Volume 7 is a special volume including the presentations of the teleconference entitled, *"Recent Developments and Needs for Wildfire Fighting on the Ground: Tactics and Technologies"* that took place on the 10th of June 2010. This conference has been organized by the National Technical University of Athens (NTUA), in the framework of the FP7 project "Fire Retardant Hoses Lines for Forestry Fire-Fighting Applications- FIRELI (No 222152), with the contribution of the Global Fire Monitoring Center (GFMC) (Conference Chair) and the European Center for Forest Fires (ECFF). Chairman of this Teleconference was Prof. Johann Goldammer, Director of GFMC. Main topics of the teleconference agenda were tactics and training in ground forest fire suppression in regard to safety of the fire-fighters, technologies and ground means, as well as end-users requirements. Representatives from the International Association of Fire and Rescue Services (CTIF), experts from the Forest Fires Commission, the Fire Management Competency Standards developed through support by EU Leonardo da Vinci (EUROFIRE), as well as UNECE / FAO Team of Specialists on Forest Fire and representatives from the Council of Europe participated in this event. The Teleconference was hosted by a central management unit for multipoint conference (MCU), using H323 and H320 IP standards. Software program NetMeeting was used for sharing presentations among participants. In addition, the videoconference was broadcasted through internet and attended by a significant number of interested parties from different EU countries (CY, CH, DE, ES, FI, FR, GR, IT, NO, SE, UA, UK); firefighters associations, fire specialists, civil protection representatives, fire hose manufacturers. A catalogue of ideas is summarizing proposals and experiences of participants. The exceptional technical support from the technicians in Max Planck Institute for Chemistry/Freiburg University and the National Technical University of Athens for the realization of the Teleconference is acknowledged.

Milt Statheropoulos

ECFF Director

FIACTU / NTUA

GFMC

UNU

ECFF

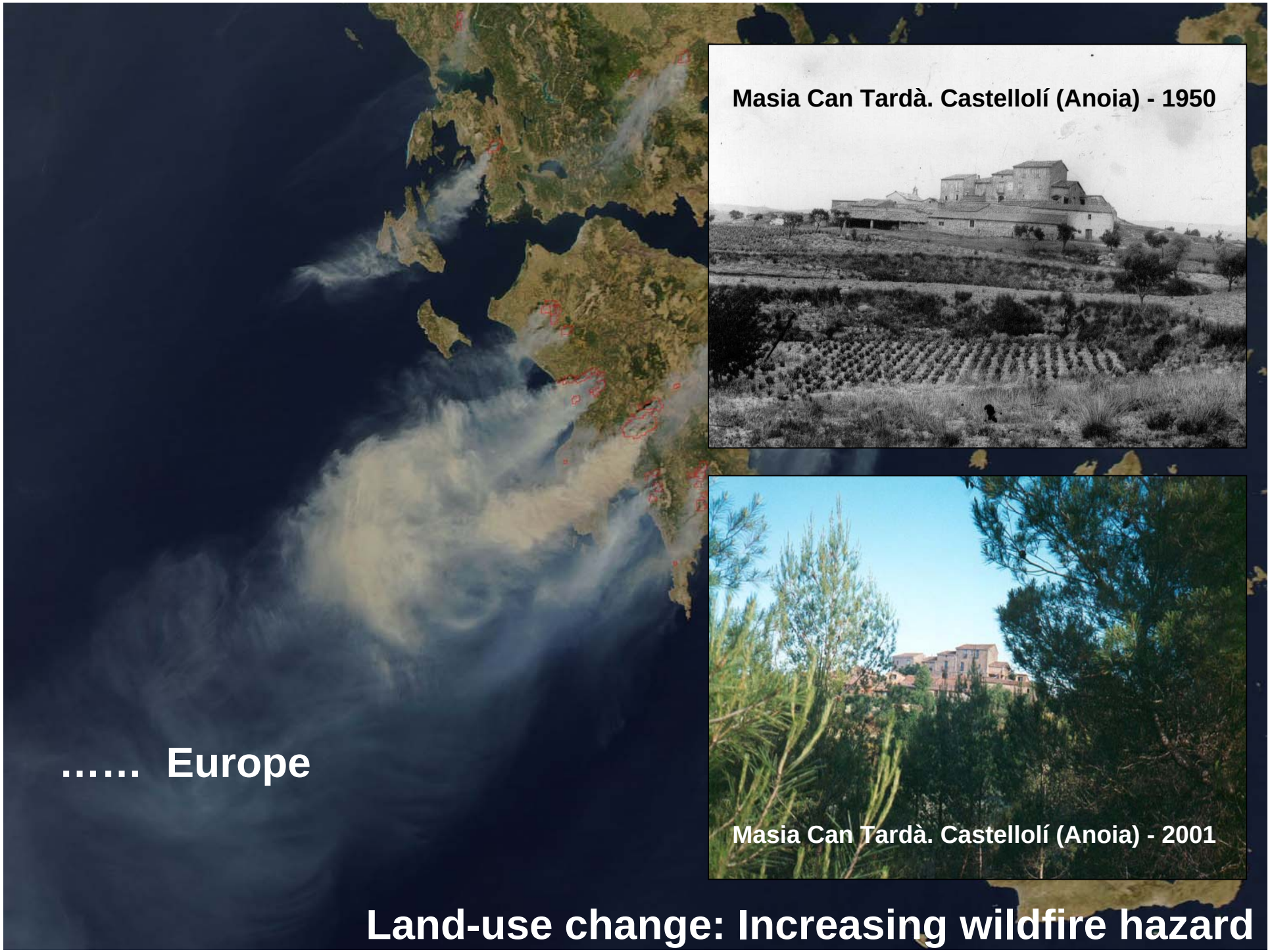
Introduction

Johann G. Goldammer,
Director of Global Fire Monitoring Center (GFMC)

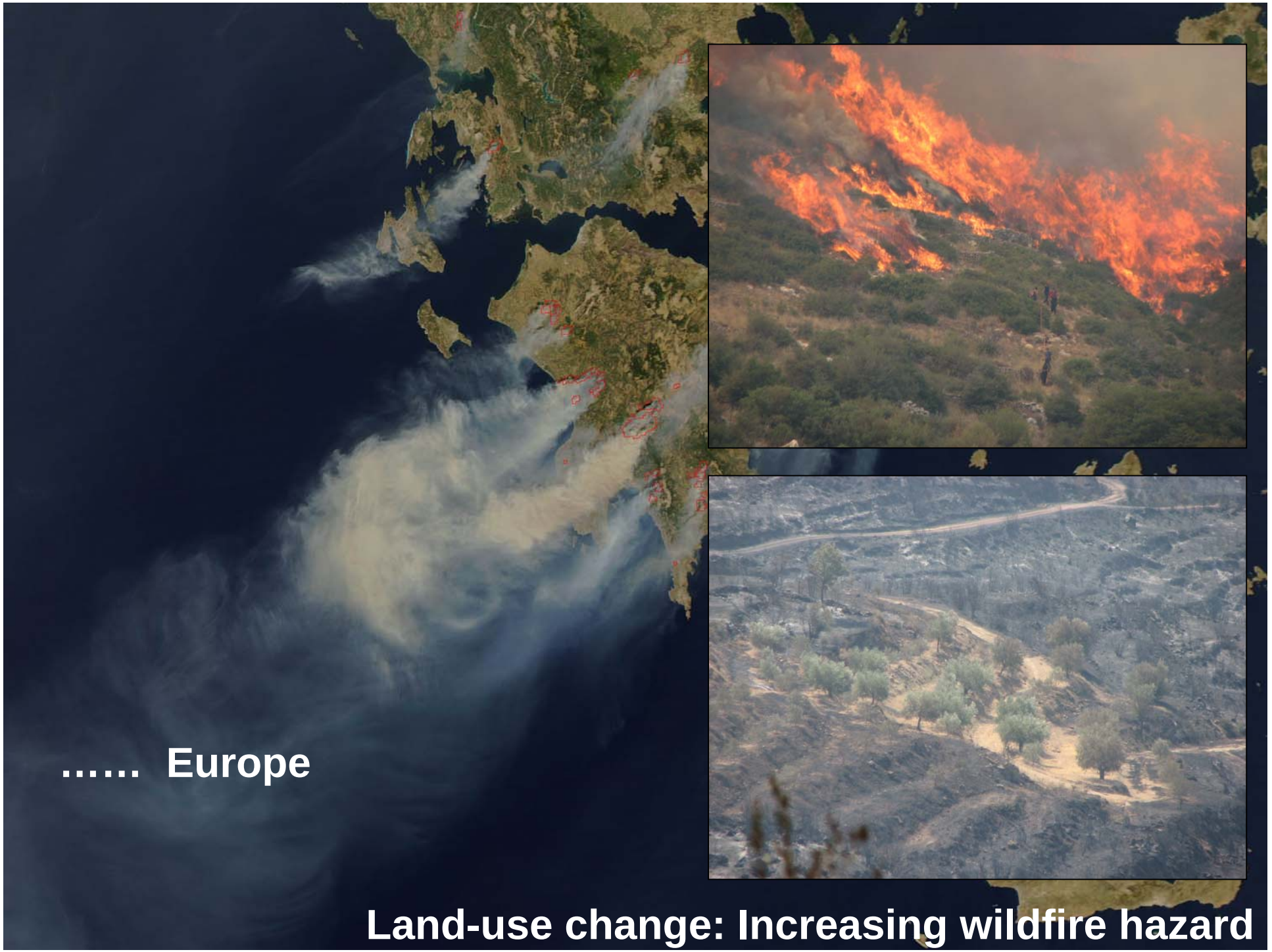

From California …..


…… and Australia


…… to Europe
Rural exodus and abandonment of land use



Land-use change: Increasing wildfire hazard


…… Europe
Land-use change: Increasing wildfire hazard


…… Europe
Increasing vulnerability of the wildland / urban interface


Marseille, France, 23 July 2009:
Largest wildfire in recent history, caused by military activities
(tracer bullet shooting by the Foreign Legion)

Structural developments in wildlands and at the wildland-urban interface

Building codes, fuel management ….

…. evacuations ….

…. aggressive aerial attack ….

Despite these efforts ….

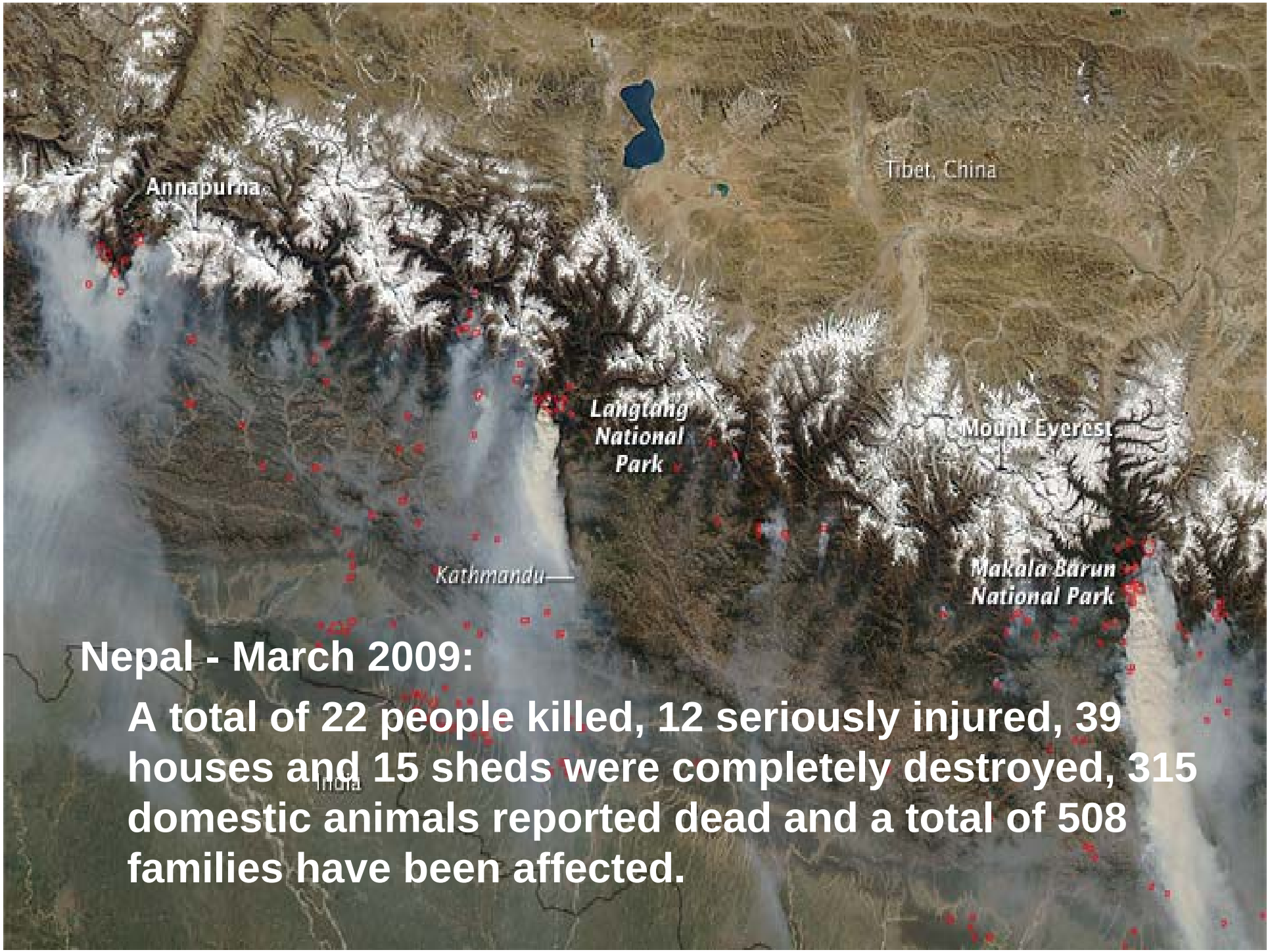

Spain, 21 July 2009
4 firefighters overrun and killed by a wildfire
Sardinia, Italy, 23 July 2009:
2 people killed by wildfires

The 2008 Global Wildland Fire Fatalities Report by the Global Fire Monitoring Center

- **350 fatalities worldwide**
- **Asia: 119 (China 94)**
- **Latin America: 12**
- **North America: 43 (USA: 42)**
- **Europe: 6**
- **Africa: 151**

The 2009 Global Wildland Fire Fatalities Report by the Global Fire Monitoring Center

- **369 fatalities – 160 injuries worldwide**
- **Asia: 91 – 35 injured**
- **Australia: 176 – 14 injured**
- **Latin America: 19 – 4 injured**
- **North America: 30 – 80 injured**
- **Europe: 11 – 20 injured**
- **Africa: 42 – 7 injured**



Nepal - March 2009:

A total of 22 people killed, 12 seriously injured, 39 houses and 15 sheds were completely destroyed, 315 domestic animals reported dead and a total of 508 families have been affected.

Towards enhancing international cooperation in managing extreme wildfire situations

- Eastern European, Near East and Central Asian States Exercise on Wildland Fire Information and Resources Exchange (EASTEX FIRE 2005)
- Fire-4
- European Union Forest Fire Tactical Reserve (EUFFTR)

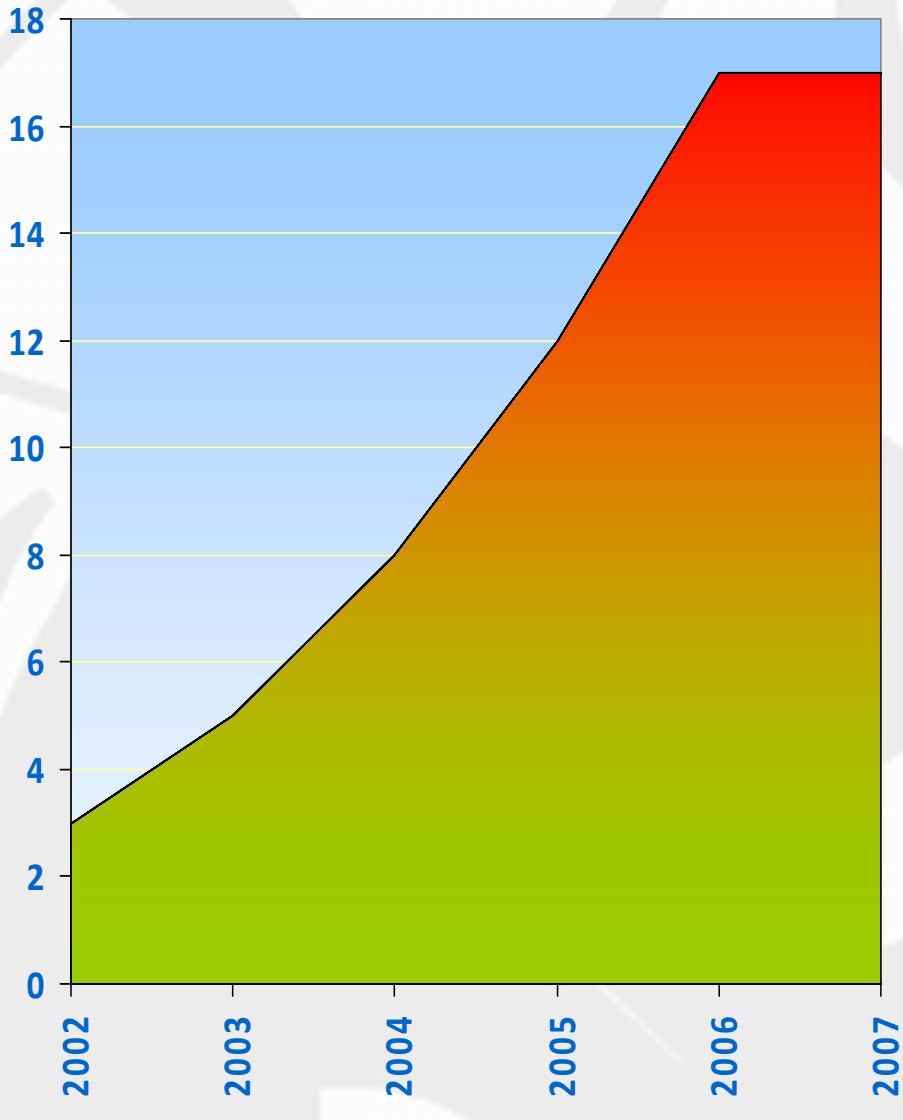
EU Civil Protection Mechanism

31 countries:

- 27 EU Member States
- Norway
  Iceland
  Lichtenstein
  Croatia

EU Civil Protection Mechanism

Activation increasing 2002-2009



Towards enhancing international cooperation in managing extreme wildfire situations

New transatlantic relationships:

- Demonstration missions and offers to support Europe's firefighting capabilities (July 2009)

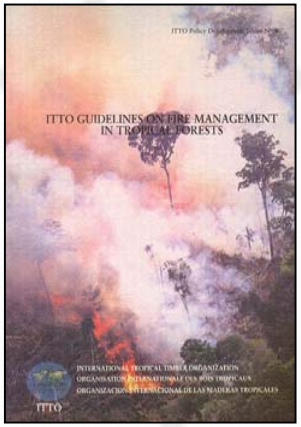
Towards enhancing international cooperation in managing extreme wildfire situations

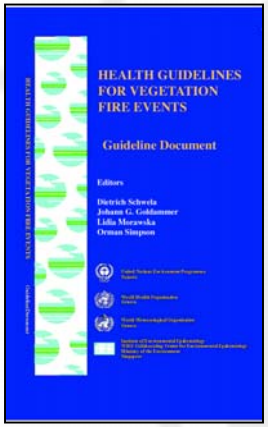
New transatlantic relationships:

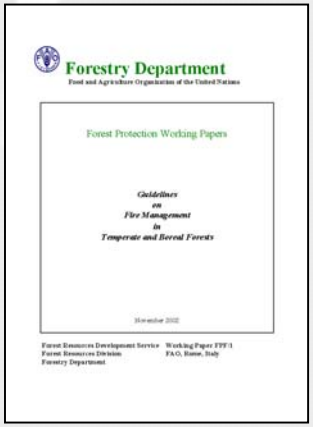
- Demonstrations in France, Spain and Germany

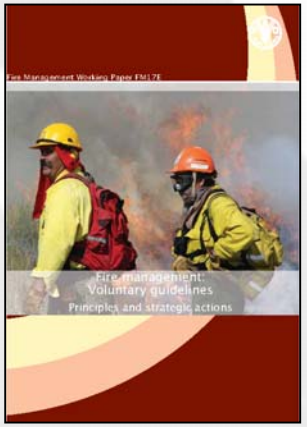
International Cooperation

Voluntary Guidelines for Fire Management: Support for policy and strategy development









International Voluntary Guidelines

- International Tropical Timber Organization (ITTO) Guidelines on Fire Management in Tropical Forests (1997)
- WHO / UNEP / WMO Health Guidelines for Vegetation Fire Events (1999)
- FAO Guidelines on Fire Management in Temperate and Boreal Forests (2002)
- UN Fire Management Voluntary Guidelines (2006)

International Cooperation

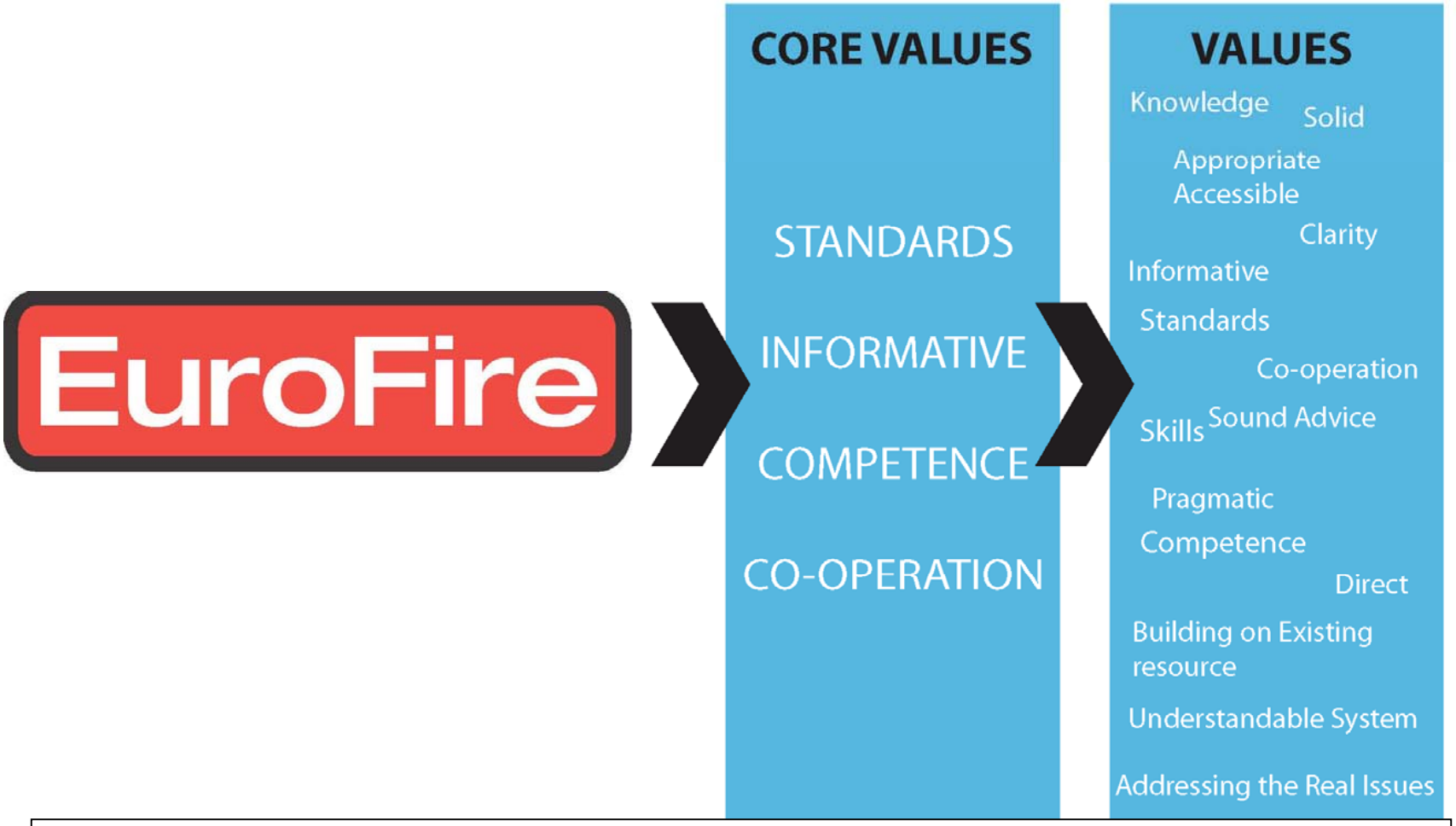
Capacity building in fire management:

