FRESh LIFE Project

Demonstrating Remote Sensing Integration in Sustainable Forest Management

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Climate change is an unprecedented issue in modern times, with significant implications for forested ecosystems, the economic benefits they provide, and the livelihoods of those who depend on them. Climate change is also a dynamic and complex issue that increases uncertainty about what future forests will look like. In this scenario, tools that allow forest managers to take forward-looking decisions are useful in order to preserve the goods and services provided by the forests.

Sustainable Forest Management is based on the principle of maintaining and enhancing the long-term health of forest ecosystems while providing environmental, economic, social, and cultural opportunities for current and future generations. The objective of the FRESh LIFE project is to demonstrate the possible integration of remote sensing technologies in Sustainable Forest Management in order to provide advanced spatial information that decision makers and forest managers can use to explore potential changes in future climate and their anticipated impacts on forests and forestry.
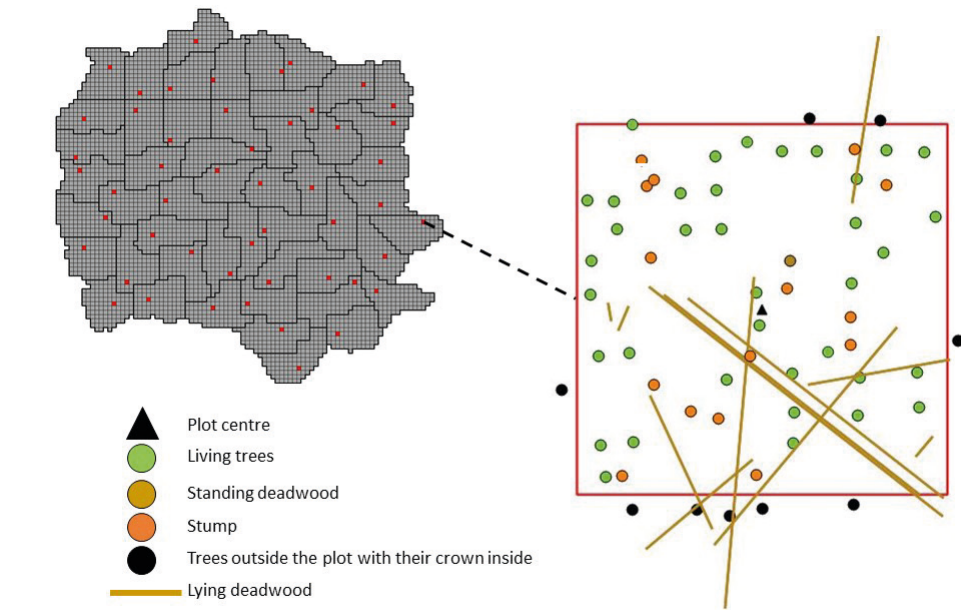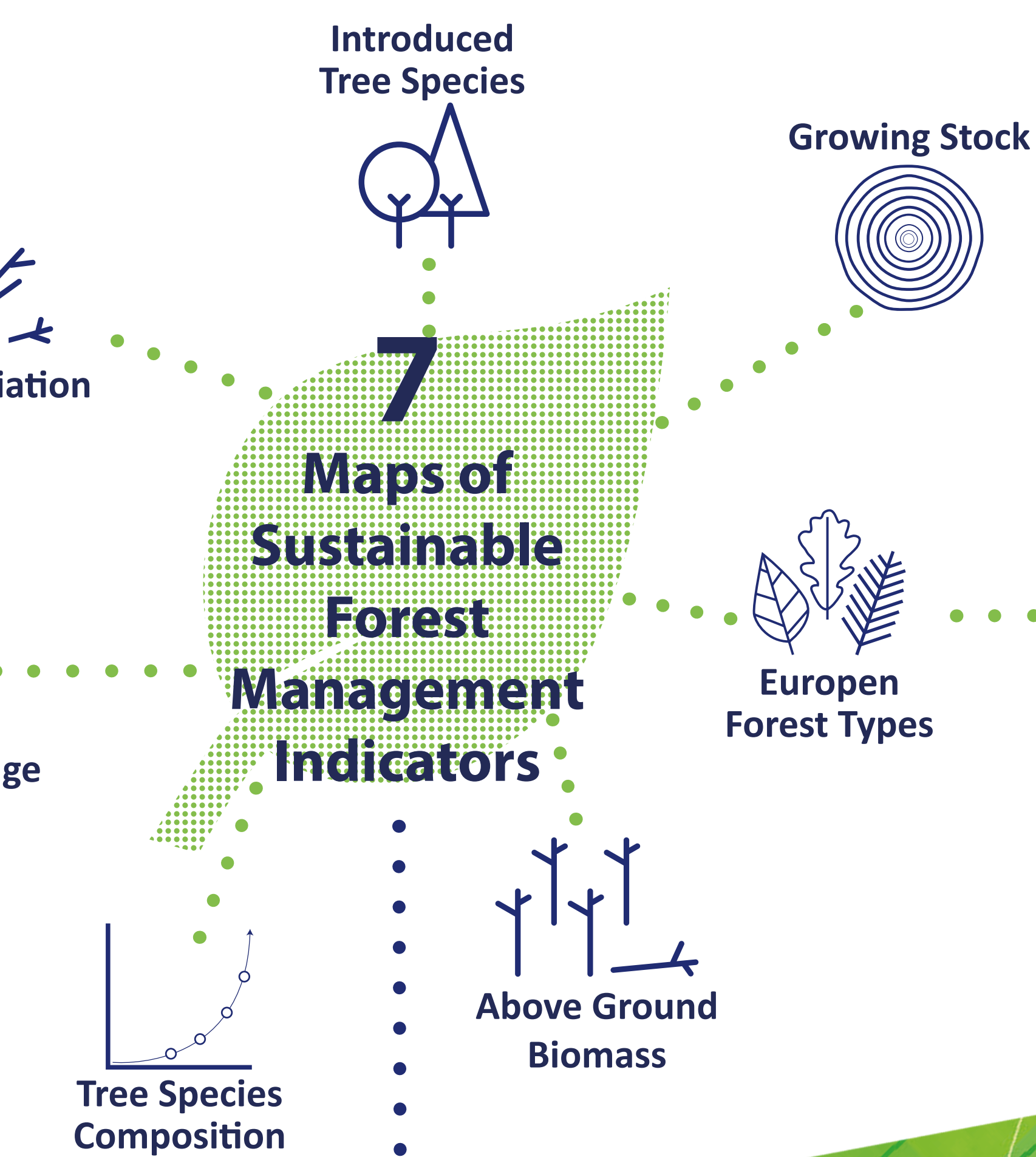
Demonstration Site

