



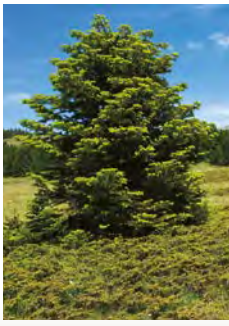

PROJECT PARTNERS:

Hellenic Society for the Protection of Nature

HELLENIC REPUBLIC
National and Kapodistrian University of Athens

REGION OF STEREA ELLADA

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HELLENIC AGRICULTURAL ORGANIZATION "DEMETER"

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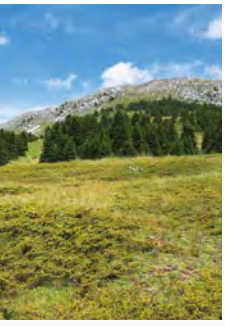
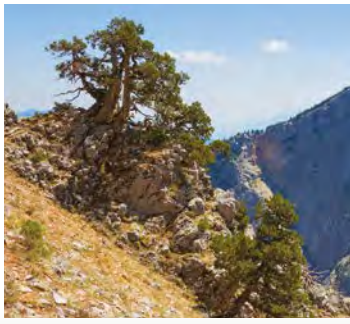
The Project «For Open Forests»

Layman's Report







Conservation of priority forests and forest openings in «Ethnikos Drymos Oitis» and «Oros Kallidromo» of Sterea Ellada