First steps towards the development of internationally compatible standards and competency

A European approach towards enhancing inter-operability between nations and regions

EuroFire

EuroFire Values Results : Version 2 as 161107



Implementation: GFMC / CTIF – 2006-2009

http://www.euro-fire.eu/

Deficits in efficiency of International Cooperation: Deployment of firefighting aircraft to foreign countries – often not well coordinated with ground operations

Need to expand the EuroFire approach to the fire aviation community

International Cooperation: Development of coordinated approaches by international actors:

- coordination ground / air
- bilateral & multilateral
- protocols & agreements

First International Aerial Firefighting Conference, Athens, Greece, 2008:

Recommendation:

Creation of a "Fire Aviation Working Group“ that would fit in the UNISDR framework as an advisory committee

First International Aerial Firefighting Conference, Athens, Greece, 2008:

Principal objectives of the "Fire Aviation Working Group“ (I):

- **Sharing of information, especially safety related information**

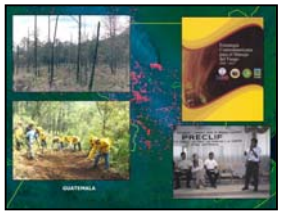
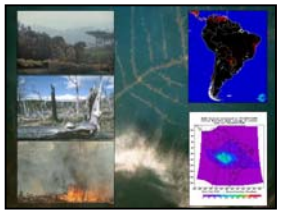
- **Agreeing and setting of consistent operating practices and standards, where appropriate, that would assist with improving safety, and with sharing of resources**

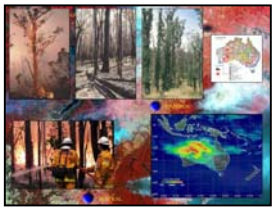
First International Aerial Firefighting Conference, Athens, Greece, 2008:

Principal objectives of the "Fire Aviation Working Group“ (II):

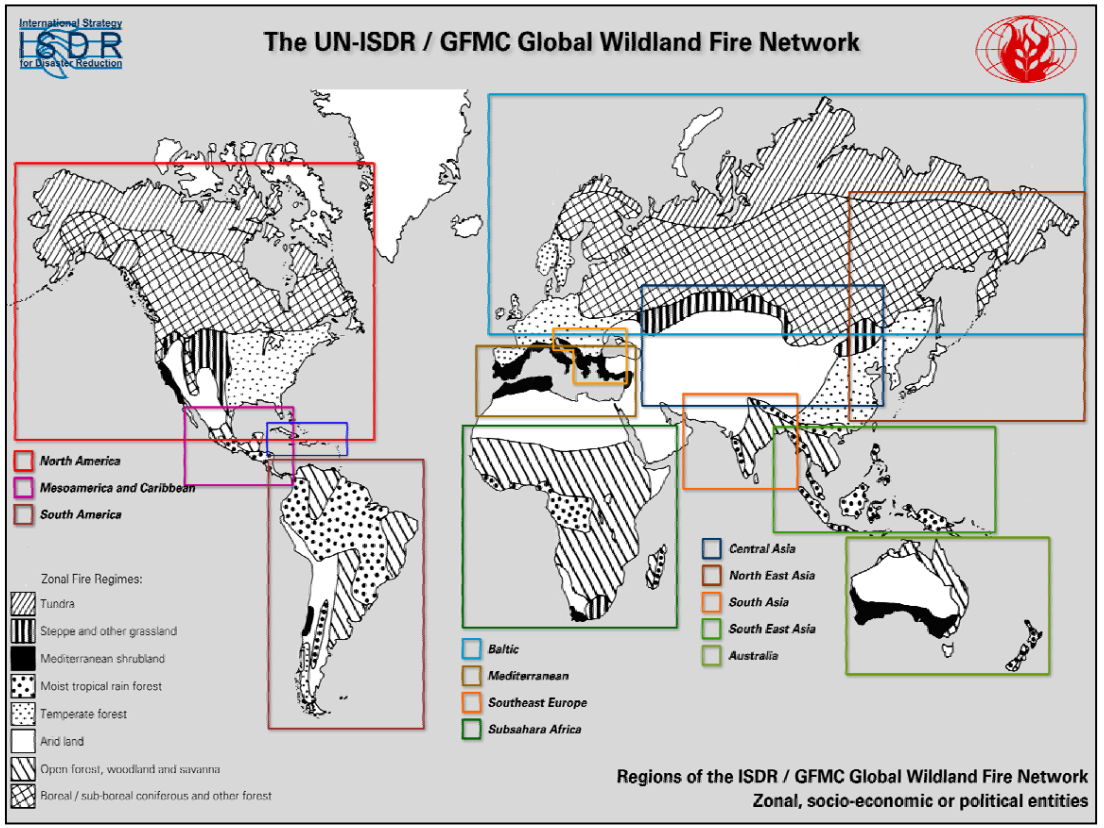
- **Providing a conduit or facilitation mechanism for the sharing of resources between jurisdictions**

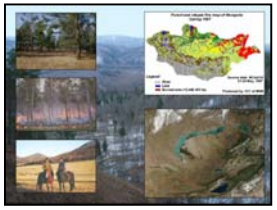
- **Providing advice to nations and the United Nations regarding fire aviation through the UNISDR Wildland Fire Advisory Group / Global Wildland Fire Network and**

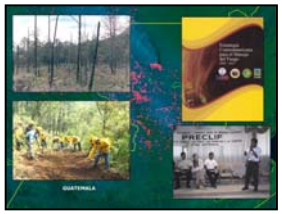
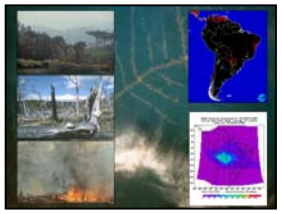


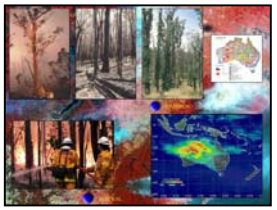


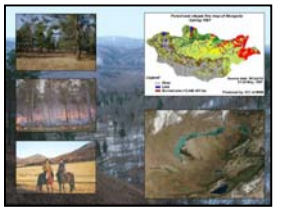



Cooperation within the UNISDR Global Wildland Fire Network

North America – Mesoamerica – South America – Caribbean – Mediterranean
Southeast Europe / Caucasus – Subsahara Africa – South Asia – Southeast Asia
Australasia – Northeast Asia – Central Asia - Baltic



WILDFIRE

The 5th International Wildland Fire Conference

2011

9-13 May 2011, Pilanesberg National Park – Sun City
South Africa

FIACTU / NTUA

GFMC

UNU

ECFF

Competency based training and Qualification System

Johann G. Goldammer,
Director of Global Fire Monitoring Center (GFMC)

EuroFire

EuroFire 1: A pilot project (2007-2009)

EuroFire has been developed to support:

- Fire-fighters
- Pilots
- The rural and land-based sector
- Sectoral organisations
- Education and training institutions

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CTIF

EuroFire

EuroFire Aims

Produce training material at a basic level to support:

- **Fire prevention**
- **Fire management**
- **Fire suppression**

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Limitations of “normal” fire service equipment

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EuroFire Objectives

- **Research and review competency-based wildfire training systems**
- **Identify best practice from Europe and around the world**
- **Inform the production of competency-based basic training**
- **Provide a basic level competency-based training resource that industry can use to update their knowledge, learn new skills and / or increase their understanding of wildfire management techniques**

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European Qualifications Framework (EQF)

- **Reference tool to compare qualification levels across national systems**
- **National qualification systems must be related to EQF by 2009, especially the “Levels”**
- **All “Europass” documents related to EQF by 2011**

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European Qualifications Framework (EQF)

- **Describe national qualifications using a "*learning outcomes*" approach.**
- **Enables industries, like fire management, that are common to all EU countries to work towards common standards & qualifications**
- ***"Subsidiarity"* applies, i.e. the EQF will be interpreted through National Qualification Frameworks in each country**

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Uses in Fire Management

- **Supports “mutual assistance” between regions and countries based on agreed competency standards & qualifications**
- **Supports process of matching employers needs with qualifications across Europe**
- **Can create a flexible framework that supports both core and elective competencies to allow different “fire regime” area, country and organisational needs to be taken into account.**

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Key Definitions

Learning Outcome	**Statement of what a learner knows, understands and is able to do on completion of a learning process, defined in terms of knowledge, skills and competence**
Knowledge	**Body of facts, principles, theories and practises that is related to a field of study or work. Can be theoretical or factual.**
Skills	**Ability to apply knowledge & know-how to complete tasks & solve problems. Can be cognitive or practical.**
Competence	**Proven ability to use knowledge, skills & personal abilities. Described in terms of responsibility & autonomy (level descriptors)**

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Key Definitions

- **Competency standards are:**
  - **Description of performance, knowledge, skill and range (scope) for a work activity at a level**
- **Called different names in different countries**
  - **National Occupational Standard (UK)**
  - **Unit Standard (New Zealand)**
  - **Units of Competency (Australia)**

EuroFire

Results: EuroFire Training Support

- **Website information portal for international resources www.euro-fire.eu**
- **Competency / training standards for core vegetation fire activity**
- **Training materials, downloadable or on CD Rom / pen drive (public domain)**

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Results: Standards and Training Modules

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Results: Standards and Training Modules

Unit EF1: Ensure that your actions in the vegetation fire workplace reduce the risks to yourself and others

Unit EF2: Apply techniques and tactics to control vegetation fire

Unit EF3: Communicate within a team and with supervisors at vegetation fires

Unit EF4: Apply hand tools to control vegetation fires

Unit EF5: Control vegetation fires using pumped water

Unit EF6: Apply vegetation ignition techniques

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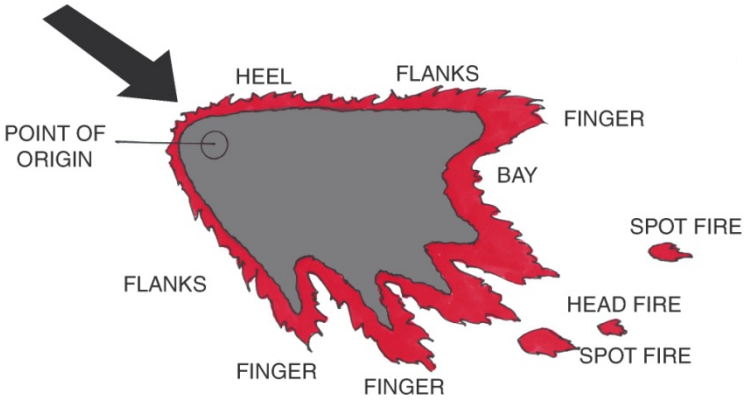
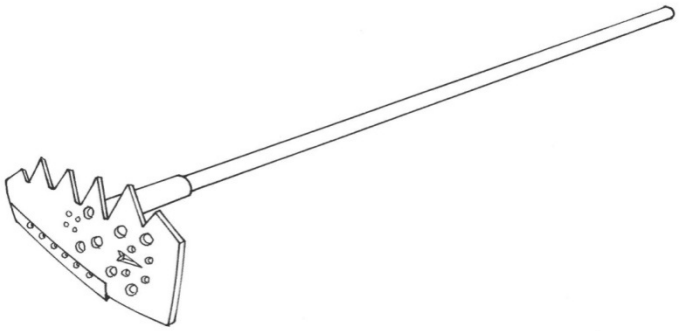
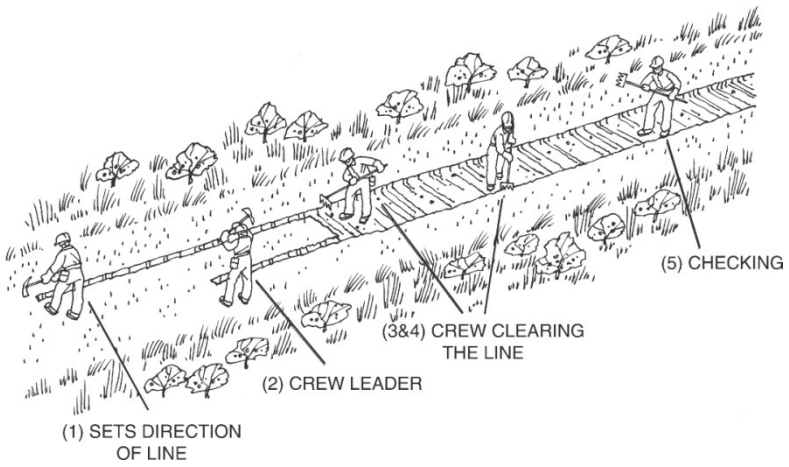
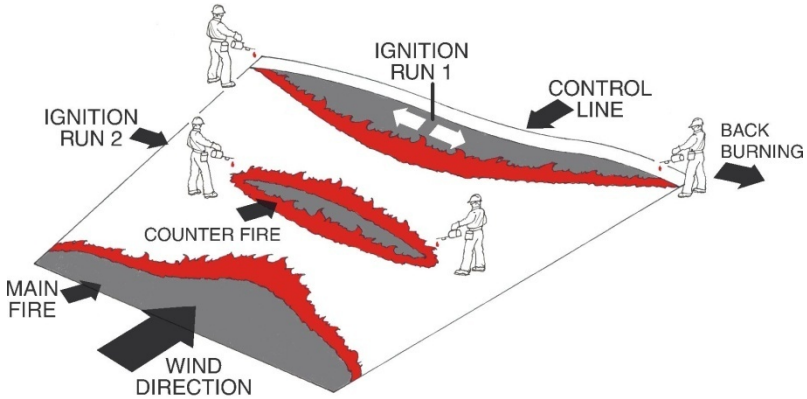
Results: Standards and Training Modules









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Outline of a Qualification System

- **Levels**
- **Competency standards**
- **Assessment of learning outcomes**
- **Training**
- **Qualifications**
- **Quality assurance**

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Proposed Levels 1-5 (simplified)

1	Introduction	Assist
2	Basic	Do / Support
3	Advanced	Supervise
4	Commander	Manage
5	Director	Decide

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Assessment of learning outcomes – generating evidence of competence

- Performance evidence
- Knowledge evidence
- Accreditation of Prior Learning

EuroFire

The Assessors' Role

- **Assessors collect evidence to judge whether a candidate has reached the competency standard.**
- **3 potential judgements: competent, partially / not yet competent, or insufficient information.**
- **The process often starts with an interview to identify a candidates current competence and the training needed to reach the standard**

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Progression of Learning

- **Induction**
- **Learning**
- **Development**
- **Competent practice**

----------Assessment----------

- **Excellence / professionalism**

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Vocational Qualifications (VQ´s)

- **Regulated by national authorities.**
- **Delivered by an awarding body**
- **Through an Assessment Centre**
- **By an Assessor**

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Quality Assurance

- **Competency standards designed by industry – to be fit for purpose**
- **Assessors and trainers are qualified, to their competency standards & subject qualification**
- **Internal and external verification and moderation of qualifications (balancing)**

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EuroFire

Conclusions from EuroFire 1

- **Competency based training, standards & qualifications are part of a balanced system.**
- **The context of the organisations working together to create standards is important**
- **Language, definitions and translation will be key issues affecting success!**

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EuroFire

Conclusions from EuroFire 1

First experiences: Multinational training course in Georgia – in Russian language (June 2009)

Курс обучения управлению пожарами – Южно-Кавказский регион
Проводится в рамках проекта ЦГПМ / ИБОС
«Усиление национальных возможностей по управлению пожарами и снижению риска их возникновения на Южном Кавказе»
Боржомский национальный парк, Грузия, 24-26 июня 2009 г.

EuroFire

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EuroFire

Conclusions from EuroFire 1

First experiences: Multinational training course in Georgia – in Russian language (June 2009)

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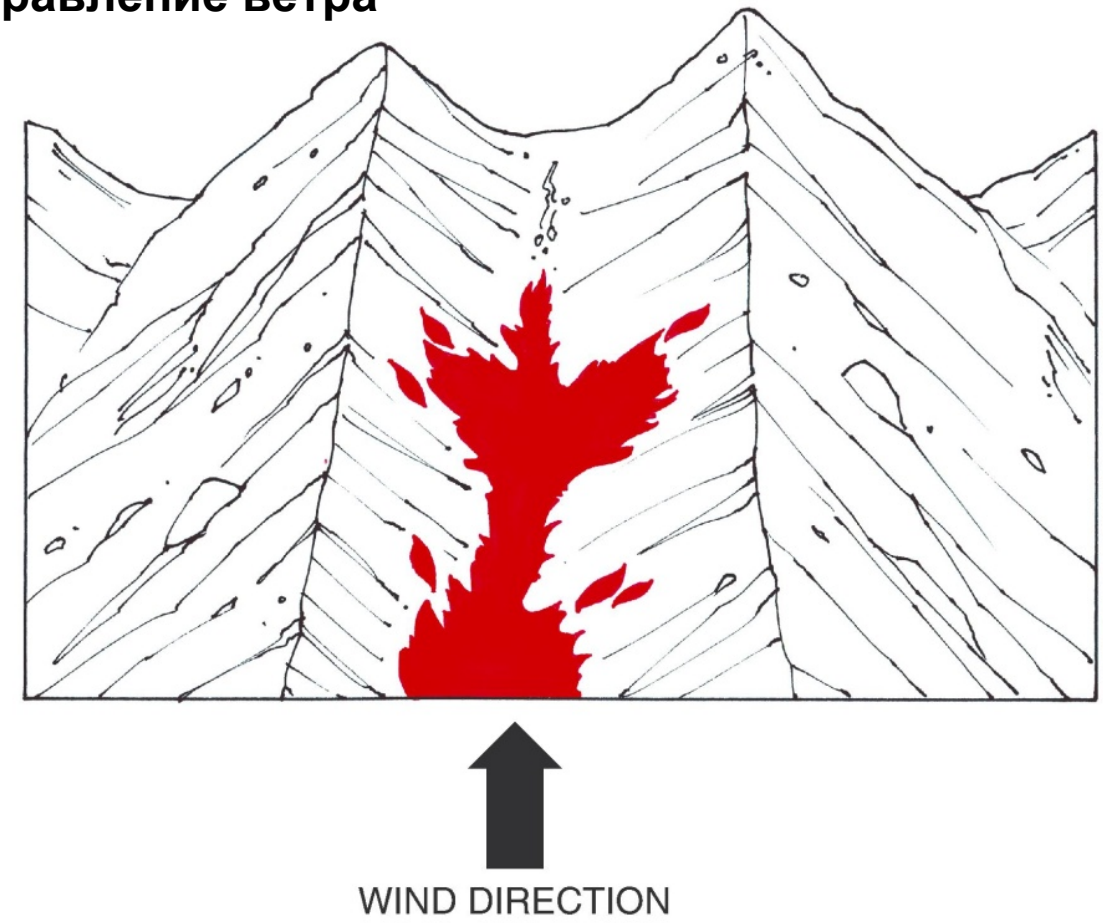
Направление ветра

Эффект дымовой трубы



В узких крутых долинах тепловая конвекция, склон и ветер могут объединиться и создать чрезвычайное поведение пожара - эффект дымовой трубы (самотяга) с большими скоростями распространения и увеличением пятнистого возгорания.

Пожарные могут оказаться в ловушке.

Персональная защитная экипировка должна защитить от:

-Физической травмы

-Воздействия высокой температуры

-Накопления метаболического тепла

Одежда для борьбы с огнем:

-Безопасный шлем и одежда

-Толстая рубашка и длинные брюки из толстой ткани или противопожарный комбинезон

-Ботинки с шерстяными носками

-Шерстяное и хлопчатобумажное нательное белье

Отряд монгольских пожарных в защитной экипировке, 2008 г.

ЦЕЛЬ ЛЕСНЫХ ПОЖАРНЫХ – ЭТО ЗАЩИТА:

- человеческой жизни, прежде всего, пожарного
- поселения
- собственности
- природных ресурсов


EuroFire
EF 6
Применение методов
зажигания растительности

EuroFire 2

Outlook: EuroFire 2 – the way ahead

Phase I	Phase II
Wrap up of EuroFire 1 Standards & training modules level 3, 4 + 5 Translations into other EU languages	Field test phase: Training + Assessment (partners: Northumberland FS, GRAF, GAUF, GRAFF) Preparation of an International Crosswalk Initiative
Certification, assessment & evaluation, accreditation processes (EQF), Development of a qualification system	Establishment of an European Wildfire Coordinating Group (partners: NWCG, SA ICS Working Team)

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EuroFire 2

Outlook: EuroFire 2 –Qualifications to be developed

- **Ignition Specialist - Tactical fire operations**
- **Fire Analysis – Fire behaviour signature prediction**
- **Prescribed Burning Planning**
- **Preventive Fire Planning**
- **Fire Weather Prediction & Analysis**
- **Pilot Training**
- **ICS Working Team**

Leonardo da Vinci

CTIF

Thanks to the EuroFire Partners

- **EU Leonardo**
- **GFMC Team, UN / Germany**
- **Firebreak Services, UK**
- **Rural Development Initiatives, UK**
- **GRAF, Spain**
- **Fire Paradox Project, EU**

FIACTU / NTUA GFMC WORKING ON FIRE INTERNATIONAL UNITED NATIONS UNIVERSITY UNU ECFF

Some thoughts on tactics by Global Fire Monitoring Center and Working on Fire (WoF)

Johann G. Goldammer,
Director of Global Fire Monitoring Center (GFMC)

Fire Behaviour Analysis

- **To implement tactics that work**
- **To avoid tactics that are dangerous**


Bombeiros

The “most important” to know about a wildfire

- **Predicted rate of spread?**
- **Predicted flame length?**

and / or ?

