2nd Mediterranean Plant Conservation Week
"Conservation of Mediterranean Plant Diversity: Complementary Approaches and New Perspectives"



An update on translocation activities of the climate relict tree *Zelkova sicula* (Sicily, Southern Italy)

presented by
Giuseppe Garfì

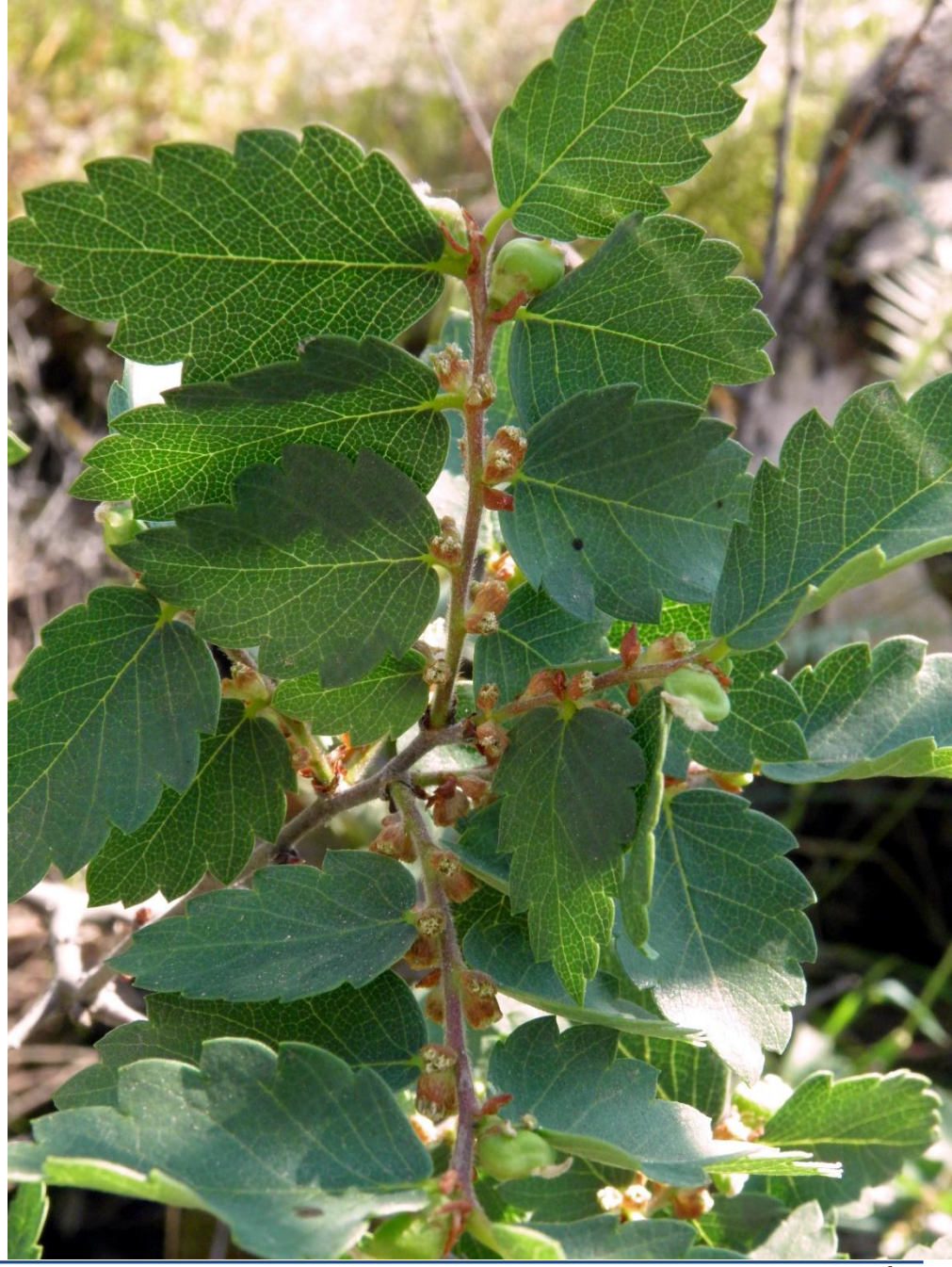
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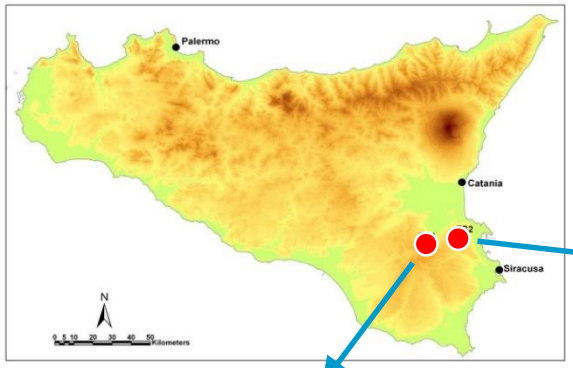
Supported by:

Outline

- The species
- Implications as a climate relict
- Ecological plasticity
- Criteria for translocation

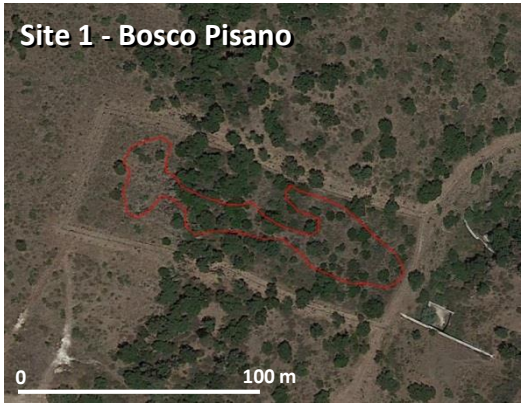


Zelkova sicula: an emblematic relict...

