

# Riparian Forests in a Context of Flow Disturbance: New Tools and Approaches to Support Ecological Research

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Project OASIS: How to Run regulated rivers in semi-arid regions? (Ref: PTDC/AAC-AMB/120197/2010) is a FCT R&D project focused on the effects of river regulation by dams on riparian forests. Under the aegis of OASIS Project new tools and evolving approaches have emerged, using remote sensing data (historical and recent imagery) and field data. Detailed information can be found at <http://www.isa.ulisboa.pt/proj/oasis/>.

We summarize below 3 main achievements of the present work:

## 1 FLOWBASE – a Plant Trait database for Mediterranean Riparian Woody Flora



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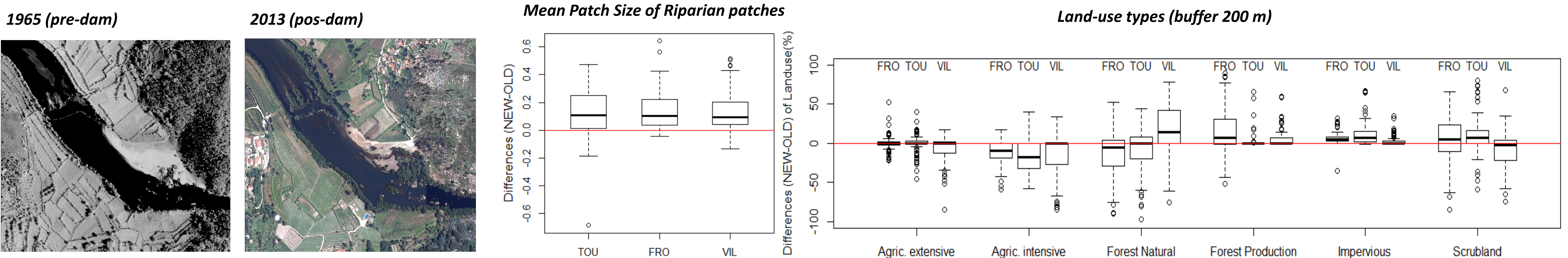
FLOWBASE is freely available at :

<http://www.isa.ulisboa.pt/proj/flowbase/>

FLOWBASE aims to make easily and freely accessible currently scattered information about Mediterranean riparian woody species, their connections to flow processes. It is an open-ended database, thus progressing in increasing the number of sources, species, traits, images and locations. FLOWBASE provides standardized information on 225 woody species - trees, shrubs, lianas – and addresses 55 functional plant traits characterizing dispersal, establishment and persistence in riparian areas and with expected linkages with hydrological changes, water availability and flood resistance.

