



LIFE17 NAT/GR/000511

RESTORATION, MANAGEMENT AND VALORISATION OF PRIORITY HABITATS OF MEDITERRANEAN COASTAL AREAS

LAYMAN'S REPORT



NESTOS RIVER



PALO LAZIALE

Introduction

The LIFE PRIMED project, co-funded by the European Union under the LIFE Programme, aimed to enhance and restore Mediterranean wetland and coastal forest ecosystems in the face of climate change and human-induced pressures. The project focuses on two key pilot areas: the Nestos Delta in Greece and Palo Laziale in Italy. These ecologically significant sites support rich biodiversity, including endemic and endangered species.

Project Objectives

The LIFE PRIMED project is designed to:

- Restore and improve the resilience of Mediterranean wetlands and coastal forests.
- Enhance biodiversity and ecosystem services in the targeted areas.
- Develop innovative, science-based conservation strategies.
- Engage local communities and stakeholders in conservation efforts.
- Provide transferable methodologies for similar ecosystems across Europe.



Specific Objectives

Habitat Restoration

The primary aim of LIFE PRIMED was to improve the conservation status of specific habitats and species:

Habitats:

- Mediterranean temporary ponds (3170)
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (91E0)
- Arborescent matorral with *Laurus nobilis* (5230)
- Pannonian-Balkan turkey oak-sessile oak forests (91M0)

Species:

- Hermann's tortoise (*Eurotestudo hermanni*)
- European pond turtle (*Emys orbicularis*)
- Jersey tiger moth (*Euplagia quadripunctaria*)
- Common pheasant (*Phasianus colchicus*)



Key Actions

To achieve these objectives, the project implemented a series of targeted conservation actions:

- **Habitat Restoration:** Removal of invasive species and reforestation with native vegetation.
- **Hydrological Improvements:** Restoration of natural water flows to support wetland functions.
- **Biodiversity Monitoring:** Assessment of species presence, habitat quality, and climate impact.
- **Stakeholder Engagement:** Collaboration with local communities, authorities, and policymakers.
- **Education and Awareness:** Public outreach campaigns and environmental education initiatives.

Key Actions and Achievements

1. Habitat Restoration:

- Expanded Mediterranean temporary ponds by 0.8 hectares in Palo Laziale and 0.02 hectares in the Nestos Delta.
- Restored 40 hectares of Pannonian-Balkan turkey oak-sessile oak forests in Palo Laziale.

2. Water Management:

- Implemented a self-sustaining hydraulic system to improve soil conditions in alluvial forests, countering forest decline.

3. Species Conservation:

- Enhanced populations of target species through habitat improvement and protective measures.

4. Community Engagement:

- Involved over 2,500 local residents and tourists in environmental awareness activities, including guided tours and educational programs.

5. Knowledge Dissemination:

- Conducted international workshops, training over 200 individuals in conservation techniques and EU funding opportunities.



Project Results and Achievements

The implementation of LIFE PRIMED has led to significant improvements in the targeted ecosystems:

- **Ecosystem Recovery:** Increased habitat quality and natural regeneration of vegetation on over 80 hectares of land.
- **Biodiversity Gains:** Positive trends in key indicator species populations, including *Emys orbicularis*, *Testudo hermanni*, and amphibians linked to habitat 3170*.
- **Water Management Improvements:** Restored hydrological balance in wetland areas through 2 site-specific hydraulic systems and dedicated Water Management Plans. .
- **Community Involvement::** Strengthened awareness and participation in conservation activities, involving over 30,000 citizens.
- **Policy Contributions:** Recommendations for sustainable wetland and forest management, contributing to the implementation of the EU Nature Restoration Law.
- **Networking:** •Strengthened cross-border collaboration and knowledge exchange with over 40 LIFE and non-LIFE projects.

Mediterranean Ponds in Palo Laziale and Nestos Delta

One of the major achievements of the project has been the restoration and ecological enhancement of **Mediterranean ponds in Palo Laziale (Italy)** and **Nestos Delta (Greece)**.

