



FLAGSHIP PROJECT
2025-2028

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Keywords

One Health

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Fire hazard

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Thematics involved

Forest ecology

Fire ecology

Health ecology

Genetics

Population biology

Remote sensing

Plant pathology

Social anthropology

Ecosystem services

Food webs

Modelling

Departments involved

ACT

ECODIV

SA

Units involved

URFM

UR LESSEM

UMR RECOVER

UMR BIOEPAR

UR EFNO

URZF

UMR Silva

UMR TETIS

UREP

UMR BIOGECO

Partners

Laboratoire Chrono-Environnement

Understanding the links between forest and human health, vulnerability to global changes, and biological diversity

Backgrounds and challenges

Forests host exceptional biodiversity and provide essential ecosystem services, ranging from carbon sequestration to disease regulation. Yet, deforestation, overexploitation, and anthropogenic pressures are weakening their resilience and fostering the emergence of health risks. In this context, the "One Health" approach—linking human, animal, and environmental health—offers a relevant framework to understand the interactions between forest health and human health. The SALUD project aims to explore these connections by studying the impacts of biodiversity and forest management history on two major issues: tick-borne diseases and fire risk. Thus, the project seeks to fill this gap by investigating how human activities, particularly forest management, affect forest ecosystem health and their potential repercussions on human health, such as the emergence of zoonotic diseases or wildfire risks.



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Objectives

The SALUD project seeks to better understand how the health of forest ecosystems directly or indirectly influences human health. To this end, it is structured around four main objectives:

- Assess the influence of forest management history on biodiversity, stand structure, and forest resilience. Old-growth forests, untouched for several decades, will serve as a reference state to characterize a "healthy" ecosystem;
- Analyze the vulnerability of forests to major hazards: wildfire risk and phytosanitary threats (pathogenic fungi and insects);
- Quantify tick population density and pathogen prevalence (particularly *Borrelia* spp.) along a forest management gradient. This approach will allow testing the dilution and amplification hypotheses of zoonotic risks in relation to biodiversity;
- Integrate these different dimensions to understand how forest health—for example, through trophic networks and ecosystem services—affects human health. This will provide essential knowledge for designing operational indicators and guiding sustainable management strategies that reconcile conservation, risk prevention, and human well-being.

Approaches

To achieve these objectives, SALUD adopts a multidisciplinary and multi-scale approach, combining ecology, genetics, epidemiology, and modelling.

The approach first relies on the selection of "pilot sites" in mountain beech-fir forests, representative of different management histories (exploited forests, forests abandoned for several decades, old-growth forests). On these sites, multitaxonomic inventories (plants, fungi, insects, birds, mammals, bats) will be conducted, along with structural (composition, regeneration, deadwood, canopy openness) and genetic (adaptive diversity of trees) measurements.

At the same time, tick density and pathogen prevalence will be assessed through standardized sampling and molecular analyses. These data will be related to host community composition, identified through trapping, acoustic monitoring, and floristic surveys.

Concerning fire risk, measurements of combustibility (deadwood, microclimate, litter moisture content) and modelling will help assess forest stand vulnerability.

All data will be integrated into trophic network analyses and multi-service models to link forest health, biodiversity, and health risks. This integrative approach, also drawing on national databases and remote sensing, will generate reliable indicators to evaluate and anticipate the impacts of forest management on both human and ecosystem health.