

## CASCADE STUDY AREA 2: Albaterra Range, Alicante, Spain

Responsible partner: UA

### 1. General information

The Albaterra range is located in SE Spain, one of the most desertification-affected areas in Europe. Past exploitation and management activities, and harsh environmental conditions, have driven the site towards a highly degraded state. According to off-site impacts, indicators of land degradation, and the expertise of local stakeholders and managers, spontaneous reversion of degradation processes cannot be expected at a management time-scale – e.g. during one to three generations, even if most of the degradation driving forces have ceased. In response to this condition, a number of restoration programmes have been implemented. Ecosystem functioning needs to be repaired by restoration actions.

### 2. Geographical description

The Albaterra Range is located in the Alicante province, SE Spain. The climate is semiarid Mediterranean, with a mean annual precipitation of 286 mm that falls mainly in autumn and spring, and a mean annual temperature of 19 °C. Most degraded areas occur on the south-facing slopes of the range. Slope angles are moderate (30%), and soils are relatively shallow, developed over clays and conglomerates, and with very low organic carbon content.



Figure 1: Location and general view of the Albaterra Range

### 3. Main ecosystem(s) in the study area, and functions/services they provide

The main ecosystems in the study area are semi-arid thermo-Mediterranean shrublands, which provide mainly recreational use and support marginal grazing by goats and sheep. Marginal agriculture (fig, almond and olive trees) also occurs in the area. The area includes a number of scattered Aleppo pine (*Pinus halepensis*) forest patches, which have resulted from past reforestation programs implemented in the area. These actions, mainly aimed at controlling erosion and floods, have yielded poor results and in some cases promoted ecological and management problems.