- In **Palo Laziale**, interventions led to the **re-establishment of natural hydrology**, improved water quality, and the return of key amphibian and bird species. The reduction of human disturbances and invasive vegetation has allowed native flora and fauna to thrive.
- In **Nestos Delta**, conservation efforts focused on **improving pond connectivity**, enhancing habitat diversity, and controlling water levels to support wetland-dependent species. The monitoring results showed an increase in the population of aquatic invertebrates and amphibians, reinforcing the role of these ponds as biodiversity hotspots.



Forest Restoration in Palo Laziale

In Palo Laziale, the **oak forest** was in an advanced state of degradation due to prolonged drought, wildfire risk, and shrub encroachment. **Habitat 91M0** was impacted by a lack of forest management, excessive competition in the understory, limited natural renewal, and an overall imbalance in soil moisture.



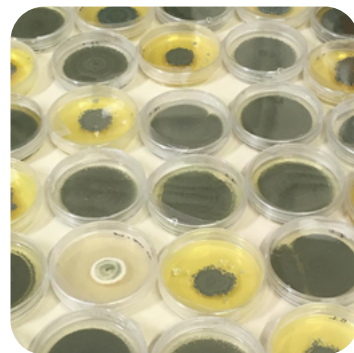
Forest management and restoration interventions were guided by **ecological principles** and the **Standards of Practice for Ecosystem Restoration**, applying an **adaptive approach** tailored to the Mediterranean context.



Selective bush cutting was carried out to reduce competition and open up the understory, while **phytosanitary removal** of infected trees helped contain the spread of pathogens. Reforestation was supported by **native seedlings** produced in a controlled-origin nursery, ensuring genetic suitability and resilience. A remotely controlled **water distribution system** was installed to improve forest hydroperiods.

More than 40 hectares of degraded woodland were restored, and a strategic forest management plan was adopted to secure long-term conservation.

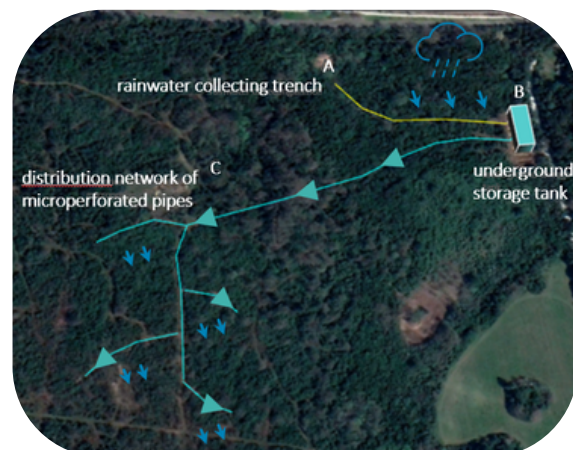
Today, Palo Laziale serves as an **open-air laboratory** for monitoring climate change effects in the Mediterranean, and as a reference site for EU-level restoration initiatives, technical exchange, and field visits.



The hydraulic systems in Palo Laziale and Nestos Delta

In **Palo Laziale**, a **gravity-fed water distribution system** was implemented to counteract severe aridity affecting the coastal forest (habitat 91M0), and the surrounding temporary ponds. (habitat 3170*).

The system collects and stores rainwater through a 200-metre gravel drainage trench, which channels water into a 500 m³ underground modular tank made of recycled polypropylene. From there, water is passively distributed via dispersion trenches to selected forest compartments through a remotely controlled valve network.



This **nature-based, energy-free solution** was designed based on site-specific topographic, soil, and climatic data to enhance forest hydroperiods, increase soil moisture availability, and build long-term resilience of the coastal ecosystem to climate-induced droughts.

In the **Nestos area**, a **solar-powered irrigation system** was installed to support the wetland habitat of rare plant species (MTPs) during extreme drought and heat. Initial assumptions about the habitat's dependence on surface water shifted after field studies showed it relies mainly on groundwater and flooding.



Designed by HAO DEMETER and Sapienza University of Rome, the system uses well-points to extract groundwater and dynamic micro-sprinklers to maintain soil moisture across three ponds.

