STUDY AREAS

RINCINE

Due to its long-established tradition of sustainable management practices, the site was included in the International Model Forest Network. The site is characterized by mixed oak, chestnut, and beech stands, as well as coniferous reforestations, is representative of the forest ecosystems typical of the central Apennines.

BOSCO PENNATARO

Characterized by mixed forests, with a prevalence of Turkey oak and beech. The University of Molise routinely conducts research in this area to study old-growth forests and to monitor biodiversity. The site was recently identified as a core area of the Collemeluccio-Montedimezzo Alto Molise Man and Biosphere Reserve.

CAPRAROLA

Characterized by a mosaic of ecologically distinct habitats dominated by mesophilous woods where beech and Turkey oak are the most abundant trees, followed by chestnut, maple, and others broad-leaved species. The Municipality of Caprarola has a long tradition of forest planning and in 1982 most of Caprarola's forested area was included in the Regional Natural Reserve of Lago di Vico.

RINCINE
Comune di Londa (FI)
Unione dei Comuni Valdarno e Valdisieve
Demanio regionale

CAPRAROLA
Comune di Caprarola (VT)
Riserva Naturale Lago di Vico
SIC/ZPS Monte Fogliano e Monte Venere

BOSCO PENNATARO
Comune di Vastogirardi (IS)
CFS-UTB Isernia
SIC Bosco M. di Mezzo, M. Miglio Pennataro, M.Capraro

LEVERAGE EFFECTS

RINCINE

The potential of the Forest Information System provided by the project has led the managers to consider the possibility of extending the surveys from the demonstration site to the entire forest to have the data necessary as a basis for the new management plan based on the methodologies developed in FRESh LIFE. The growing stock data, provided by the FIS at the scale of the single forest unit, are extremely useful, for example, in preparing timber auctions.

CAPRAROLA

The demonstration area is subjected to ancient public land use requirements, such the right for local community's members to collect fallen wood for firewood. In addition, as Caprarola test site is included in a Regional Natural Reserve, the public accessibility and use of the area for leisure activities is a high priority, although forest ageing may cause tree/branch collapse incidents, posing danger to visitors. In this perspective, the Forest Information System provided by the project can offer a concrete opportunity to support local forest management decision-making in regulating and improving the public use of the forest.

BOSCO PENNATORO

The cartographic approach of FIS is very useful to support local forest decision making. It allows to collect and store data to produce several thematic maps that are highly useful to display the state of forest and to support discussion among forest decision makers involved in the management. The thematic maps offer the opportunity to have common documents to discuss and take decision about forest harvesting and other forest-related activities.

PARTNERSHIP

Under the coordination of the Italian Academy of Forest Sciences a partnership was created including Universities, local managers and private companies, in order to ensure the interaction between the research world and the daily work of local stakeholders. In detail the list of beneficiaries includes:

INFORMATION

www.freshlifeproject.net

MORE INFORMATION ON THE FRESh LIFE PROJECT CAN BE FOUND AT THE FOLLOWING WEB PAGES

Project website , routinely updated with news, details of upcoming events, and downloadable material regarding activities, methods, and results.

PROJECT REALIZED WITH THE CONTRIBUTION OF THE LIFE + PROGRAMM OF THE EUROPEAN UNION.

WEBSITE

YOU TUBE

FACEBOOK

DEMONSTRATING REMOTE SENSING INTEGRATION IN SUSTAINABLE FOREST MANAGEMENT

FRESh LIFE

REPORT FOR POLICY MAKERS

LIFE 14 ENV/IT/000414

FRESh LIFE
INNOVATIVE METHODS

Climate change is an unprecedented challenge and significantly impacts the functioning of forest ecosystems and the services they provide. The complex nature of climate change increases the uncertainty associated with predicting future forest ecosystem dynamics and requires an adaptive management approach. Forest managers therefore need monitoring and analysis tools to assess the current conditions of forest resources and their capacity to supply ecosystem services. Geographic information systems (GIS) and remote sensing are useful tools to quantify sustainable forest management (SFM) indicators to support local decisions.

SFM is widely recognized as a key objective of forestry policy and practices. To monitor, evaluate, and track progress toward SFM in Europe at the regional, national and international levels six key criteria were adopted and measured through a suite of quantitative and qualitative Pan-European indicators of forest management.

