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REINFFORCE

*(REsource INFrastructure for monitoring and adapting
European Atlantic FORest under Changing climatE)*

“Climate Change Guidelines for Forest Managers”
Poland, April 2015



REINFFORCE project aims

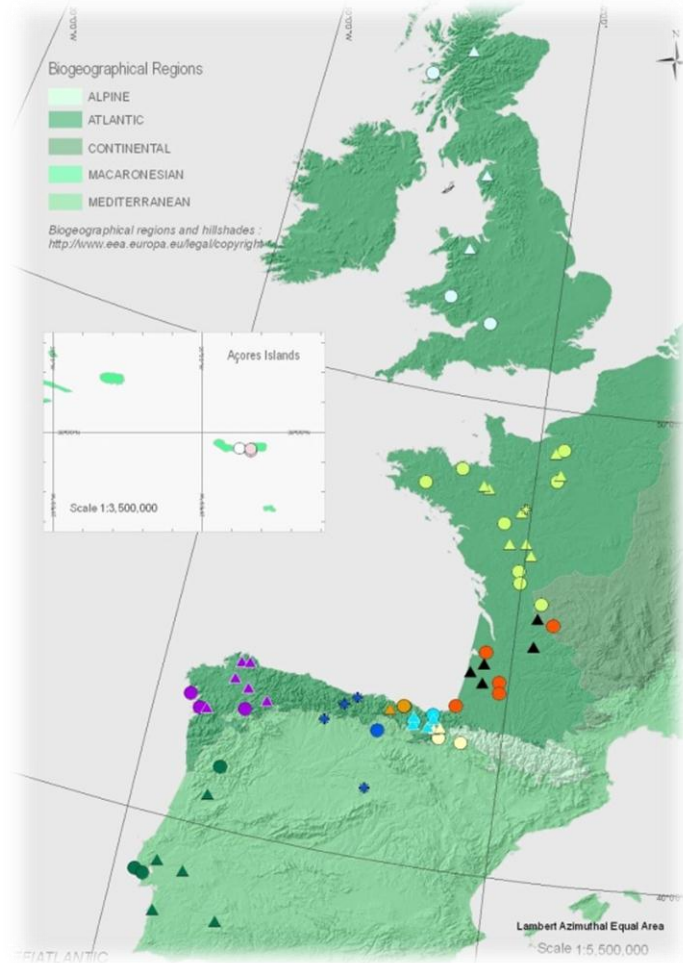
- ❖ The existing research infrastructures are providing valuable data for adaptation to climate change but not designed for
- ❖ The aim of the REINFFORCE project was to design a R&D infrastructure to contribute to answer the two main questions faced by the forest manager dealing with climate change:
 - What tree species/provenance is more adapted to my site under actual and future climate?
 - What change in forest management should I implement to address climate change issue in existing stands?

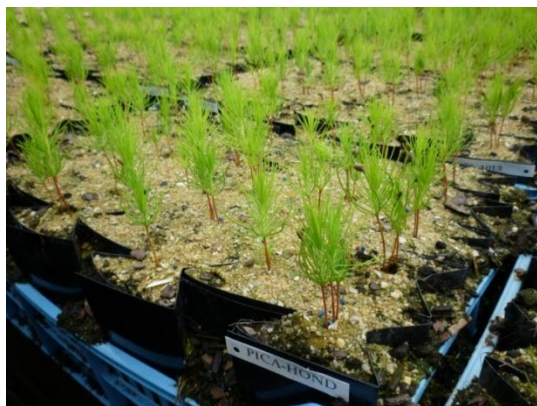


REINFFORCE Infrastructure

- ❖ Network of 38 arboreta: *exposing the same genetic material produced in the same conditions to various climate/soil contexts*
- ❖ Network of 41 demonstration sites: *demonstrating that meteorological context produces damage and demonstrate efficiency of mitigation measures not commonly used*
- ❖ Databases, protocols and reference tools:
e.g. FORESTRIAL database on long term monitoring trials

Project funded by Interreg 4B Atlantic area during 5 years (end on November 2013)



