KEY ISSUES FOR THE SUCCESS OF FOREST RESTORATION PROJECTS IN NATURA 2000 SITES IN GREECE

Kakouros, Petros

Section of Biotic Resources and Management of Protected Areas, Greek Biotope / Wetland Centre, 14th km Thessalonikis-Mihanionas, Po Box 60394 57001 Thermi, GREECE, e-mail: petros@ekby.gr

Abstract: In this paper key issues regarding forest restoration projects in Natura 2000 sites are presented. The projects were implemented in the Palm Forest of Vai situated in "Voreioanatoliko akro Kritis" and the Riparian Forest of Nestos situated in the "Delta Nestou and Limnothallases Keramotis".

The main objective of both projects was the improvement of the conservation status of priority habitat types and the enhancement of the sites' integrity. That was achieved by re-establishing native vegetation, which was cleared for agriculture and forest plantations from 1950 to 1970. Planting, fencing and irrigation were implemented on both sites, along with communication actions and creation of information infrastructure.

The Vai project was a Life-Nature project. By restoring palm trees over an area of 13.4 ha, the project managed to double the surface of the habitat type "Palm groves of Phoenix" (9370) from 15.6 to 31.7 ha. Nestos Delta project was funded by EFTA. Its main objective was the restoration of riparian vegetation in an area of 280 ha. Through this action the area covered by "Alluvial forests with Alnus glutinosa and Fraxinus excelsior" (91E0) increased from 385 to 467 ha. Consideration of landscape perspectives in the selection of the restored areas resulted in the reduction of forest's fragmentation.

Clear and scientifically sound restoration objectives, thorough study of the soil conditions that had been created after forest destruction and safeguarding of the availability of planting material of local origin were the key issues that led to projects' success.

Keywords: 9370 * Palm groves of Phoenix, 91E0 * Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae), land use change, reafforestation

Introduction

Greek forests are rapidly recovering in terms of area and structure in the mountains, mainly due to the decline of grazing pressure. The opposite is happening in the plains, along rivers and at the coastal areas, where pressure for agricultural land and urban development is increasing. Forests cover an important part of the area of the Greek Sites of Community Interest. According to the latest available data (MINENV 2001), 42% of the terrestrial area of Greek SCI's is covered by forests, while almost 30% of Greek high forests are included in SCI's, while EU15 rate is approximately 12% (European Communities 2003). Forest priority habitat types cover an area of approximately 10% of the terrestrial area of Greek SCI's. In Greece, until 1990 forest restoration was applied by the Forest Service only for soil protection and wood production. Nature conservation issues were usually ignored, while reaforestations were applied only to state owned land, avoiding interference with other landowners. Integration of nature conservation issues in all aspects of forest management, introduced by the Habitats Directive, brought new challenges for forest restoration, such as fauna requirements, obligatory use of indigenous species, restoration on private owned land etc. This work summarise the key issues that have been identified from two important and successful forest restoration projects, as a contribution to the built up of knowledge on forest restoration in Europe, particularly now when climate change poses new problems.

The projects that were selected are the Life-Nature project "Conservation measures for the Palm Forest of Vai, Greece" implemented in the Palm Forest of Vai situated in "Voreioanatoliko Akro Kritis" (SCI GR4320006) from 1998 to 2002 and the EFTA-funded project "Restoration and environmental interpretation of the Riparian Forest of Nestos Delta" situated in the "Delta Nestou and Limnothallases Keramotis" (SCI GR1150010) which started in 2004 and will end in 2009. These projects were selected because their main actions in terms of project structure and budget regard forest restoration. The main objective of both projects was the improvement of the conservation status of priority habitat types and the enhancement of the sites' integrity.

Materials and methods

Phoenix theophrastii, included in Annex II of the Habitats Directive, and also covered by the priority habitat type "Palm groves of Phoenix", can be found in small clusters in several parts of Crete (Greece) and in Turkey. However, it is only in the Vai forest that the species forms a grove. It is estimated (Dafis 1985) that before 1957 the palm forest covered almost 300 ha. Extensive land reclamation took place afterwards and the forest was reduced to just 15.6 ha. Life-Nature project came as a response of the local community and the landowners of the area to the continued degradation of the forest that was already recognised (Dafis 1985). The Riparian Forest of Nestos in the beginning of the 20th century was covering an area of more than 10.000 ha (Papaioannou 1953). The forest was a mixed softwood and hardwood forest, consisting of Willows (*Salix* sp), White poplar (*Populus alba*), Common alder (*Alnus glutinosa*), Elms (*Ulmus* sp.), English oak (*Quercus robur*), Narrow-leaved ash (*Fraxinus angustifolia*) etc., hosting an especially rich fauna including Brown bear (*Ursus arctos*), Eurasian Lynx (*Lynx lynx*) etc. Land reclamations and channeling after 1922, resulted in the preservation of three isolated patches of the ancient forest summing just 155 ha and the establishment of a secondary forest along the artificial course covering an area of 1700 ha. Areas not suitable for agriculture were used for poplar and acacia plantations, but intensive use of the sandy soils cause rapid reduction of productivity after 1960 (Alifragkis and Papaioannou 1998). Gradually nature conservation was recognised as the primary management objective and finally, the Forest Service decided the cease of plantations and declared its will for the restoration of the native vegetation of the forest. In this framework a new management plan (Kakouros and Dafis 2005) was drafted and begun to be implemented in the framework of the EFTA project. Its basic objectives are the restoration of the native vegetation and the restoration of a landscape structure similar to the pre-reclamation era.