LIFE11 NAT/GR/1014

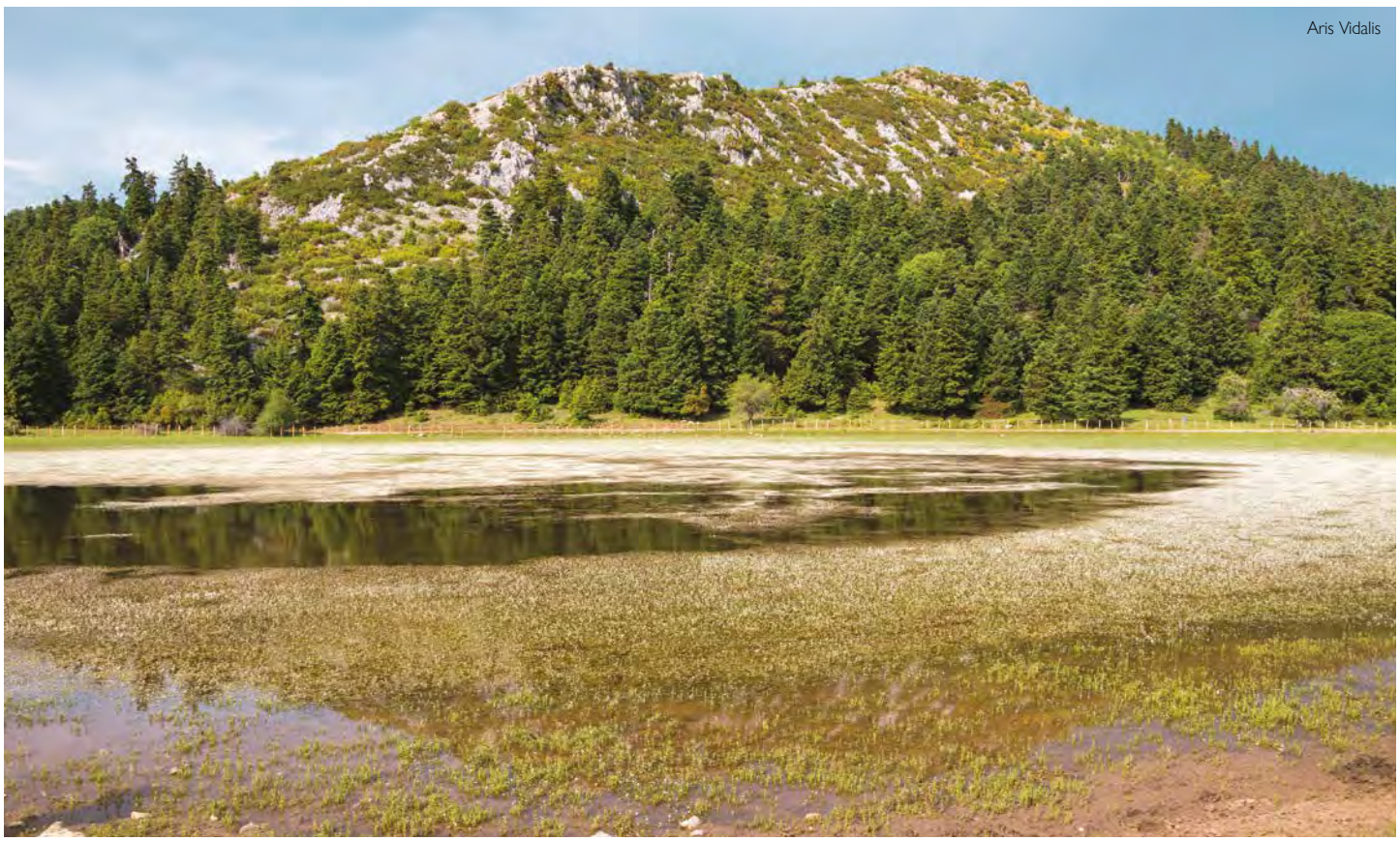
HSPN ΕΕΠΦ

ForOpenForests

With the contribution of the LIFE financial instrument of the European Union

NATURA 2000


Nikos Petrou


Aris Vidalis

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HSPN ΕΕΠΦ

ForOpenForests

With the contribution of the LIFE financial instrument of the European Union

The Project «For Open Forests»

Conservation of priority forests and forest openings in «Ethnikos Drymos Oitis» and «Oros Kallidromo» of Sterea Ellada

LIFE11 NAT/GR/1014

Objective

The main objective of the project is to implement management in forests and forest openings for the conservation of biodiversity at species, habitat, and landscape level.

Areas

- ETHNIKOS DRYMOS OITIS (GR2440004)
- ETHNIKOS DRYMOS OITIS - KOILADA ASOPOU (GR2440007)
- OROS KALLIDROMO (GR2440006)

Habitats

- Mediterranean Temporary Ponds (3170*)
- Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* locations with remarkable orchids) (6210*)
- Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) (6230*)
- Endemic forests with *Juniperus* spp. (9560*)
- (Sub-)Mediterranean pine forests with endemic blackpines (9530*)

Species

*Veronica oetaea** ■ *Ursus arctos** ■ *Aegolius funereus* ■ *Alectoris graeca* ■ *Dryocopus martius* ■ *Dendrocopos leucotos* ■ *Picus canus*

Project Partners

Hellenic Society for the Protection of Nature ■ National and Kapodistrian University of Athens ■ Region of Sterea Ellada ■ Institute of Mediterranean Forest Ecosystems (ELGO DEMETER) ■ Arctouros - Association for the Protection and Management of the Natural Environment and Wildlife

