

# REINFFORCE

*(REsource INFrastructure for monitoring and adapting european atlantic FORest under Changing climatE)*



# Demonstration site alternative management on architecture parameters for thinning

## IDF



## Climate changes generate French foresters' fears about common oak

Common oak dieback is more and more observed in France.

This complex phenomenon is correlated with temperatures and precipitations. Thus, climate changes would have an effect on common oak health.

In 2009, a project have been organised by IDF over 7 French regions along the Atlantic coast.

The first essential step is to apply an effective method to diagnose decline. The currently used diagnostic method only permits to know the punctual dieback state of broadleaved trees. A goal of the study was to complete this method by implementing a new visual method to diagnose the capacity of reaction of declining common oaks.

Using this new method of diagnosis, foresters would be able to recognize resilient tree and moribund tree. It would be a useful tool for foresters to identify final crop trees in particular.

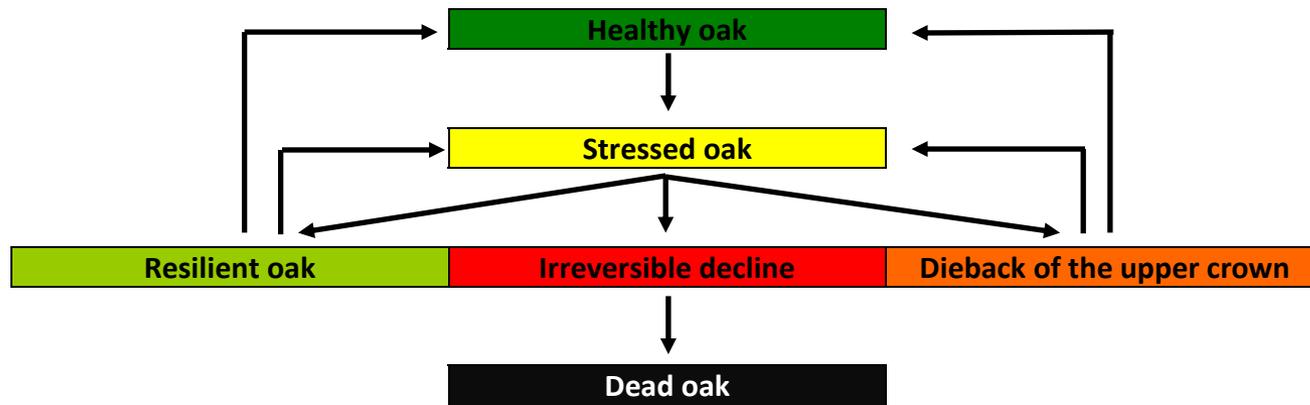


## Principles of ARCHI method

It is based on the crown architecture analysis and on suckers description.

Tree's architecture combines tree's endogenous development strategies and stress caused by environment.

Declining dynamic of oak can be separated in 5 architectural types from healthy oak to moribund oak (+ dead oak):



This method make hypothesis on oak's future.

Different steps have to be followed to determine the Archi type:

- Observation of the upper crown (part of the crown directly facing to sunlight) mortality

- Observation of the upper crown branching

- Observation of the restructuration of a distinct structured crown at a lower level

- Determine the most important sucker's type at the entire tree

A determination key has been created to make the method more operational



# A new diagnostic method, ARCHI : development to the Common Oak (1)

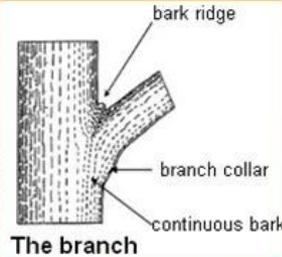
## A) Branching observation + difference between branches and suckers