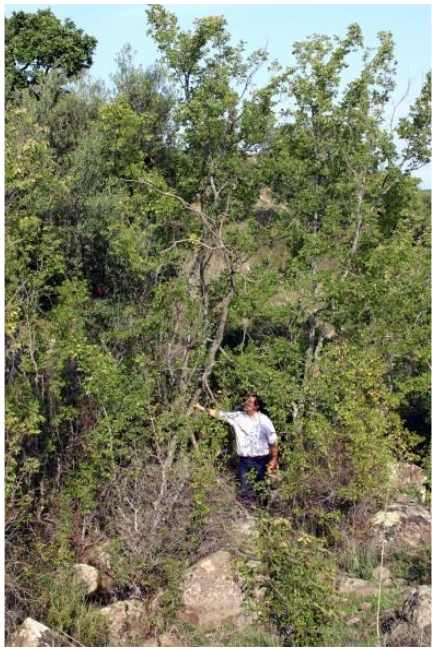






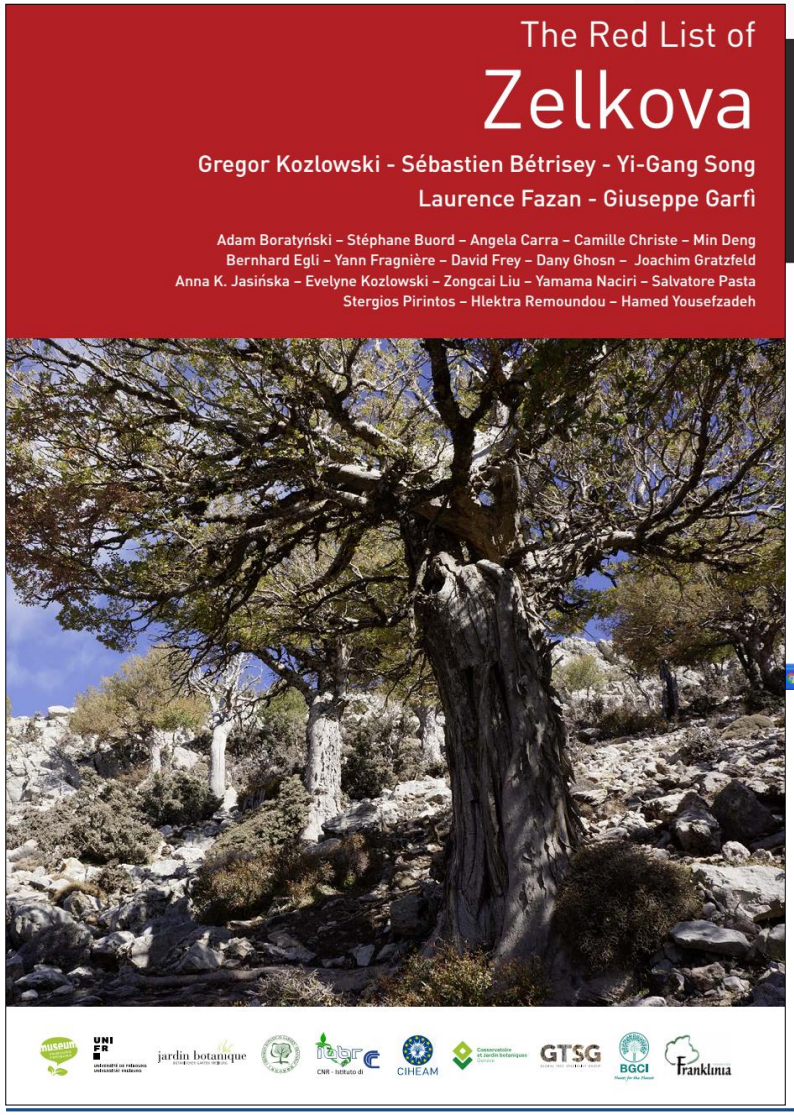


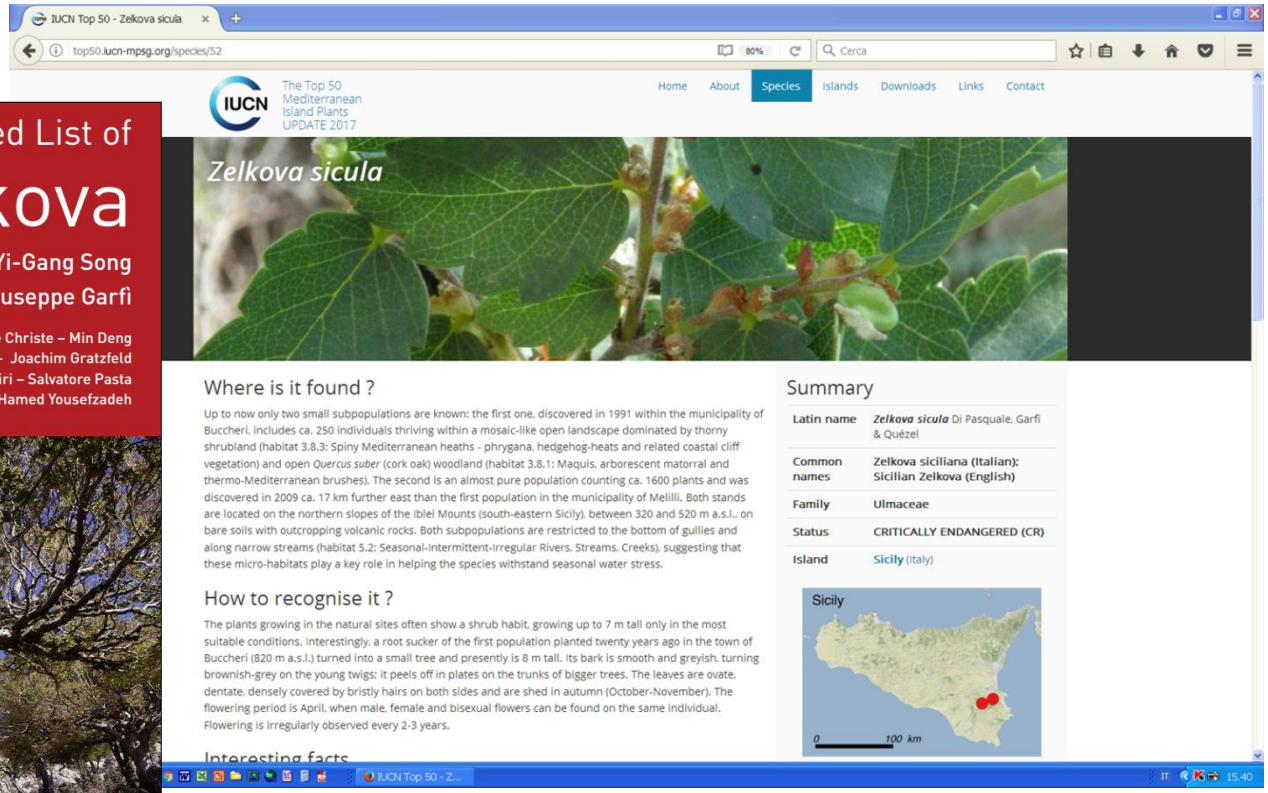




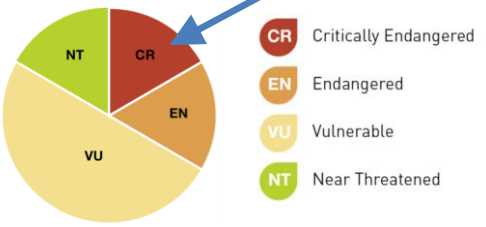
- **Current distribution:** *2 single, isolated populations, some hundred trees in total*
- **Area:** *0.5 ha (site 1), 0.8 ha (site 2)*
- **Habit**: *shrub to small tree*
- **Habitat**: *sparse, disturbed sclerophyllous forests*
- **Conservation**: *critical*

Zelkova: endangered all over the world





Zelkova sicula



Threats vs. viability

- Enclave populations
- Recurrent drought stress
- Anthropogenic pressure
- No sexual dispersal
- Genetic depauperation

  ↳ (ONLY 2 CLONAL PLANTS!!!)

