

People, Forests & Climate: an Integrated Approach to Forest Fire Prevention in Ticino, Southern Switzerland

introduction

theoretical background

perspectives

¹Forest Ecosystems and Ecological Risks, Swiss Federal Research Institute WSL, Lausanne and Birmensdorf, SWITZERLAND
²Laboratory of Ecosystems Management (GECOS), Swiss Federal Institute of Technology (EPFL), Lausanne, SWITZERLAND
 P.O. Box 96, CH - 1015 Lausanne, SWITZERLAND, michael.reinhard@wsl.ch Phone +41-21-693 5754, Fax +41-21-693 3913

WSL
 Carraro, G. et al., 1999. Osservazioni di precipitazione in relazione al clima. *Informazioni meteorologiche*, N°9-31. Final report, VWF, Zürich.
 Conedera, M. et al., 1999. *Incendi Boschivi in Svizzera. Analisi, passato, presente e possibili sviluppi futuri*. Rapporto di lavoro PWR 31, VWF, Zürich.
 Johnson, E.A. & Myrland, K., 2007. *Forest Fire Behavior and Ecological Effects*. Academic Press, San Diego, London.
 Walther, Z. et al., 2002. Ecological responses to recent climate change. *Nature*, 416: 669-675.

Context & Objective

Forest fires are common events in winter in Ticino, southern Switzerland. During winter little precipitation and strong Foehn winds occur, resulting in frequent droughts. This drastically dries out the fuel available, and forest fires are likely to burn intensely. Forests are valued by humans for several reasons, and fires reduce their perceived value. Ironically, people are the primary source of ignition of forest fires. We assess this dual role in an integrated manner to better understand human behaviour towards forest fire phenomena, linking our results to climate change and its impacts.

Methods

The integrated approach of the present research required a selection of various quantitative and qualitative methods:

- Statistical exploration and analysis of fire, society and climate records
- Semi-directive interviews and Focused Group Research
- Questionnaires
- Integration of cultural and natural aspects using GIS for decision making support



Available fuel in the forests builds up from natural vegetation growth, but largely depends on agro-forestry activities. Fuel consists of standing and fallen wood (live and dead), leaves or needles (dry and humid) on the ground and trees, and grasses (dry or green). The quantity and quality available matters because it defines the intensity of a fire event.

Forestry and Agriculture



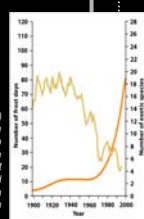
In winter, dead leaves contribute to fuel load in the forests and lead to ground fires when lit



Laurophyllation became characteristic of Ticino's lowest forests



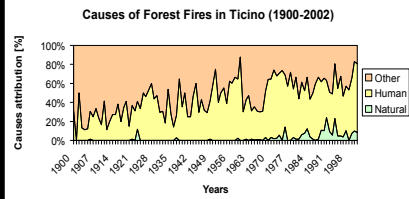
Grass and shrubs increased considerably in the forests due to socio-economic changes during the 1960ies (see fire curve below)



Walther (2002) demonstrated the relationship between the number of frost-free days and exotic vegetation invasion

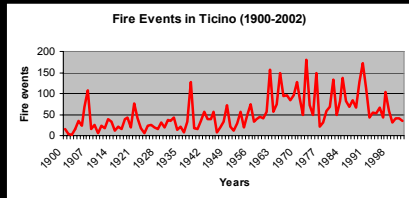
Vegetation growth and change

Climate also governs the nature of vegetation and the fuel load in the forests. Climatic changes might lead to modifications of the current species composition in the forests. Furthermore, not all vegetation types burn similarly and some trees are more resistant to fire than others. These changes may well affect the behaviour of forest fires and their altitudinal distribution.



Most forest fires are caused by human behaviour (Banca Dati Incendi, WSL Sottostazione Sud delle Alpi)

Forest fires cannot be regarded as natural phenomena in the South of Switzerland because they are mostly anthropogenically triggered. The changing climatic patterns set new conditions for the forests, however, climate and vegetation response cannot explain the sudden increase in forest fires events by themselves.



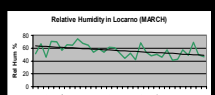
New trend from the 1960ies onwards (Banca Dati Incendi, WSL Sottostazione Sud delle Alpi)

State of the Forest

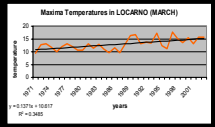
Trigger

Fire event

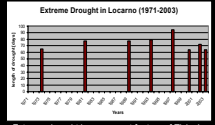
Climate is a key element, which affects relative humidity within the forests. In Southern Switzerland, we have observed increasing trends in extreme drought, probably linked to climatic change.



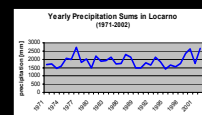
There is a decreasing trend in relative humidity. However, this trend needs to be investigated more into depth



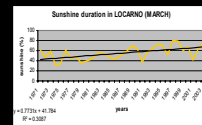
There is a clear trend in Maxime Temperatures increase in March, when fires mostly occur



Extreme drought is a recurrent feature of Ticino's climate



There is no significant trend in Ticino's yearly precipitation sums all over the past century.



Sunshine has a drying effect on the fuel load within the forests

These changes are more important than changes in annual precipitation sums. An increase in extreme drought implies a higher risk for forest fires.