Results and discussion

In Vai after close consultation with the landowners of the reclaimed farmland, several farmers were voluntarily relocated from 9.2 ha around the forest to alternative land donated by the Holy Monastery of Toplou. An additional 26 ha of land was fenced and planted with the Phoenix palms. Other restoration actions included silvicultural treatments for the existing plants and the installation of an irrigation system and underground water-level monitoring system for the planted areas after a special study for the water availability. Tourist facilities were also relocated to ease pressure from tourists. Seed collection from the forest and plant production in the State Forest Nursery

of the area started with the approval of the project in order to anticipate all possible needs of the project. Fortunately, Forest Service was already producing *Phoenix theophrastii* plants, so necessary time and method of plant production were known. Additionally, a small experimental plantation provided the necessary experience for the treatment of the plantings. The project managed to double the surface of the habitat type from 15.6 to 31.7 ha.

In the case the Riparian Forest of Nestos, re-introduction of the native tree species was based on soil data derived from maps and observations related to plantations productivity. Planting material availability was an important concern from the beginning, since hardwood species does not produce the same quantity of seeds every year. So, like in the case of Vai, the Forest Service started to gather reproductive material (seeds and material for asexual reproduction) enough before the final restoration plan was elaborated. All reproductive material was collected from the area and the plants were produced in the State Forest Nursery of Kavala. The main species used are White poplar, English oak and Narrow-leaved ash. The project foresees an increase of the total area of the priority habitat type "Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*" (91E0) from 385 to 467 ha (21,1%) and of the habitat type " Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia* "(91F0) from 100 ha to more than 250 ha. Plantings (Figure 1) are applied in an area of 280 ha selected not only with soil quality criteria but also with an effort to reduce the fragmentation of the areas with natural forest vegetation. Current data show high success (over 80%) in the planting of all species used (e.g. White poplar and English oak) except Narrow-leaved ash, an issue that is under research. The anticipation for excess reproductive material allows the nursery to produce enough plants for replanting when the cause of low survival of Narrow-leaved ash is revealed.

Figure 1. Restoration with White poplar in the Riparian Forest of Nestos. (Petros Kakouros)

Consideration of soil conditions was an important step for the adoption of the restoration strategy in both projects. This is especially apparent in the case of the Riparian Forest of Nestos where soil conditions had irreversible changed after the cessation of the periodical flooding of the forest in combination with the lowering of underground water level. Taking these changes into account, a "succession acceleration" strategy was adopted, to the stage of the hardwood forests (Ward et al. 2002). Of particular importance proved the decision to gather reproductive material and prepare the production of plants. In both cases these decisions overcame the problem of limited time of the projects and in the case of Nestos anticipated the low survival rates of Narrow-leaved ash. Clear and long term management objectives for the restoration of the native vegetation act as a secure basis for such kind of decisions, since the management authorities have alternatives for the excess plants such as new restoration efforts. Nevertheless, it must be noted that the time provided in projects such as Life-Nature is marginal for the funding of seed gathering, plant production and replacement of non survived plants. This is an issue that needs to be examined in the future.

Conclusions

What we learn from these projects is that a successful restoration need sound management as long as sound scientific basis. The adoption of a simple, clear and scientifically sound restoration objective put all efforts in the same line and helps safeguarding of the availability of planting material of local origin, especially when the project is of limited duration. From the other hand, thorough consideration of the soil conditions that had been created since the removal of the forest that is to be restored help the adoption of the restoration strategy that led to projects' success.

References

Alifragkis D. & Papaioannou A. (1998). Soil Conditions of Nestos Riparian Forest. In: "Ecological analysis management, and ecodevelopment of the Riparian Forest of Nestos". Aristotle Unuversity of Thessaloniki, School of Forestry and Natural Environment, Thessaloniki, Greece. (in Greek)

Alifragkis D., Papaioannou A. & Smyris P. (2000). Soil conditions of the Ancient Kotza-Orman riparian forest of Nestos. In: Proceedings of the 8th Greek Soil Science Congress, Kavala , Greece. Geotecnical Chamber of Greece (East Macedonian and Thrace Siction)-Agronomist Society of Kavala, pp 276-292. (in Greek)

Dafis, S. (1985). The palm forest of Vai in Sitis, Crete. Manuscript. (in Greek)

European Communities (2003). Sustainable forestry and the European Union. Office for Official Publications of the European Communities, Brussels. p.60.

Hellenic Ministry for the Environment, Physical Planning and Public Works (MINENV), 2001. Identification, Description and Mapping of Habitat Types of Greece. Operational Programme Environment, Subproject 3.Action 3.3. (In Greek).

Land accounts for Europe 1990–2000, (2006). Towards integrated land and ecosystem accounting. Office for Official Publications of the European Communities, Brussels p. 112.

Kakouros, P. & Dafis S. (2005). Management plan for the riparian forest of Nestos. Greek Biotope-Wetland Centre. Thermi, Greece 144 p. (in Greek)

Papaioannou, I.K. (1953). Kotza Orman forest. Eklogi 88, pp 55-64. (in Greek)

Ward, J.V., Tockner K., Arscott D.B. and Claret. C. (2002). Riverine landscape diversity. Freshwater Biology 47, pp. 517-539.