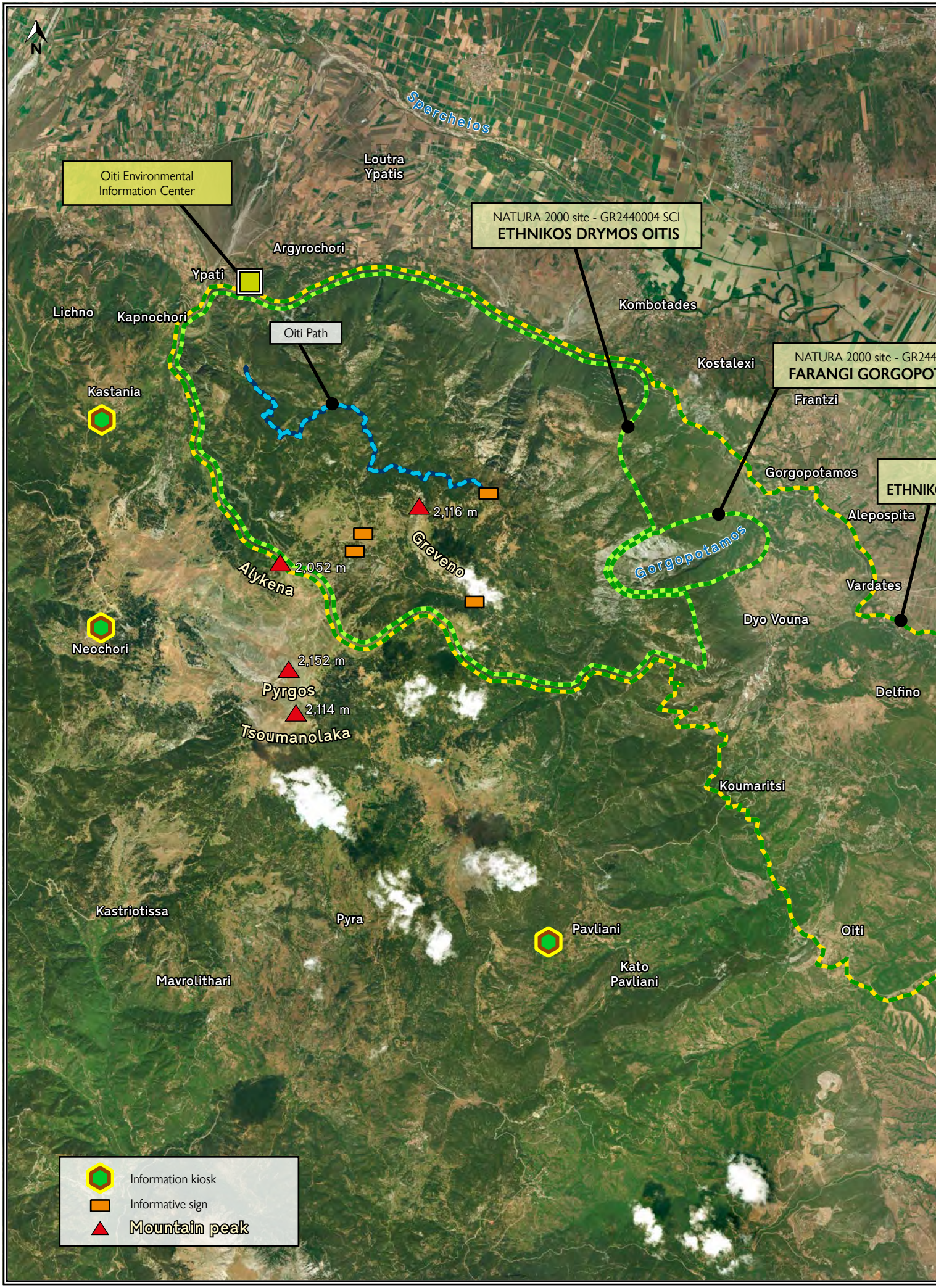
Duration: September 2012 - November 2019

Budget: 1,750,840 euros - E.U. Contribution: 1,309,840 euro (74.81 %)

