

# Efficient fire risk communication for resilient societies (eFIRECOM)

*Project co-funded by ECHO -Humanitarian Aid and Civil Protection*

## Teaching Programmes for children, youth and teachers

(Taradell, 21st December 2016)

# 1. Children

## 1.1. Kidergarten (3-6 years old)

During this life period, children shall discover that Earth is made of land, air and water. Mountains, forests, rivers, lakes, oceans, valleys and deserts are parts of the Earth. They shall explore the characteristic of each ecosystem and identify the features of their local environment.

They shall understand the concept of *resource* and its relationship with life and natural systems. Next, they shall understand that places where we live change over time due to natural environment changes. Specifically related with wildland fires, the following table shows some guidelines to help developing the program:

KINDERGARTEN (3-6 years old)
<i>General points to take into account:</i>
<ul style="list-style-type: none"> <li>• New knowledge must be told in a story.</li> <li>• Children are extremely experimental.</li> <li>• Children are extremely tactile and sensorial.</li> <li>• Attention spans about ten minutes.</li> <li>• Every new concept must be introduced by an age-adapted example.</li> </ul>
<i>Main concepts to be introduced</i>
<ul style="list-style-type: none"> <li>• Good fire/Bad fire.</li> <li>• What to do in case of forest fire.</li> <li>• The forest</li> </ul>
<i>Topics to talk about</i>
<ul style="list-style-type: none"> <li>• Simple questions about fire               <ul style="list-style-type: none"> <li>- Is fire hot or cold?</li> <li>- What happen if you touch a fire?</li> <li>- Have you ever seen a fire?</li> <li>- What was the fire doing? (campfire, cigarette, burning house...)</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• Telling stories about detecting a fire.               <ul style="list-style-type: none"> <li>- How does smoke smell?</li> <li>- What would you do? Urban and rural children have very different experiences and reactions.</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• Flammable and non-flammable materials. Leaves, brunches, glass, clothes.</li> <li>• What to do if clothes ignite.</li> </ul>
<ul style="list-style-type: none"> <li>• Good fire: examples of fire that we need in our life.</li> <li>• Bad fire: uncontrolled effects.</li> </ul>

## 1.2. From 6 to 8 years old

At this age, students start to learn that animals and humans need shelter and food to survive, that healthy ecosystems offer benefits to their inhabitants, and that human activities can influence those resources, positively or negatively, changing natural systems.

During this stage animal life cycles shall be introduced and why these cycles are vital for species survival. They shall learn about animal evolution and adaptation, and factors that affect plants health and grow. Students also shall learn about the relationship between human needs and ecosystem's resources, goods and services.

At the end of grade three, students shall learn how environmental changes, caused by living organisms, can have beneficial, detrimental or neutral effects on other organisms. At this point, students shall be able to identify ecosystems by the way humans have changed them.

From 6 to 8 years old
<i>General points to take into account:</i>
<ul style="list-style-type: none"> <li>• Attention spans about 15 minutes for a sit-down program.</li> <li>• Children begin to absorb adult fears, concerns and restraints.</li> </ul>
<i>Main concepts to be introduced:</i>
<ul style="list-style-type: none"> <li>• Fire and animals on the forest.</li> <li>• The fire triangle.</li> <li>• The story of a forest. Ecology.</li> </ul>
<i>Topics to talk about:</i>
<ul style="list-style-type: none"> <li>• Four seasons + fire season               <ul style="list-style-type: none"> <li>- Good fire: cleaning the ground.</li> <li>- Bad fire: the more brush and trees in the forest, the bigger the fire will be. Comparison with basic concepts (campfire...)</li> <li>- Plant adaptations to fire.</li> <li>- Human causality: good practices, activities that causes fires: campfire, matches, cigarettes...</li> <li>- Animal adaptations to fire.</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• Fuel – fire starter – oxygen. Practical demonstration.               <ul style="list-style-type: none"> <li>- Applications of the fire triangle during fire suppression: fuel reduction, water dropping.</li> <li>- Reducing the number of trees high-intensity, fire can be reduced. Forests provide goods such as wood to make furniture, paper, firewood to be warm on winter...</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• Forest ecology               <ul style="list-style-type: none"> <li>- Trees growing from seeds. Need of light into the forest.</li> <li>- Fires are a natural perturbation in unmanaged forests: <u>trees density and size increase</u> &gt; light does not get to the ground &gt; grass and flowers star to die &gt; animals do not have enough food (if a forest fire occurs) &gt; old trees die due to the fire &gt; sunlight gets to the ground &gt; grass and flower grow &gt; animals can eat again &gt; old trees that survived the fire keep producing their seeds &gt; new trees star to grow &gt; <u>tree density and size increase</u>... so we need good fires.</li> </ul> </li> </ul>