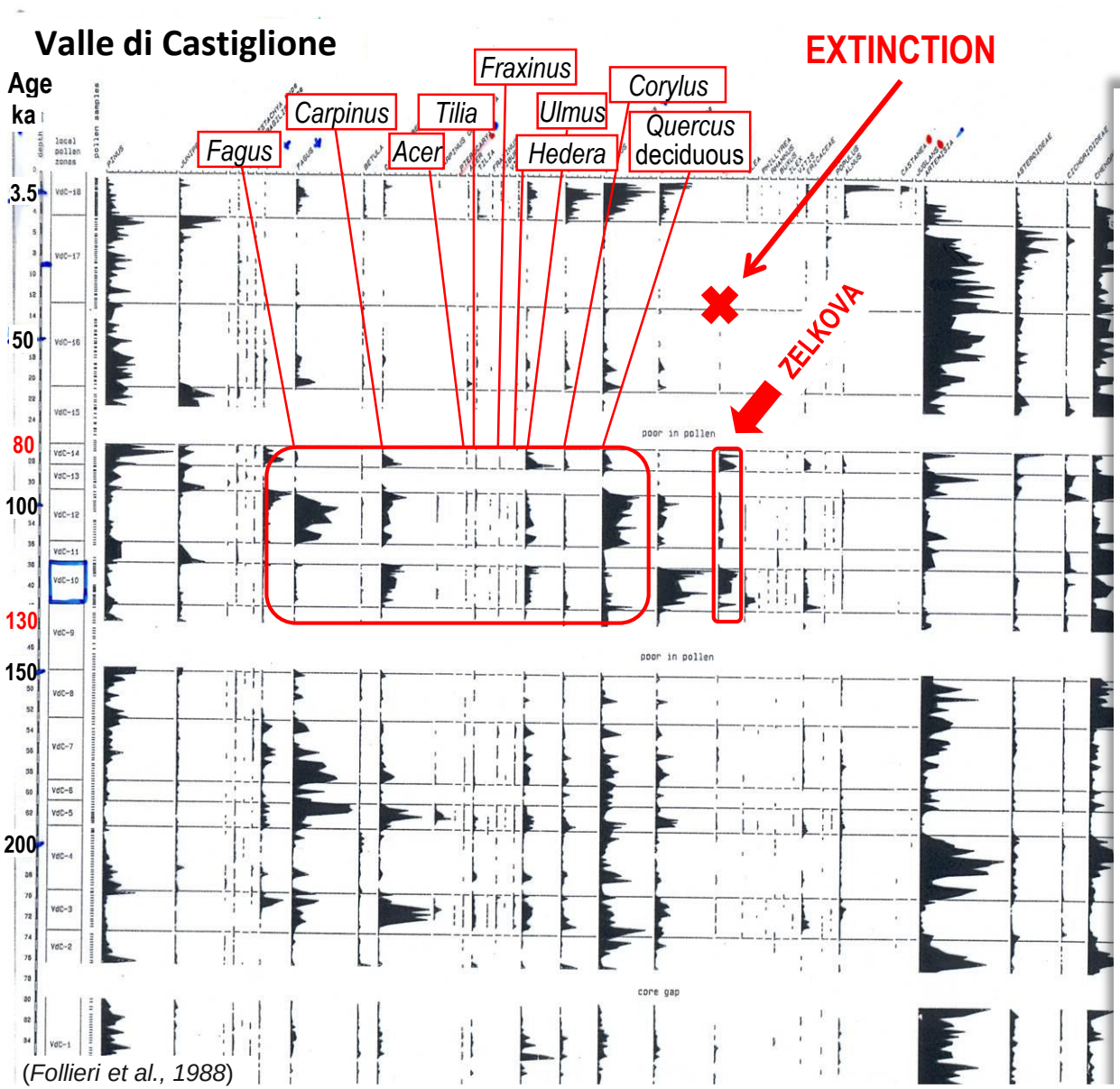


unlikely to naturally shift the range in response to rapid change of environmental conditions



