

CLI-MIT

CLIMADAPT**The use of Ecological Site Classification in adapting forests and their management to climate change****PROJECT TEAM**

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BACKGROUND

The project was initiated to improve forest species site selection in Ireland. This is a fundamental requirement for implementing sustainable forest management. Climate change will also impact on species selection and CLIMADAPT will provide guidance on suitability for future climate scenario projections.

OBJECTIVES

- Design a forest classification system for tree species selection and yield potential in Ireland, based on the interpretation of six biophysical factors.
- Develop a knowledge-base of climate change adaptation strategies including species choice and silvicultural modifications from an interpretation of the likelihood of abiotic and biotic impacts resulting from climate change scenario projections.
- Validate knowledge-based yield models for Sitka spruce and other species if data availability permits.
- Develop a web-based combined stand-scale and spatial-scale decision support tool.

PROGRESS

CLIMADAPT is a forest classification system based upon ESC (Pyatt et al. 2001) for Great Britain. Six biophysical variables have been used to specify site conditions based on: climatic warmth, climatic wetness/droughtiness, wind exposure, continentality, soil wetness and soil fertility.

Spatial data representing the six biophysical variables have

been completed for Ireland. In addition, spatial climatic variables based on future climate change projections based on the IPCC A2 and B1 emissions scenarios have been calculated for Ireland. This will allow CLIMADAPT to check tree species suitability in future climate scenarios, providing an initial assessment of likely climate impacts and adaptation strategies for particular species-site type-climate impact combinations.

Knowledge-based suitability models have been described for 21 tree species. Models use information from a Delphi group meeting held in Dublin, in July 2007, and from the results of an expert group that discussed tree species suitability for Britain in 2001. The models describe the suitability response of a species against each of the six biophysical variables. Suitability is defined by the most limiting factor for a particular site type.

An initial validation of the knowledge-based yield predictions for Sitka spruce has been designed using Bayesian and Monte Carlo methods. Initial investigation showed that validation data must be improved, this work is currently being undertaken.

The core model of web-application has been completed and tested. This uses java script and ajax (asynchronous java and xml) technologies, and also links to Google™ maps and satellite imagery.

The user interface was discussed at a user group meeting in 2008. A mock-up of the system was tested by users, who provided feed back on amendments and additional functionality that was required. The user interface will be completed and tested by May 2009.

A pilot study (part of a PhD at UCD), to assess several species of tree for moisture stress across a west-east transect through Ireland and the UK, has been completed. The pilot study tested the sampling and analysis techniques to be used in the main project. The project will measure stable isotopes of carbon and oxygen in the early wood and late wood of specific tree rings, taken from dominant trees within permanent sample plots on freely draining soils. In Figure 1 the moisture deficit anomaly from three meteorological stations in eastern and southern Ireland records the synchronous occurrence of particularly dry summers in 1959, 1976, 1984, 1989 and 1990. The study will determine whether narrow tree rings associated with dry summers show isotope signals associated with closed stomata – caused by drought conditions. Figure 2 shows a core being taken from a tree in Avoca forest.

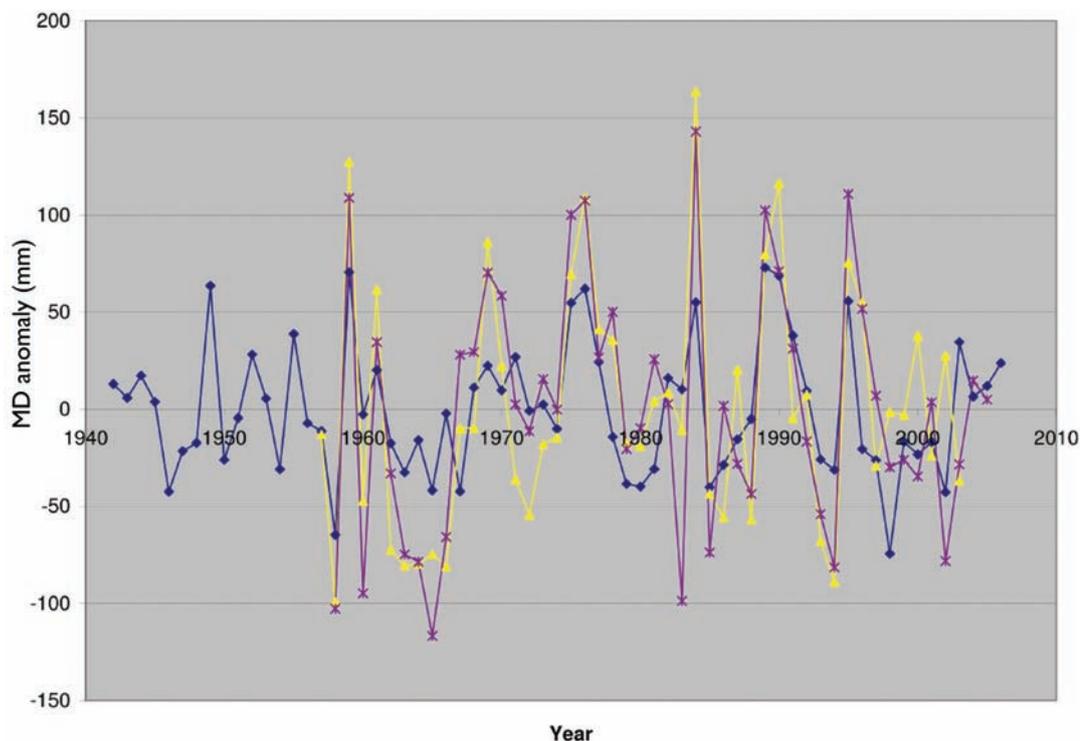


Figure 1: Moisture deficit (MD) anomaly for three meteorological stations in Ireland (Dublin \diamond , Rosslare Δ , and Kilkenny \times), showing synchrony between dry summers (positive anomaly) and wet summers (negative anomaly).

ACTIVITIES PLANNED

- Complete a CLIMADAPT yield validation for Sitka spruce,
- Complete the user interface of the web-application,
- Test the application with the user group in Ireland,
- Hold workshops in Ireland to demonstrate the CLIMADAPT web-application,
- Complete the first field season of tree coring and analysis for the main dendroclimatology study.
- Complete and submit two papers.

OUTPUTS

Papers published

Ray, D., Xenakis, G., Semmler, T. and Black, K. 2008. The impact of climate change on forests in Ireland and some options for adaptation. In: E. Hendrick and K.G. Black (Eds). *Forests, Carbon and Climate Change - Local and International Perspectives*. COFORD, Dublin, Glenview Hotel, Dublin, Ireland, p 27-33.

Papers submitted

Ray, D., Xenakis, G., Tene, A. and Black, K. Submitted. Developing a site classification system to assess the impact of climate change on species selection in Ireland. *Journal of Irish Forestry*.

Conferences attended

Site Classification Conference, Tullamore, Ireland, June 2008 - presentation.



Figure 2: Taking a tree core in a 50-year-old permanent sample plot at Avoca.

International Conference on climate change, Nancy, France - poster.

Dendro-ecology conference, Birmensdorf, Switzerland - poster.

Reference

Pyatt, D.G., Ray, D. and Fletcher, J. 2001. *An Ecological Site Classification for Forestry in Great Britain*. Bulletin 124. Forestry Commission, Edinburgh.