Aris Vidalis


Ilias Dimitriadis

CONTENTS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Loutra Ypatis
Oiti Environmental Information Center
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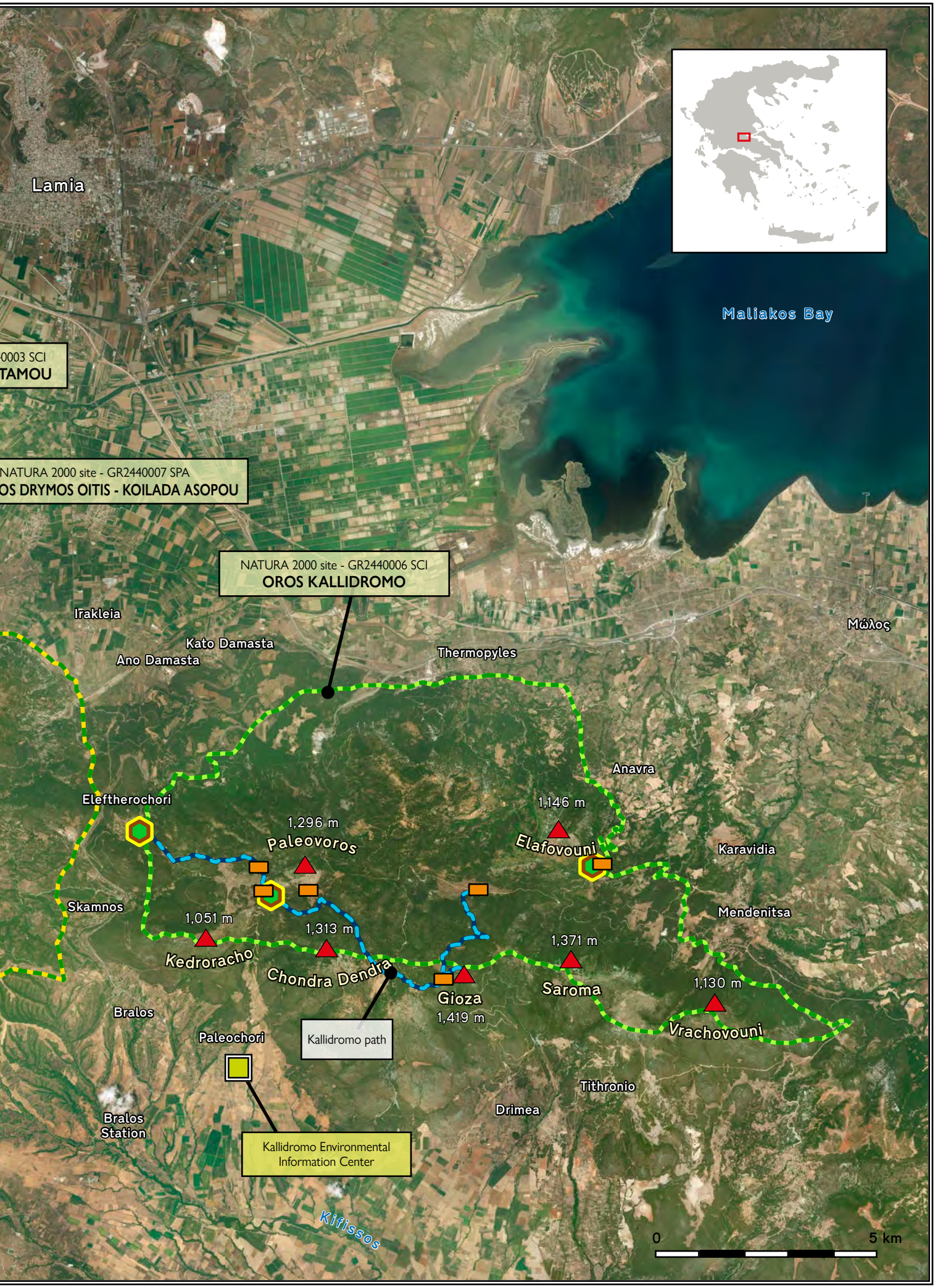
Argyrochori
Ypati
Lichno
Kapnochori
Kombotades
Oiti Path
Kostalexi
NATURA 2000 site - GR244
FARANGI GORGOPOT
Kastania
Frantzi
Gorgopotamos
ETHNIK
Alepospita
2,116 m
Greveno
2,052 m
Alykena
Gorgopotamos
Vardates
Dyo Vouna
Neochori
2,152 m
Pyrgos
2,114 m
Tsoumanolaka
Delfino
Koumaritsi
Kastriotissa
Pyra
Pavliani
Oiti
Kato Pavliani
Mavrolithari
Information kiosk
Informative sign
Mountain peak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OROS KALLIDROMO
Irakleia
Kato Damasta
Ano Damasta
Thermopyles
Μώλος
Anavra
Eleftherochori
1,146 m
1,296 m
Paleovoros
Elafovouni
Karavidia
Skamnos
1,051 m
1,313 m
Mendenitsa
1,371 m
Kedroracho
Chondra Dendra
Gioza
1,419 m
Saroma
1,130 m
Vrachovouni
Bralos
Paleochori
Kallidromo path
Tithronio
Drimea
Bralos Station
Kallidromo Environmental Information Center
Kifissos
0
5 km