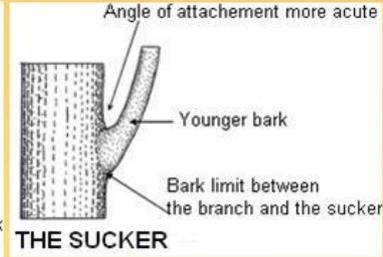
Usual branching



Restricted branching



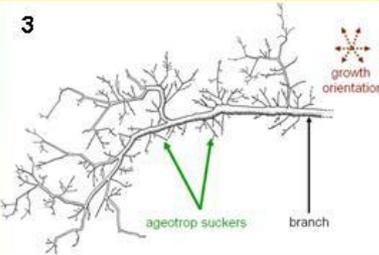
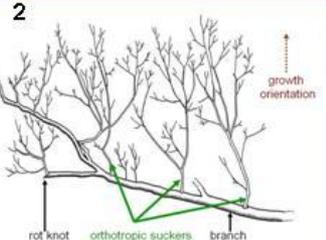
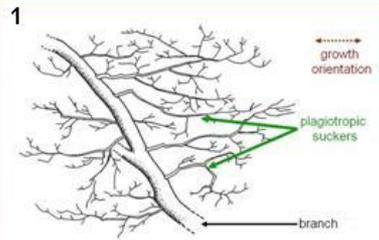
The branch



THE SUCKER

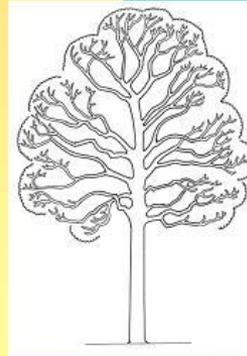
The sucker is connected on its branch like a bend.

## B) Different types of suckers



- Three suckers' types :
- 1) Plagiotropic suckers (horizontal growth)
  - 2) Orthotropic suckers (vertical growth)
  - 3) Ageotrop suckers (small and none favorite growth direction)

## A+B = C) Determination of the ARCHI type

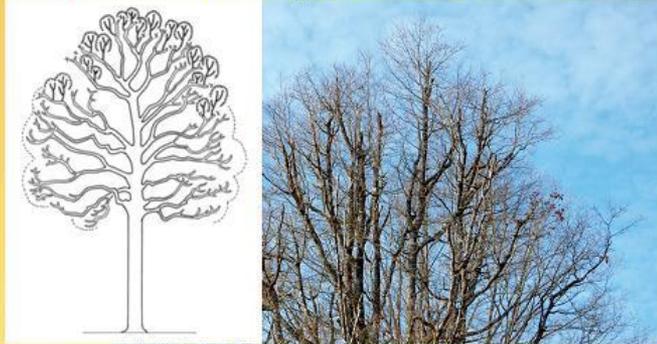


- No mortality in the upper crown
- Usual branching for the top branches

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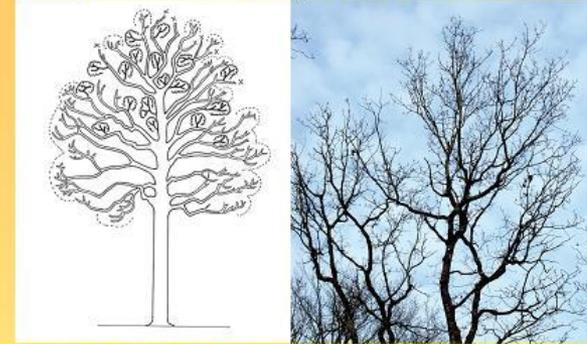
## A new diagnostic method, ARCHI : development to the Common Oak (1)

**ARCHI type R : Resilient**



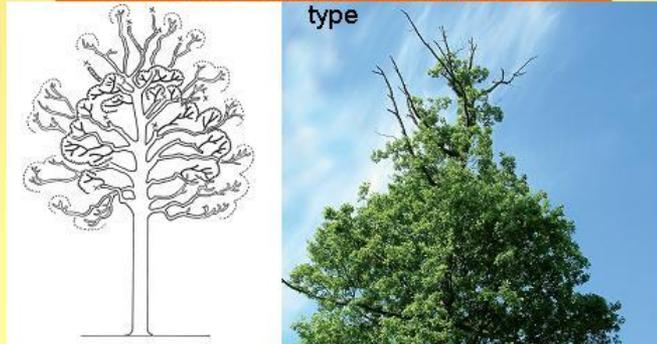
High branches substituted or being substituted by orthotropic suckers with an usual branching.

**ARCHI type S : Stressed**



- Crown mortality and presence of suckers,  
- no dominant type of suckers or orthotropic suckers with a poor branching or plagiotropic suckers with an usual branching.