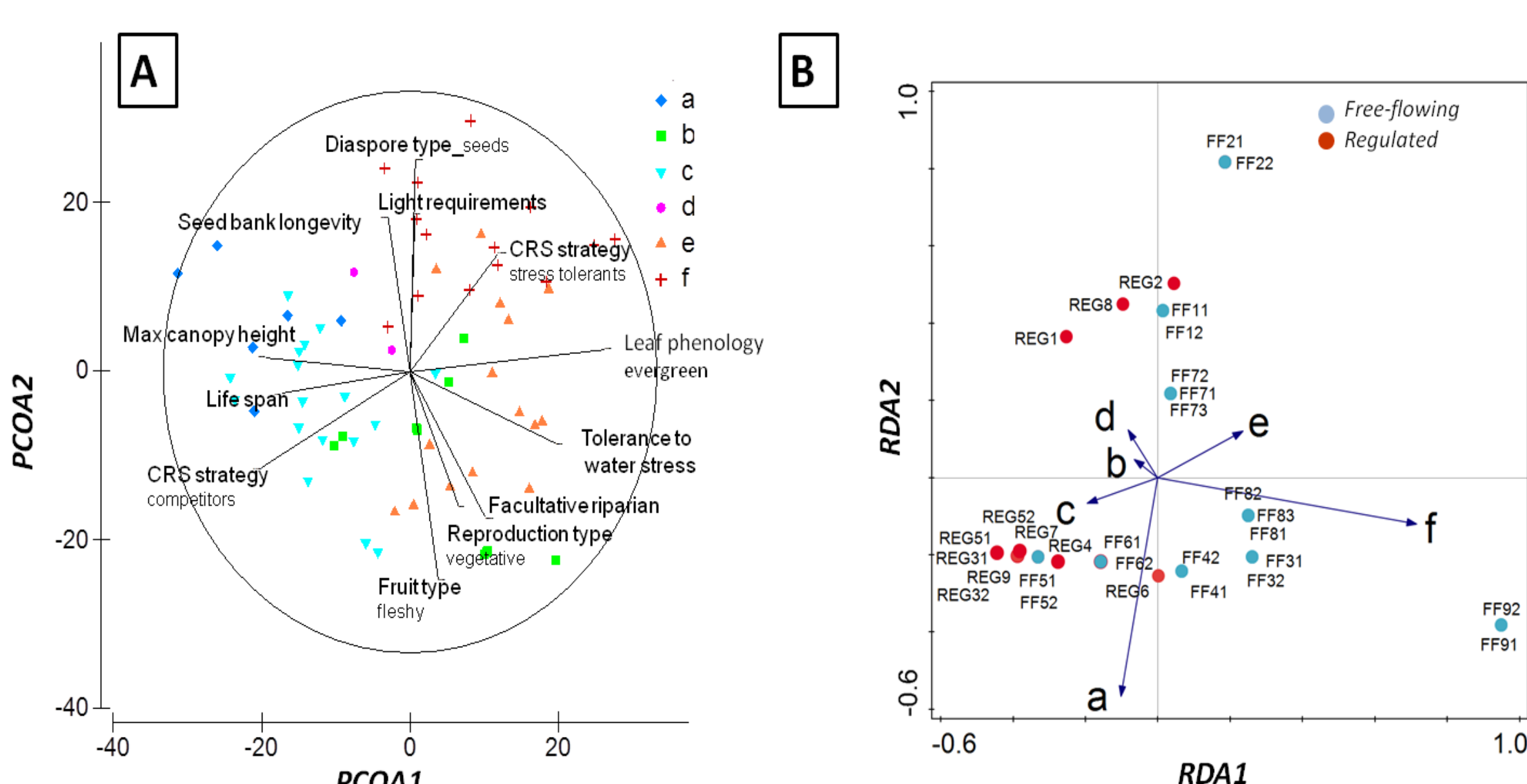
## 2 Historical alterations downstream dams: land-use and altered streamflows

Land-cover and riparian cover change in three hydropower rivers with different dam operations (run-off river Touvedo dam -TOU- and two reservoirs with storage capacity – Vilarinho das Furnas, VIL and Fronhas, FRO) were studied. A new approach was devised to correct the spatial offset between historical and current imagery. Graphs represent the differences between Post-dam (NEW) and Pre-dam (OLD). Photos are from Touvedo case study.



## 3 Functional trade-offs of riparian forests in regulated rivers

Riparian guilds (groups of species with similar traits responsive to changes) were derived to assess *trait syndromes* to altered flows using data from 9 hydropower rivers. Obligate riparian competitors with hygromorphic leaves and high waterlogging tolerance (riparian guild a) were more abundant in FF than in REG, but facultative riparian, with physical defences, tap roots and high tolerance to drought (guild b), and non-riparian short-lived perennials (guild f) had similar covers, reflecting the widespread terrestrialization of Mediterranean rivers. High Pulse Duration and Magnitude of October Flows were the main hydrological drivers.



**A** PCoA ordination plot showing the distances among 66 riparian woody species based on 26 functional plant traits for the first two axes; riparian guilds obtained with Gower similarity measure and UPGMA are overlapped. Significant correlations of traits ( $R>0.5$ ;  $p<0,001$ ) with PCoA axes are shown.

**B** RDA ordination biplot of the first two axes, showing the dispersion of 31 regulated (REG; red circles) and free-flowing sites (FF; blue circles), the correlation of the six riparian guilds with axes are represented as arrows.



Dual disturbance of land-use and hydrology!

### ACKNOWLEDGEMENTS

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