*Veronica oetaea**

A. BRIEF DESCRIPTION

*Veronica oetaea** is an annual, dwarf (1–5 cm) plant species with minuscule seeds (mass < 23 μg) restricted to the temporary ponds of Mt. Oiti. It occurs in three small high altitude ponds, namely Livadies, Greveno and Alykaina. It is an ephemerous, amphibious species specialised to temporary ponds and it requires the alternation of a wet and a dry ecophase in order to complete its life cycle. It is characterised by extreme population size fluctuations (>100 fold), which may be attributed to abiotic exogenous factors (i.e. meteorological conditions) and/or to endogenous factors. This is a threat for the species, since in case of consecutive adverse years population size may diminish below the minimum necessary for survival. In addition, global climate change is a plausible threat for this high altitude species since its habitat is absolutely dependent on precipitation while increasing temperatures may reduce its habitat.

*Veronica oetaea** is a priority plant species of Annex II Directive 92/43/EEC and it is also protected by the Bern Convention. It is a threatened plant, characterised as Endangered (EN) according to the IUCN criteria B1ac+B2ac.

B. PROJECT ACTIONS

A4. Study of the population dynamics (Implementing body: UoA).
C2. Enhancement of the population (Implementing body: UoA).
C7. Ex situ conservation and propagation of keystone species of the target habitats (Implementing body: UoA).
D1. Monitoring the impact of management on temporary ponds (Implementing body: UoA).

C. IMPLEMENTATION

Restoration specifications were prepared after 2 years (2013, 2014) of population size, spatial distribution and soil seedbank monitoring in the ponds of Livadies, Greveno and Alykaina. In these 2 years, total population size was large, 100,000 – 1,000,000 individuals in total with a density of 10–50,000 plants / 0.25 m^2, so population enhancement was deemed unnecessary in the extant populations. Population monitoring continued until 2019 due to the large population size fluctuations, so as to assess this phenomenom and its relations to meteorological conditions.

Ex situ conservation of the species included seed collection at the pond of Livadies, seed germination experiments in order to determine optimal germination conditions and storage of seeds to the seedbank of UoA.

In situ conservation of the species included pilot conservation introduction at the pond of Louka. It is the only pond with similar geomorphological and hydrogeological properties and similar plant communities with the extant habitat of the species but at a lower altitude. Seedings of 30,000 seeds were applied in spring and autumn for 3 consecutive years (2016–2018).

D. RESULTS

In 2013, 2014 and in 2015 the population size was fairly large. However, in 2016–2019, total population size dropped to to 3,000–50,000 individuals. This pattern was similar in all ponds. Especially in Alykaina there were only 31 individuals in 2019. The reduction may be related to re-flooding of the ponds after the onset of the dry period and fruiting of the plant or even to shelf-regulation of the population size.

The soil seedbank study results showed that the number of seeds in the soil is generally in accordance with population sizes estimated the following year. It is possible that the plant does not form a permanent soil seedbank.

Population introduction in Louka was partially successful. In 2017, there were several plants growing in the pond. However, in 2018 and 2019 no plants were found. This may be related either or to the total population size drop of the plant in these years or with the expansion of the mat forming *Mentha pulegium*.


Pinelopi Delipetrou


George Karetsos

E. CONSERVATION SPECIFICATIONS

Long term monitoring of the population is needed for an accurate assessment of the conservation status of the population size of the species and for understanding the causes of fluctuations.