- **When and where fire behaviour will change?**

Questions to ask:

- **When and where a fire will change?**
- **When and where we will be in control of the fire ?**

Ask yourself and your colleagues

- **Why some fire fighters seem to know what fire will do - while others don’t?**
- **Where have they aquired this knowledge? Lessons - or experience?**
- **How long it took them being good in fire prediction?**
- **How many times they couldn’t explain their intuition and they failed to change tactics?**

OBSERVATION

- **To know where and when the fire will change**

- **So:**
  - **When and where will it be dangerous and beyond our threshold of control**
  - **When and where will it be safe and within our threshold of control**

The Campbell Prediction System - CPS

Rationale - I

Wildland firefighters face variations in fire behaviour that can be predicable, but unfortunately, **too many fire fighters lack the training and knowledge to foresee these changes**, resulting in unsafe and / or ineffective tactics that can lead to burn-over accidents and / or the inefficient use of resources.

The Campbell Prediction System - CPS

Rationale - II

The development of a **reliable prediction system** that would mitigate these problems drew upon the **first hand experiences** of seasoned firefighters, **investigating** the commonalities in burn-over accident reports, **analyzing** fire weather and fuel moisture concepts …….

The Campbell Prediction System - CPS

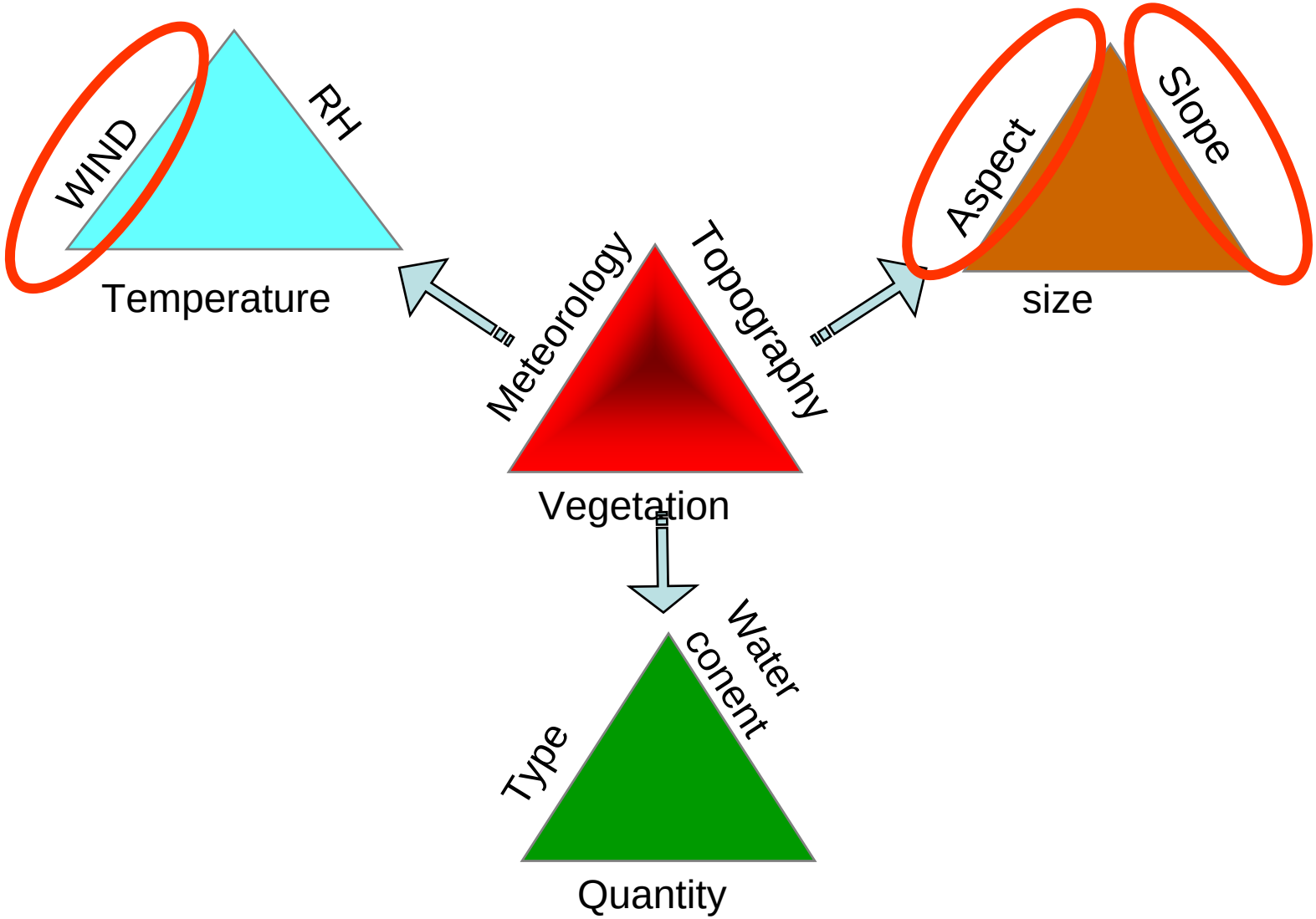
The **CPS** has been developed to explain

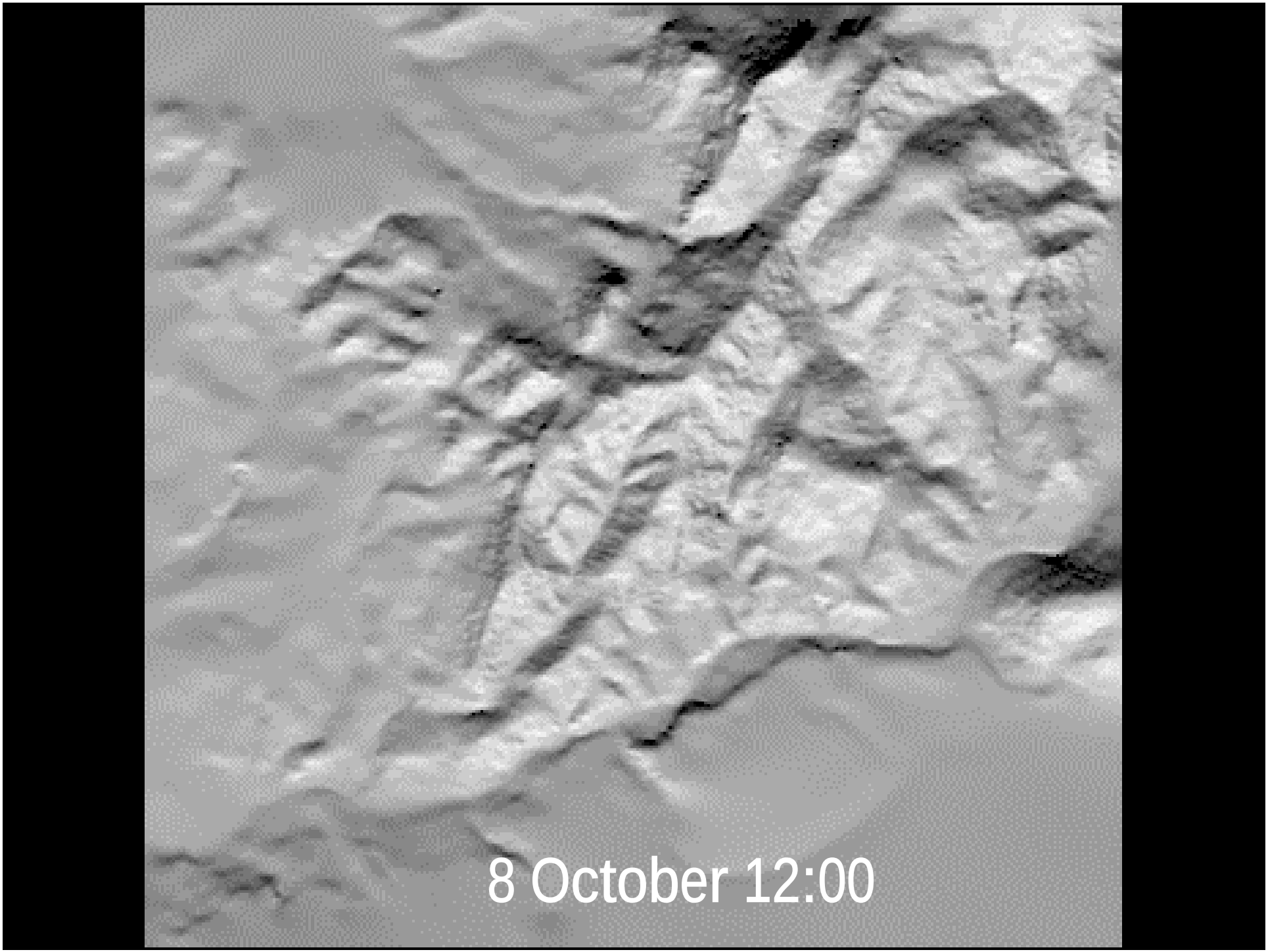
- how firefighters can make predictions of fire behaviour changes that may occur at any time, and
- make these predictions while on the fireline

The CPS enables the firefighter to:

- **Identify and use the correct information to make fire behaviour predictions**
- **Explain how you arrived at your prediction of fire behaviour change**

The CPS Factors

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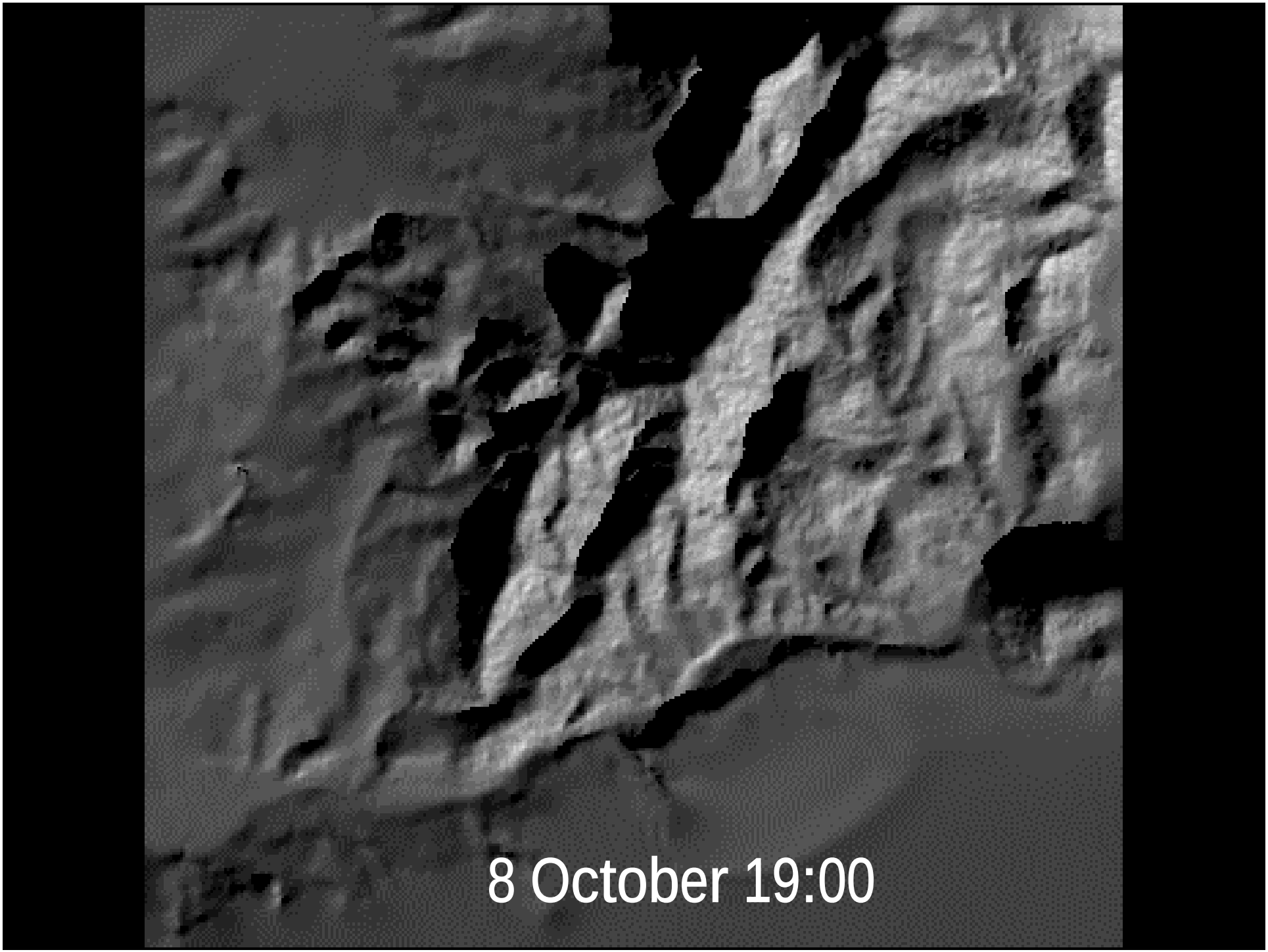
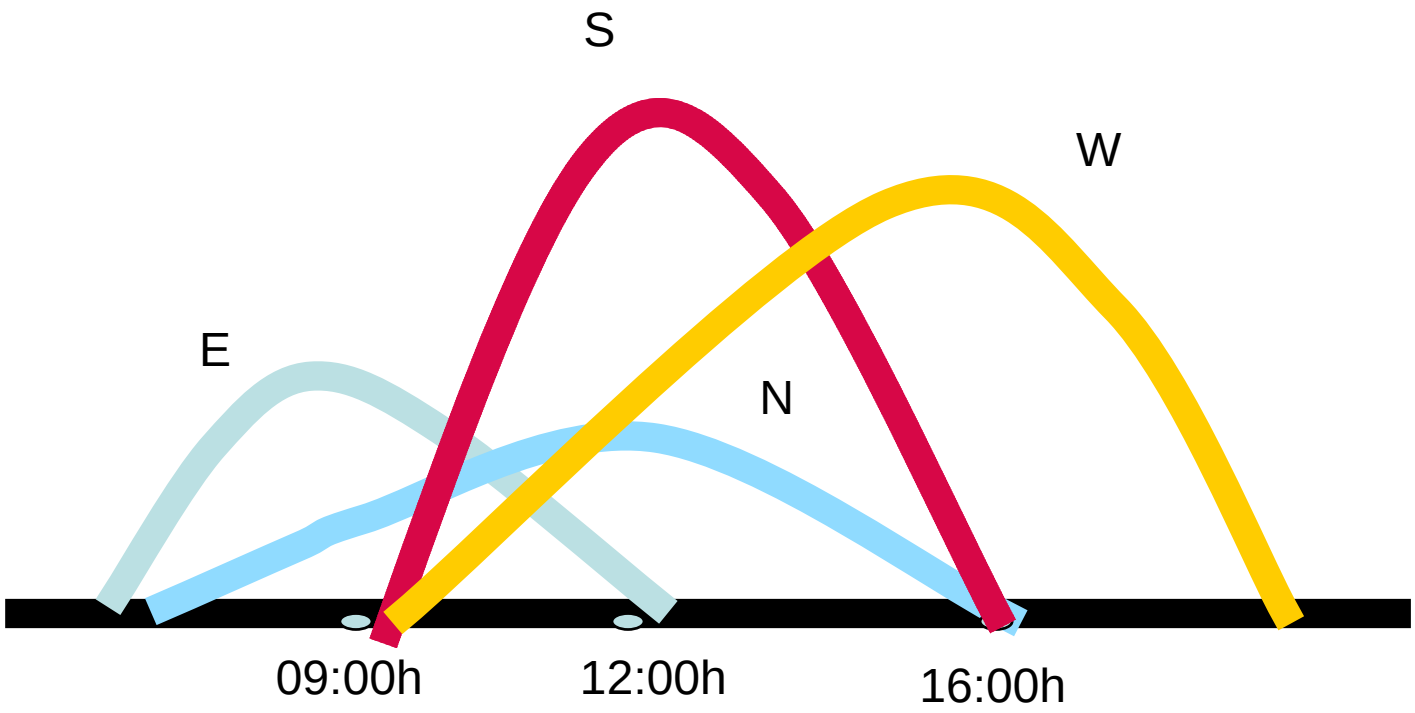

8 October 19:00

The hourly variation of solar radiation



Morning

Noon

3 p.m.

6 p.m.

Fuel flammability and fire signature variation on a daytime topography fire
Source: http://www.dougsfire.com/articles/html/cps_working_paper.html

The Logic (CPS)

- **“Alineation” of factors:**

  - **» 0 / 3 out of alignment**
  - **» 1 / 3 small alignment**
  - **» 2 / 3 medium alignment**
  - **» 3 / 3 full alignment**

BETTER or WORSE ?

- **The fire behaviour is going to a better or a worse scenario ?**

- **What kind of factors influencing fire behavior, will change the situation ?**

To Decide the TACTIC

- How to attack the **situation?**
- Is this tactic **safe** and **effective?**
- Do we apply the professional **ethic?**
- Can we explain **why** this will work?

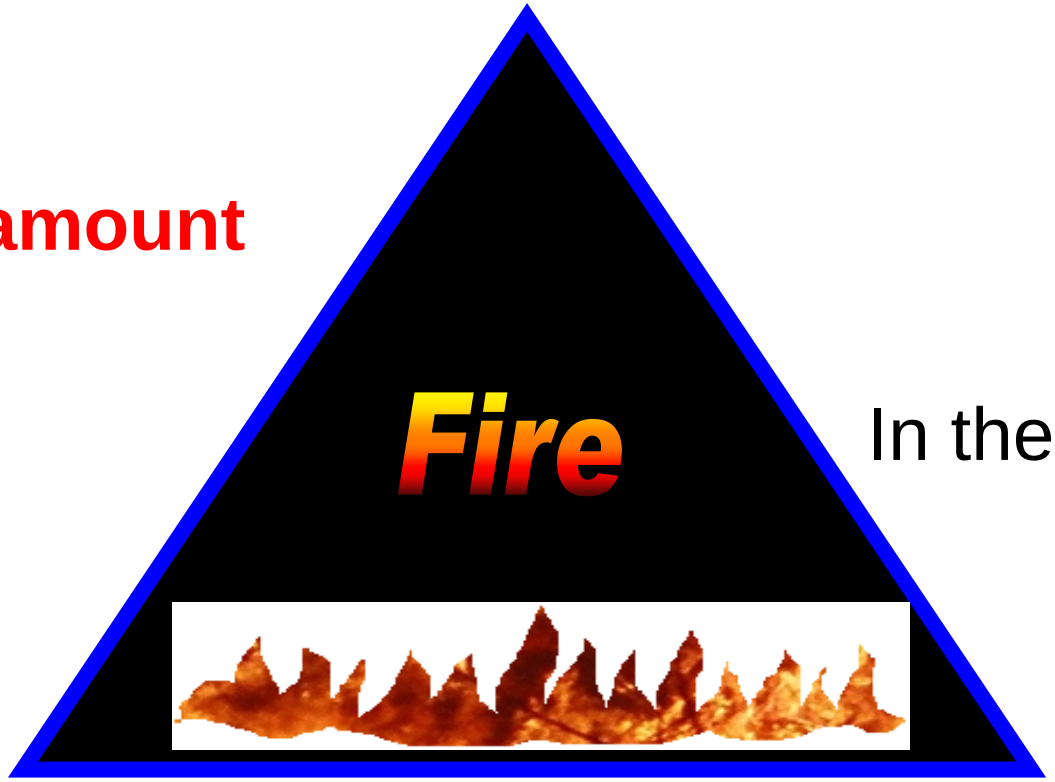
What is the fire telling you?

- The combination of factors (fuel, topography, meteorology) are influencing fire behaviour….

Basics: Application of water - It´s not that easy ….

Water Triangle

The **right amount**



In the **right form**

At the **right place!**

Experiences:

“Years of Service” do not translate into (fire) Experience…..”

You can fly helicopters for 20 years and still not understand wildfire.

At the following fire scene…where would you bomb as a pilot?

Another quick example:

FOREST FIRES COMMISSION

Technique and Tactics of fire fighting on the ground

JUNE 2010

Daniele Ryser, Swissfire

Introduction

In Southern Switzerland (Cantone Ticino) all the firemen are trained in forest fire fighting.

Every fireman as the necessary technical training to work at the front of fire on the ground.

The officers became a special training in the tactics and are habilitated to the function of chief of intervention.

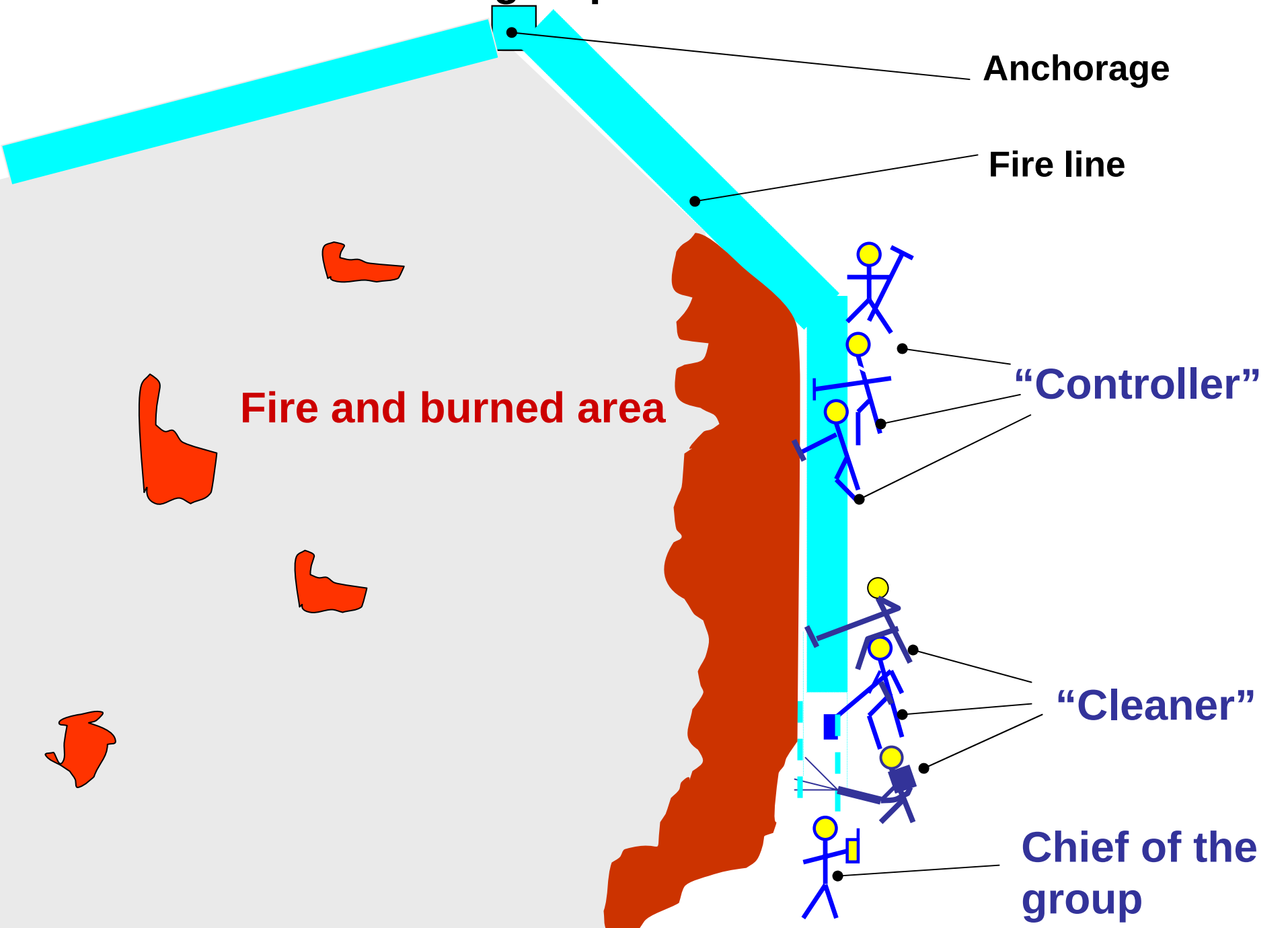
Technical principles

The fire fighting can be direct or indirect.