HUMAN-MEDIATED TRANSLOCATION PROBABLY THE LAST RESORT TO ENHANCE THE CONSERVATION OF THE SPECIES

Extinct from continental Europe at 31000 BP

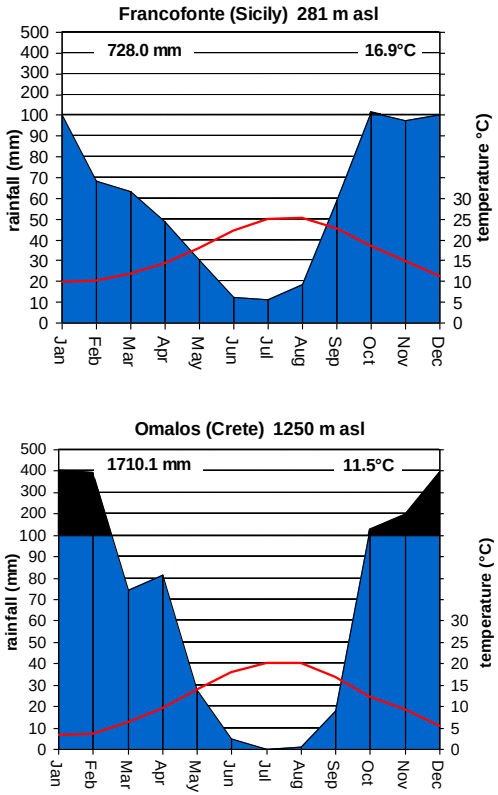


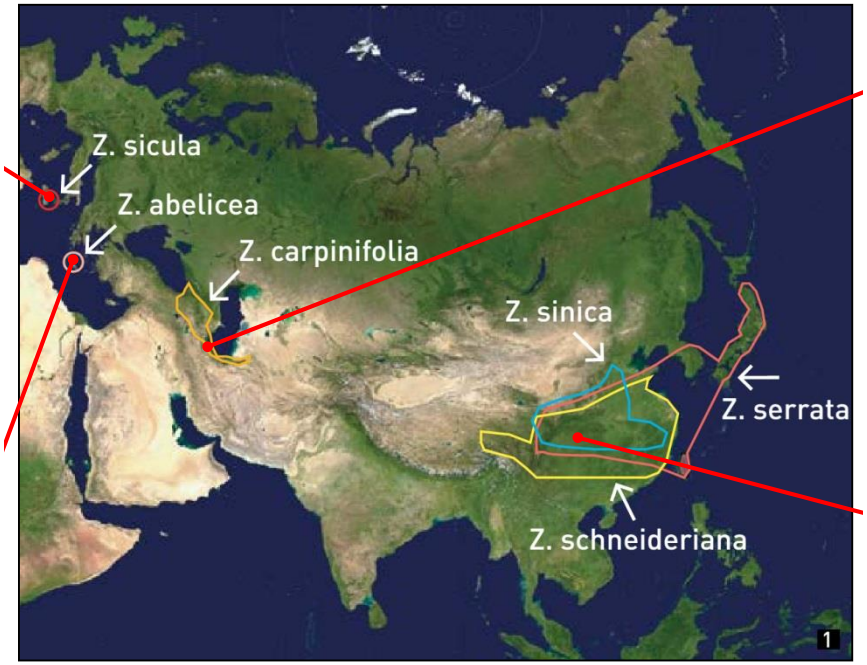
(*Follieri et al., 1988*)

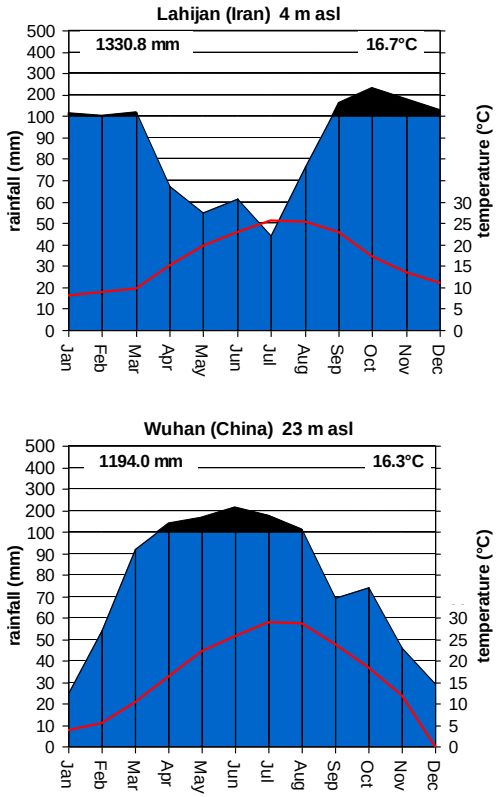


(*Sadori et al., 2008*)

ZELKOVA relicts: which bioclimatic tolerance range?



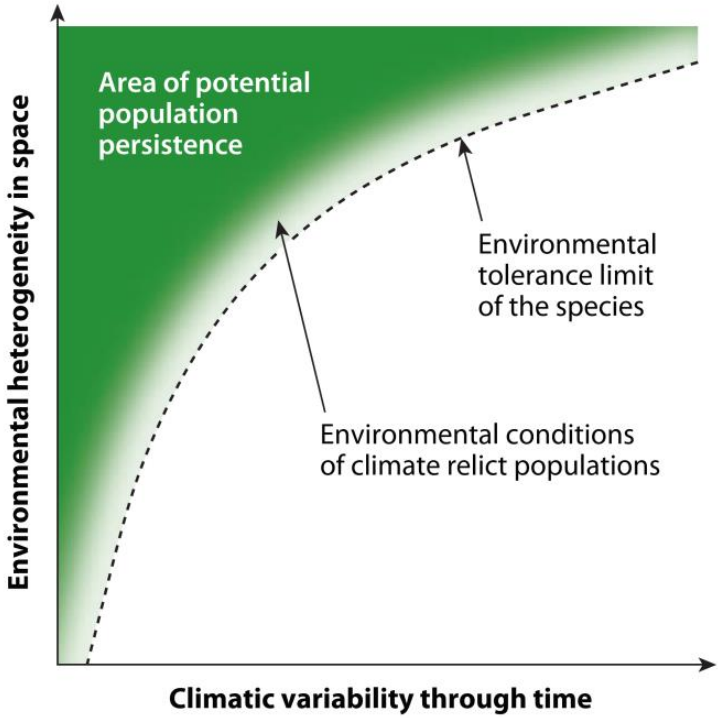




TO
seasonal water shortage

FROM
satisfactory yearly water supply

Importance of topography and related terrain effects for the persistence of climate relicts

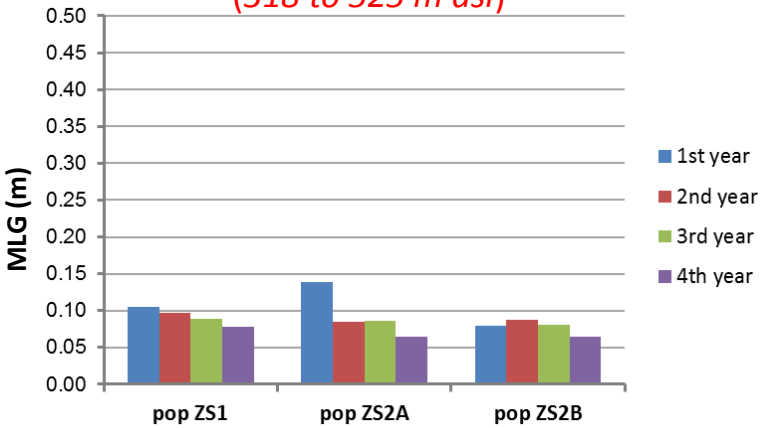


(*Hampe & Jump, 2011*)



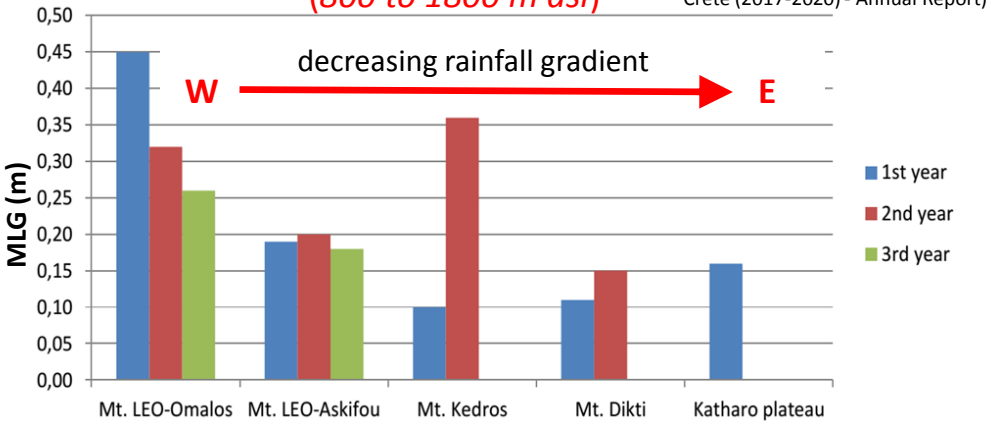
Adaptation to refugia is variable

ZELKOVA SICULA
(318 to 525 m asl)



