EFC WP on the Management of Mountain Watersheds

The protective Functions of Forests in Mountain Watersheds in the context of a Changing Climate

French national Report

ONF - NATURAL HAZARDS DEPARTMENT

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What does « protective forests » mean, in France?

- Forests with a role in the control of natural hazards (avalanche, erosion, rock fall, etc.)
- Forests with an important ecological or social role
What does « protective forests » in France mean?

- Forests with a role in the control of natural hazards (avalanche, erosion, rock fall, etc.)

  → with a protective function
FRENCH FORESTS WITH A PROTECTIVE FUNCTION

- only mountain forests

French forests by elevation ($A$) class

- $A > 1200$ m
- $600$ m $< A < 1200$ m
- $600$ m $> A$

Total French forests: 16.2 M ha

(30% French area)

- 6% $A > 1200$ m
- 21% $600$ m $< A < 1200$ m
- 73% $600$ m $> A$

French mountain forests: 27% $\rightarrow$ 4.4 M ha
FRENCH METROPOLITAIN FORESTS WITH A PROTECTIVE FUNCTION

- **only mountain forests**: 4.4 M ha

- **with different owners**

- **but not all mountain forests**: c.a. 40 % have a real protective function
  - **1.9 M ha** of French forests with a protective function, in mountains

- **policy of reforestation and restoration of mountain areas (RTM)**
  - **0.2 M ha** of French State mountain forests (1860-1980)
PROTECTIVE FUNCTIONS OF MOUNTAIN FOREST

- limiting soil erosion and concentration of solid materials in torrents
  - forest capacity: to fix the soil (at first, the reason of RTM policy and still the major role)
  - forest characteristics: plant coverage in erosion area

- preventing from release of snow avalanches
  - forest capacity: to capture the snow in branches and stems
  - forest characteristics: evergreen species in release areas

- limiting or stopping rock falls
  - forest capacity: to decrease the speed or to stop rocks smaller than 1 m³
  - forest characteristics: great stem density and basal area in propagation zone
French mountain forests:
mainly spontaneous

- Hardwood species (beech) 37 %
- Coniferous species (fir, spruce, scots pine) 63 %

RTM forest policy
→ increased forest area: c.a. 0.2 M ha
→ most used species: Austrian pine, larch

Risk for sustainability of protective function in mountain forest
- very prone to aging:
  • under-exploitation of forests in high elevation: stands are not renewed
  • low stem density can impact the protective function
  • too old trees do not display the same resistance as young ones
- plantations are even-aged forests: “Renewal of Protection forest Stands Program” (2007)
- natural hazards: big storms (1999, 2009), fire (Southern Alps)
- wild game (mostly deers): difficulties for forest regeneration
MANAGEMENT OF PROTECTIVE FORESTS

- **Private forests**: management difficulties
  - highly fragmented with most forests < 4 ha → no management obligation
  - slopes and lack of forest trails → lack of management

- **Public forests**: adapting general management to protective forests
  - **forest management plan**: main document, definition of decisive function of the forest
  - **assertion of protective function of forests**:
    - **Hazard Control Index (IMA)**: 0 to 6 (no to max efficiency of forest)
    - **determination of silvicultural operations** for maintaining protective function
  - **renewal prioritization**: 12 % of RTM stands with a high protection potential

- **Challenges**
  - **financial**:
    - management of mountain forests is expensive and less attractive
    - ONF receives around 600 to 700 k€ for whole measures in public RTM forests
  - **technical**:
    - to reconstruct an equilibrium of life cycles in homogeneous forests
    - to develop a specific monitoring of wild game in protective forests
“Mountain guidelines of silviculture”
- national strategy for mountain forests
- good practices (*timber marking, logging, other*)
- technical sheets for each natural hazard and specie
  (*global objectives, situations, adapted sivilcultural interventions*)

**Effect of agriculture** on protective forests
- *during centuries:* increase of population and demand for food and wood  $\rightarrow$ negative
- *then:* rural exodus + industrial Revolution + politics of reforestation  $\rightarrow$ positive
- *nowadays:* the lowest proportion of agricultural areas is in mountains (26 % in the Alps)
  but role of pastoralism on biodiversity and tourism  $\rightarrow$ encourage silvopastoralism
**PROTECTIVE FORESTS POLICY AND GOVERNANCE**

- **Effect of recreational and touristic activities** on protective forests
  - important touristic activity *increases the places to be protected*
  - some societal conflicts (very limited): mainly linked to skiing

- **Protective forests and ecology**
  - mountain forests are *really rich* in terms of natural heritage
  - most protected forests are mountain forests

- **Research studies on protective forests** (examples)
  - Irstea: studies on the protective function of forests on rock fall
  - ONF / R&D: applied research project

*French national and regional nature parks*
drier weather than observed nowadays
- impacts the vitality of some mountain tree species not adapted (e.g. Austrian pines)
  → replacement adaptation is needed (e.g. cedar)

increase of natural hazards
- fires: more frequent and localized at higher altitudes and elevations
  → measure to decrease the speed of propagation and the time of firemen intervention
- storms: windfall and broken branches → decrease the stands density
  → to look at the regeneration and see if young trees regenerate naturally or not

increase of the elevation of the tree line
- positive impact: forests will be able to maintain soil and the snow on new areas
  → their protective function will increase

Until now, no specific policy is developed to face these challenges
SYSTEMATIC MAPPING OF PROTECTIVE FUNCTION

- Interreg project IV (2007-2013)

- Urban area of Grenoble (Northern Alps)

- Systematic application of Hazard Control Index (IMA)
  - in regard to rock fall
  - in regard to snow avalanches

- Quite representative of the role of protective forests in the high elevation mountains of France (Alps and Pyrenees)

Global IMA Index
0: no effectiveness
1-2: low effectiveness
3-4: medium effectiveness
5-6: high effectiveness
FRENCH PROTECTIVE FOREST AND HAZARD MAPS

- Example of Veyrier-du-Lac (Northern Alps) → 2010: risk plan review

1. Rock fall hazard (using an Irstea 3D model)
   - with protective forest
   - without protective forest

2. Resulting Risk Plan
   - "Green zones": identified forests are subject to specific silvicultural measures
TAKE HOME MESSAGE

- **Forests with a protective function** against natural hazards (erosion, avalanches, rock fall) are a **small part of French forests, specific to mountain areas**.

- **Other issues to consider**: agriculture, ecology, tourism.

- **Mainly private owners** with no management, but a **specific management** by ONF in public forests.

- Specific French **silvicultural guides** adapted to different mountain regions.

- **Financial and technical challenges** to adapt silvicultural measures to **even-aged forests, wild game and changing climate** (fires and storms).

- A specific **Index** to help assessing **effectiveness** of forest protective functions.

- Forests with protective functions can be considered in risk plan.
THANK YOU FOR YOUR ATTENTION

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