The demonstration site is located in Tuscany (Italy) within the public forest of Rincine. This study area included within the International Model Forest Network.

The selected area, which extends over 276 ha is characterized by mixed oak forests, beech forests and conifer plantations witch are common in the Appennines.

50 plots

In each plot all plants with a dbh > 2.5 cm were inventoried. The centres of the inventory plots were acquired with GNSS receivers with a sub-meter accuracy.
Dead wood was also collected.

Plot centre
Living trees
Standing deadwood
Stump
Trees outside the plot with their crown inside
Lying deadwood

7 Maps of Sustainable Forest Management Indicators

Introduced Tree Species
Growing Stock
Defoliation
Forest Damage
Europen Forest Types
Tree Species Composition
Above Ground Biomass

2 Remotely Piloted Aircraft Systems (RPAS)

The use of RPAS in forest management is particularly advantageous for the following reasons:

- the very high spatial resolution of drone imagery greatly enhances the capability of visual interpretation of the forests;
- high temporal resolution: the users can acquire imagery frequently giving the possibility of making acquisitions in short 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 sensors;
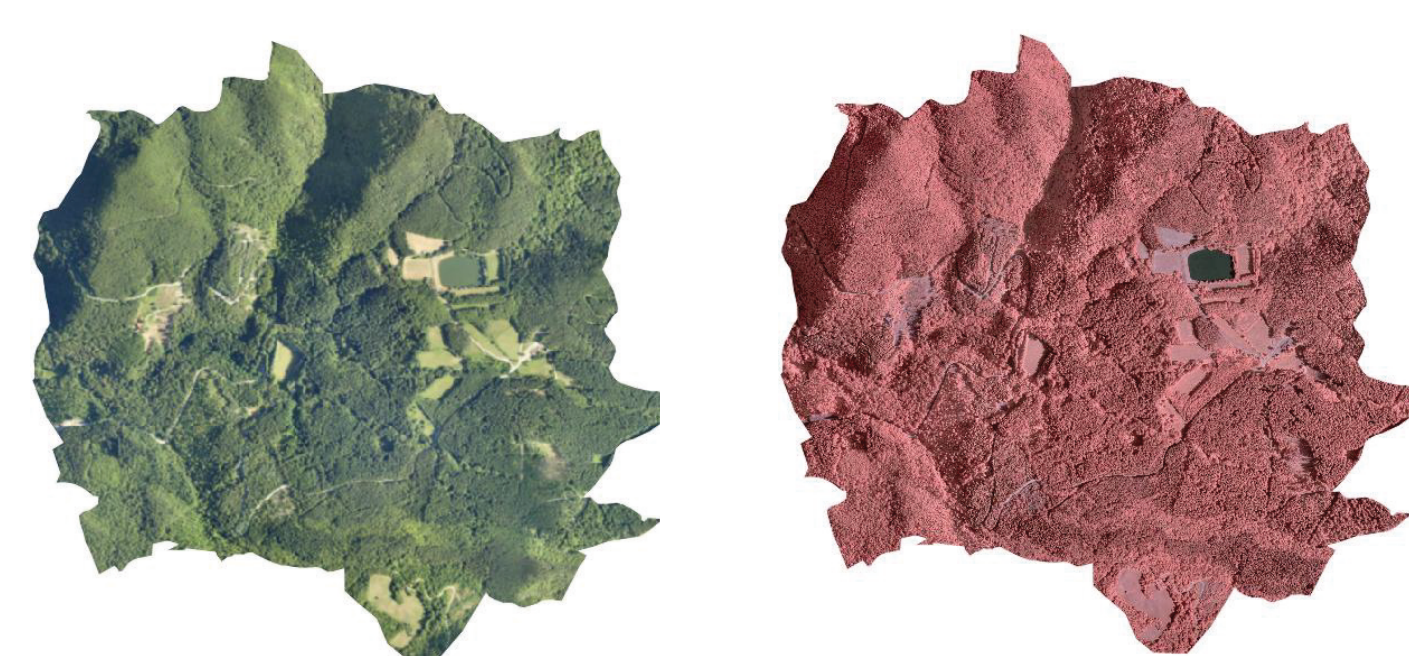
Fixed Wing

- eBee model from SenseFly;
- camera with RGB and NIR sensors;
- wingspan 98 cm;
- weighs 700 g;
- maximum flight time of 45 minutes;
- possibility to cover over 60 ha with a single flight;
- photogrammetric RPAS;

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;
- ultralight Yellowscan LiDAR sensor;

Forest Information System

All project data were organized in a Forest Information System (FIS) developed in a GIS software in order to give to the managers of the demonstration sites a tool useful for the activities that they carried out daily for the forest management.
A geo-located data package was created, in order to display all the layers could be viewed on any GIS software.
The FIS contains all the data collected and elaborated during the project, organized on the scale of the forest management unit.
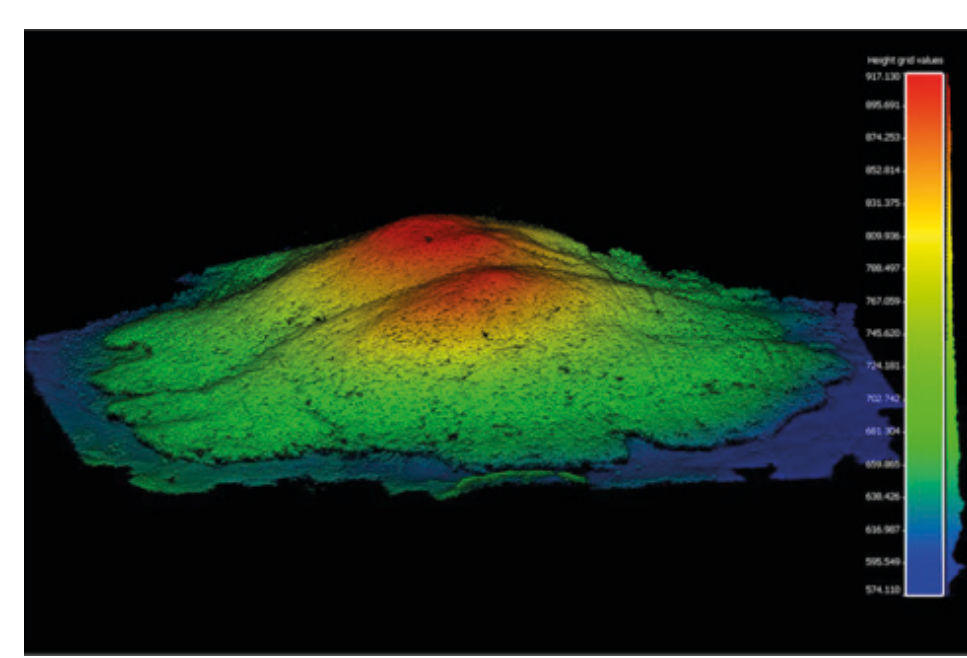
Multispectral data