- The natural cycle of fires imprinted in tree scars.
- Effects of removing the fire perturbation from forests: in dense forests there is a high competition for water and soil nutrients, thus lots of unhealthy and dry trees are ready to burn in very intense (bad) fires that ultimately kill all the trees, old and young, sick and healthy.
- Current situation: dense forests induce large wildland fires.

### 1.3. From 8 to 12 years old

At this point, students shall learn that plants are the primary source of matter and energy entering most food chains, the role of plants in those food chains and the importance of living things. They shall examine how all organisms, including humans consume energy and matter and how natural systems are the ultimate source of these resources.

They also discover that living organisms depend on each other and their environment for survival; how organisms compete with each other for food shall be analysed and students shall learn the role that humans can play in the health of an ecosystem.

At this stage, they will discover about energy: heat, energy transference, sources and a wide range of concepts that are primarily related with wildland fires:

From 8 to 12 years old
<i>General points to take into account:</i>
<ul style="list-style-type: none"> <li>• Attention spans about 20 minutes for a sit-down program.</li> <li>• Children are very physical and full of energy.</li> <li>• Some children can be reluctant to get involved.</li> <li>• They can assimilate major ecological concepts and discussions.</li> </ul>
<i>Main concepts to be introduced:</i>
<ul style="list-style-type: none"> <li>• Fire effects. Intensity and frequency.</li> <li>• Healthy forests.</li> <li>• Prescribed fires.</li> <li>• Wildland firefighters (at this point it is necessary a close collaboration with wildfire suppression national, regional and local services).</li> </ul>
<i>Topics to talk about:</i>
<ul style="list-style-type: none"> <li>• Evolution of fire suppression: from suppression to management.</li> </ul>
<ul style="list-style-type: none"> <li>- Application of scientific criteria after investigation.</li> <li>- Relationship between fire intensity and tree survival.</li> <li>- Fire as a common and useful fact: good fires keep the forest healthy.</li> <li>- Low intensity and high frequency fires vs. one single fire of very high intensity.</li> </ul>
<ul style="list-style-type: none"> <li>• Current situation: dense forest is perceived as a good and healthy forest.</li> </ul>
<ul style="list-style-type: none"> <li>• Prescribed fires.</li> </ul>

<ul style="list-style-type: none"> <li>• When? Environmental conditions that allow controlled fires.</li> <li>• Why? Because these fires consume young, weak and sick trees, letting big trees to grow in a less dense and healthier forest. <ul style="list-style-type: none"> <li>◦ Because they help reducing fuel load and preventing wildfires.</li> </ul> </li> <li>• Prescribed fires are a professional matter: like pills have to be prescribed by a doctor, prescribed fires have to be prescribed by a forest technician.</li> </ul>
<ul style="list-style-type: none"> <li>• Protective suit. Adaptable to every region.</li> </ul>
<ul style="list-style-type: none"> <li>• Objective: no firefighters injured or killed.</li> <li>• Nomex fabric: special fire –resistant material.</li> <li>• Fire-resistant vs. fire-proof.</li> <li>• Main equipment: Boots/helmet/glasses/ear plugs/leather gloves.</li> <li>• Others: first – aid kit, head-lamp...</li> </ul>
<ul style="list-style-type: none"> <li>• Firefighting tools: adaptable to every region.</li> </ul>
<ul style="list-style-type: none"> <li>- McLeod, Pulasky, hoe, shovel, chainsaw...</li> <li>- Challenge: eliminate all fuels that can burn (sticks, leaves, pine needles, young and sick trees) with tools to avoid the growth of the fire.</li> </ul>
<p>✓ It is important that children understand that firefighters are highly prepared professionals (carrying heavy tools, protective wearing and fighting against bad wildfires) with very high level both physical and technical training who assume a high risk when they work in order to protect society so, everyone has the responsibility of preventing forest fires trying to avoid that high risk to emergencies workers.</p>
<ul style="list-style-type: none"> <li>• Firefighter training</li> </ul>
<ul style="list-style-type: none"> <li>- The fire triangle:</li> </ul>
<ul style="list-style-type: none"> <li>▪ Fuel and its change over the time.</li> <li>▪ Fine fuels (grasses, pine needles and leaves) and heavy fuels (limbs, logs, tree trunks).</li> <li>▪ Why do we have bigger wildfires now than in the past? Because we have many fuels.</li> <li>▪ Air to supply oxygen for the flame.</li> <li>▪ Heat to start and continue the combustion process.</li> </ul>
<ul style="list-style-type: none"> <li>- Crown fires: most destructive fires, spreading from crown to crown instead of on the ground. Unstoppable.</li> </ul>
<p>✓ At this point, statistic information about wildfires, forest, ecology... can be provided.</p>