Ex situ conservation should continue with seed collections in years of large population sizes for the replenishment of the seedbank and the ensurance of available plant material for population enhancement and introduction.

In situ conservation at Louka should be repeated with larger numbers of seeds, probably preceded by *Mentha pulegium* thinning.


Pinelopi Delipetrou


Aris Vidalis


Pinelopi Delipetrou

Mediterranean Temporary Ponds (3170*)

A. BRIEF DESCRIPTION

Mediterranean temporary ponds are shallow and usually small (< 10 ha) water bodies with annual inundated and dry phases. They have a wide but sporadic distribution and their conservation status at European level is unfavourable. The main ecological characteristic of the habitat is that the autumn-winter wet (aquatic) ecophase is followed by a spring-summer dry (terrestrial) ecophase. The typical plants and animals (mainly invertebrates) are highly specialised "amphibious" species adapted to this alternation of ecophases, living a life between inundation and drought. The plants are usually dwarf (1–2 cm), appear at the start of the dry period and complete their life cycle within 15–30 days. In the high altitude, rain-fed mountain ponds of the project sites, the plants appear after the snow melts in late spring or in summer. All plant communities present high variation of spatial distribution and plant abundance due mostly to random meteorological changes.

On **Mt. Oiti** there are four ponds on flysch: **Livadies** (0.06 ha, 1,810 m), **Greveno** (0.02 ha, 1,890 m), **Alykaina** (0.01 ha, 1,920 m) and **Louka** (0.03 ha, 1,150 m). The alternation of ecophases is quite regular, the wet phase is shorter, pond depth is smaller, and the dry phase starts in late May or early June. The conditions are oligotrophic. The typical species are dwarf annuals: *Juncus minutulus*, *Limosella aquatica, Lotus angustissimus, Lythrum thymifolia, Lythrum portula, Myosurus minimus, Ranunculus lateriflorus* and *Veronica oetaea*.

On **Mt. Kallidromo** there are three ponds on limestone: **Nevropoli** (2.65 ha, 980 m), **Mourouzos** (0.01 ha, 1,071 m) and **Mouriza** (0.06 ha, 1,070 m). The alternation of ecophases is quite irregular, the wet phase is longer, pond depth is larger, and the dry phase starts in late summer. The conditions are mesotrophic to eutrophic. The typical species are Verbena supina, *Heliotropium supinum, Mentha pulegium, Crypsis schoenoides, Juncus articulatus* and *Cyperus fuscus*.

The ponds of Livadies, Greveno and Alykaina are at a good conservation status. Grazing has a low to medium intensity and impact by trampling is rare. The ponds of Louka, Nevropoli, Mourouzos and Mouriza are at medium to bad conservation status. Grazing and trampling by cars and animals have high intensity and impact. At the Kallidromo ponds there is invasion by alien plants and thistles and at Louka by nitrophilous native species. None of the ponds is threatened by scrub encroachment. At Nevropoli silting caused by erosion is possible.

B. PROJECT ACTIONS

A2. Geo-environmental, hydrogeological and geochemical study of the temporary ponds (Implementing body: UoA).
A3. Determination of vegetation structure and of flora and fauna composition and phenology in the temporary ponds (Implementing body: UoA).
C4. Conservation of temporary ponds (Implementing bodies: DEMETER, UoA).
C7. *Ex situ* conservation and propagation of keystone species of the target habitats.
D1. Monitoring the impact of management on temporary ponds (Implementing body: UoA).

C. IMPLEMENTATION

Restoration specifications were prepared after 2 years of pond monitoring. Fencing preventing the entrance of vehicles and information signs were established at all ponds. Fencing preventing the entrance of animals was established at part of the ponds of Nevropoli, Louka, Alykaina and Mourouzos. At Nevropoli, small scale erosion prevention works were undertaken.