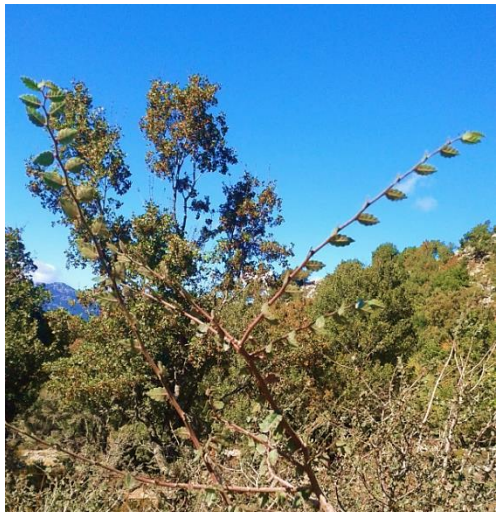
ZELKOVA ABELICEA
(800 to 1800 m asl)

(courtesy: CIHEAM-MAICh 2017. Conservation of Zelkova abelicea in Crete (2017-2020) - Annual Report)



Annual average of Maximum shoot Length Growth per tree (MLG)

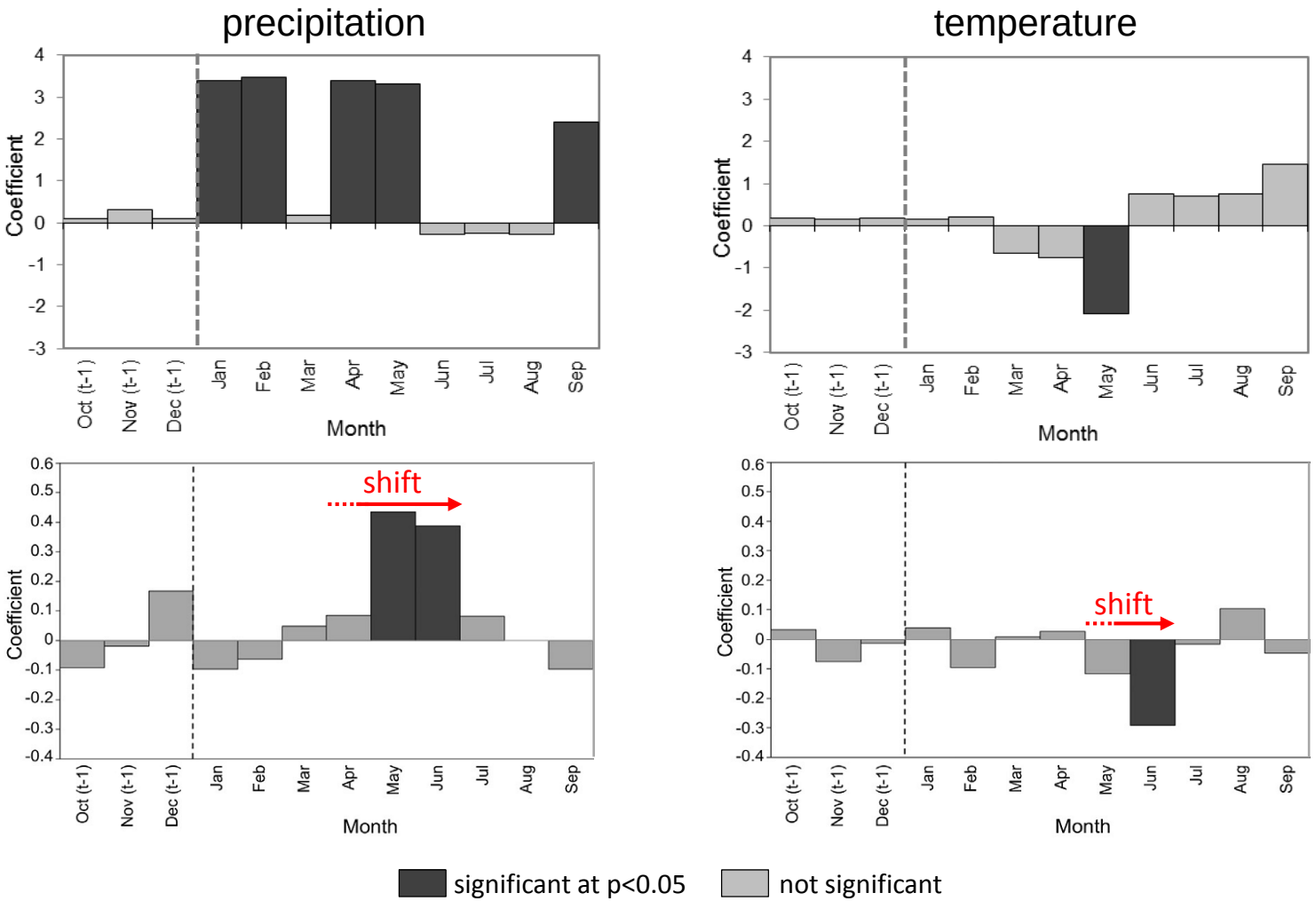




Current climate and growth performances

ZELKOVA SICULA
POP ZS1
(*495 to 525 m asl*)

ZELKOVA ABELICEA
POP Omalos
(*1120 to 1400 m asl*)
(Fazan et al., 2017)