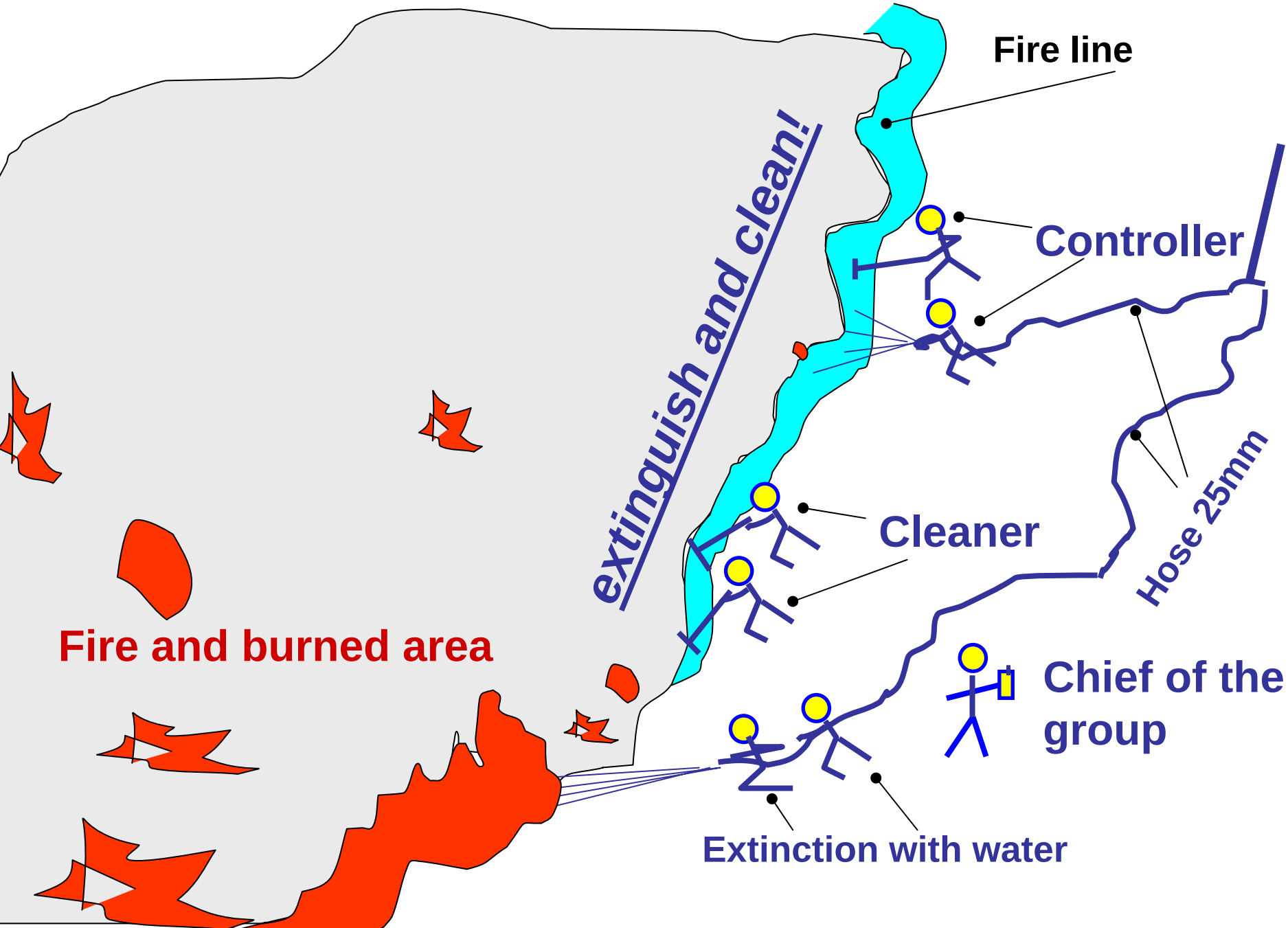
To fight directly is possible only when:

- **the firemen are sufficiently equipped,**
- **the terrain allow a good accessibility,**
- **the extinctions limits (fire lines) are sure enough long time after the extinction.**

Firemen group: direct extinction



Firemen group: direct extinction with water

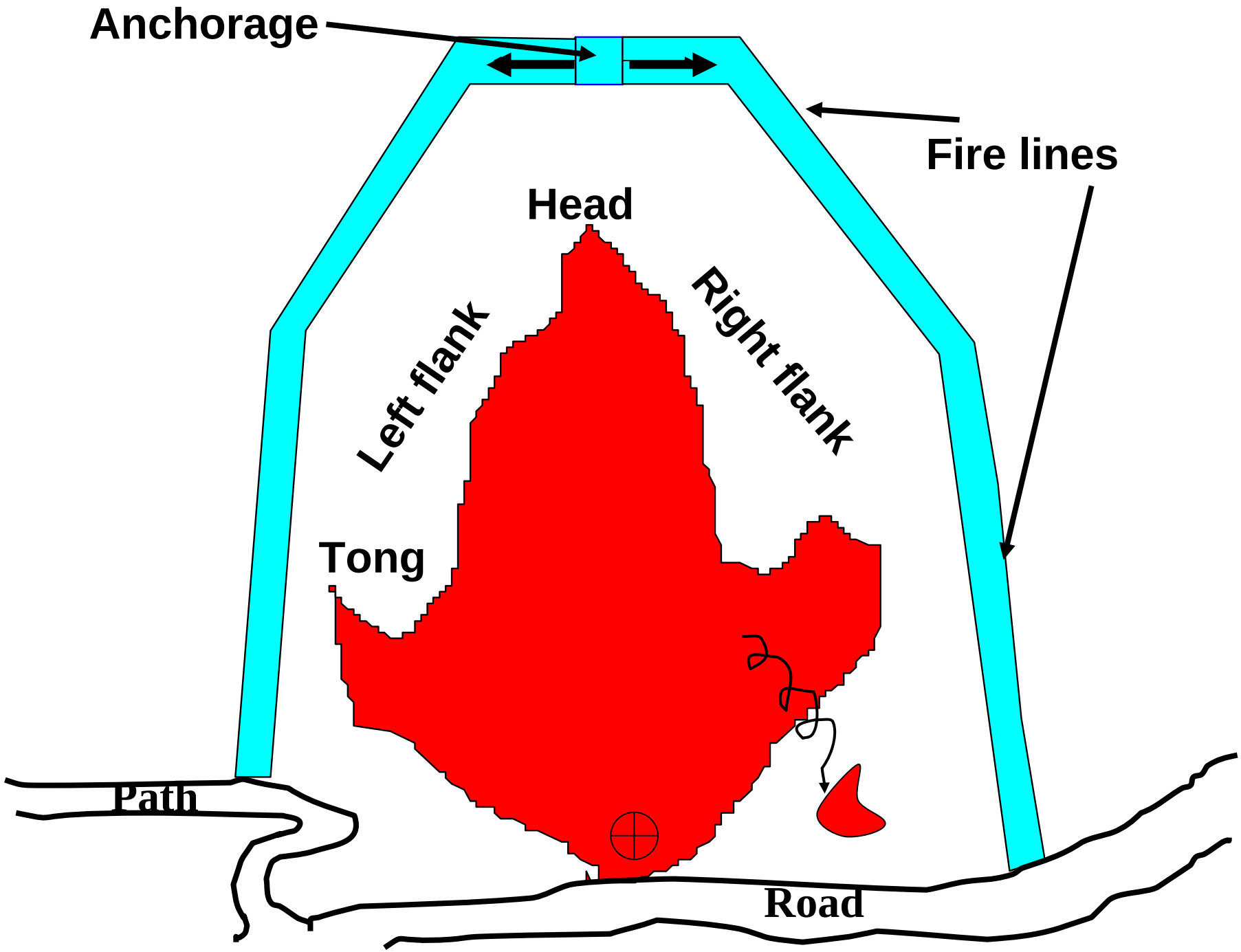


To fight indirectly a fire require a planning.

It must identify a point of anchorage far enough from the main front (head) of fire to have the time necessary to organise the extinction groups and to trace fire lines that are sure and accessible to the firemen.

This technique must combined with the backfire.

It needs good trained people and a perfect coordination with the chief of intervention (radio connection).


Anchorage
Fire lines
Head
Left flank
Right flank
Tong
Path
Road

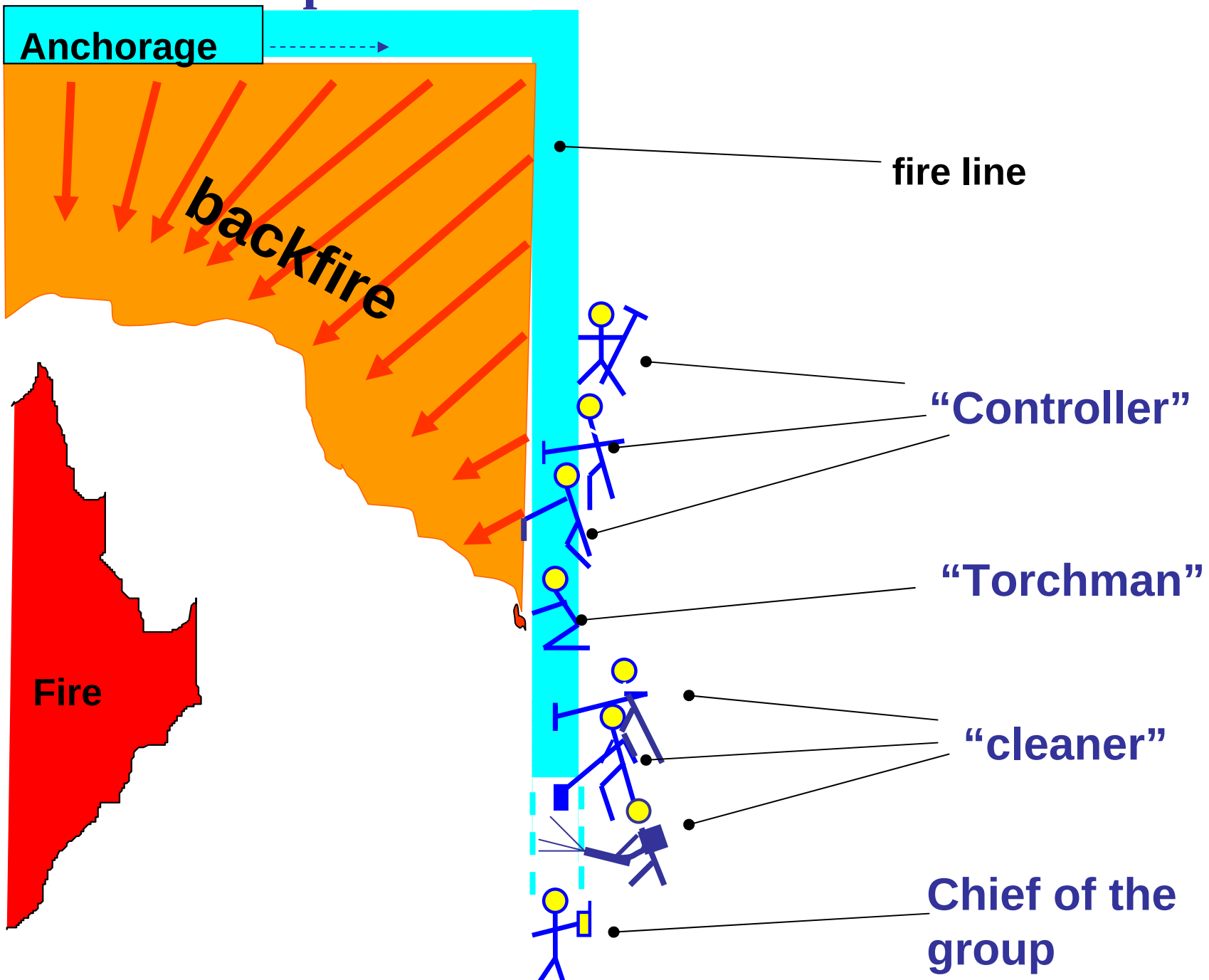
Fire Lines

Fonte: Servizio forestale Cantone Ticino VI Circondario

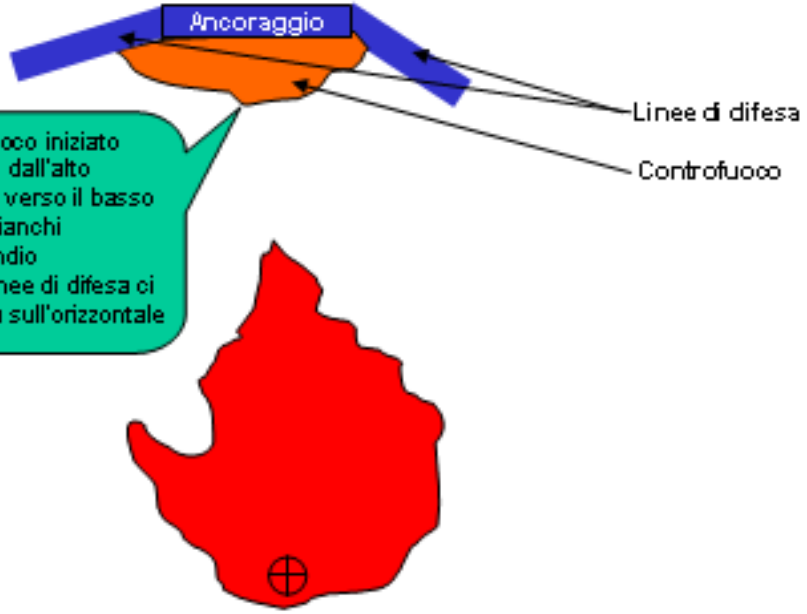
Backfire

Fonte:
Servizio forestale
Cantone Ticino
VI Circondario

Firemen Group: indirect extinction and bachfire



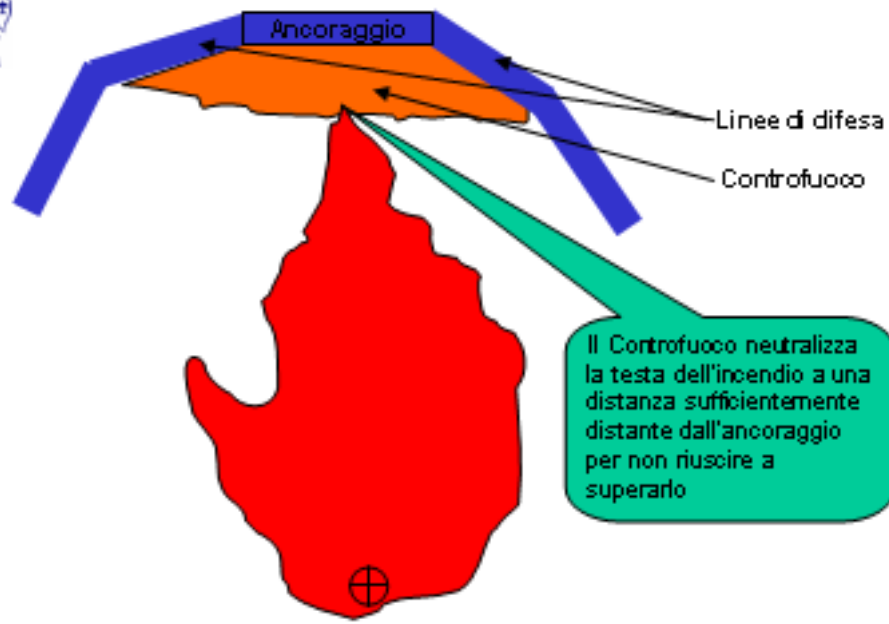
CONTROFUOCO



Controfuoco iniziato partendo dall'alto andando verso il basso sui due fianchi dell'incendio
Con le linee di difesa ci si allarga sull'orizzontale

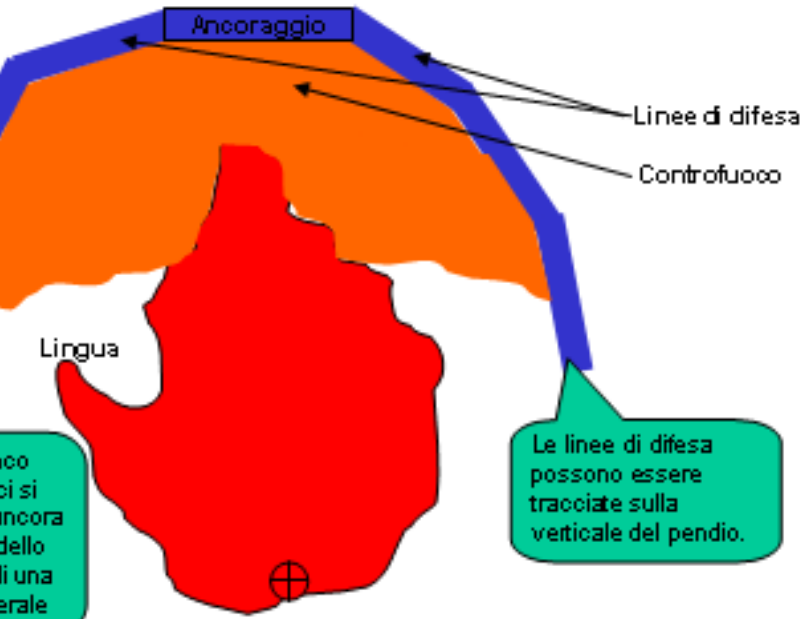
Corpo Pompieri Novaggio

CONTROFUOCO



Il Controfuoco neutralizza la testa dell'incendio a una distanza sufficientemente distante dall'ancoraggio per non riuscire a superarlo

CONTROFUOCO

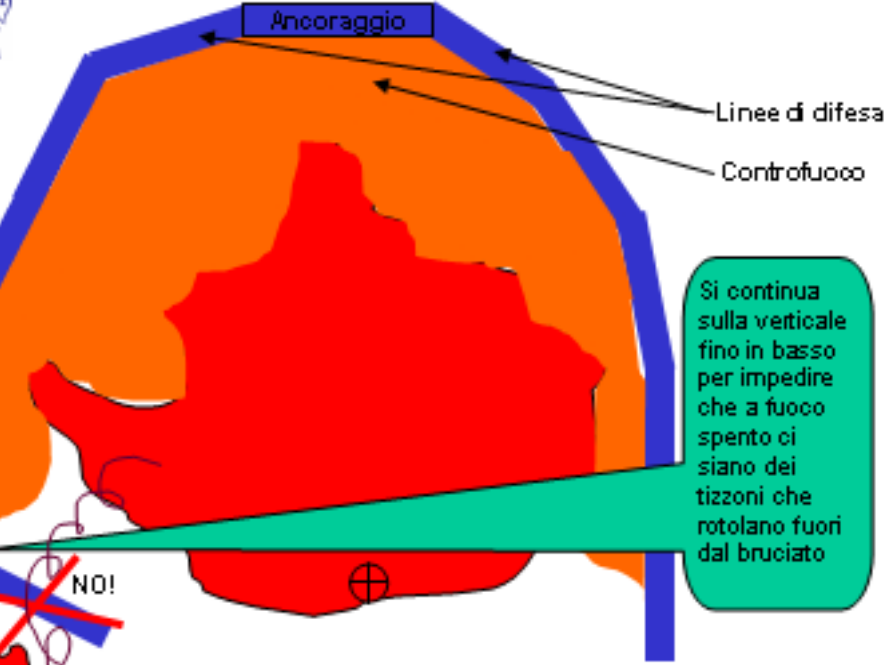


Sul fianco sinistro ci si allontana ancora a causa dello sviluppo di una lingua laterale

Le linee di difesa possono essere tracciate sulla verticale del pendio.

