

# Analysis of density effect using Nelder wheels design: current situation and challenges ahead

Irene Ruano  
irene@pvs.uva.es



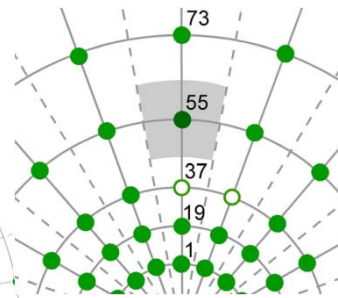
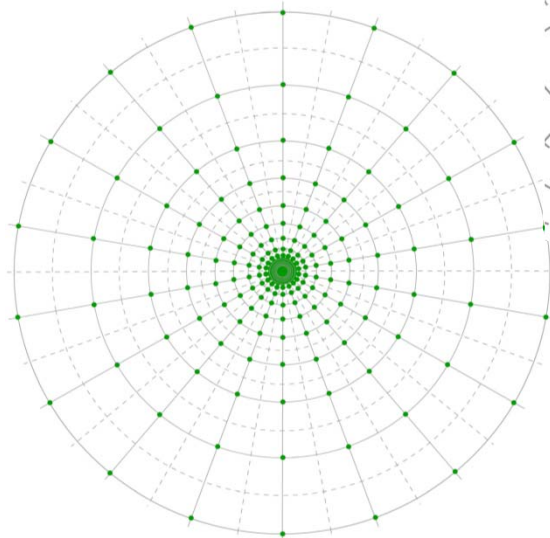
May 10th, 2017

Mixed Forest complexity and sustainability: dynamic, silviculture and adaptive management tools



## INTRODUCTION

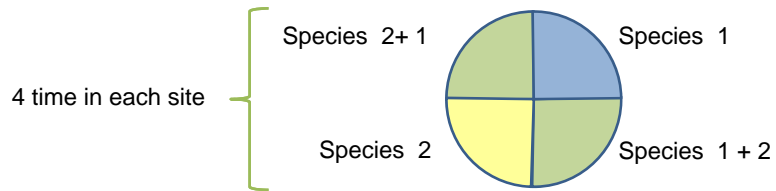
Nelder design



Figures: Uhl et al. (2015)



## EXPERIMENTAL SITES

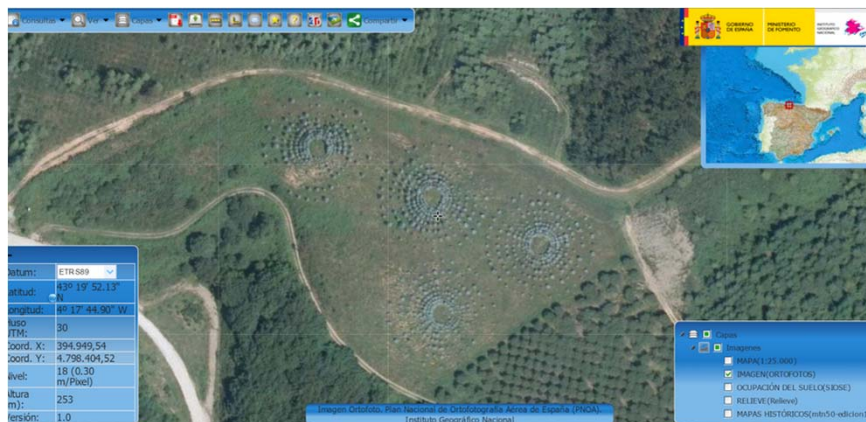


Site	Specie 1	Specie 2
CANTABRIA 1	<i>Eucalyptus nitens I</i>	<i>E. nitens II (Resistant code to Mycosphaerella sp.)</i>
CANTABRIA 2	<i>Pinus radiata</i>	<i>Pinus sylvestris</i>
LEÓN	<i>Pinus sylvestris</i>	<i>Quercus pyrenaica</i>
SEGOVIA	<i>Pinus pinaster</i>	<i>Quercus ilex</i>

## EXPERIMENTAL SITES

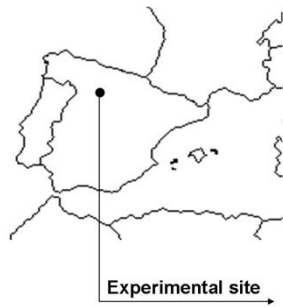


Setting up: 2012  
Measures: 2013 and 2014



## EXPERIMENTAL SITES

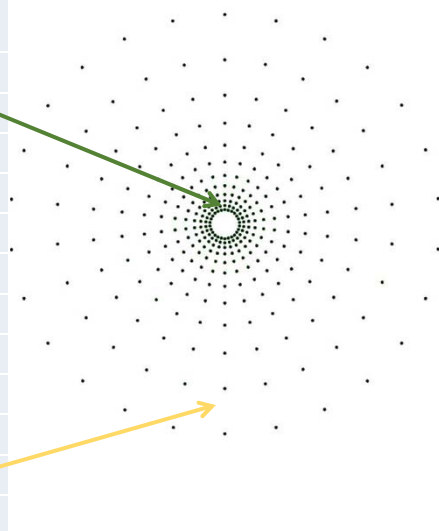
### Natural regeneration of Mediterranean pines



