4.5 Above-ground Biomass

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Above-ground biomass refers to all living plant material above the soil and is one of the recognised stores of terrestrial carbon. Other stores include below-ground biomass, litter, dead wood and soils. Vegetation biomass contains a similar amount of carbon as the atmosphere and is therefore of great importance in understanding climate. Removal of vegetation, for example by fires, deforestation, and conversion of vegetated land to urban use, causes a net increase of carbon in the atmosphere, whereas an increase in forest leads to a reduction of atmospheric carbon as photosynthesis draws CO_2 from the atmosphere and stores it in biomass. In Ireland, most of the biomass is held in grassland and natural ecosystems. However, due to an ongoing policy of afforestation the greatest addition is in forest.

Photo: © Ned Dwyer

Measurements

Above-ground biomass is quantified in terms of the mass of plant material. In many instances, the mass is not measured directly but is inferred from volume. *In situ* measurement methods are used for small-scale studies but are labour intensive and time consuming. Although no direct estimates of forest biomass in Ireland are currently made, much work has been done on developing country-specific models to estimate biomass and hence carbon stocks in forests. These models take full advantage of the robust forest area data that are available. In general, an assessment of above-ground biomass is an adequate indicator of other carbon pools with the exception of soils.

'Models are used to estimate forest biomass using robust forest area data.'

Internationally, remote-sensing data from optical, radar and laser sensors have been used to estimate above-ground biomass as part of research studies. Robust, operational methods, however, are not yet in place.

'Forest carbon stock has increased by over 40% since 1990.'

Time-series and Trends

Figure 4.9 shows the modelled annual total forest carbon stock. This has increased steadily since 1990 as the area under forest increases and the trees mature: therefore, capturing more carbon. The biomass stored in other land cover types is essentially constant.

Forest area and type can be derived from analysis of satellite imagery, complemented with ground data. Figure 4.10 shows the location of forested areas from the CORINE land cover database for 2006. Forest products such as those produced under the GMES Fast Track initiative may also prove useful to verify biomass change at high spatial and temporal resolution.

Maintaining the Observations

As part of the national inventory reporting to the UNFCCC by the EPA every year, annual estimates of above-ground forest carbon stock are made. Estimates of above-ground biomass for other land covers are also carried out. A complete national forest inventory was last published in 2007 by the Department of Agriculture, Forestry and Food and the Forest Service. A repeat forest inventory was undertaken in 2012. The ESA is planning a mission currently entitled BIOMASS, based on radar technology, to take global measurements of forest biomass.