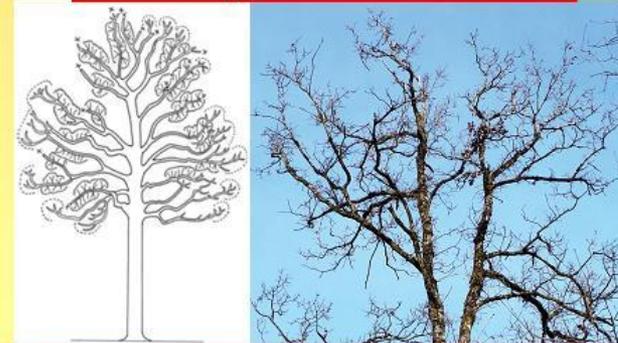
**ARCHI type D : dieback of the upper crown**



Mortality in the upper crown with restoration of a distinct structured crown at a lower level.

Drawns , photos : Ch. Drénou, CNPF-IDF

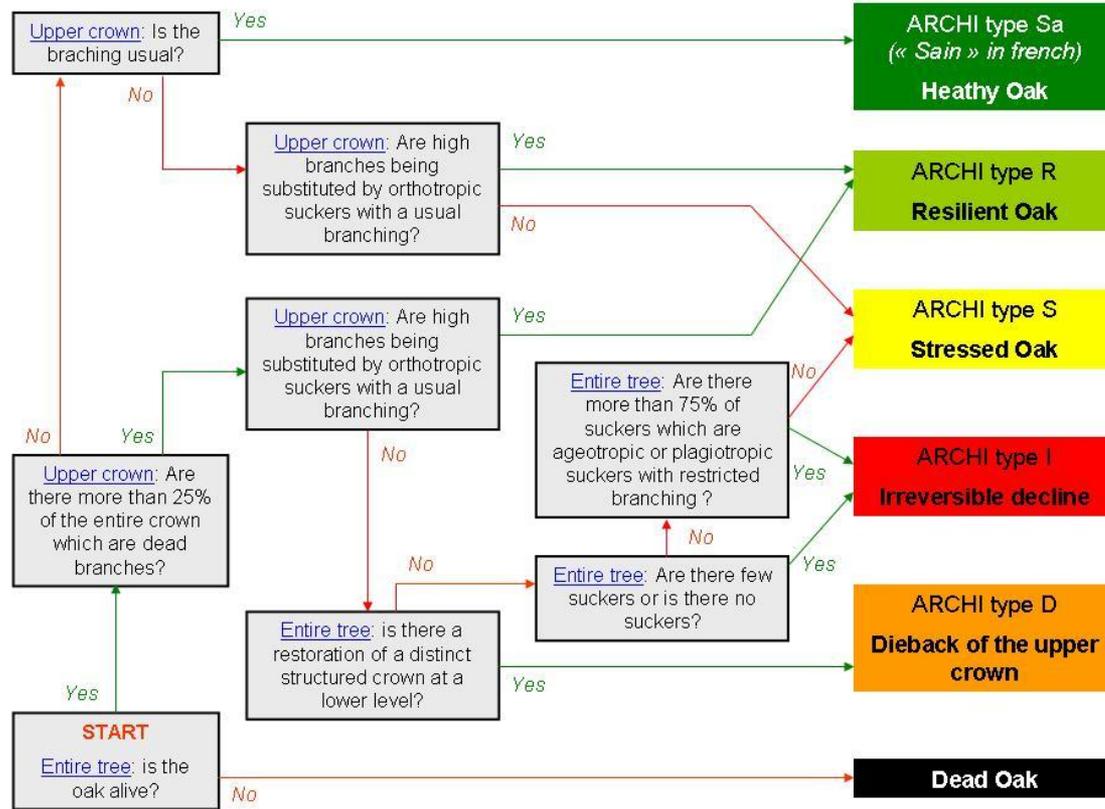
**ARCHI type I : Irreversible decline**



- Death of the crown,  
- Few suckers or no suckers or a lot of ageotropic suckers or plagiotropic suckers with a poor branching.

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## Determination key to identify ARCHI types: application to the Common oak



## Validation of this method ARCHI

1 - In 2010, this new method has been validated by dendro-chronology analysis of growth rings on resilient trees and moribund trees.