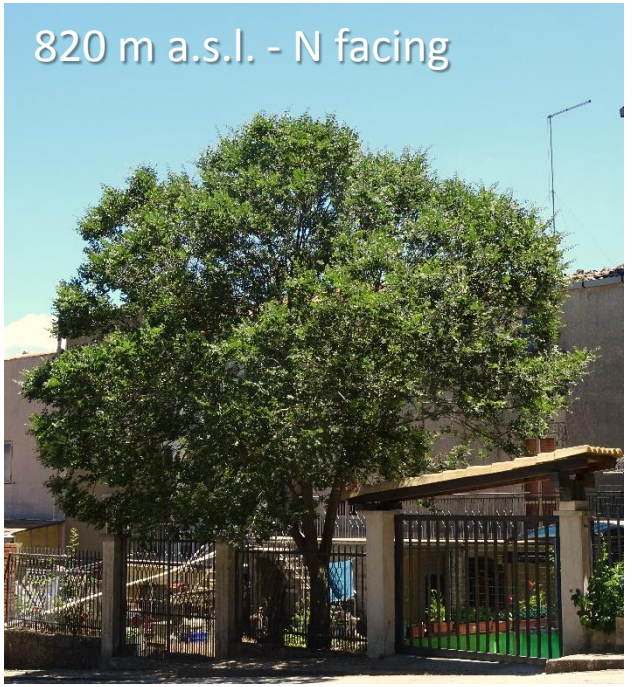


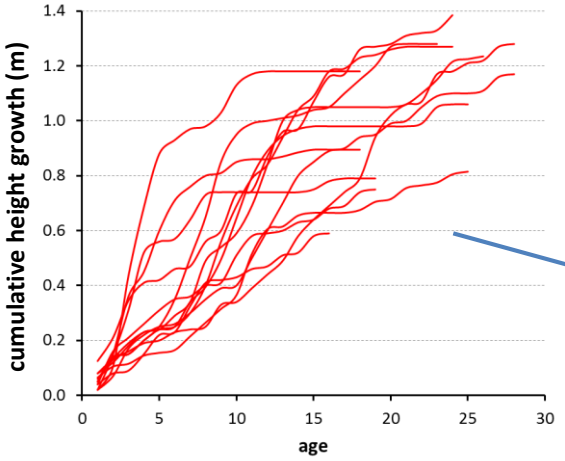
Key role of underground water reserves

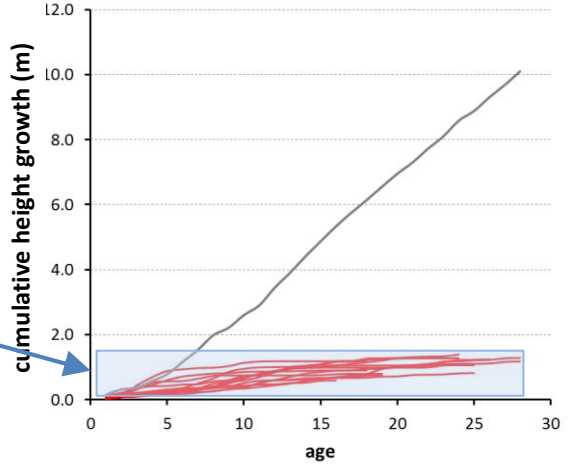


Tree growth potential still preserved





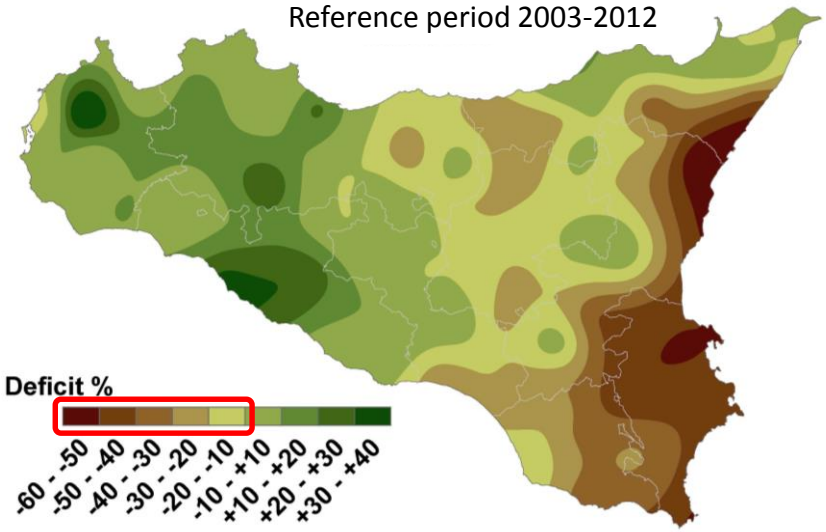




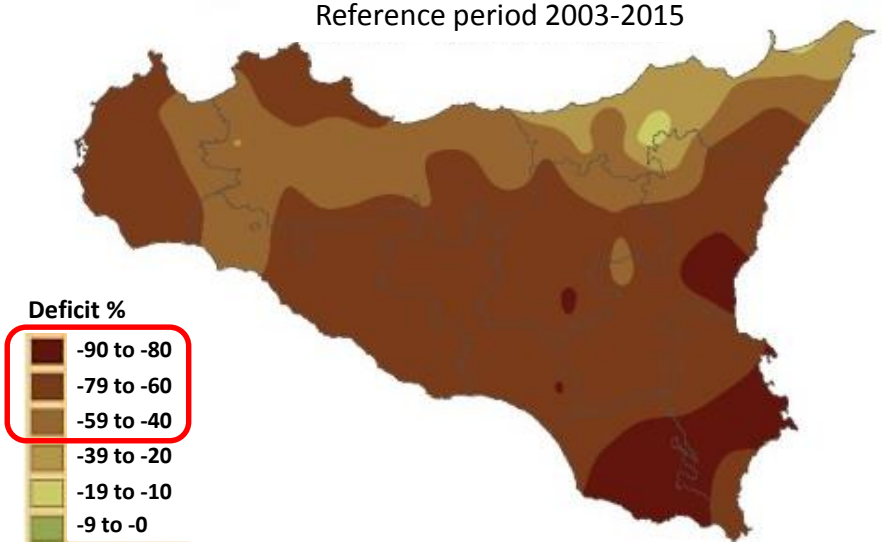
Climate Change and recent climatic trends

significant decrease in precipitation !!!

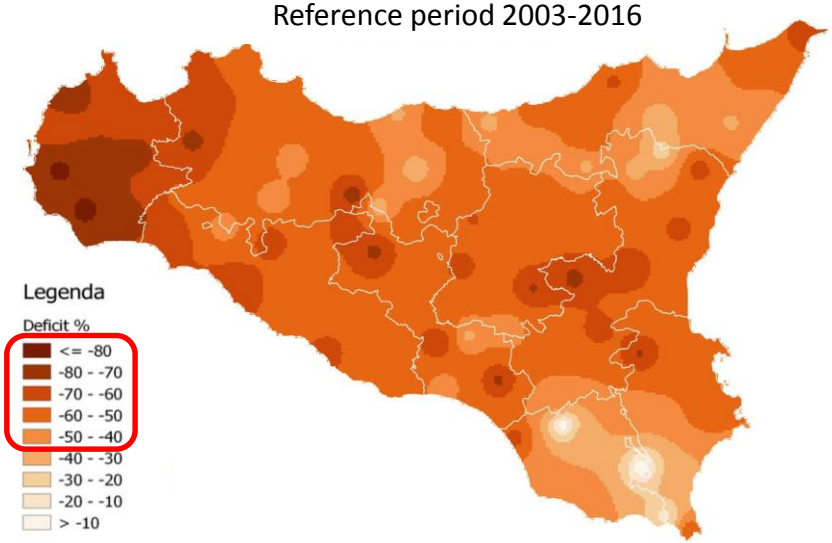
Deficit % year 2013
Reference period 2003-2012