Corpo Pompieri Novaggio

CONTROFUOCO



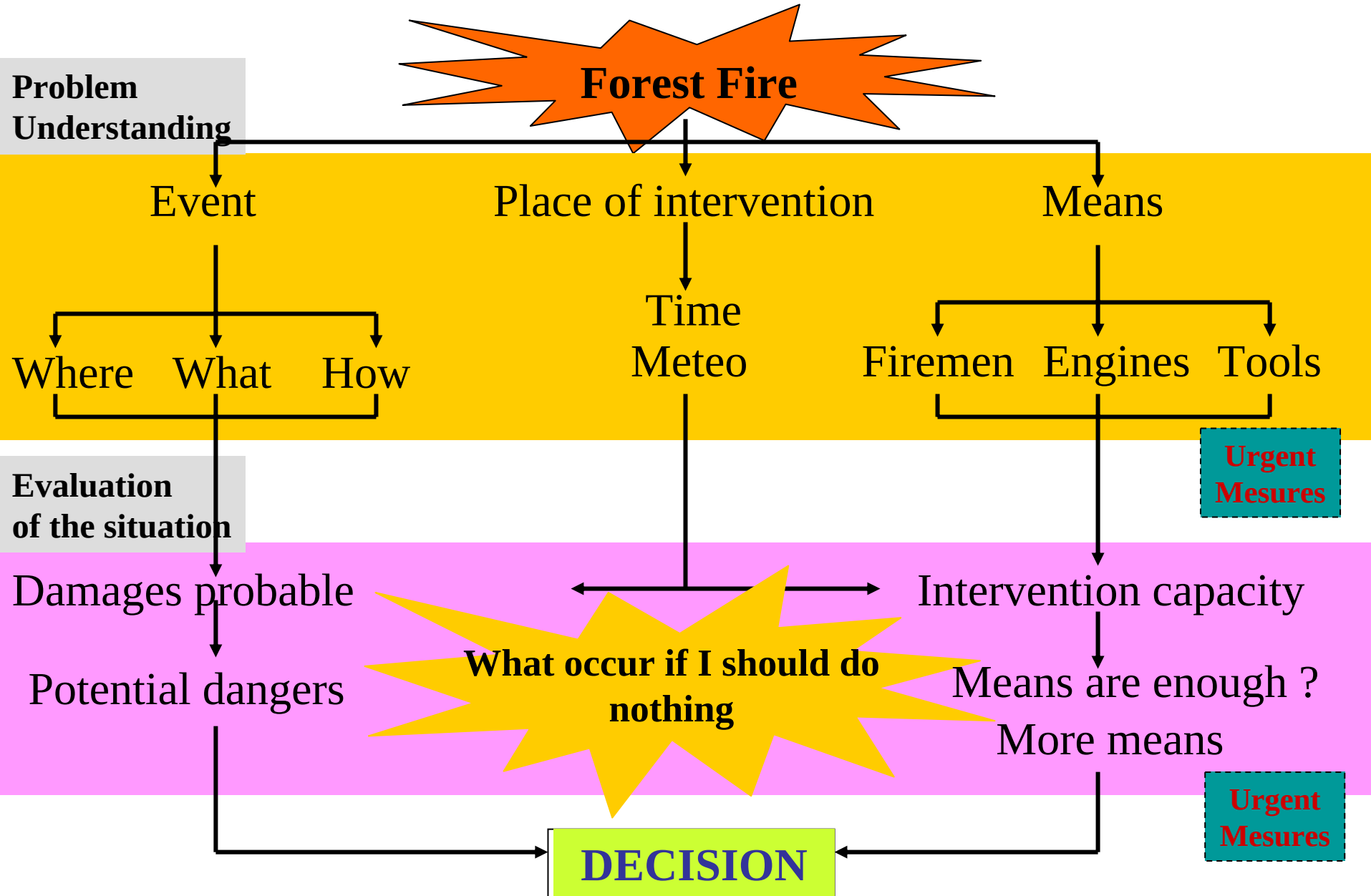
Si continua sulla verticale fino in basso per impedire che a fuoco spento ci siano dei tizzoni che rotolano fuori dal bruciato

Tactics

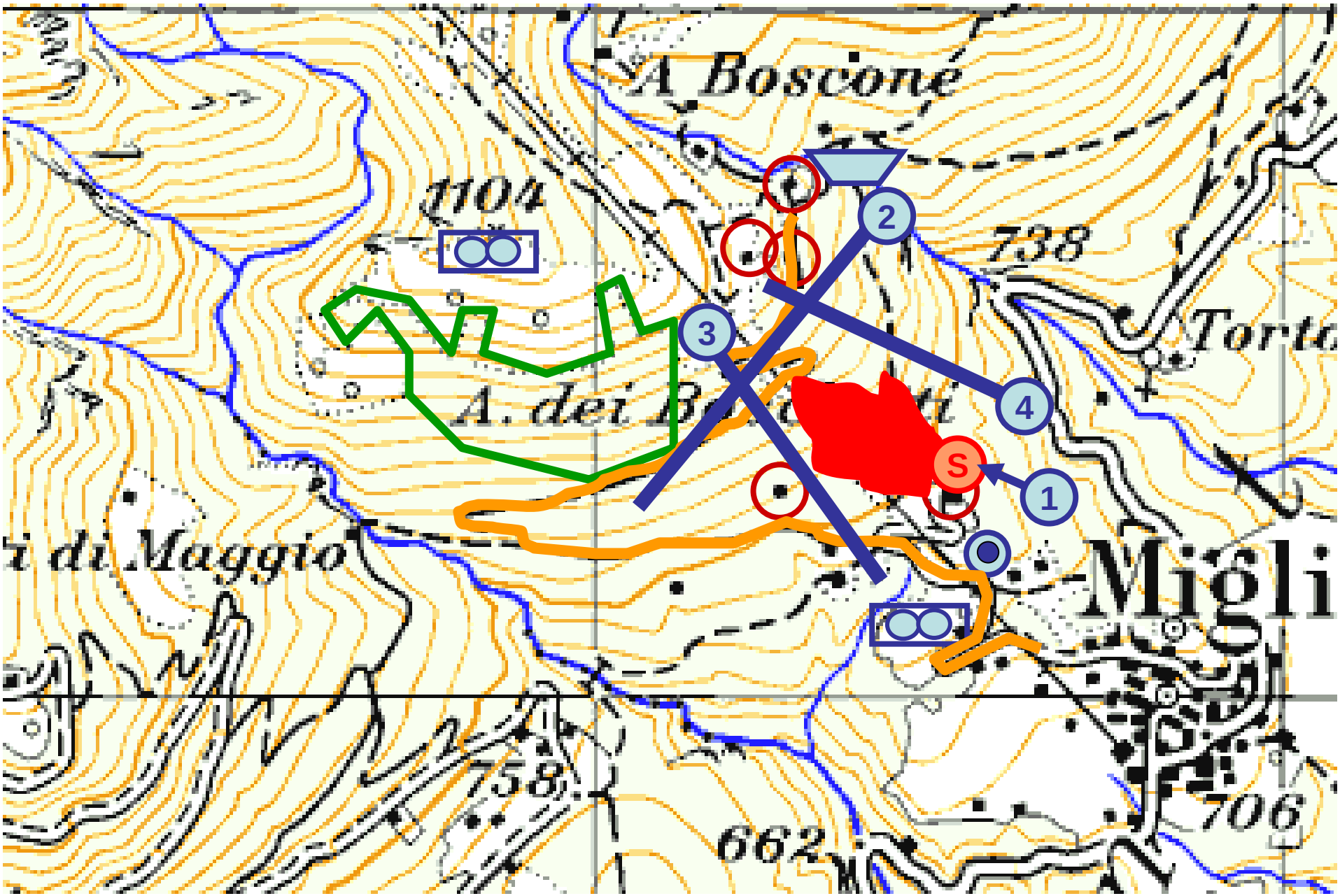
The chef o intervention must have or acquire rapidly a good knowledge of the terrain (slopes, vegetations, winds, menaced peoples, animals and objects, ….).

That allow to take urgent measures and to take the first decision.

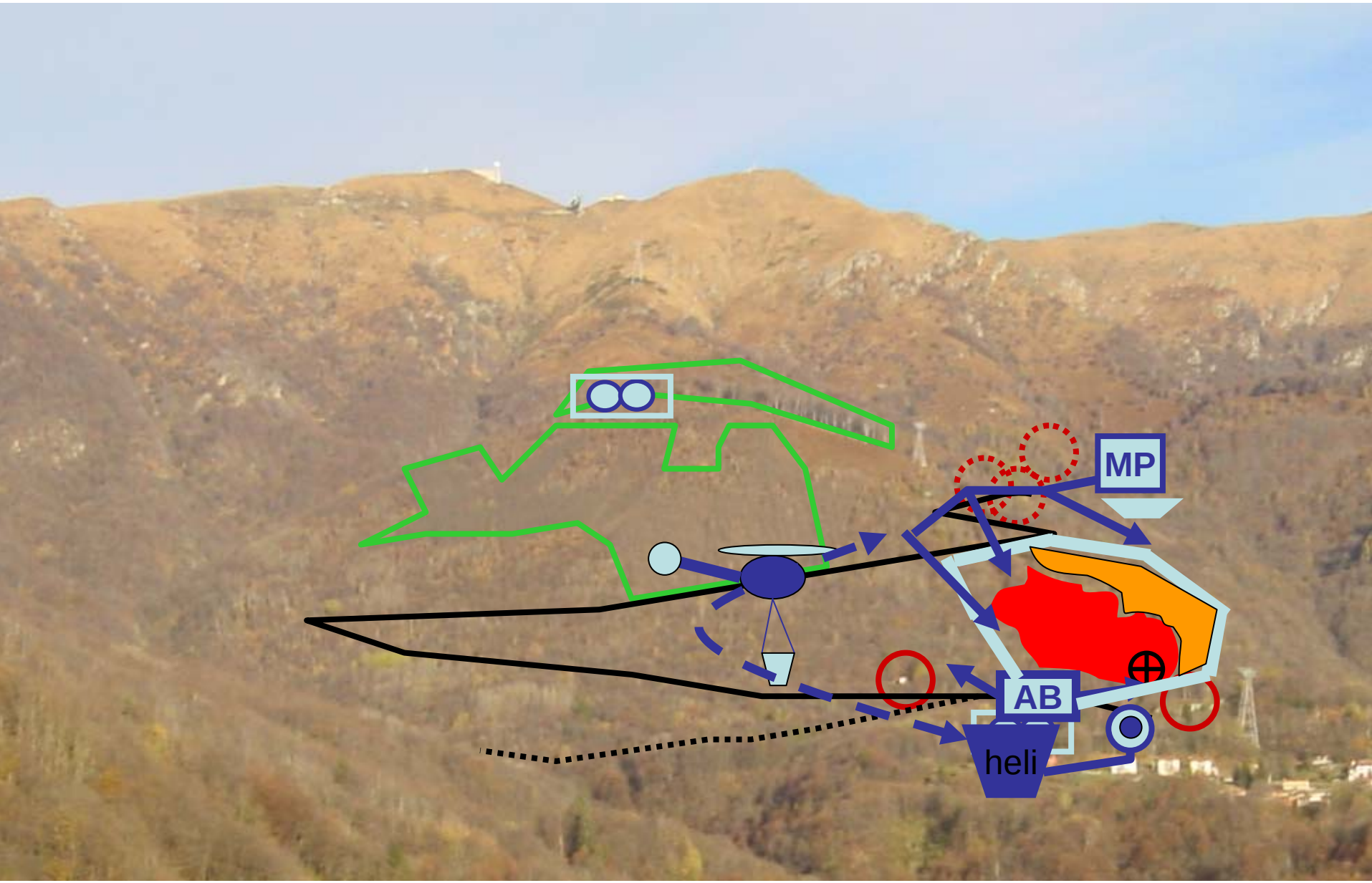
Tactic pattern



Decisione di principio: 1 Salvataggi all’azienda agricola; 2 tenere la testa dell’incendio; 3 tenere e spegnere fianco sinistro; 4 tenere e spegnere fianco destro



Linee di difesa; controfuoco sul fianco destro, spegnimento diretto fianco sinistro



Rural firefighting in Cyprus: A challenge for many.

Chrysilios Chrysiliou
Deputy Director
Cyprus Civil Defence

Fire risk in Cyprus

- Over the years, forest fires have become a constant threat to Cyprus every summer. Taking in account the dry, hot and long summers of Cyprus this has become a real problem especially in the last few years.

Fire Fighting, a job for many!

- A number of Government agencies are involved in the extinguishment of fires,
  - the Fire Service,
  - the Forest Service,
  - the Civil Defense Force,
  - the Games Reserve,
  - the District Offices and
  - increasingly the last years, village volunteer firefighters.

Each agency is involved according to the fire classification criteria as follows:

- Forest Fires: The primary responsibility rests on the Department of Forest of the Ministry of Agriculture, Natural Resources and Environment. (Ministry of Agriculture)
- Rural Fires: The Cyprus Fire Service, which comes under the jurisdiction of the Ministry of Justice and Public Order through the Police, is responsible to fight all rural fires which are up to the distance of 1km from forests boundaries. (Ministry of Justice and Public Order)
- It is important to mention that the Civil Defense Force, the Game Reserve Agency, the District Officers and other volunteer groups act in support of both in case of an emergency. (Ministry of Interior)

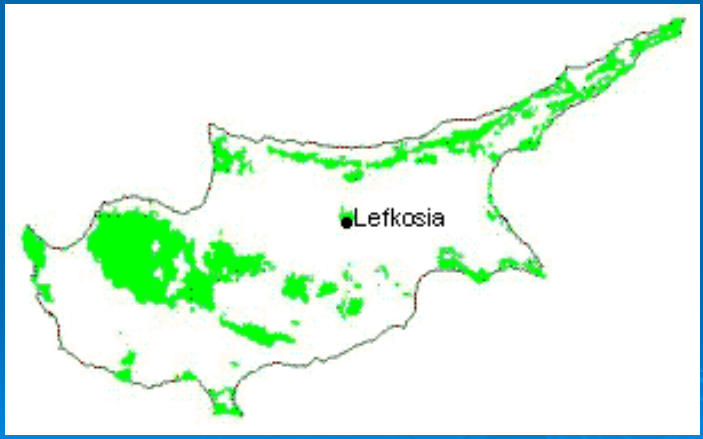
The major players

- The Fire Service is responsible for saving lives, for the prevention and extinction of fires, and rendering humanitarian services to the public.
- According to its mission statement, the Cyprus Forest Service, is responsible for the formulation and implementation of the forest policy, the formulation and enforcement of the forest legislation, the Management of state forests, the running of the Cyprus Forestry College and the reforestation of all degraded forest lands.

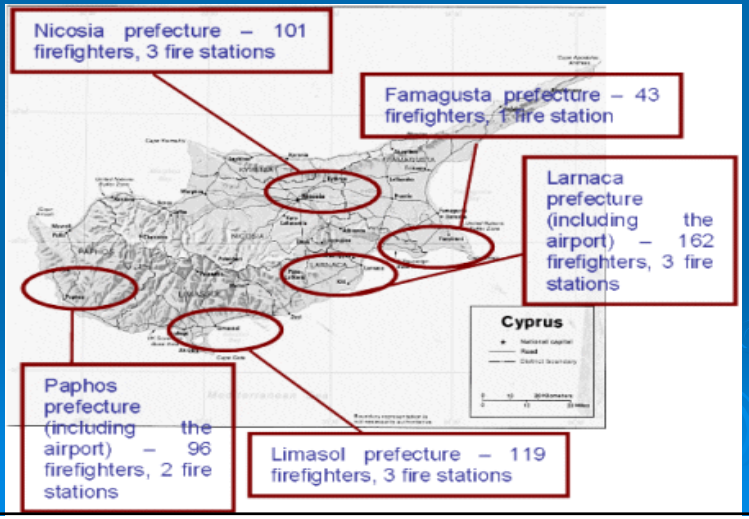
The major players

- The main mission of the Civil Defense Force is the performance of various humanitarian tasks intended to protect the civilian population and help it recover from the immediate effects of hostilities or disaster as well as to provide the conditions necessary for its survival.
- The Game Reserve Agency is responsible for preserving the wild life in Cyprus.
- The District Offices are responsible for coordinating the fire fighting efforts in their respective districts as well as providing auxiliary personnel and means.

Forests in Cyprus: The area of jurisdiction of the Forestry Department



The Cyprus Fire Service: Stations are located primarily in the 5 major towns



The area between the Forests and the Towns. A cooperation challenge put to test in every rural fire.

- The Forestry Department focuses on the Forests and
- The Fire Service focuses on the towns and other urban areas like villages, industrial areas etc.

When a fire breaks in a rural area, usually, both the F.D. and the F.S. respond.

If the fire is within a kilometer from the forest, then a F.D. Officer takes command.

If the fire is off the limits of the forests, then a F.S. Officer takes command.

All other agencies which respond to assist operate under the command of the respective officer of either the F.D. or the F.S.

Coordination and logistic support

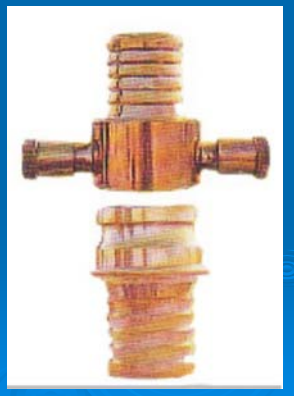
- The Ministry of Interior operates as the overall coordinator and provides logistic support.

Challenges

- The Forestry Department uses primarily Storz couplings
- Storz coupling is a "quarter turn coupling", or "sexless coupling", commonly used to connect to fire hydrants, easy to connect, no particular male or female end, lugs are on inside of coupling. The standard coupling on fire hoses in Germany.

Challenges

- The Fire Service uses the British type fire hose couplings



Civil Defence, Games Reserve, District Offices, others

- The other smaller “fire services” use much smaller engines, hoses and different couplings, Quick Release - Quick Disconnect Hose Couplings

Challenges

- At the moment, fire crews on the ground find it difficult to share equipment, especially to interconnect using the different types of couplings used by the different agencies.

The future

- Cooperation and coordination between the agencies involved in rural firefighting in Cyprus need to be improved and this could easily start by all agencies deciding to incorporate a single hose coupling.

PRODUCTOS MESA

Production of advanced firefighting hoses

Fernando Marijuan Martinez, Project Manager, Productos MESA

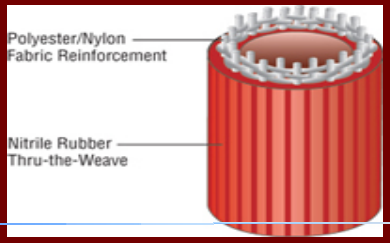
Fire retardant hoses lines for forestry fire-fighting applications

FP7-SME-2007-1
Grant agreement no: 222152

Project Overview

Produce a novel FIRE-FIGHTING HOSE SYSTEM for forestry applications able to:

- Enhanced versatility
- Improved efficiency
- Assured safety of fire-fighters



Scientific Objectives

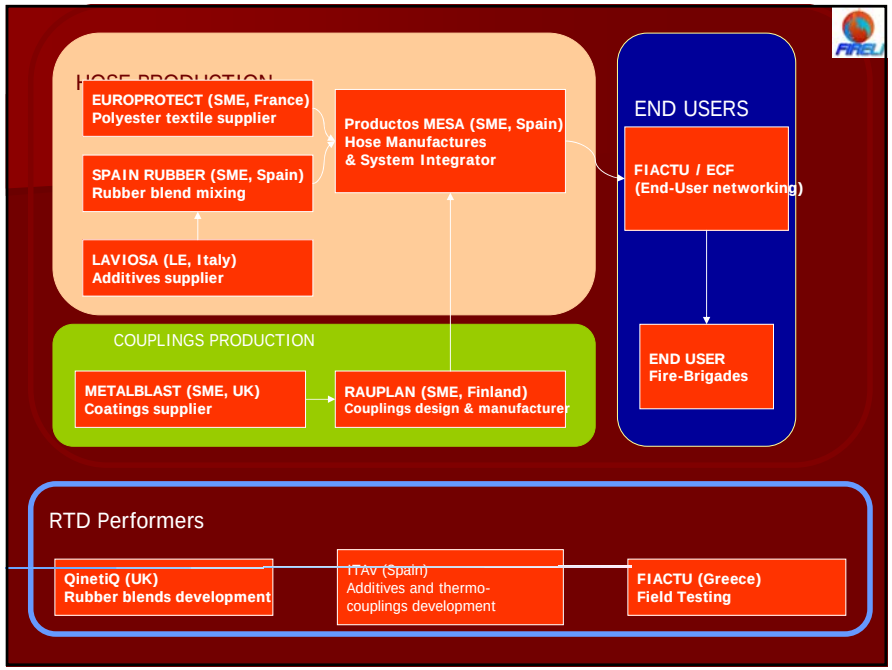
1. Increase understanding on the chemical formulations and action mechanism of fire-retardant additives, to provide a FR performance at 350°C fire flame
2. Enhance knowledge on novel organic-based PVC stabilisers
3. Study the effect of alternative low-toxicity plasticiser in PVC/NBR rubber blends
4. Understand the reaction compatibility between pre-activated polyester textile and rubber formulations
5. Enhance knowledge and understanding on suitable coatings based magnesium zirconate, aluminium oxide and mullite as well as deposition techniques to create thermal barriers on coupling under 350°C fire flames

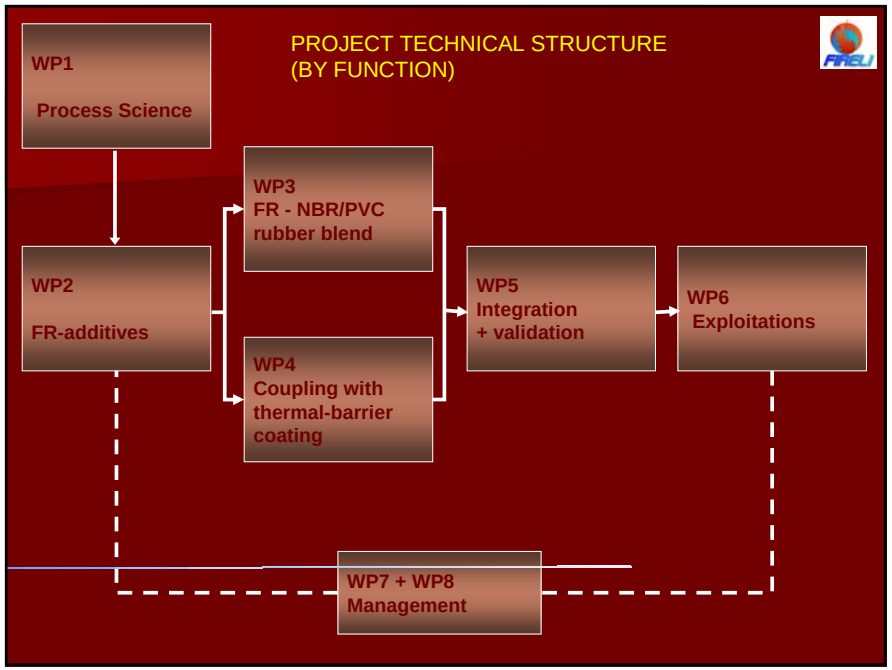
Technological Objectives

1. Development a polymer formulation based on a NBR/PVC rubber matrix with nanoclays to be used as an outer layer of the fial hose product
2. Development of a polymer nanocomposite formulation based on NBR/PVC and plasticiser
3. Development of a pre-activated polyester textile with a compatible adhesion component
4. Development of a new high temperature coating based on magnesium zirconate, aluminum oxide and/or mullite powder and deposition technique for thermal protection of coupling of thickness between 0,005 mm to 0,3 mm
5. Production of a novel coupling design able to reduce charge loss by 15%

Operational Targets

- Production of a fire-retardant hose that satisfies the specifications and with a market price not increasing more than 60%
- Development a new hose product with fire resistance properties 5-10 times better than current solutions
- Reduction of thickness of different layers of polymers in the hose
- Production of thermal protected coupling with a market price not higher than 25%
- Reduction of the minimal pressure with a harmonised coupling design by 15%


HOSE PRODUCTION
EUROPROTECT (SME, France)
Polyester textile supplier
SPAIN RUBBER (SME, Spain)
Rubber blend mixing
LAVIOSA (LE, Italy)
Additives supplier
Productos MESA (SME, Spain)
Hose Manufactures
& System Integrator
END USERS
FIACTU / ECF
(End-User networking)
END USER
Fire-Brigades
COUPLINGS PRODUCTION
METALBLAST (SME, UK)
Coatings supplier
RAUPLAN (SME, Finland)
Couplings design & manufacturer
RTD Performers
QinetiQ (UK)
Rubber blends development
ITAv (Spain)
Additives and thermo-couplings development
FIACTU (Greece)
Field Testing


PROJECT TECHNICAL STRUCTURE
(BY FUNCTION)
WP1
Process Science
WP2
FR-additives
WP3
FR - NBR/PVC
rubber blend
WP4
Coupling with
thermal-barrier
coating
WP5
Integration
+ validation
WP6
Exploitations
WP7 + WP8
Management

PROJECT BROCHURE

Project Web Site is On-Line.
Visit us at:

WWW.FIRELI.EU

"Recent Developments and Needs for Wildfire Fighting on the Ground: Tactics and Technologies"

Video conference, Athens 10/6/2010

Field testing of a new firefighting hose

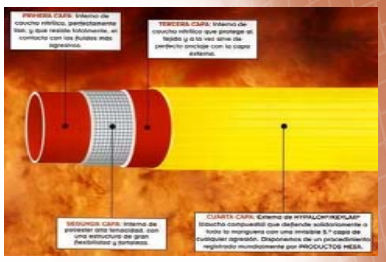
Milt Statheropoulos, European Center for Forest Fires (ECFF)

Sofia Karma, National Technical University of Athens (FIACTU/NTUA)

Athina Pappa, National Technical University of Athens (FIACTU/NTUA)

Contents

1. The FIRELI product



- composed by a 4 layer co-extruded polymer with sufficient fire and abrassion resistance and cleaning capacity
- harmonized design suitable for field-use (light weighted, smooth shape)
- enhanced fire retardancy due to the use of a coating fixed to the coupling