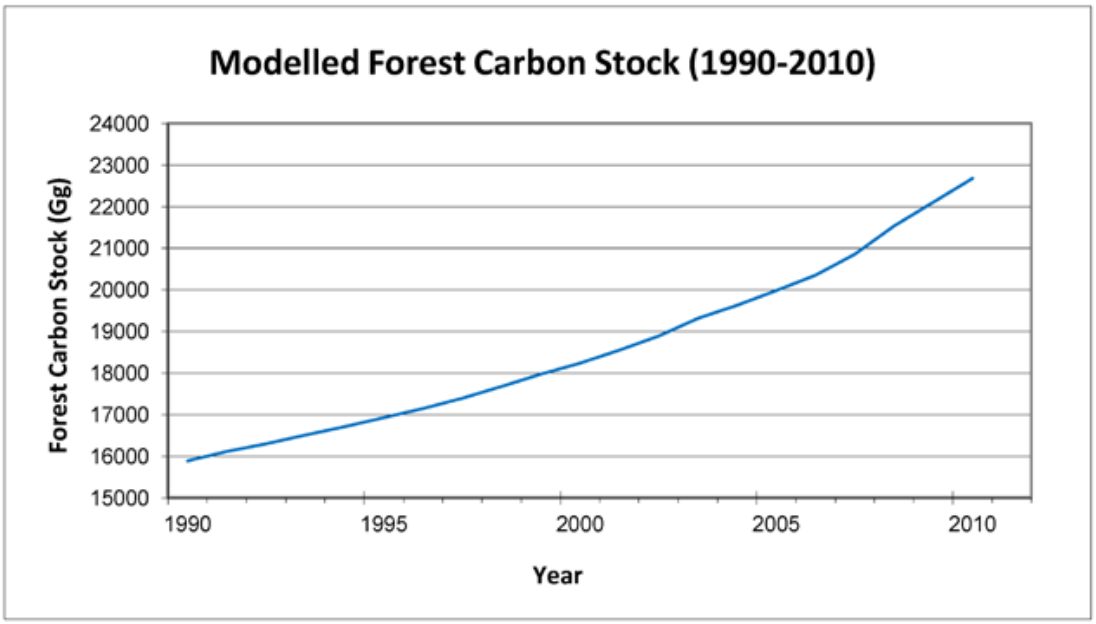

Figure 4.9. Modelled annual total forest carbon stock (1990–2010).

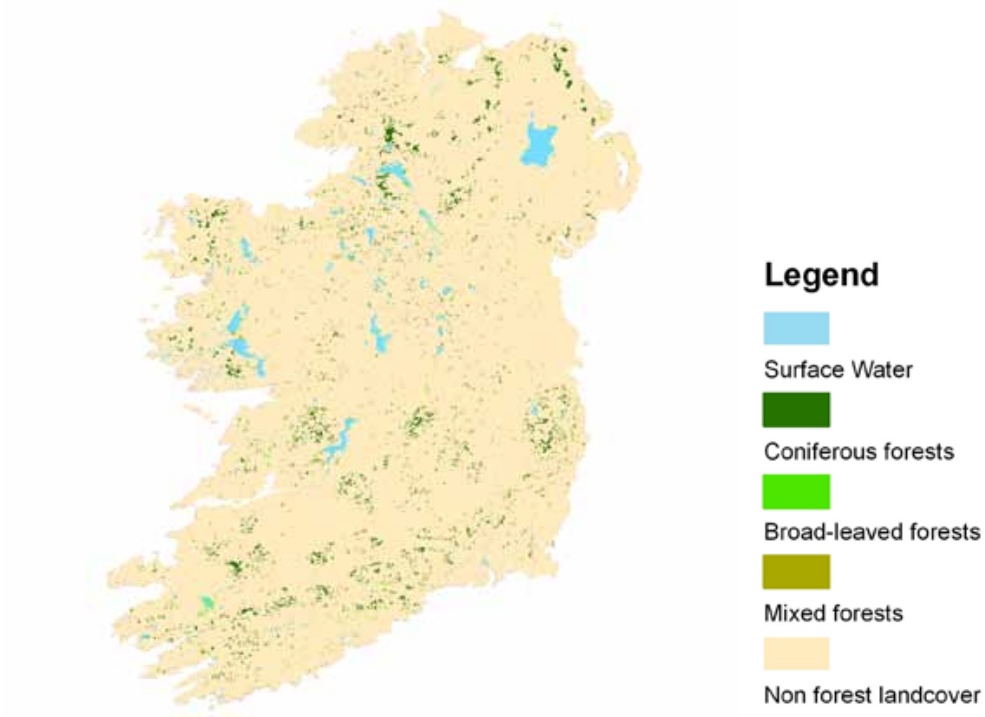

Figure 4.10. Location of forest areas, as derived from CORINE 2006.

Further Information and Data Sources

Duffy, P., Hanley, E., Hyde, B., O'Brien, P., Ponzi, J., Cotter, E. and Black, K. (2012) *National Inventory Report, 2012. Greenhouse Gas Emissions 1990–2010,* Reported to the UNFCCC, Environmental Protection Agency, Johnstown Castle Estate, Co. Wexford, Ireland.

Hendrick, E. and Black, K.G. (eds.) (2007) *Forest, Carbon and Climate Change, Local and International Perspectives, proceedings of the COFORD conference on 19/09/2007.*

European Space Agency, BIOMASS Mission: http://www.esa.int/esaLP/SEMFCJ9RR1F_index_0.html

Information on the GMES forest Fast Track products is available from: http://www.gmes-forest.info/

CORINE datasets are available from the EPA at: http://www.epa.ie/whatwedo/assessment/land/corine/datasets/

Forest Inventory data is available from the Forest Service at: http://www.agriculture.gov.ie/forestservice/forestservicegeneralinformation/abouttheforestservice/forestcoverdatasets/