Deficit % **Dec** 2015 to **Feb** 2016
Reference period 2003-2015



Deficit % **Mar** to **Aug** 2017
Reference period 2003-2016



Risks associated to Climate Change

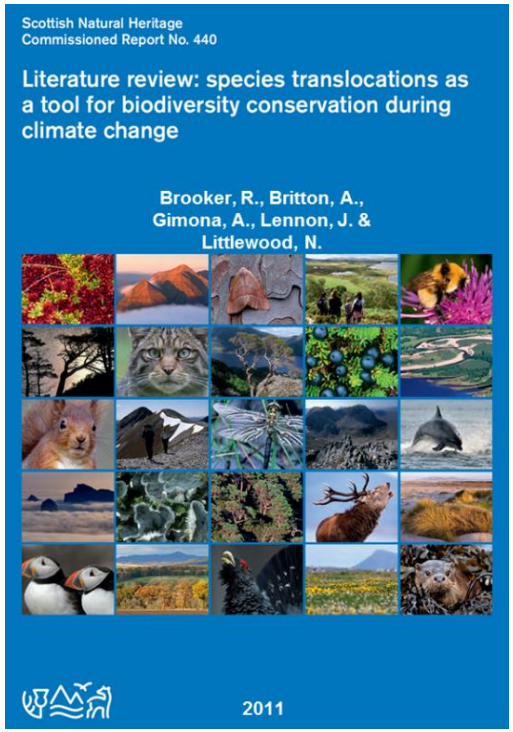


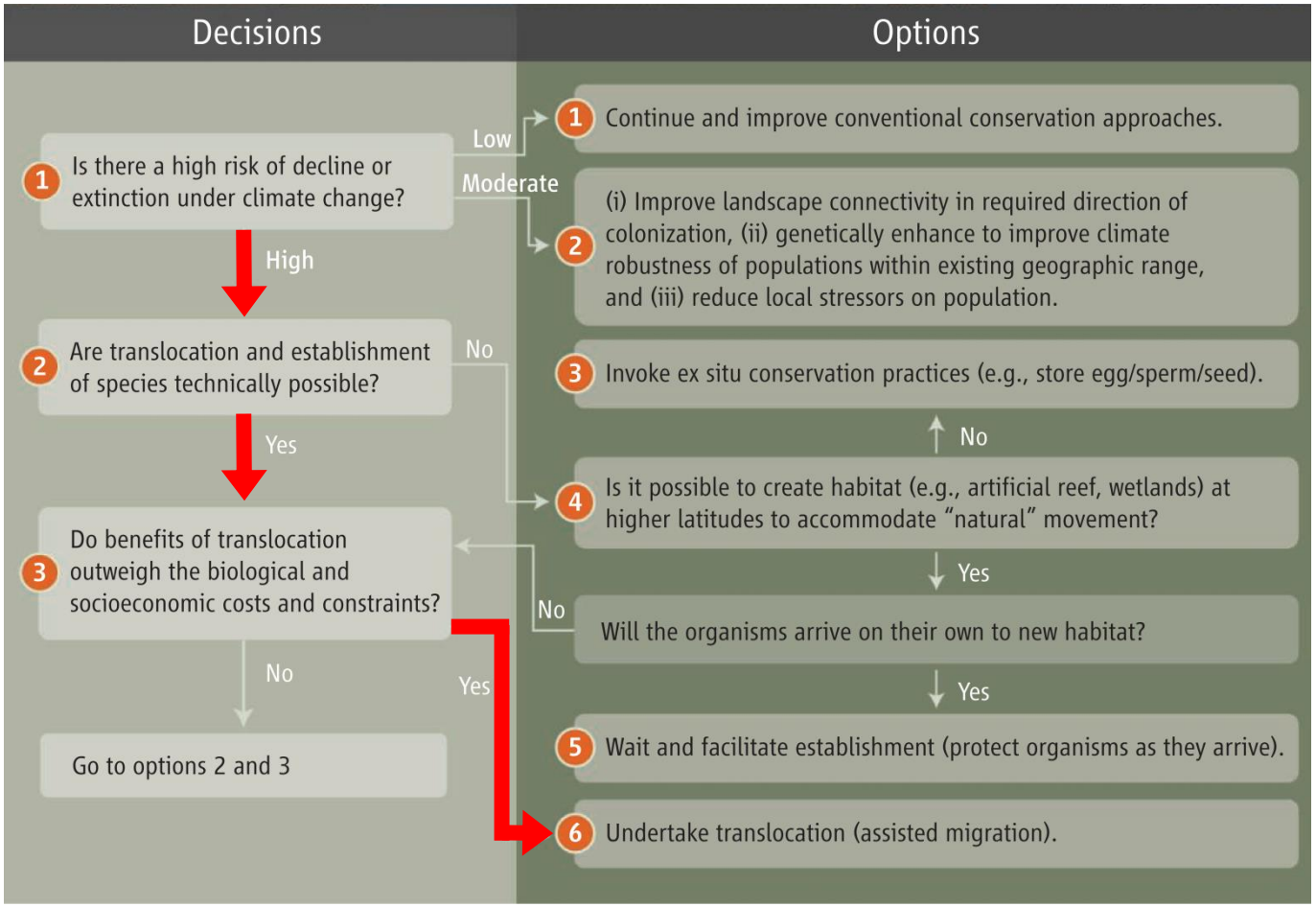
June 2018
GREAT
RESILIENCE!





Translocation as a tool for long-term *in-situ* conservation





(*Hoegh-Guldberg et al., 2008*)

Which is the real “optimum” for *Zelkova sicula*?





Site selection criteria for translocation

Madonie Mts. – Bosco Pomieri (1341 m a.s.l.)



SUPRA-MEDITERRANEAN BELT
***Quercus* deciduous-*Fagus* forests**

- Paleobotanical data (past floristic assemblages)
- Biogeography of the genus *Zelkova*
- Elevation (500 to 1340 m a.s.l.)
- Micro-topography (streamsides, northern face)
- Protected areas
- Public property

Nebrodi Mts. – Bosco Tassita (1309 m a.s.l.)

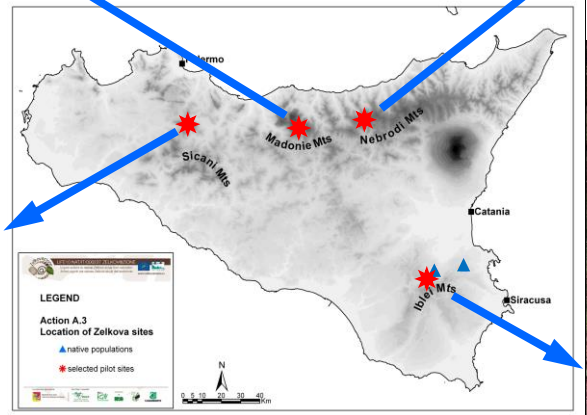


SUPRA-MEDITERRANEAN BELT
***Fagus-Acer-Taxus* forests**

Sicani Mts. – Bosco Ficuzza (1014 m a.s.l.)