2. Planning session of the fire tests in the field

•Tests for hose performance with the contribution of Hellenic Fire Brigade

• Safety plan was established for the field tests (mock-up trials prior real experiments)

• Objectives of the field tests

1)To test the hose time-life of operation before any water leaking

2) To test the time-life of the hose before any melting or burning of the hose

Test Protocol

•**Site :** National Technical University Campus (restricted open field)

• **Scenario:** Controlled fires of forest biomass representing the Mediterranean flora

- Flaming and smouldering phases of a forest fire were **simulated in the scenarios**

- Procedures were mainly focused on **smouldering-glowing** phases of the fire

Procedures for testing hose performance (1)

• **Exposure to both approaching fire-front and inside fire-front during the flaming phase, having water circulation inside the hose**

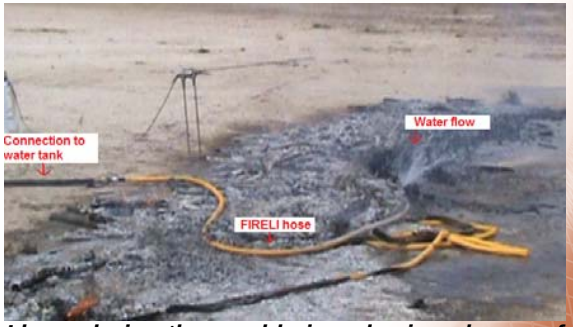
• **Exposure to smouldering-glowing phases having water circulation inside the hose, until water leaking in the hose line is observed**

The FIRELI hose during the flaming phase of the fire

Procedures for testing hose performance (2)

• **Exposure to the smouldering-glowing fuel bed without having water circulation inside the hose for about 5 minutes; then the water was re-circulated**

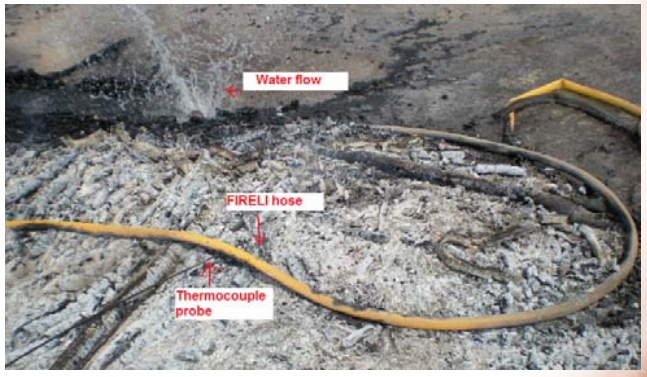
•**The hose line was drawn through the fuel bed during the smouldering-glowing phases: test of the combined thermal and abrasion resistance**



The FIRELI hose during the smoldering-glowing phases of the fire

Field Monitoring(1)

The heat profile of the fire was monitored



Field Monitoring(2)

• **Visual camera :** for recording the whole experiment (maximum and average height of the flames, spreading velocity of the flame-front)

• **Thermo-graphic camera :** for monitoring the temperature profile of the hose line during the fire

Thermographic camera in the field (FLIR P65)

Visual camera in the field

Field Monitoring(3)

Sound recording: A condenser / shot gun microphone (AKG C391B – SE300B) has been employed to record the audio frequencies

• Meteorological conditions were measured during the fire test by using a field meteorological station (Kestrel 4500 Pocket Weather Tracker)

Field Monitoring(4)

- **Combustion G**as monitoring: **CO, CO_2, O_2, NOx** (MRU Delta 1600-V)

Gas analyzer measuring during the field experiment

- Other gases monitoring: **H_2S, NH_3, O_2 and LEL%** (RAE)

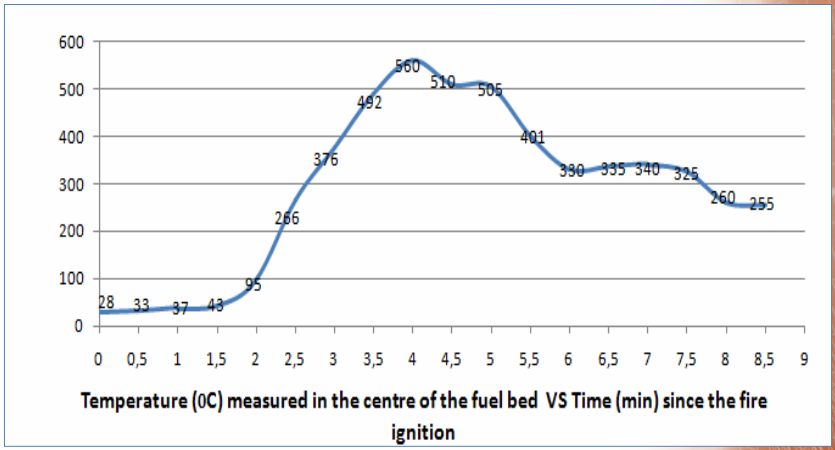
Field Monitoring (5)

- **CO/CO_2 detector: Anagas CD 98 Plus, linearity area: 0–60%)**

- **A portable particle analyzer (DustrackTSI, linearity area: 0–100 mg/m^3) was used for measuring concentration levels of $PM_{2.5}$ around the fire.**

3. Results and evaluation (1)

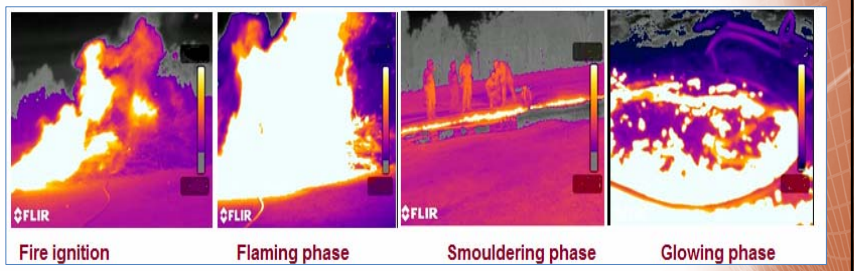
Temperature profile of the fire



Temperature profile of the fire-front approaching the FIRELI hose at the center of the fuel bed

Results and evaluation (2)

- **Thermographic camera**



Thermographic images showing the four phases of the fire during the field experiment

4. Conclusions (1)

FIRELI hose performance in the tests is summarized:

•Flaming phase (water circulation): Hose life before melting and burning had an average of
1 min exposed to a temperature range of 266 to 560°C (average temp. 380°C)

•Smouldering/glowing phases (water circulation): Hose life over 10 min without any water leaking in a temperature range of 216 to 538°C (average temp. 370°C)

• Smouldering/glowing phases (without water circuation): hose life 8 min before becomes un-operational

• Combined smouldering/glowing phases and abrassion resistance (without water circulation): No deterioration was observed after 5 passings through the fuel bed

Fireli product has performed successfully in the field tests

Conclusions (2)

In general:

• It seems that combined visible and thermographic camera **can effectively used for field test of fire hoses**

• **Chemical data** can be used **for both identifying the fire phases** (e.g. flaming, smouldering, glowing) but also as a simplified **early warning system for safety reasons.** Critical chemicals, such as **CO** and **particles** can be monitored.

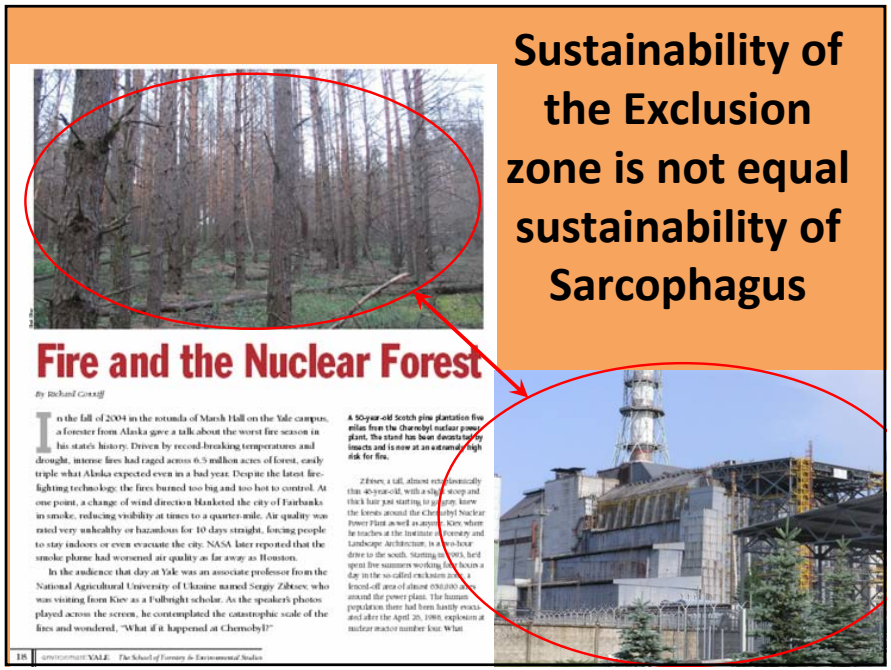
• Use of **sound recording** was quite experimental with the scope of investigating if the **integration of images, sounds and chemical data** can provide an advanced method, as part of a protocol for field testing of fire hoses

WILDFIRES IN THE IRRADIATED FORESTS AROUND THE CHERNOBYL NPP: NEEDS FOR DEVELOPMENT OF EARLY WARNING, DETECTION AND MONITORING CAPACITY FOR DISASTER RISK REDUCTION

Sergiy Zibtsev	National University of Life and Environment Science of Ukraine (NUBiP of Ukraine)
Chadwick Oliver	Yale University, School of Forestry and Environmental Studies
Johann Georg Goldammer	Global Fire Monitoring Center (GFMC) / Max Planck Institute for Chemistry, United Nations University

The Chornobyl Exclusion zone today – is the territory sustainable managed?

- 260 000 ha of heavily contaminated forests and former agricultural lands
- Sarcophagus of 4-th Unit of NPP and radioactive waste storages, more then 100 temporary waste storages all over 10-rm zone
- 4 000 people of personal including 400 Chornobyl Forest Enterprise staff
- 300 local peoples who came back to their homes after evacuation and living in the Exclusion zone permanently
- Number of infrastructural and other activities



Fire and the Nuclear Forest

By Richard Grandy

In the fall of 2004 in the rotunda of Marsh Hall on the Yale campus, a forester from Alaska gave a talk about the worst fire season in his state's history. Driven by record-breaking temperatures and drought, intense fires had raged across 6.5 million acres of forest, easily triple what Alaska expected even in a bad year. Despite the latest fire-fighting technology, the fires burned too big and too hot to control. At one point, a change of wind direction blanketed the city of Fairbanks in smoke, reducing visibility at times to a quarter-mile. Air quality was rated very unhealthy or hazardous for 10 days straight, forcing people to stay indoors or even evacuate the city. NASA later reported that the smoke plume had worsened air quality as far away as Houston.

In the audience that day at Yale was an associate professor from the National Agricultural University of Ukraine named Sergiy Zibtsev, who was visiting from Kiev as a Fulbright scholar. As the speaker's photos played across the screen, he contemplated the catastrophic scale of the fires and wondered, "What if it happened at Chernobyl?"

A 50-year-old Scotch pine plantation five miles from the Chernobyl nuclear power plant. The stand has been decimated by insects and is now at an extremely high risk for fire.

Zibtsev, a tall, almost robotically thin 45-year-old, with a slight stoop and thick hair just starting to go gray, knew the forests around the Chernobyl Nuclear Power Plant as well as anyone. Kiev, where he teaches at the Institute of Forestry and Landscape Architecture, is a two-hour drive to the south. Starting in 1993, he'd spent five summers working long hours a day in the so-called exclusion zone, a fenced-off area of almost 650,000 acres around the power plant. The human population there had been hastily evacuated after the April 26, 1986, explosion at nuclear reactor number four. What

Sustainability of the Exclusion zone is not equal sustainability of Sarcophagus

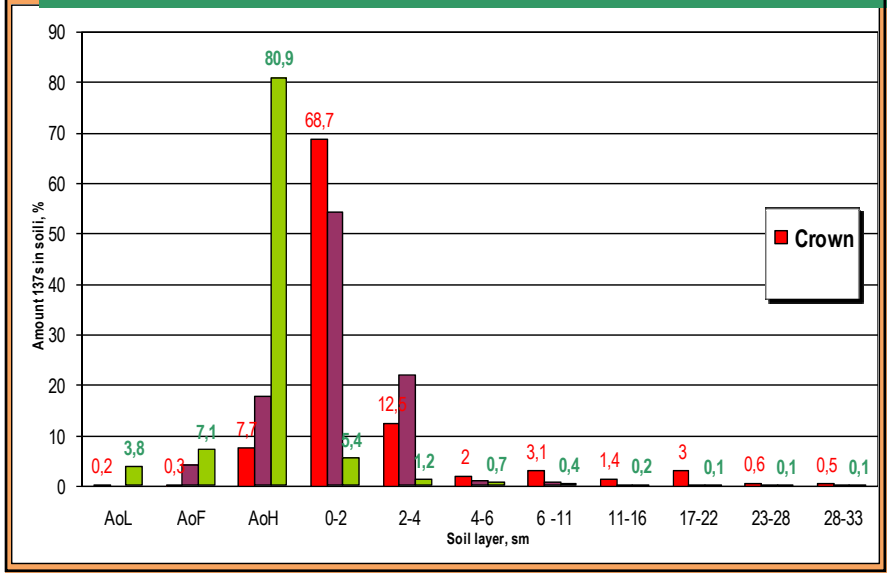
Forests play important environmental role in the EZ accumulating of radionuclides and preventing them from migration out of the EZ

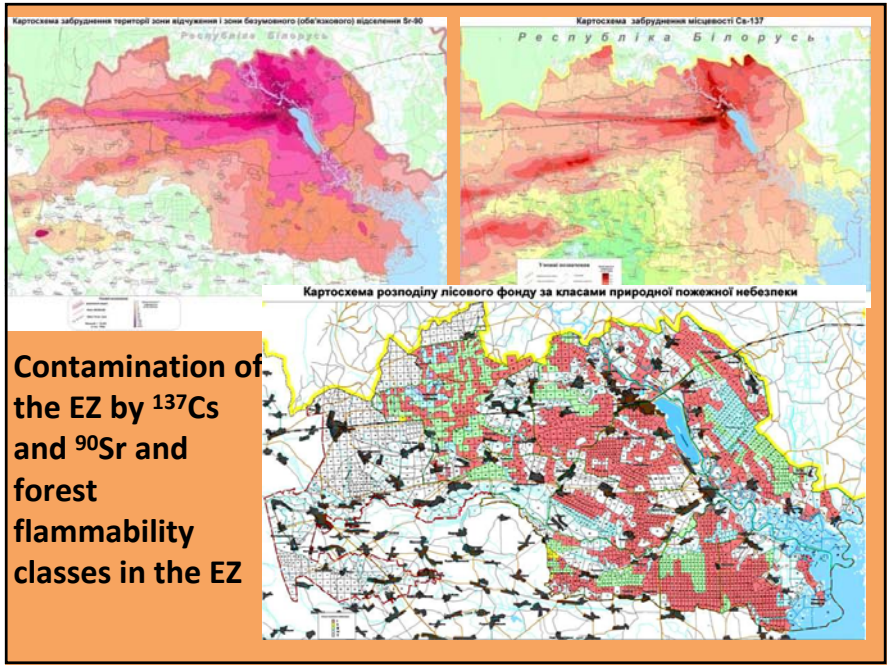
Main potential disturbances:

1. **Fire**
2. Windstorm
3. **Insects and diseases**
4. Flood
5. **Combination**

→ ***Destroyed accumulating function of forest in the EZ***

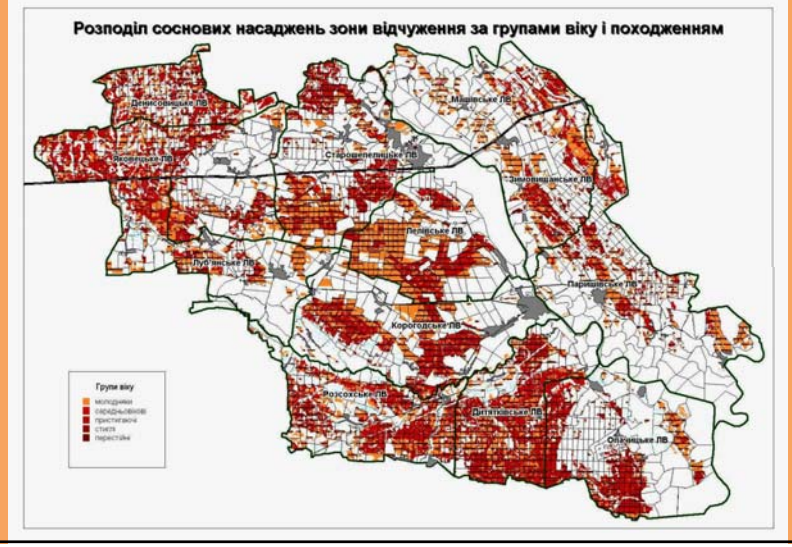
After wildfire 60-80% of ^{137}Cs moved from forest litter to soil





Contamination of the EZ by ^{137}Cs and ^{90}Sr and forest flammability classes in the EZ

Fire prone Scotch pine forests occupied near 38% of all area in the Exclusion zone

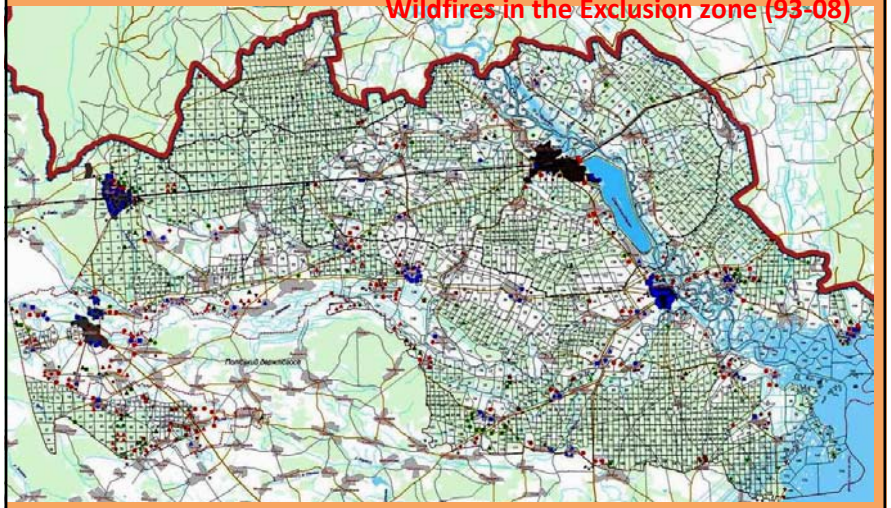


Died Scotch Pine contaminated forests damaged by insects and diseases with high fire risk (10 km zone)

Ocneria Dispar and Fomitopsis annosa Karst.)

Fires because of human ignition are common in EZ

Wildfires in the Exclusion zone (93-08)



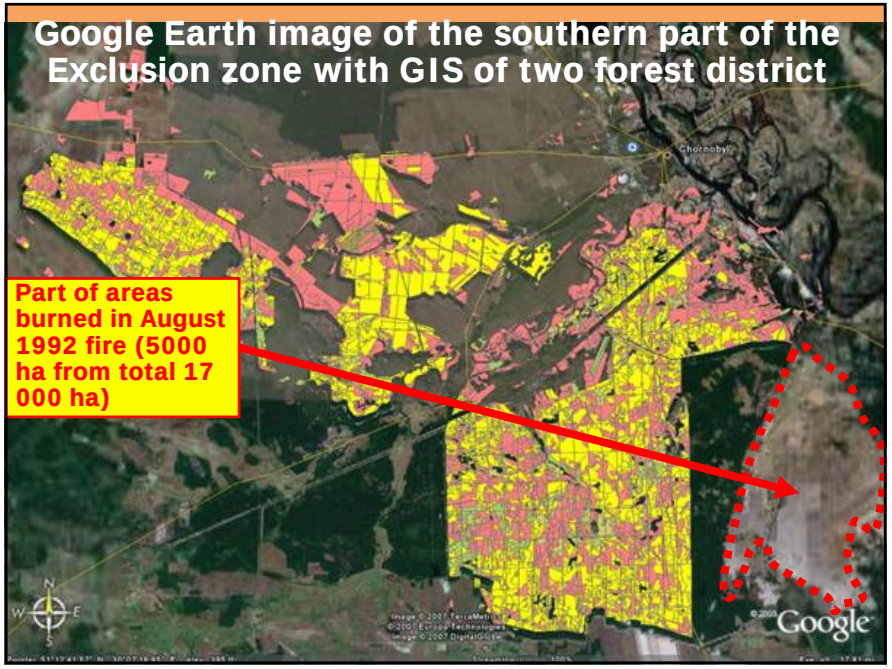
•Despite a general prohibition of access to the Exclusion Zone, human-caused ignition is common in the area.

Near 47% of area in the EZ is former agricultural lands which area fire prone and consists half of fires

Natural regeneration of Scotch Pine which is appears on the grass lands is also fire prone

Conclusion: There is a risk that large high-intensity crown fire occur drought periods and extreme wind conditions

Large crown fires will lift radionuclides to the atmosphere with the smoke, resulting in uncontrolled radioactive fallout downwind



Insufficient levels of technical and human resources in proactive wildfire risk reduction

Poorly maintained forest roads

Lack water pounds for fire suppression needs

Detection system based on fire towers

↓

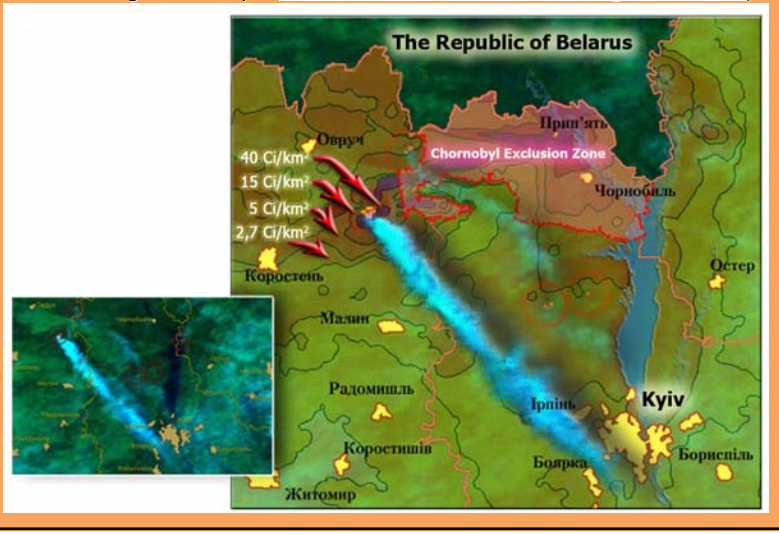
Do not allow rapid response and transportation of fire equipment and personnel to the fire.

↓

Large fires will not be suppressed at an early stage before they become catastrophic

Smoke from medium size wildfire out of the EZ reached vicinity of Kyiv in May of 2003

(NOAA satellite image is courtesy of **Ukrainian Land and Resourses Management Centre**).