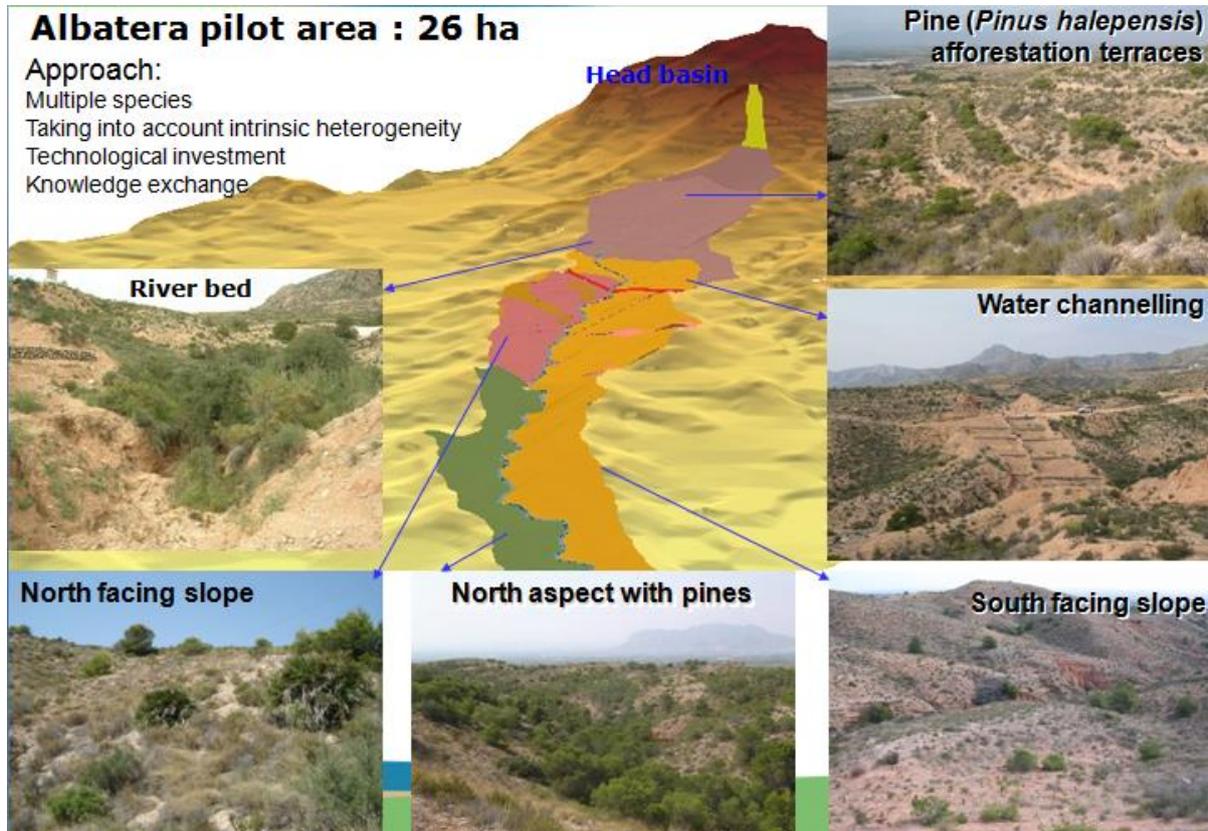


Figure 2: Albaterra pilot area: A demonstration project of restoration actions to combat desertification

In recent years, a new set of restoration actions have been implemented in the site by the Valencia Region Forest Service and the Spanish Ministry of Environment. These actions mainly consisted of multi-species and spatially heterogeneous plantations designed to combat land degradation. The selection of plant species was focused to match the diversity of habitats, landscape functional units, and natural patterns in the target area. The main objectives of the restoration program were: 1) to repair ecosystem functioning by creating fully functional vegetation patches that contribute to the conservation of resources, 2) to increase ecosystem diversity and resilience, and 3) to prevent further landscape degradation and off-site damage.

#### 4. Ecosystem dynamics

Land degradation has been driven by the synergetic effect of past exploitation and management – grazing, marginal agriculture, wood gathering – and harsh environmental conditions such as scarce and highly variable rainfall and soils prone to erosion. Further anthropogenic disturbances, such as terracing, roads, water channelling for irrigation, etc., have deeply altered soil surface and landscape. All together, these drivers changed the main ecosystems in the area, shrublands and steppes, into stable degraded states that did not recover after the cessation of mismanagement and exploitation activities. The main indicators for irreversible changes are:

- Loss of ecosystem functions: water infiltration and nutrient cycling are not fully functional in the degraded area; productivity is therefore greatly reduced; plant cover is very poor. The system is producing net losses of resources.
- Deeply altered landscape patterns due to past and current land uses: terracing, irrigation works and channelling, and derived gullies and rills.
- Off-site damage due to flooding. According to the Land Action Plan to Prevent Flooding in the Valencia Region (PATRICOVA, Regional Government), the Albaterra-Crevillente range, which includes the pilot area, is one of the key areas of flooding risk in the province of Alicante.

The restoration actions implemented in the study site during the last decade aimed to stop and reverse land degradation.

## 5. Proposed experiments

- Experiments at the plant-soil system scale aimed to assess feedbacks between vegetation and soil leading to tipping points in ecosystem functioning. Plant-soil systems will be compared across three degradation status: (1) reference/healthy; (2) partially degraded; and (3) very degraded.
- Landscape-scale assessment of changes in ecosystem services provision between (a) reference/healthy and degraded ecosystem, and (b) degraded and restored ecosystem.

## 6. Relevant end-users of knowledge in the region / country

- National authorities: Ministry of Environment (MARM, Spanish Government)
- Regional authorities and natural resource managers: representatives from the Regional Forest Services (Regional Government of Valencia, Generalitat Valenciana)
- Research and Academic institutions (CEAM Foundation, University of Alicante, University of Barcelona, IAMZ-CIHEAM)
- Local authorities: Albaterra Major and representatives from the Albaterra Municipality Council
- Environmental NGOs
- Recreational and cultural associations, including hunting associations, which represent users and beneficiaries of ecosystem services
- Local land owners and farmers

## 7. Anticipated activities and workshops with stakeholders

- Identification and establishment of a CASCADE stakeholder platform through a chain referral processes, starting from an existing platform established in a previous project (PRACTICE).
- Initial workshop to (1) inform about CASCADE project framework, goals, activities, and expected results, and (2) to capture the baseline perspective of stakeholders on degradation drivers, current ecosystem status and potential actions to reverse degradation.
- Workshop on trade-offs between ecosystem services: Through a participatory weighting exercise, stakeholders will establish the relative importance of a variety of ecosystem services provided by the main ecosystem in the area.