The FRESh LIFE – Demonstrating Remote Sensing Integration in Sustainable Forest Management (LIFE14/IT000414) project aims to develop innovative methods to integrate forest inventory data collected in the field with remote sensing information to estimate selected SFM indicators across space at the local scale. Within the project, high-resolution data were collected at three sites in central Italy using drones equipped with light detection and ranging (LiDAR) and optical sensors. Automated and semi-automated mapping methods were then used to spatially characterize the variables used to assess forest physiognomy and conditions at the scale of the forest management unit..

REMOTELY PILOTED AIRCRAFT SYSTEM

The use of Remotely Piloted Aircraft System (RPAS) in forest management is particularly advantageous for the following reasons:

- The spatial resolution of drone imagery, in the order of few centimeters, due to the low flying altitude of small drones; this feature augment the capability of visual interpretation of the imagery;
- High temporal resolution: the comparatively lower cost of operation and maintenance of small drones allow users to acquire imagery more frequently than with conventional remote sensing technologies such as commercial satellite and piloted aircraft imagery; possibility of making acquisitions in near real times in the case of specific events;
- Possibility to carry out multi-sensor acquisitions due to the availability of RPAS equipped with multispectral or LiDAR optical instruments.

In the FRESh LIFE project two RPAS were used: an octocopter and a fixed wing.

OCTOCOPTER

- Diameter of 1,8 m
- Total weight 15 kg
- Flight range 20 minutes
- Operating height 20 m above the canopy
- Possibility to cover from 20 to 50 ha in a day
- Equipped with ultralight Yellowscan LiDAR that allows to obtain point clouds with a density of 50 points/m²

PROJECT ACTIVITIES

THE AVERAGE COST OF SFM INDICATORS MAPPING PROCESS REFERRED TO 5 ha OF FOREST

The average cost the three data collection and processing techniques applied in Freshlife SFM indicators mapping process, are detailed. The cost of traditional field survey, regarded as "business as usual", amounts to more than one third of the total cost.

- Field survey - 360 €
- Ebee - 100 €
- Lidar - 500 €

FIXED WING

- eBee model from SenseFly
- Camera with RGB and NIR (near infrared) sensors capable of acquiring high definition multispectral images
- Wingspan 98 cm
- Weighs 700 g
- Maximum flight time of 45 minutes
- Possibility to cover over 60 ha with a single flight
- Created for photogrammetric applications able to create 3D digital models and high resolution orthophotos

DATA ACQUISITION

- Inventory data (position, plants list and aggregated data from the existing plots);
- Remote sensing data (orthophotos, multispectral and LiDAR data);
- Management plans with their maps;
- Auxiliary data (topographic maps, land use maps, etc.).

FOREST INVENTORY DATA COLLECTION

50 squared plots of 23mx23m (plot size = 529 m²) have been sampled where all plants (trees and shrubs) with a dbh > 2.5 cm were inventoried. The spatial position of the inventory plots (x, y coordinates of the centre of the plot) were acquired with GNSS receivers with a sub-meter accuracy. The following information were measured in each plot:

- Position, species, diameter, height, crown area, health status, and microhabitat of living trees;
- Position, diameter, height, and decay class of standing dead trees, stumps and down deadwood.

REMOTE SENSING DATA ACQUISITION

From the images acquired with eBee the following products have been elaborated:

- 2 point clouds (RGB and NIR) with an average of 20-40 points/ m²;
- 2 Digital Surface Models (DSM) with spatial resolution of 50 cm;
- 2 orthophotos (RGB and NIR) with spatial resolution of 10 cm.

From the LiDAR data we obtained the following products:

- Dense points cloud with an average of 70-120 points/ m²;
- Digital Terrain Model (DTM) with spatial resolution of 50 cm;
- Digital Surface Model (DSM) with spatial resolution of 25-50 cm;
- Canopy Height Model (CHM) with spatial resolution of 50 cm.

SUSTAINABLE FOREST MANAGEMENT INDICATORS MAPPING

Indicators derived from ***multispectral data***

- Map of the European Foret Types (EFTs);
- Defoliation;
- Forest Damage;
- Tree Species Composition;
- Introduced Tree Species.

Indicators derived from ***LiDAR data***

- Growing Stock;
- Above Ground Biomass.

FOREST INFORMATION SYSTEM (FIS)

To provide managers of the study sites with a useful forest management support tool, all data acquired and processed within the FRESh LIFE project were organized in a GIS-based FIS. A georeferenced data package was prepared in order to use GIS software used by managers and local foresters who were trained fore it's use.
All data collected during the project were stored in the FIS provided at the scale of the forest management units.