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

- 2 point clouds (RGB/NIR) with an average of 20-40 points per square meter;
- 2 Digital Surface Models with resolution of 50 cm;
- 2 orthophotos (RGB/NIR) with resolution of 10 cm;

LiDAR data

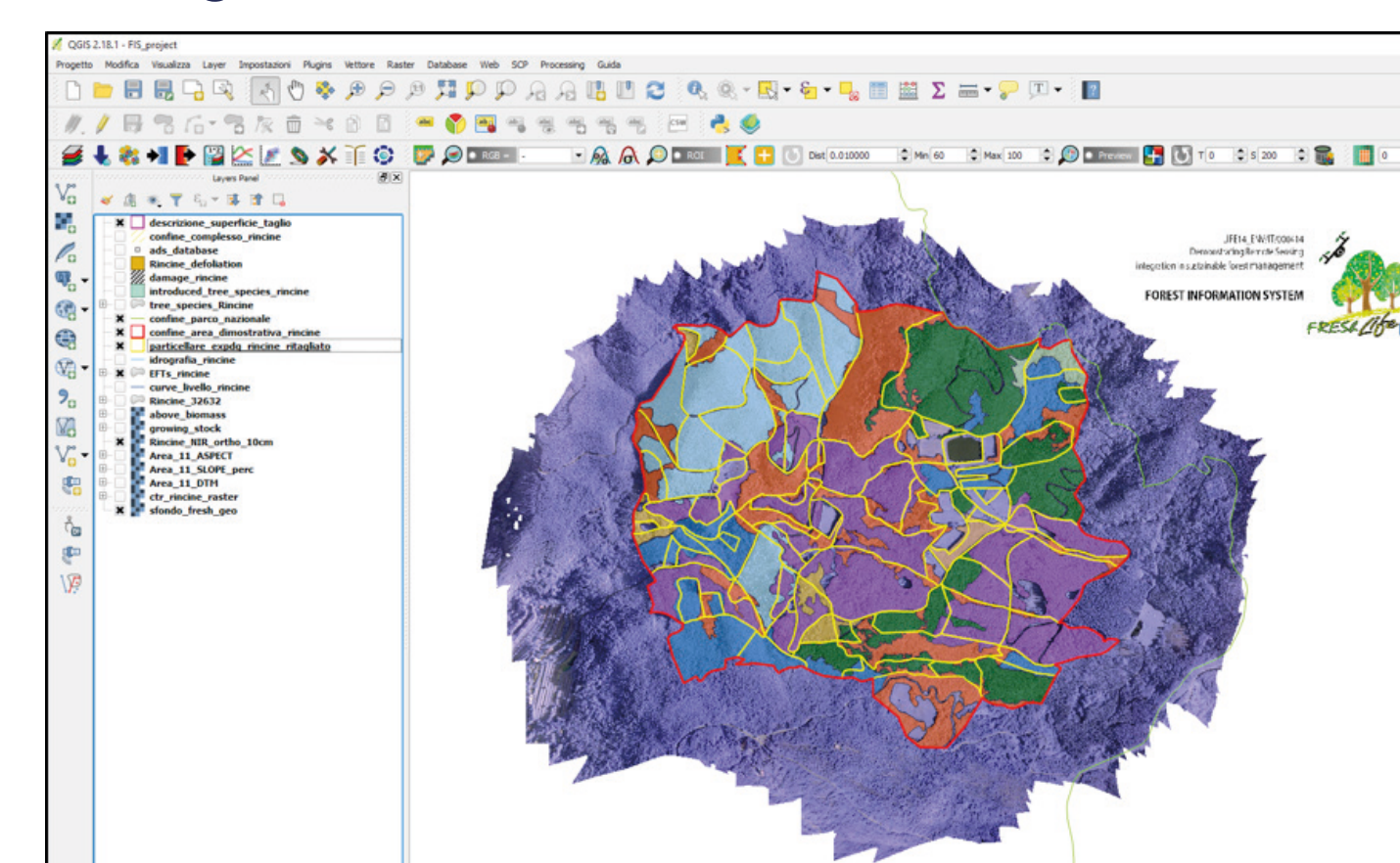From the LiDAR data we obtained the following products:

- dense points cloud with an average of 70-120 points per square meter;
- Digital Terrain Model with resolution of 50 cm;
- Digital Surface Model with resolution of 30 cm;
- Canopy Height Model with resolution of 50 cm;

https://freshlifeproject.net/