Participants of the International conference devoted to Chornobyl wildfire problem (July 2007)

OSCE

Council of Europe

International Strategy for Disaster Reduction

Avialesoohrana Russia

IUCN

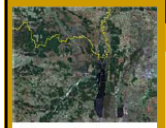
Global Fire Monitoring Center (GFMC)

Ministry of Emergency

Yale University School of Forestry & Environmental Studies

National University of Life and Environmental Sciences of Ukraine

http://research.yale.edu/gisf/EDSC/Chernobyl/chernobyl_ftp.htm



Chernobyl Wildfire Project

Чорнобильські сайти

- Домашня
- Члени групи
- Web Конференції
- Данні у FTP
- Моделі
- Розподілені дані
- Публікації
- Посилання

http://research.yale.edu/gisf/EDSC/Chernobyl/chernobyl_team.htm

Партнери - виконавці проекту

Єльський університет
МНС України
НУБіП України
Глобальний Центр Моніторингу пожеж
Університет Об'єднаних Націй
Сімейний Фонд Юрія Чопівського

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Volodymyr Kholosha

Yale University

School of Forestry and Environmentally Studies

George Chopivsky Family Foundation

NUBiP of Ukraine

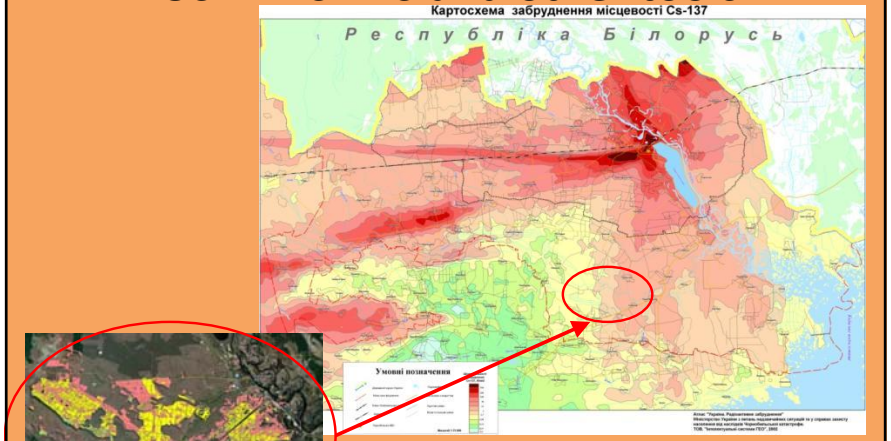
Global Fire Monitoring Centre

UN University

Sources of information for the project and its structure

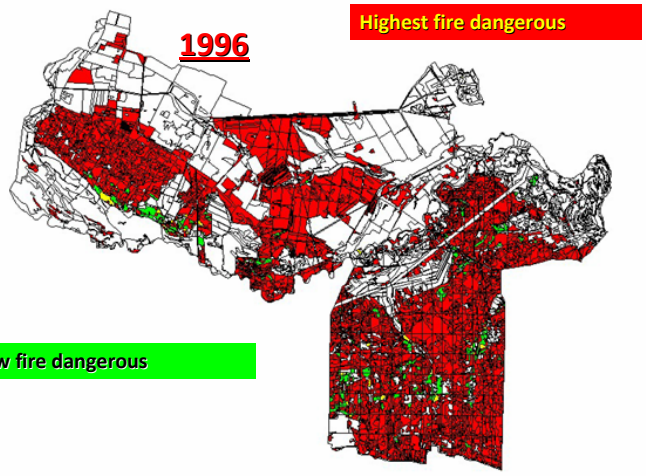
- **Forest inventory, land contamination, meteorological data bases etc.**
- **Software (fuel model, growth model, meteorological model, fire behavior etc)**
- **<u>Decision support system</u> for sustainable forest and fire management in critical regions (LMS)**
- **Studying of the radionuclide migration process in forest ecosystems without -, during – and after wildfire**
- **GIS “Chornobyl Wildfire”**

Forecasting of fire dangerous using USDA FS FVS and other tools



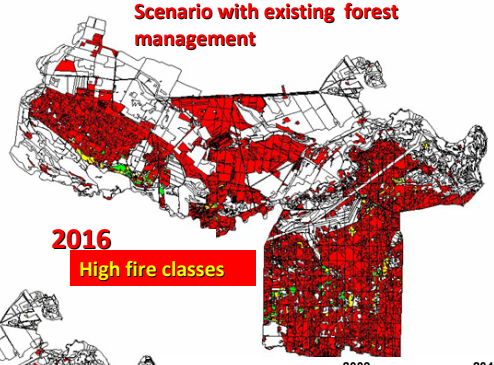
Modeling of wildfire risks for two forest range districts in the Exclusion Zone (Ditiatkivske)

- Yale University School of forestry and environmental studies
- USFS
- National University of Life and Environmental Sciences of Ukraine

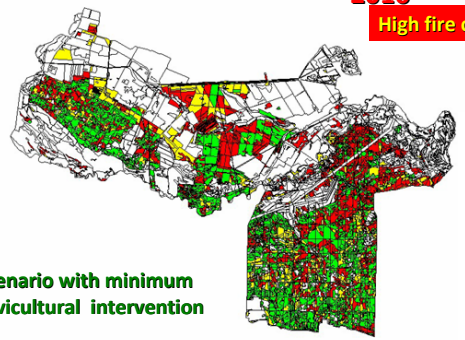


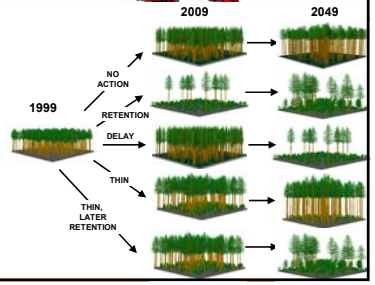
Forecast for fire dangerous classes for 2016 for two scenarios

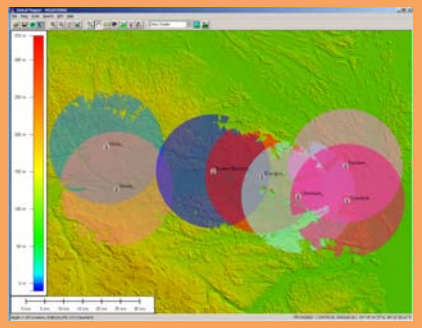
Scenario with existing forest management



Scenario with minimum silvicultural intervention





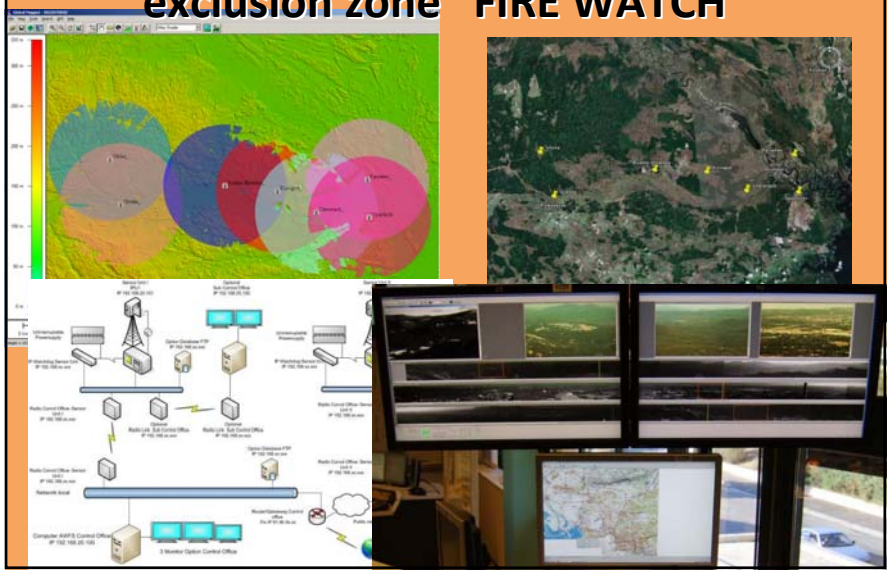


Forest range districts and coverage for early warning system of forest fires

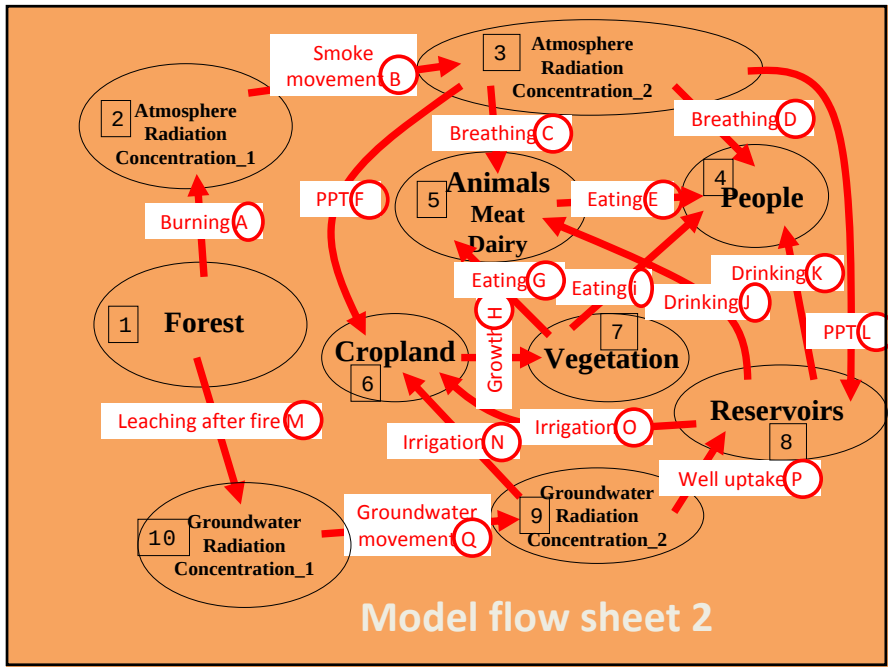
Early detection system

- An advanced ground based early detection system in close interaction with operation satellite monitoring system **needs to be built** to provide early detection and warning of local fire fighting forces
- A fire-weather based fire early warning component would increase the efficiency of fire prevention efforts as well as the preparedness for fire disasters

Proposed early detection system for the exclusion zone “FIRE WATCH”



Scientific assessment of ecological and social risks during large radioactive wildfires



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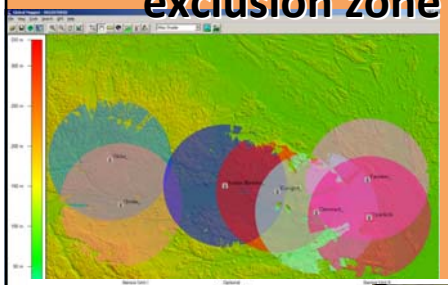

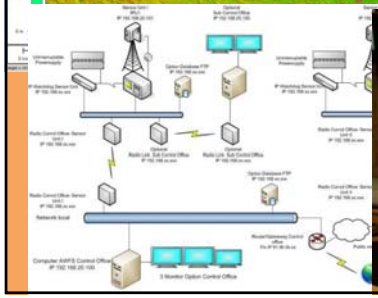

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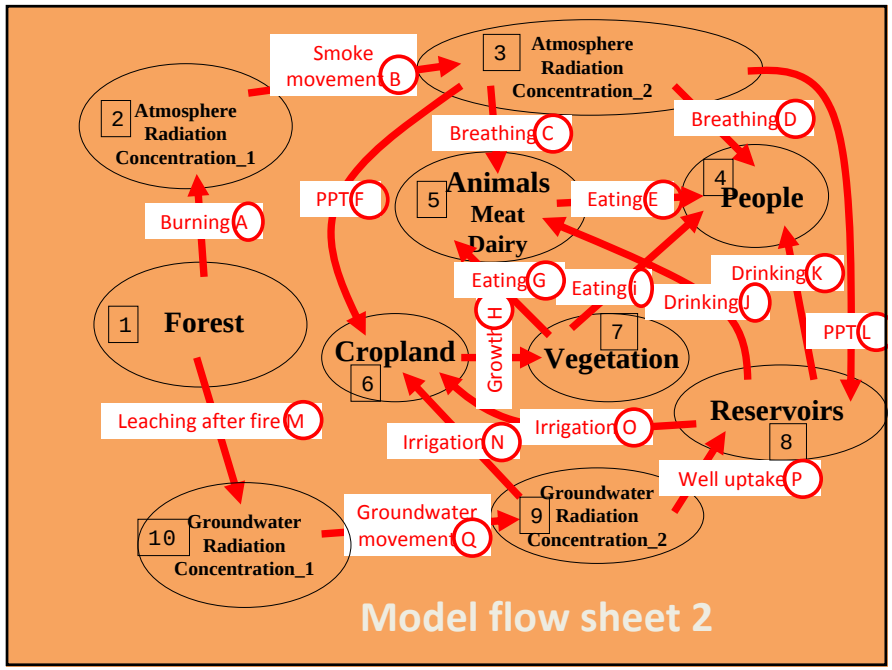
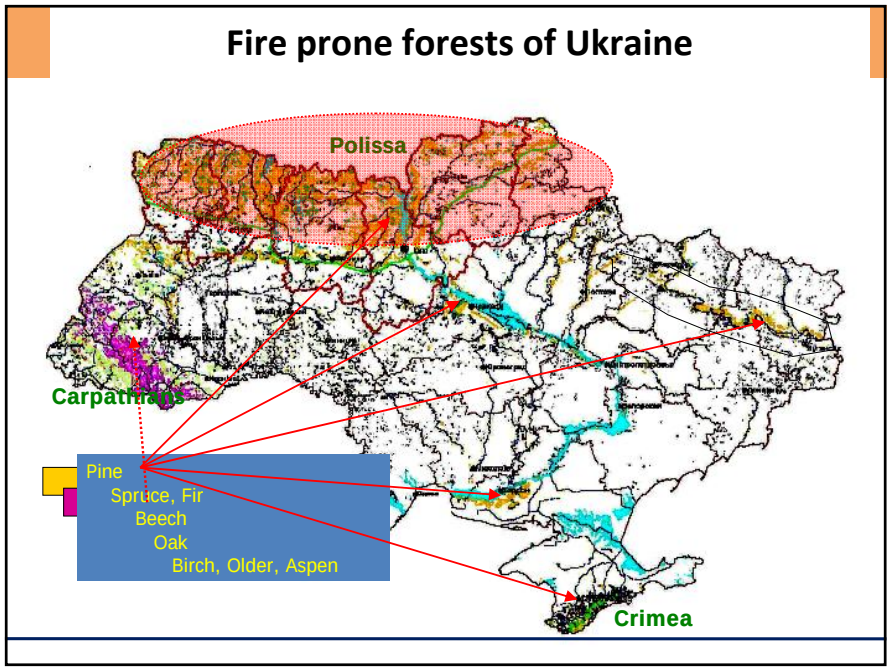

Smoke movement B
3 Atmosphere Radiation Concentration_2
2 Atmosphere Radiation Concentration_1
Breathing C
Breathing D
PPT F
5 Animals Meat Dairy
Eating E
4 People
Burning A
Eating G
Eating I
Drinking J
Drinking K
1 Forest
Growth H
Cropland 6
7 Vegetation
PPT L
Leaching after fire M
Irrigation N
Irrigation O
Reservoirs 8
Well uptake P
10 Groundwater Radiation Concentration_1
Groundwater movement Q
9 Groundwater Radiation Concentration_2
Model flow sheet 2


Fire prone forests of Ukraine
Polissa
Carpathians
Pine
Sprtice, Fir
Beech
Oak
Birch, Older, Aspen
Crimea

Contamination of territory of Ukraine with ^{137}Cs (2006)

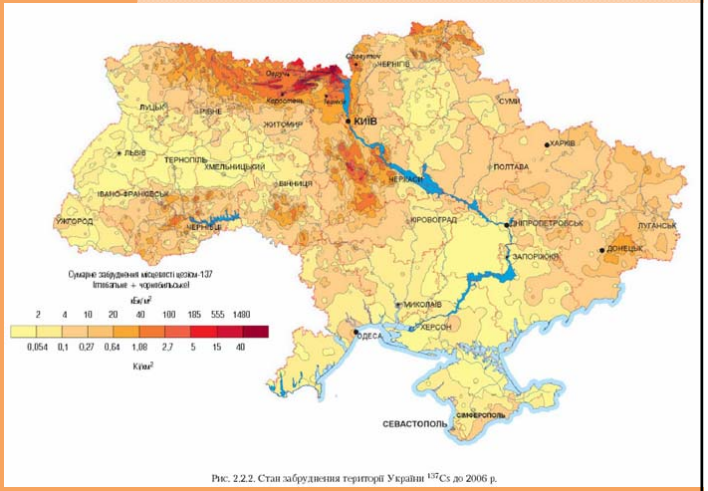


Рис. 2.2.2. Стан забруднення території України ^{137}Cs до 2006 р.

Source:

National report "20 years after Chornobyl", 2006

Plans and needs for 2010 year

- 1) It is forecasting extremely dry summer 2010 year - so we **expect fires** and it's need to be addressed properly.
  3) List of Individual protection means for firefighters should be proposed to Ministry for purchasing (consulting GFMC) to protect fire fighters
  4) Elaboration of decision support system on natural resource (forest) management of the exclusion zone on sustainable way
  5) GIS and remote sensing based forest management plan and Fire management plan for the exclusion zone
  6) Civilculture strategy for reducing fire dangerous of forests based on harvesters

FIACTU / NTUA

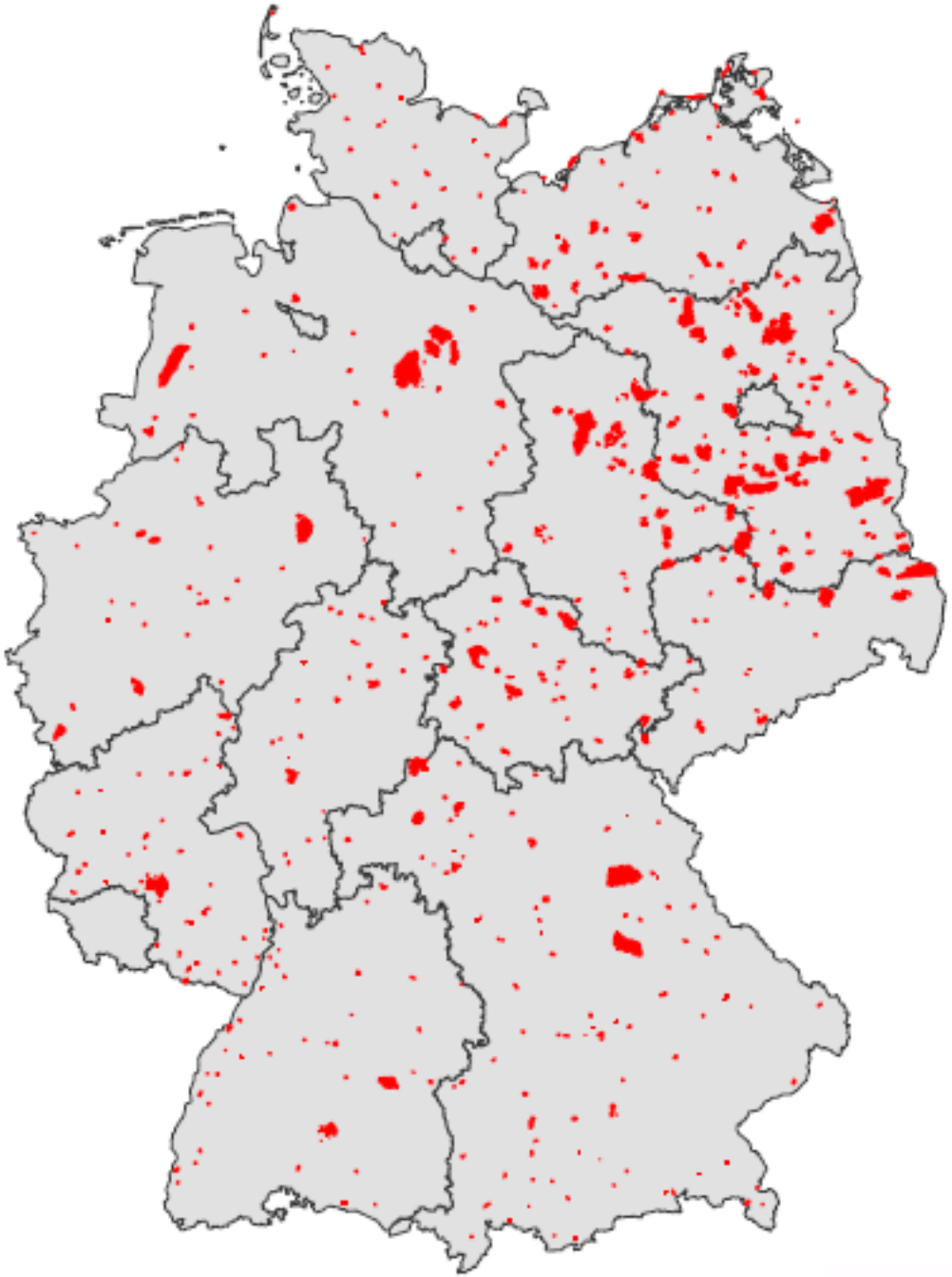
GFMC

UNU

ECFF

Prescribed fire on terrain contaminated by Unexploded Ordnance (UXO) and land mines

Johann G. Goldammer,
Director of Global Fire Monitoring Center (GFMC)



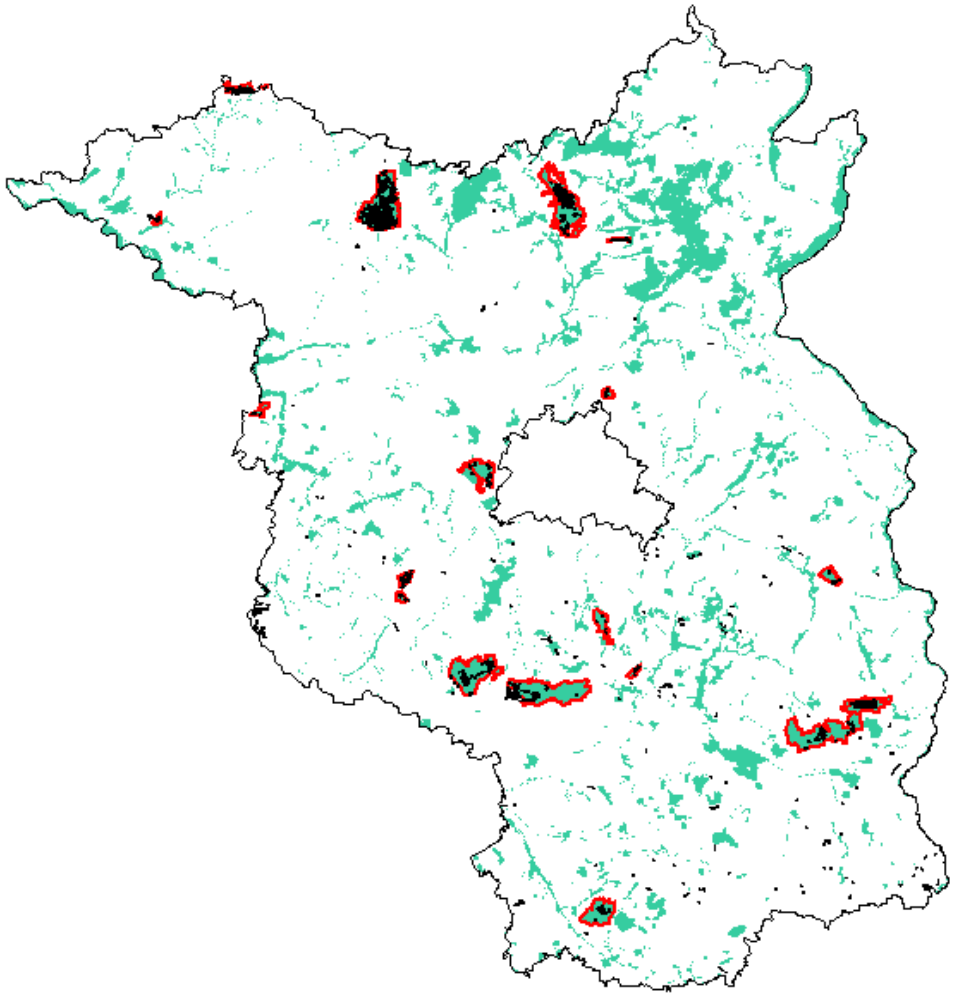
Extent of UXO-contaminated sites in Germany

ca. 250,000 ha active and former military training sites.