(MESO-)SUPRA-MEDITERRANEAN BELT
***Quercus* deciduous/evergreen-*Acer* forests**



Iblei Mts. – Bosco Pisano-Manco (507 m a.s.l.)



THERMO-MEDITERRANEAN BELT
***Quercus* evergreen forests**

June 2016: the first trials


Browsing protection by fencing




Planting patterns: half-shadow, along stream side


Technical expedients: use of hydrogel (high water retention polyacrylate)

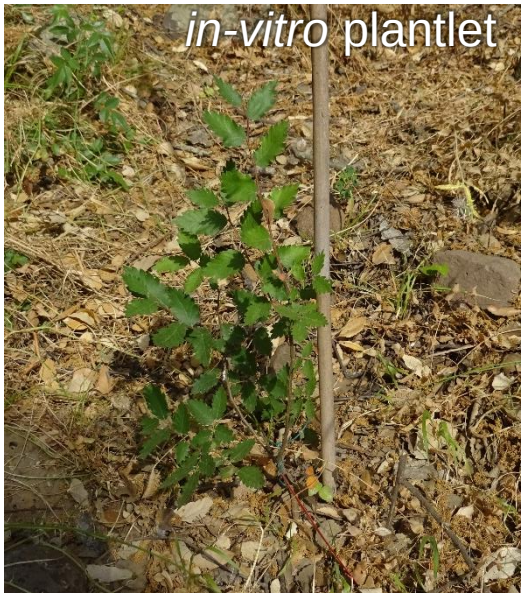

Mulching with biodegradable mat

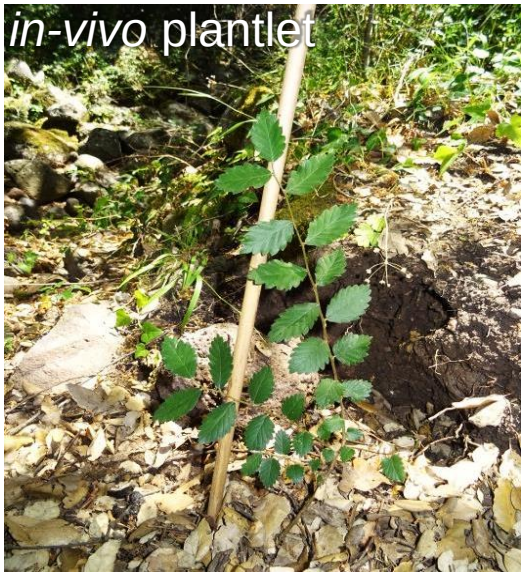

Emergency irrigation during the first growing season


Growth monitoring

Successful results!





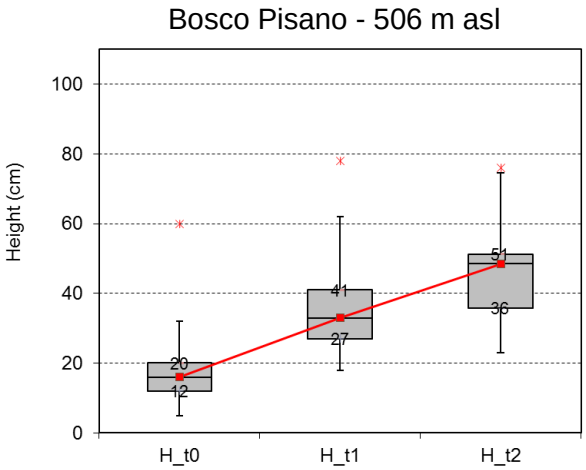


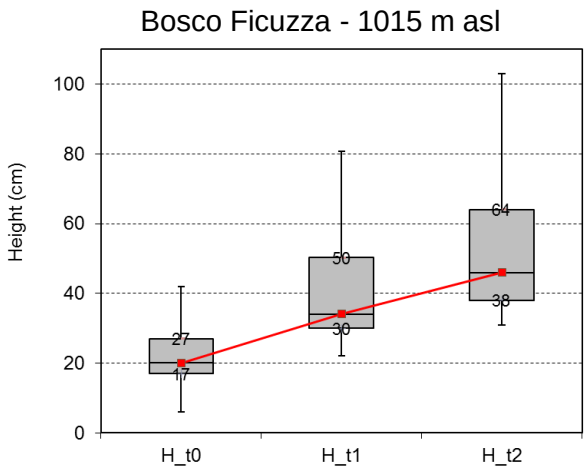
- 45 new plantlets per site in 4 new pilot-sites
- damages to some plantlets by heavy snow (!!!!) at the 3 most elevated sites
- up to September 2018, ≅ 98% of plants are alive and healthy (only 4 dead)

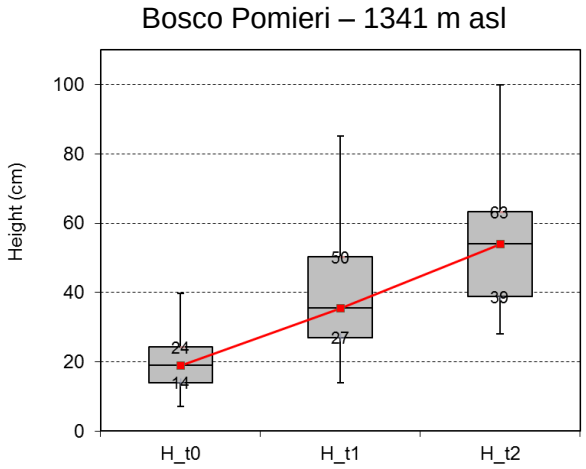
Unexpected remarkable growth

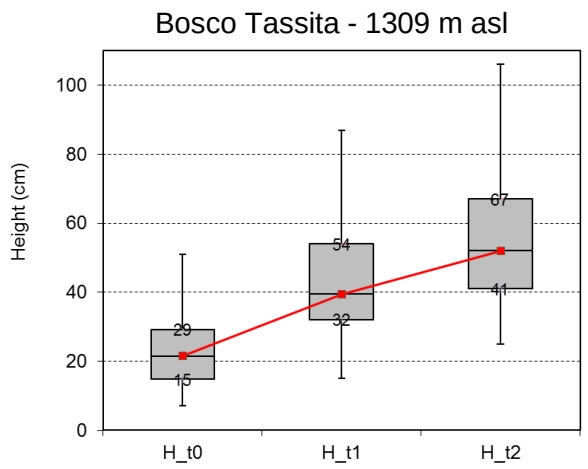












mean annual growth rate ≅15 cm in each site

CONTRIBUTORS

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THANK YOU FOR YOUR ATTENTION