## 2. Youth (from 12 to 18 years old)

At this point, students begin to choose their own educational path, so the information transferred shall be focused on the students’ main interests. In any case, there are two topics that must be included at this stage of the program, in order to spread information useful not only for children and youth, but for the whole community:

- a. Effects of fire on the diversity of the forest. Fuel management. Prescribed fires.

- ✓ Fire is an ecological action all over Mediterranean Region (example of plant adaptations: cork).
  - ✓ Humans will unavoidably have to live with fires. If we have to co-exist with fire, we have to manage it.
  - ✓ The causes of a fire are not as important as the resources that we have and use to manage it.
  - ✓ Most of fires remain small due to the fast suppression carried out by the extinction services.
  - ✓ Uncontrolled fires can be very devastating: threatening communities, whole forests and lives.
  - ✓ *Prevention*: we want to stop high-intensity fires before they start.
  - ✓ *Suppression*: detection (lookouts, emergency calls) and dispatch (assigning resources – ground and aerial ones - to the fire, depending on the fire evolution).
  - ✓ *Wildland Fire Management*: 'let it burn' and fire monitoring when required, mainly when low and medium fires occur through specific forest species. The fuel burnt in these cases will not be available in the future, reducing high-intensity fires probability.
  - ✓ *Fuel management*:
    - Fuel types: fine and heavy, dead and live fuels.
    - Determination of the best tools to manage those fuels: tree thinning and prescribed fires.
    - Why fuel management: to reduce the threat of large and intense forest fires, to get healthier forests without large wildfires like we had in the past, to protect life and communities, to get our forests closer to historic ecological conditions, to increase forest diversity...
- b. Fire in the wildland-urban interface (WUI).
- ✓ What is the WUI? Area where human development meets the wildland. Wildfires in these areas threaten lives and assets.
  - ✓ (FIRE + PEOPLE + INCREASING FIRE IGNITION + LARGER FIRES) = GREATER LOSS OF LIFE AND ASSETS    More money spent on Firefighting.
  - ✓ What can be done to reduce de WUI fire risk?
    - Assessing home safety in the WUI. Checklist design.
    - Explain to homeowners that they are living in an area “designed” by nature to burn.
    - Resource allocation: Water and electricity supplies.
    - Garden design.
    - House risks: what is the construction made of? Is firewood and other stored woods touching walls? Are weeds and tree limbs cleared away from the sides of the house? Does the house have a “green fence”?
    - Around the house risks: are trees and shrubs 5m apart or more? Are low branches cleared from underneath big trees?
    - Location house risks: is the house at the top of a slope? Is the road wide enough for fire engine circulation?

These two topics, closely related with safety and landscape management, must be introduced at every educational program in order to motivate a general knowledge about wildfires. On the other hand,

specific programs can be introduced making the most of students interests. Following, there are two examples:

a. The role of Chemistry in Fire Management.

- ✓ The chemistry of fire. Oxygen + Fuel + Heat.
  - Fire = combustion.
  - Oxygen. What is it? Where is it? Is it enough in the atmosphere to sustain a fire?
  - Fuel. What is the fuel of a wildfire? Fuel Models.
  - Heat. What are natural and human-made ignition sources?
  - The combustion process of wood.
  - Flammable gases. Smoke components.
- ✓ The fire risk rating systems. (Weather + winds + draught rate + fuel) = Fire risk prediction.
- ✓ Using the chemistry to control wildfires.
  - Fire foam.
  - Fire retardant.
  - Combustion extinguisher.
  - Ignition balls.

b. People in fire's homeland (managing the fact that people live in the forest).