Results show a correlation between the crown's visual aspect according to the method ARCHI and radial growth.

2 - A second way of validation has been planned by following oaks' sanitary state over years. 6 REINFFORCE demonstration sites ARCHI have been installed in 4 regions of Atlantic coast.

The all trees' Archi types of those demonstration sites have been determined in 2012.

The all trees' circumferences have also been measured. In 2013, crowns have been measured to evaluate competition.

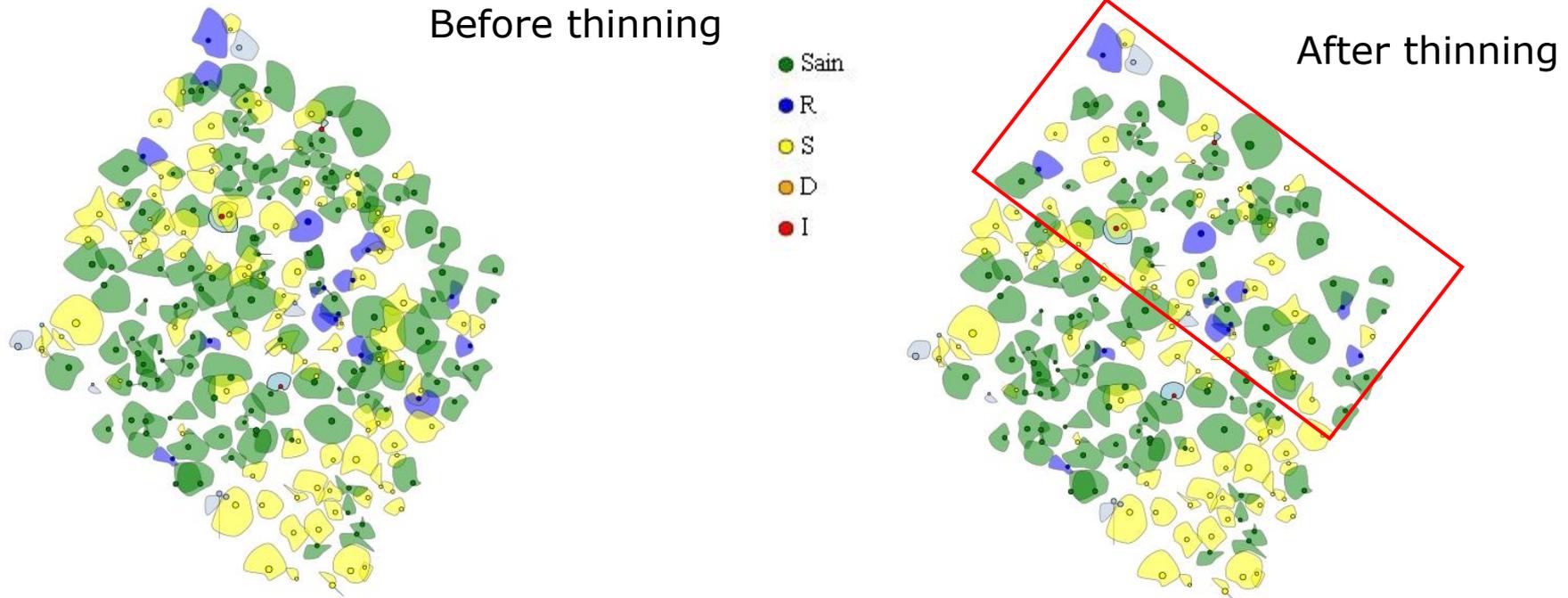
## Study of effects of thinning

An other goal of those REINFFORCE demonstration sites is to evaluate impacts of thinning on common oak development and dieback.



## Example of DS 30 Verrue site

- 1 – geolocation trees
- 2 – individual ARCHI notation (green = healthy trees, yellow = stressed trees, ...)
- 3 - crowns measurement to evaluate competition
- 4 – thinning on healthy and stressed oak



Now, in the coming years, we will have a monitoring on individual ARCHI status

- to validate or not the Archi diagnosis,
- to evaluate the effect of thinning on common oak development and dieback risk.

These demonstration sites will be use to ensure formation on Archi method and to vulgarise it.