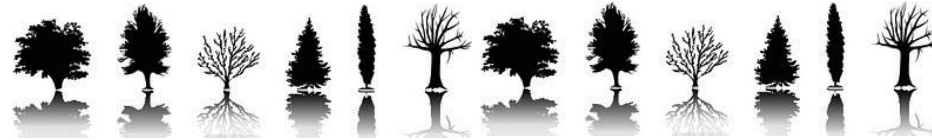


A complex seedling production divided in 3 years:

- 2011: 97000 seedlings → 148 provenances
- 2012: 17000 seedlings → 122 provenances
- 2013: 22500 seedlings → 60 provenances



- *Acer pseudoplatanus* L.
- *Betula pendula* Roth
- *Calocedrus decurrens* (Torr.)
Florin



- *Castanea sativa* Mill.
- *Cedrus atlantica* (Endl.) Manetti
ex Carrière
- *Cedrus libani* A.Rich.
- *Ceratonia siliqua* L.
- *Cunninghamia lanceolata* (Lamb.)
Hook.
- *Cupressus sempervirens* L.
- *Eucalyptus nitens* (H.Deane &
Maiden) Maiden
- *Eucalyptus globulus* Labill.
- *Eucalyptus gundal* (*gunnii* x
dalrympleana)
- *Fagus orientalis* Lipsky
- *Fagus sylvatica* L.
- *Larix decidua* Mill.

- *Liquidambar styraciflua* L.
- *Pinus brutia* Ten.
- *Pinus caribaea* var. *hondurensis*
(Sénécl.) W.H.G.
- *Pinus elliottii* Engelm.
- *Pinus nigra* subsp. *laricio* Maire
- *Pinus nigra* subsp. *salzmannii*
(Dunal) Franco
- *Pinus peuce* Griseb.
- *Pinus pinaster* Aiton
- *Pinus pinea* L.
- *Pinus ponderosa* Douglas ex
C.Lawson
- *Pinus sylvestris* L.
- *Pinus taeda* L.

- *Pseudotsuga menziesii* (Mirb.)
Franco
- *Quercus ilex* L.
- *Quercus ilex* subsp. *Rotundifolia*
(Lam.) O. Schwarz ex Tab. Morais
- *Quercus petraea* (Matt.) Liebl.
- *Quercus robur* L.
- *Quercus rubra* L.
- *Quercus shumardii* Buckley
- *Quercus suber* L.
- *Robinia pseudoacacia* L.
- *Sequoia sempervirens* (D.Don)
Endl.
- *Thuja plicata* Don ex D.Don



41 sites

Comparison of alternative silviculture with business as usual to improve adaptation to climate change

Climatic risk addressed/ Management alternative	Demonstration site ID	Wind risk	Growth	Regeneration loss	Drought	Frost	Biotic
Site preparation mainly removing any old tree and applying methods for soil cultivation.	DS25	x					
Density management decreasing the number of stands and/or seedlings in the site. this practice is particularly important in the drought prone areas to reduce the water	DS06 DS07 DS08 DS09 DS14 DS15 DS18 DS22 DS23 DS24 DS26 DS30 DS31 DS32 DS33 DS34 DS35 DS37	x	x	x	x		
Edge management improving the plot's edge-stands.	DS27	x					x
Species switch / comparison / mixture/ provenance selecting, combining and comparing the potentially best suited species and/or provenances.	DS01 DS04 DS05 DS28 DS29		x	x	x	x	x
Stand structure comparing both even-aged and uneven-aged stands' tolerance to future climate.	DS10 DS13 DS36 DS38 DS39 DS40 DS41	x	x	x			x
Soil organic matter enrichment to improve soil water holding capacity using biochar.	DS19 DS20 DS21				x		
Understorey management reducing the density of understorey species to minimise water competition.	DS03				x		



Weather is monitored on all sites

- ❖ Most of the sites are equipped with a standard weather station :
 - ❖ Collect data on the field
 - ❖ Temperature
 - ❖ Precipitation
 - ❖ Windspeed
 - ❖ Solar radiations
 - ❖ Soil water content (optional)
 - ❖ Transfer data to server by GSM
 - ❖ All servers are queried to centralised daily data on an regular basis on project server
- ❖ Sites with no weather station are using the closest weather data provider and upload daily data