- Integrated assessment of changes in ecosystem services due to both land degradation and restoration actions. This assessment will be carried out through both semi-structured individual interviews and participatory workshops.

#### **8. Past and on-going projects on ecosystem functioning, thresholds, and related aspects**

- Prevention and Restoration Actions to Combat Desertification. An Integrated Assessment (PRACTICE), GA226818. EC-funded Support Action, 2009-2012. See <http://www.gmes.info/pages-principales/projects/project-database/database-of-projects/?idproj=164&what=1&filter=16&page=0&cHash=8b2cbcc68e>
- Gradual and sudden climate changes and environmental impacts (GRACCIE), CSD2007-00067. CONSOLIDER-INGENIO 2010, funded by the Spanish Ministry of Education and Science, 2007-2011. See <http://www.graccie.eu/happens.html>
- Interactions between diversity and function in degraded drylands. Effects on restoration (FUNDIVFOR), (FPA/2009/035). Funded by Fundación Biodiversidad, Gerónimo Forteza Program, 2009. See <http://80.24.165.149/fundivfor/>
- Restoration strategies to combat desertification in a context of climate change. Effects on water balances (ESTRÉS), 063/SGTB/2007/7.1. Funded by National Program of Science and Environmental Technologies. National Plan on Research and Innovation, Spanish Ministry of Environment, 2007-2009.
- Evaluation of ecological restoration techniques for restoring Mediterranean ecosystems (TRESECO), CGL2005-07946-C02-02/BOS. Biodiversity National Program, funded by the Ministry of Education and Science. 2005-2008.
  - Restoration Actions to combat desertification in the Northern Mediterranean (REACTION). EC-funded Accompanying Measure. 2003-2005. See <http://portales.gva.es/ceam/reaction/Home.htm>

#### **9. Key references about ecosystem dynamics in the study area or wider spatial setting**

- Bautista S., Orr B.J., Alloza J.A., and Vallejo V.R. 2010. Evaluation of the restoration of dryland ecosystems in the northern Mediterranean: Implications for Practice. Chapter 18. In: M-F Courel and G. Schneier-Madanes (eds.) Water in Arid and Semi-arid Zones. Advances in global change research. Springer, Dordrecht, The Netherlands, pp. 295-310.
- Zucca C., Bautista, S., Previtali, F. 2009. Desertification: Prevention and Restoration. In R. Lal (ed.), Encyclopedia of Soil Science, Second Edition. Taylor & Francis Group, New York, US.
- Chirino, E. Vilagrosa, A., Cortina, J., Valdecantos, A., Fuentes, D., Trubat, R., Luis, V.C., Puértolas, J., Bautista, S., Baeza, J., Peñuelas J.L., Vallejo, V.R. 2009. Ecological Restoration in Degraded Drylands. In: Steven P. Grossberg (ed.), Forest Management. Nova Publishers.
- Bautista S., Aronson, J., Vallejo, R. (editores). 2009. Land Restoration to Combat Desertification. Innovative Approaches, Quality Control and Project Evaluation. Fundación CEAM. 168 pp.
- Cortina, J., Maestre, F.T., Ramírez, D.A. 2009. Innovations in Semiarid Land Restoration. The case of *Stipa tenacissima* L. Steppes. In S. Bautista, J. Aronson, and R. Vallejo (editores). Land Restoration to Combat Desertification. Innovative Approaches, Quality Control and Project Evaluation. Fundación CEAM, pp. 121-144.



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