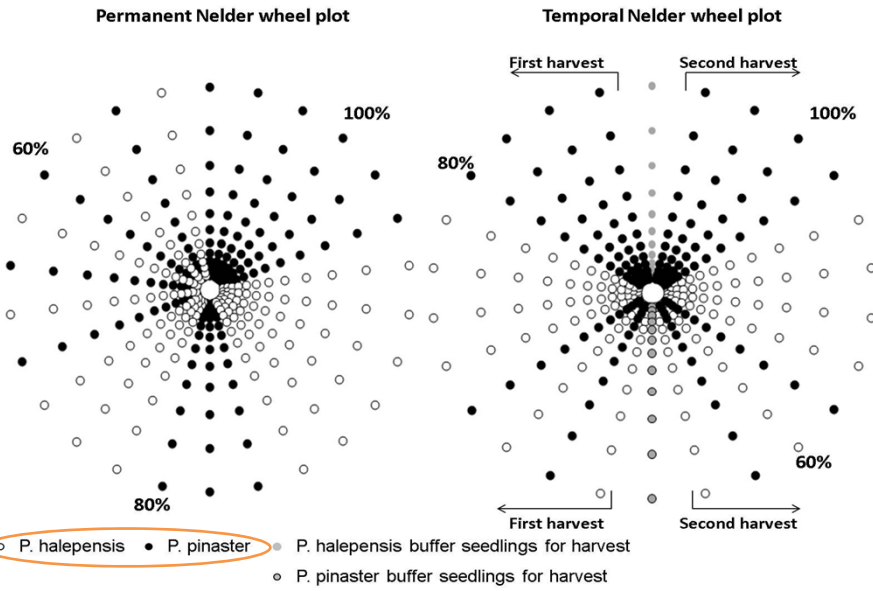
Setting up: 2013  
Measures: 2014

## EXPERIMENTAL SITES

Ring	Radial length (m)	Tested densities (seedlings/ha)
0	1.14	-
1	1.45	80000
2	1.85	49162.68
3	2.36	30212.11
4	3.01	18566.36
5	3.84	11409.65
6	4.90	7011.61
7	6.25	4308.87
8	7.97	2647.94
9	10.17	1627.25
10	12.97	1000
11	16.55	-



## EXPERIMENTAL SITES

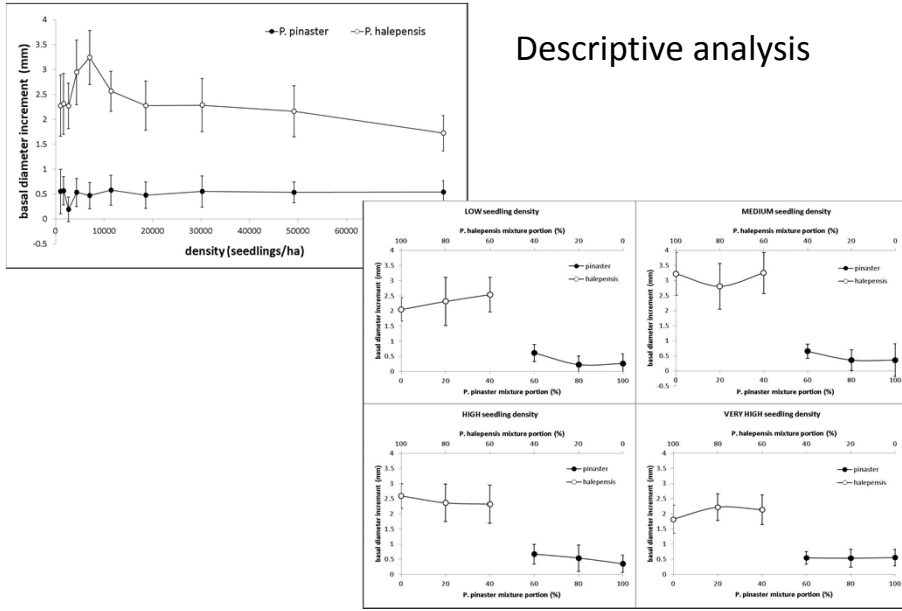


## DATA



**CURRENT SITUATION**

**Descriptive analysis**



**CURRENT SITUATION**



*Pinus pinaster*



*Pinus halepensis*



CHALLENGES AHEAD

High mortality during first years



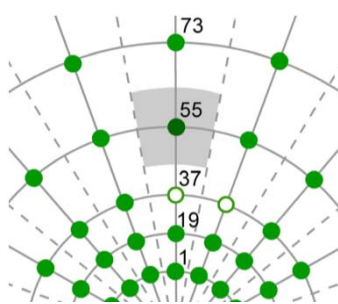
5.4 % dry seedlings



9.9 % died seedlings  
9% lost of principal stem

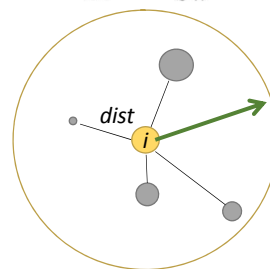
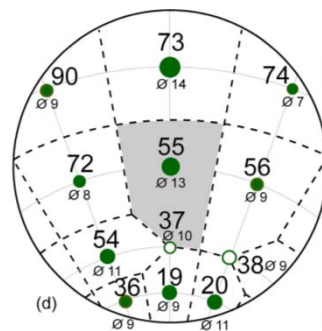


CHALLENGES AHEAD



Heghyi's index (1974)

$$C_i = \sum_{j=1}^{N(R)} (d_i/d_j) / Dist_{ij}$$



Radius?

Figures: Uhl et al. (2015)