Additional products

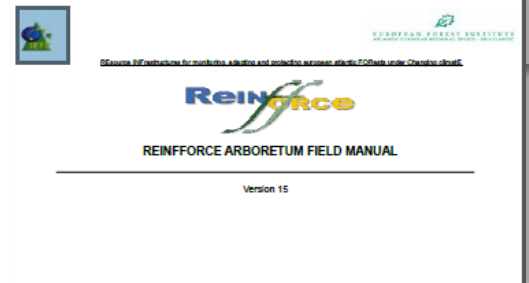
- ❖ Report on state of the art of regional actions on climate change and forest
- ❖ Report on selection process for REINFFORCE arboretum
- ❖ Scientific paper on exotic species introduction and new pests
- ❖ Adaptive capacity of 65 species analyzed in bibliography
- ❖ Harmonised protocol for field data collection
- ❖ FORESTRIALS Databases for European long term monitoring forest trials open for ANY organisation
- ❖ Tools for data collection and sharing between organisations

Authors:
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Species and genetic units selection process for
REINFFORCE ARBORETA



Authors
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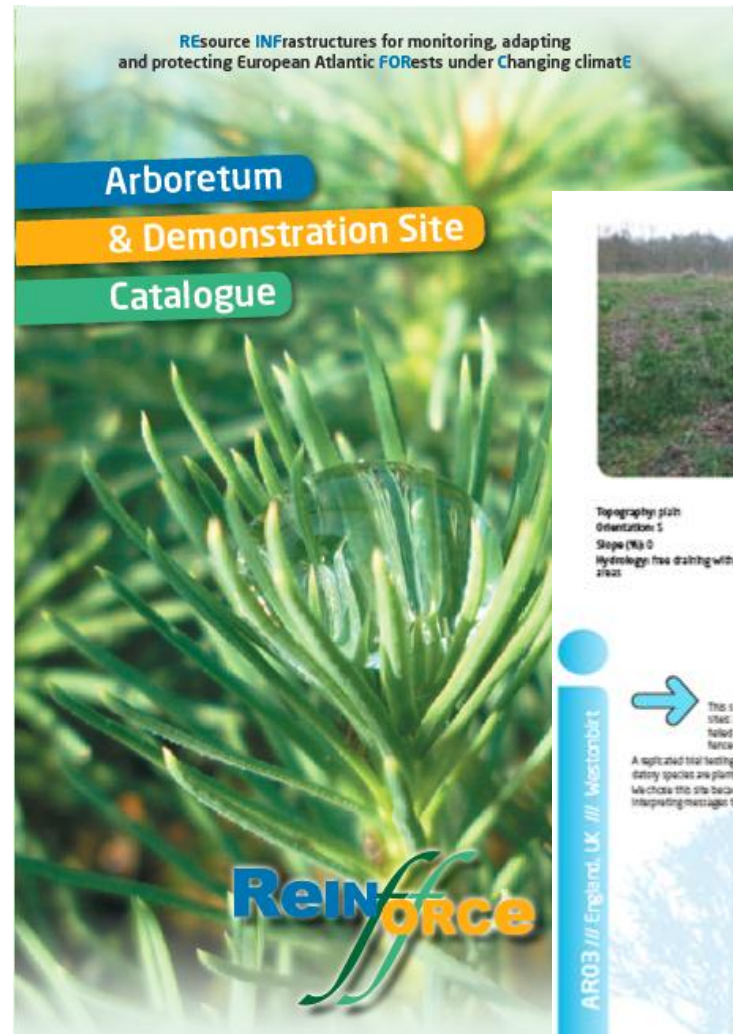


THE CATALOGUE

describes :

- *Procedures*
- *Field trials*
- *Provenances and sites characteristics*

*You can get **one for free** at the end of the meeting!*



AR03 - Westonbirt

Local name: Westonbirt
Municipality: Cotswold
Region: Gloucestershire / Country: England, UK
Altitude (m): 140

Department in charge: Center for Sustainable Forestry and Climate Change
Contact e-mail: richard.j@cefcforestry.gov

Topography: plain	pH (soil layer 0 - 30cm): 4.7	Mean T (°C): 9.2
Orientation: S	Type of Soil: CAMBSOLS	Mean T (°C) Coldest Month: 0.5
Slope (%): 0	Soil type of Soil: chronic	Mean Precipitation (mm): 768
Hydrology: free draining with some water table	Bedrock: limestone	N Frost Days: 91

AR03 // England, UK // Westonbirt

➔ This site is situated in the Forestry Commission's National Arboretum at Westonbirt. It is located on two former experimental sites: a larch progeny trial, and a trial of willow established to test for resistance to Dutch elm disease. Both areas were clear felled the year before planting. Because of constraints imposed by the position of existing paths, the new planting is in four fenced areas.