- ✓ Fire is a natural disturbance of the forest. When people move to the forest have to understand that they are exposed to new risks and obligations.
- ✓ Fire behaviour:
  - Diversity of landscapes and topography cause very different fire behaviour.
  - Applying scientific investigation, including topographical spreading, will help to better understand fire behaviour.
  - This knowledge has to be implemented to civil engineering and settlement design in order to be proactive against wildfire risk.

### 3. Teachers

Society has been taught that all fires are bad and that suppression is our only option. Teachers shall be able to transform children and youth in the conductors of the information that must be spread to the population in order to change the global perception about fire. Thus, any education program shall begin by training teachers on teaching children and youth on topics, such as wildfire ecology and management, that are often unknown by the educators themselves. It is therefore necessary that the values of learning environmental education related to wildfires are first taught to teacher together with the overall societal benefits. A comprehensive draft about wildland fire knowledge has been designed in order to achieve well-trained teachers:

- 1) Introduction
  - a) *History of humans and fire.*
  - b) *Main concepts. Uncontrolled fire vs. Controlled Fire.*
- 2) Ecological Aspects of Wildland Fires
  - a) Fire Triangle.
    - i) *Heat: convection, radiation, conduction.*
    - ii) *Fuel: moisture content, size and shape, quantity, vertical arrangement.*
    - iii) *Oxygen.*
  - b) Fire Behaviour.
    - i) *Fuel. Influence on fire and flame spreading.*
    - ii) *Weather. Wind, temperature and humidity influence. Spot fire. Fire's own winds. Up and downslopes wind and their safety consequences. Day-night humidity fluctuation and its effects.*
    - iii) *Topography. Shape of the landscape, elevation and slope direction, amount of shade or sunlight, slope steepness.*
- 3) Fire Regimes.
  - a) *Ecological factors dependant on fire regime. Plants: protection, growth, reproduction, germination. Impacts on animals.*
  - b) *Fire dependant ecosystems. Fire exclusion policies. Effects of fire regime variation.*
  - c) *Fire-sensitive ecosystems.*
  - d) *Fire-independent ecosystems.*
  - e) *Fire exclusion policies. Effects of fire regime variation.*
  - f) *Ecologically appropriate vs desirable fire regime.*
- 4) Fire Effects.
  - a) *Wildland fire effects: animals, plants, environment, human resources and life.*
  - b) *Prescribed fire effects.*
  - c) *Public perceptions and attitudes toward wildland fires. Motivation and education.*
- 5) Fire Management.
  - a) *Fire as a management tool.*
  - b) *Prescribed fires.*
  - c) *Fuel management.*
  - d) *Public education is necessary to the success of fire management programs.*
- 6) Fire Prevention.
  - a) *Causality (campfires, smoking, fireworks, trash, vehicles, arson).*
  - b) *Risk awareness and societal responsibility.*
  - c) *Need and advantages of a resilient society.*
- 7) Fire Mitigation.
  - a) *Wildland-Urban Interface. Types of configuration and associated risks.*
  - b) *Society responsibility on its own protection.*
  - c) *The main concept: wildfires are going to occur. It is not a matter of 'if', it is a matter of 'when'. It is necessary to be prepared.*



In order to get a high motivation in teachers, new methods of learning must be implemented. A good example to take into account is the Forestry Institute for Teachers, where multidisciplinary training is taught in a dynamic environment. On the other hand, economic and professional encouragement must be set to ensure high participation at the beginning of the educational program. Teachers of rural areas, already concerned about wildland fire risk should be encouraged to participate in the program, as a way of easily spread the need of a high involvement within the educational community.

**“Learning for understanding, understanding to love, loving to protect”**

**(Office de l'environnement de la Corse)**

**"...me lo contaron y lo olvidé, lo vi y lo entendí, lo hice y lo aprendí..."**

**'...they told me and I forgot it, I saw it and I understood it, I did it and I learnt it...'**

**More detailed information about teachers programmes in:**

eFIREcom Project *D17 Report on operational recommendations to enhance children, youth and teachers involvement in wildfire risk management through communication actions:*

<http://efirecom.ctfc.cat/?lang=en>