Plant community restoration, including planting of typical species and removal of problematic species, was implemented at the ponds of Louka, Nevropoli, Mourouzos and Mouriza. The plant material (seeds) for the restoration was collected at the project sites, optimal germination conditions were determined, and the seeds were stored at the UoA seedbank. Also, seedlings of the species *Lythrum thymifolia* were grown in agar for planting in pots. All removals of problematic species were made by


Nikos Petrou

hand so as not to disturb the pond communities, and plantings were applied after the removal. At the pond of Louka the nitrophilous plant *Convoluvulus arvensis* was removed and the typical species *Lythrum thymifolia*, *Myosurus minimus* and *Veronica oetaea* were seeded in late spring and autumn for three consecutive years. Also, biodegradable pots with *Lythrum thymifolia* plantlets were planted. At the ponds of Mourouzos and Mouriza *Myosurus minimus* was seeded in summer and autumn and *Heliotropium supinum* was planted in autumn for three consecutive years. The alien species *Xanthium spinosum* (Spiny Cocklebur) was removed for two consecutive years. At the pond of Nevropolis *Myosurus minimus* was seeded in summer and autumn and *Heliotropium supinum* was seeded in autumn for two consecutive years. The alien species *Xanthium spinosum* and *Echinochloa crus-galli* (Barnyard Grass), the


Nikos Petrou


Ilias Dimitriadis

thistle *Cirsium vulgare* (Bull Thistle) and the nitrophilous *Cynodon dactylon* (Bermuda Grass) were removed for two consecutive years. *Mentha pulegium* was planted by transplants at the emptied spaces.

D. RESULTS

Fencing for vehicles was effective, since trampling at the ponds was prevented. Fencing for animals was not applied long enough to show clear results for the comparison between grazed and ungrazed pond parts. Initial results from Louka and Mourouzos show an increase of grassland species at the periphery of the ponds.

The removal of *Convolvulus arvensis* from Louka was effective since the plant was diminished. The removal of *Cynodon dactylon* from Nevropoli was ineffective possibly because hoeing was not deep enough since the plant intermingles with the typical species. This plant reproduces by runners and rhizomes and is very difficult to extirpate without chemicals. The removal of *Cirsium vulgare* from Nevropoli was effective. The removal of the aliens *Echinochloa crus-galli* and *Xanthium spinosum* from Nevropoli was effective, but the results lasted for only one year after the treatment, since the animals kept transferring diaspores throughout the pond. The removal of *Xanthium spinosum* from Mourouzos seems to have longer lasting results.

Seeding is the best planting method for the very small seeds of the temporary pond typical species. The production of plantlets for pot seeding is inefficient, since it is time and effort consuming but has very poor results. The results of planting are difficult to evaluate due to the high variation of plant abundance due to meteorological conditions. Notably, the plantings were applied in 2016–2018, the years where a high reduction in the abundance of typical pond annuals was observed both on Oiti and at Nevropolis. Moreover, seed collection of *Heliotropium supinum* and *Verbena supina* yielded very small seed lots due to the low abundance of the plants and the non synchronised maturation of the fruits, so there were very few seeds available for planting at the ponds of Kallidromo. In Louka, treatments were followed by an extreme increase of the abundance of *Mentha pulegium* not connected with grazing, which is under study. In conclusion, in temporary ponds the success of plant restoration treatments depends heavily on the annual meteorological conditions and is difficult to evaluate due to the high inteannual variations.


Nikos Petrou

E. CONSERVATION SPECIFICATIONS

The fences should be maintained at all ponds.

For the restoration of plant communities, long term restoration implementation and monitoring are needed.

Removal of the the alien species *Xanthium spinosum* and *Echinochloa crus-galli* at Nevropoli and Mourouzos should be repeated at an annual or biennial basis for a period of 6 years and then the scheme should be reviewed based on the results. Thinning of *Mentha pulegium* should be probably applied at Louka.