Remotely controlled and equipped with flow meters, **the setup ensures efficient water use with minimal environmental impact.**

The system became operational in July 2024, marking a key milestone in the project's restoration efforts.



Control of *Amorpha fruticosa* in Nestos Delta

One of the critical challenges addressed in the **Nestos Delta** was the **invasion of *Amorpha fruticosa***, a fast-spreading alien species that negatively affects native vegetation and ecosystem functions.

During the project, targeted interventions were implemented, including **mechanical removal and habitat restoration measures** to control its spread. Additionally, **regular monitoring and reforestation with native species** were carried out to enhance habitat resilience.

These efforts have significantly reduced the presence of *Amorpha fruticosa* in key areas, allowing native wetland and riparian vegetation to recover, ultimately improving the overall ecological balance of the delta.



What are invasive alien species?

Invasive alien species are plants, animals, and micro-organisms that are introduced into an ecosystem where they are not native.

Once introduced, they have the ability to spread rapidly.

A. fruticosa density range 15.000-40.500 plants per ha, posing significant threats to the local biodiversity, causing damage, for example to agricultural crops, fish farming, or infrastructure, or impacting human health by transmitting diseases.

Looking for Nature-based Solutions

Over the past decade *Amorpha fruticosa* has been spreading rapidly throughout the Nestos even encroaching upon cultivated fields adjacent to natural areas. To safeguard the ecological equilibrium of the Nestos Delta riparian ecosystem and mitigate the diverse impacts on local biodiversity and native species, the LIFE Primed project is currently exploring methods to effectively address the problem. Areas of *A. fruticosa* scrub have been enclosed with fences in three locations within the Delta, and the following management interventions have been applied:

- I. **Artificial shading** through the installation of a sunshade positioned at a height of 3m.
- II. **Natural shading** by planting **Black Alders** (*Alnus glutinosa*).
- III. **Natural shading** by planting **White Poplars** (*Populus alba*).
- IV. **Removal** of *A. fruticosa* and covering of the ground with ground cloth.
- V. **Regular and repeated cutting** of *A. fruticosa* to manage its growth.
- VI. **Controlled grazing** of *A. fruticosa* by goats



Long-term Impact and Sustainability

The success of LIFE PRIMED extends beyond the project's duration. The methodologies developed provide a model for conservation actions in other Mediterranean wetlands and coastal forests. Additionally, stakeholder engagement ensures continued commitment to the project's objectives, enhancing the long-term sustainability of the interventions.

The European Union Restoration Law

The **European Union Restoration Law**, recently adopted as part of the EU's **Biodiversity Strategy** for 2030, aims to restore degraded ecosystems and enhance biodiversity across Europe. This legislation sets binding targets for the restoration of **at least 20% of the EU's land and sea areas by 2030**, with a long-term goal of covering all degraded ecosystems by 2050. The law supports nature-based solutions to combat climate change, improve ecosystem resilience, and restore essential services such as carbon sequestration and water regulation.

The Italian Hub

The Italian Network on Ecological Restoration (RIRE) promotes inclusive, science-based restoration across Italy, connecting researchers, practitioners, and institutions to share knowledge, good practices, and influence national strategies under the EU Nature Restoration Regulation and the National Restoration Plan.

The Greek Hub

The Greek Knowledge Community for the Protection and Restoration of Nature (working title) is an expanding national community of experts on nature protection, restoration, policy and advocacy. The development of the Greek Community was initiated during the final Conference of the LIFE PRIMED Project in Drama, Greece.

The objectives and methodologies of **LIFE PRIMED** align closely with the Restoration Law, demonstrating practical applications of large-scale ecosystem recovery. The project serves as a **model for future restoration efforts** under the new legislation, showcasing the **importance of wetland and coastal forest rehabilitation** in achieving the EU's biodiversity and climate goals.





LIFE PRIMED has demonstrated that **nature-based solutions** are effective in restoring and preserving Mediterranean ecosystems. Through collaborative efforts, innovative strategies, and strong community participation, the project contributes to a more sustainable and resilient natural environment.

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