High concentration in Eastern Germany – especially former Soviet Army training sites.

Problems:
Contamination with toxic and hazardous waste, many locations on sandy soils. UXO contamination remains unsolved.

Cost of decontamination would reach an amount of binary billion €.



Red = boundaries of former and active military training sites
Black = open heathlands due to intensive military use

Due to its geopolitical location 7% of Brandenburg faced military use by the end of the 1990s, highest percentage of land-use in Central Europe

About 69,000 ha former military training sites (eastern Germany) are contaminated with a high to very high degree by (UXO) and later declared to nature reserves

Wildfire on military training site Jüterbog
June 2008

Since the 1940s:
Many firefighters killed by explosions of UXO

<u>Observation</u>:
Former military exercise areas are characterized by biodiversity-rich open ecosystems – created by disturbances

New Concept: The dual purpose of controlled (“prescribed”) fire:

- Facilitating the identification of UXO (removal of vegetation cover) and trigger controlled explosions

- Use the fire disturbance to maintain open, biodiversity rich conservation areas

<u>Examples</u>: Atlantic heathlands
North German islands and mainland

Created by human-made disturbances over centuries

Calluna vulgaris

Erica tetralix


FEUERWEHR

Zschorno Heathland, Brandenburg:
Succession control for maintaining *Tetrao tetrix* habitats

and to reduce wildfire spread and behaviour potential

Success story: Zschorno Aerial Bombing Exercise Site

Procedures and Techniques

Delineation and securing areas to be burned

Note: Photos and maps in the following slides have been provided by the Project Team Heidehof-Golmberg, Germany

Integration of roads, tracks and natural boundaries

Procedures and Techniques

Delineation and securing areas to be burned

Protection of personnel

Firefighting tank

DTF SPOT 55

(T-55)

11.000 litres water

Protected Cell for Operators

Cameras / Monitors

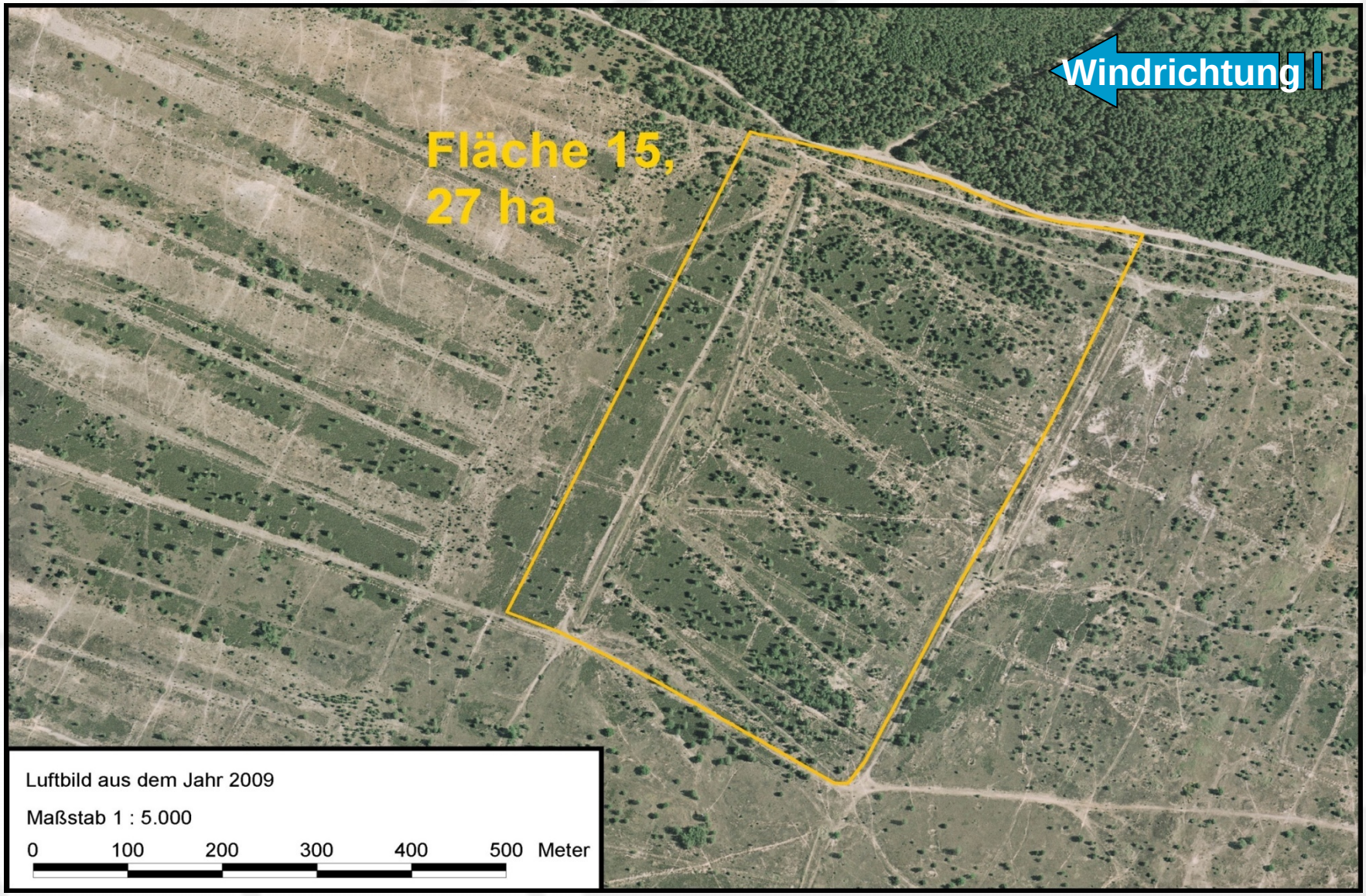

DRAGON

Prescribed burning action is coordinated

- **From control point outside the exclusion zone (safety zone = 1000 m radius)**
- **Inside exclusion zone: Tactical decisions made inside armoured vehicle**
- **Remote ignition**
- **Monitoring by UAV (drone)**

Sicherheitskonzept

Brenntechnik am Beispiel von Fläche 15



Sicherheitskonzept

Brenntechnik am Beispiel von Fläche 15

Fläche 15,
27 ha

Windrichtung

Gegenwindfeuer

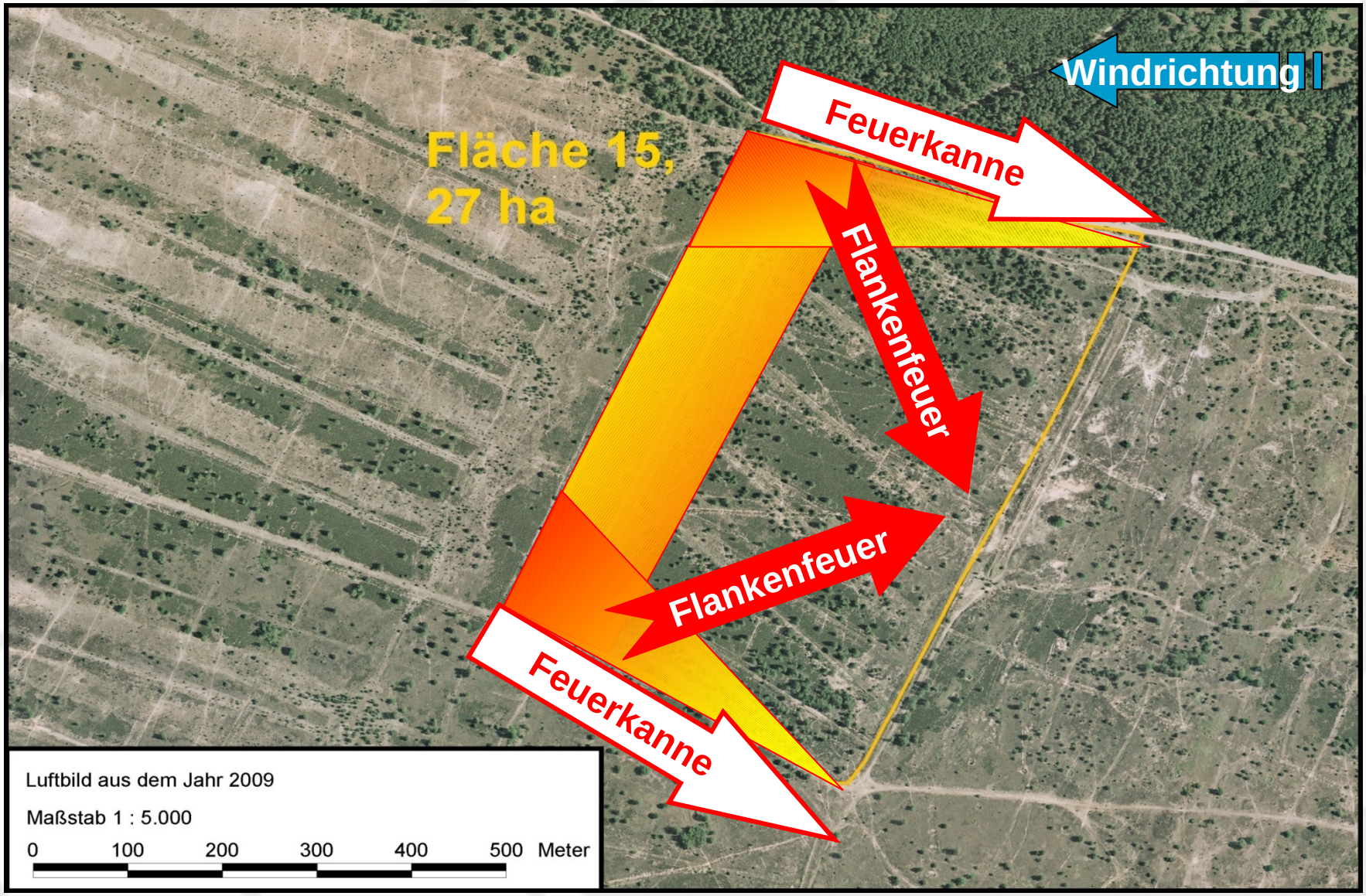
Luftbild aus dem Jahr 2009

Maßstab 1 : 5.000

0 100 200 300 400 500 Meter

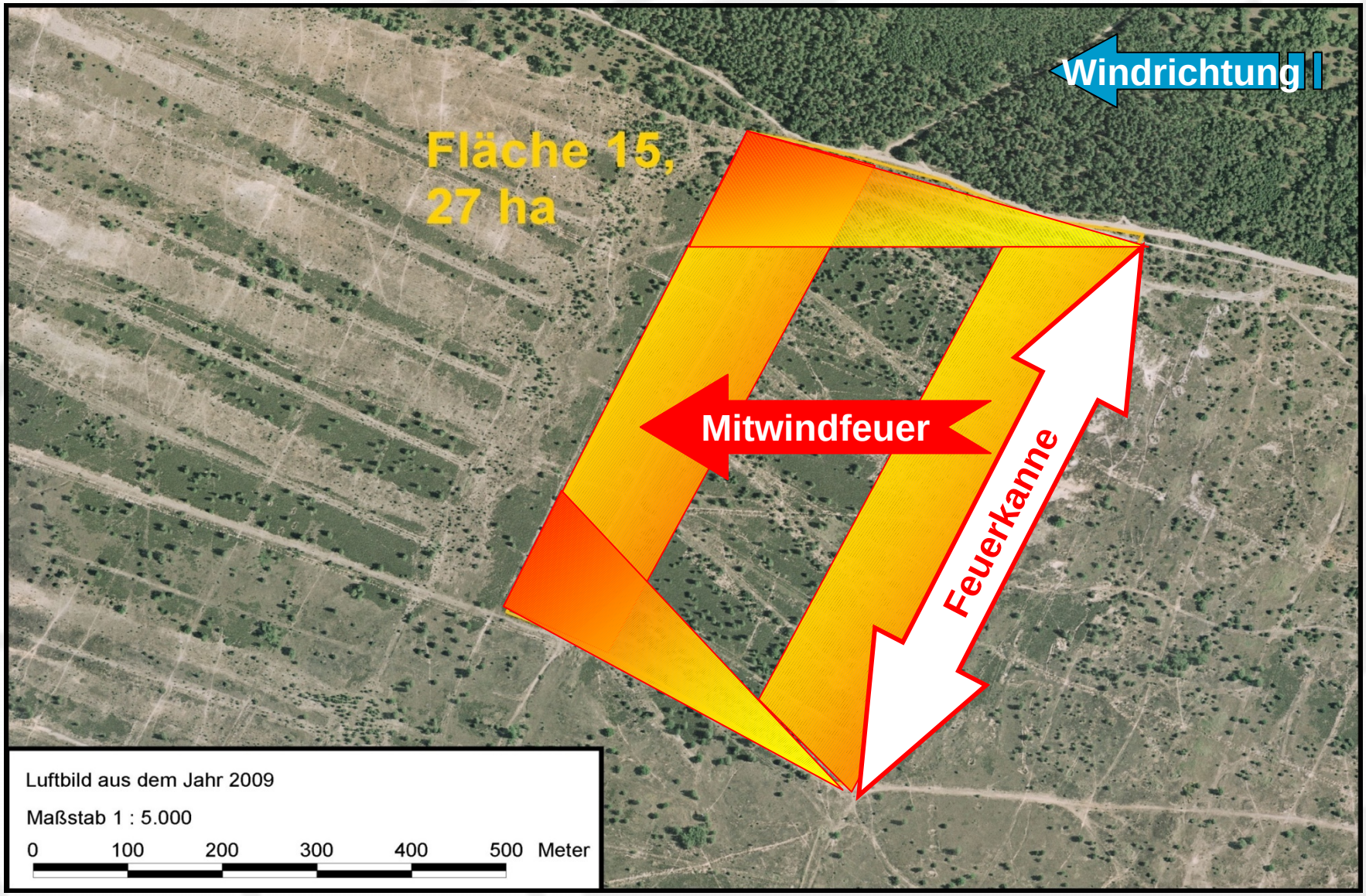
Sicherheitskonzept

Brenntechnik am Beispiel von Fläche 15



Sicherheitskonzept

Brenntechnik am Beispiel von Fläche 15

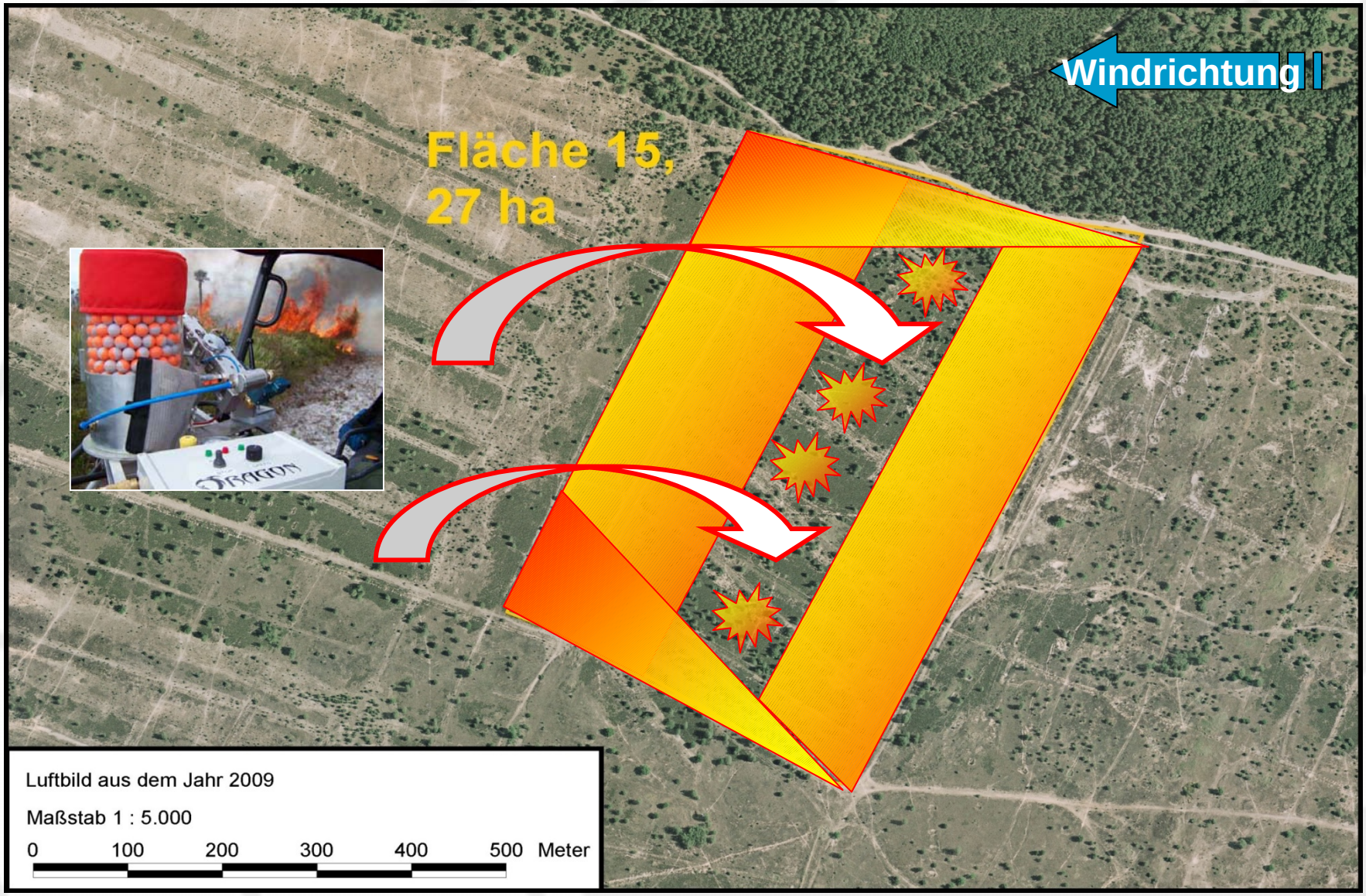


Sicherheitskonzept

Brenntechnik am Beispiel von Fläche 15

LAND BRANDENBURG

Stiftung Natur Schutz Fonds Brandenburg



Sicherheitskonzept

Einsatz einer Drohne zur Brandbeobachtung

Sicherheitskonzept

Feuerlöschpanzer SPOT 55

Wassertank:	11.000 Liter
Schaummittel:	2.000 Liter
Löschpulver:	500 kg
Pumpleistung:	max. 1.250 Liter pro Minute (Löschwasser)

Sicherheitskonzept

Wassernachschub durch Tankfahrzeug

Sicherheitskonzept

20.000 Liter im Tankfahrzeug Typ „Tatra“

LAND BRANDENBURG

Stiftung Natur Schutz Fonds Brandenburg


ZS - HWV
Aerial ignition

Aerial Ignition

- Ignition is a result of injecting glycol into the capsule which contains potassium permanganate ($KMNO_4$)
- Ignition after approx one minute
- Drop from helicopters

Aerial Ignition

Aerial Ignition


ZS - HWV
Aerial ignition

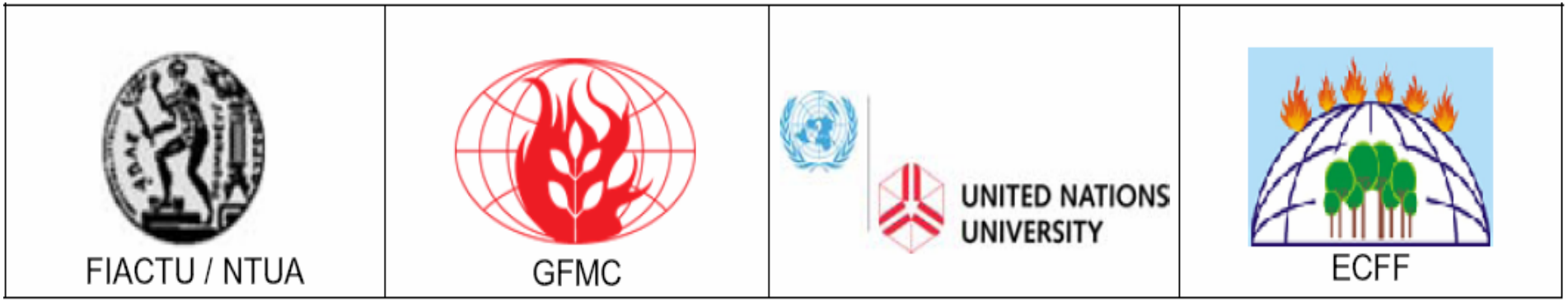
Conclusions

Benefits and Risk Management

- The controlled ignition of contaminated terrain enables the fire manager to have control and to take the necessary safety measures

- Follow-up mine and UXO clearing facilitated

- Maintenance of important biodiversity



Conclusions: A Catalogue of Ideas

- During an extremely large forest fire event (fire emergency situation), countries that are asking for assistance often are faced with problems of compatibility both in technical and procedural terms. Compatibility of equipment / appliances for fire suppression, including water supply, are critical

- Agreements and use of standards of hoses and hose couplings in EU countries would increase interoperability of cooperating teams. Training programs (exercises), especially among countries sharing a common border, are recommended. Cooperation agreements between authorities at local and regional levels would increase the speed and efficiency of border-crossing

- Safety of firefighters extremely depends on the hose life during the fire-suppression; sufficient fire and abrasion resistance, so that to water circulation inside the hose without any leaking or pressure drop is ensured

- Operational performance of an innovative formula for fire-fighting hoses has been evaluated and validated through a field test protocol, by simulating real fire conditions

- Benchmarking of existing ground fire fighting means, e.g. coupling and hoses, as well as recording of end-user requirements could show technological trends and challenges for new effective products

- Furthermore it was noted that:

  - Aerial firefighting could be used supportively to ground means suppression

  - Early Detection Systems can contribute to fire risk reduction; this is specifically important for coping with extremely dangerous situations, such as fires in irradiated forests and terrains contaminated by Unexploded Ordnance (UXO) and land mines

- The development and use of Unmanned Aerial Vehicles (UAVs) and robotics should be promoted as tools for field monitoring in a fire incident (fire behaviour, fire emissions, etc.)

Council of Europe
Conseil de l'Europe

Under
the aegis of the

General Secretariat for
Civil Protection, Greece