A replicated trial testing both REINFORCE and other species is planted out in a single enclosure on the old elm site, and the REINFORCE mandatory species are planted on three fenced enclosures on the former larch site.

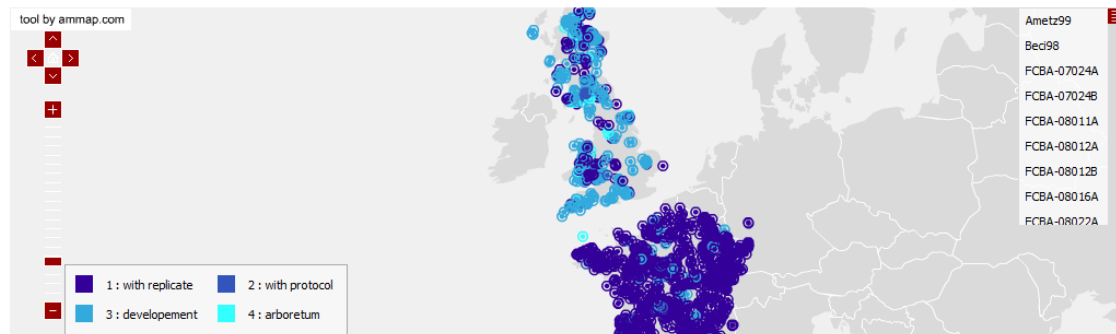
We chose this site because Westonbirt Arboretum attracts 300000 visitors a year, and the new REINFORCE site is an important opportunity for interpreting messages to both professionals and the general public about the impact of climate change.

FORESTRIALS Databases for long term monitoring forest trials

Accessible on-line, free access and open for ANY organisation who would like to share info (including non-REINFFORCE).

Register of forest long term monitoring trials

Objective codes are the same as for NOLTEFOX database



Filter	
country	[All]
Data owner	[All]
Municipality	[All]
Latin name	[All]
Adaptation to site	[All]
Objective	[All]
Show map	<input checked="" type="checkbox"/>

Number of matching rows : 4508

plot_id	country	Experimental serie	Experiment id	Priority	Altitude	Province-Region	Municipality	Municipality code	Local name	Stand establishment	Stand removal	Start monitoring	End monitoring	Responsible institution	Responsible department	Responsible name	Responsible phone number	Objective	Results	Comments	Last update	species id	Latin name	Adaptation to site
Ametz99	Spain			1	257	Alava	Gordexola			1999-01-01	0000-00-00	0000-00-00	0000-00-00	NEIKER	Plant Production and Protection	Santiago Espinel	34945121313	A02			2010-05-18 12:36:38	Ametz99_048_FR1	Quercus robur	Bad
Ametz99	Spain			1	257	Alava	Gordexola			1999-01-01	0000-00-00	0000-00-00	0000-00-00	NEIKER	Plant Production and Protection	Santiago Espinel	34945121313	A02			2010-05-18 12:36:38	Ametz99_048_FR2	Quercus robur	Bad
Ametz99	Spain			1	257	Alava	Gordexola			1999-01-01	0000-00-00	0000-00-00	0000-00-00	NEIKER	Plant Production and Protection	Santiago Espinel	34945121313	A02			2010-05-18 12:36:38	Ametz99_048_RP1	Quercus robur	Bad



Conclusion

- A unique worldwide strategical tool to help forest adapt to climate change
- A impressive effort of harmonisation
- The first step of long term monitoring
- A tool for local communication (visits, leaflet, etc)
- An opportunity to design promising networking tool: long term monitoring trial database, Treedata, etc.
- OPEN FOR FUTURE COOPERATIONS

<http://reinforce.iefc.net>



Thank you!