Seed collections of the species *Lythrum thymifolia, Ranunculus lateriflorus, Myosurus minimus, Veronica oetaea, Heliotropium supinum*, and *Verbena supina* should take place every 3–6 years, in years with high population abundance, in order to replenish the seed bank and ensure that there is adequate plant material for restoration. Seedings should be implemented annually


Ilias Dimitriadis


Nikos Petrou

Grasslands on Calcareus Substrates (6210*, 62A0)

A. BRIEF DESCRIPTION

Species-rich semi-dry calcareous grasslands are present throughout Europe including Greece. In Kallidromo, they are found in Greek Fir (*Abies cephalonica*) forest openings, almost to the top of the mountain (1,400 m). Main species include: *Festuca valesiaca, Hordeum bulbosum, Agrostis gigantea, Plantago lanceolata, Lotus corniculatus, Potentilla reptans* and *Eryngium campestre*. They have developed with the presence of man and his activities, mainly livestock husbandry and firewood collection. These traditional activities have been altered or ceased over the last few decades, resulting in shrinkage of the forest openings due to shrub and tree invasion leading to forest expansion. Current area of forest openings has been reduced by more than half since 1945.

B. PROJECT ACTIONS

A5. Determination of vegetation composition and structure (Implementing body: UoA)
C3. Grazing management and woody vegetation clearing for restoration (Implementing body: DEMETER)
D2. Monitoring the impact of management (Implementing body: DEMETER)

C. IMPLEMENTATION

Shrubs such as *Rosa canina, Juniperus oxycedrus* and *Crataegus* spp. were manually clear-cut and the branches were piled up and deposited in neighboring streams while woody and herbaceous weeds such as *Ononis spinosa, Prunus spinosa,* thistles and Bracken Fern were rotary slashed. The impact of treatments on vegetation was evaluated by measuring plant cover and species composition on line transects at the end of the grazing period. In addition, biomass was measured on paired plots (grazed and protected from grazing with exclosures) to evaluate grazing impact.

D. RESULTS

Clear cutting was the most effective treatment in controlling the shrubs that invaded the forest openings thus significantly increasing the habitat area. Rotary slashing was also effective but required implementation every year, even twice a year. Grazing animals were almost exclusively cattle, which overgrazed forest openings, especially those with temporary ponds, due to their large numbers. They were also a few goats but sheep were completely absent, although both these species constituted the dominant domestic animals of the mountain in the past when forest openings were developed, indicating an important change in grazing management of the habitat.

E. CONSERVATION SPECIFICATIONS

It is suggested that the number of cattle currently grazing on Kallidromo is reduced at least by half along with reduction of the their grazing period in the summer, so that a moderate grazing of the habitat is achieved. In addition, effort should be made to bring back sheep in the mountain by substituting equivalent animal units of cattle. Shrubs in forest openings should be regularly cut to meet firewood needs of the local people, while weeds should be rotary slashed annually. All these measures should become part of a grazing management plan to be prepared for the habitat ,in which other uses of the forest openings, such as beekeeping and mountain tourism, are also considered.

Overgrazed forest opening that favoured the establishment of the weed *Ononis spinosa*

Forest openings of Kallidromo where the habitat develops are invaded by shrubs and trees.

Measuring biomass in grazing exclosures

Rotary slashing of woody weeds

Clearcutting of shrubs

Clearcut area (foreground)

The habitat is threatened by aggressive grasses and the invasion of dwarf juniper assisting the expansion of the fir forest.

Grasslands on Siliceous Substrates (6230*)

A. BRIEF DESCRIPTION

Species-rich *Nardus* grasslands grown on siliceous substrates are very common in mountain areas all over Europe including Greece. On Mt. Oiti, they are found in relatively large Greek Fir (*Abies cephalonica*) forest openings of high altitude, especially in the pseudo-alpine zone of the mountain. Main species include *Nardus stricta, Festuca alpina* ssp. *briquetii*, *Centaurea nervosa*, *Gallium verum*, *Astragalus hamosus, Plantago holostemum* and *Hieracium hopeanum*. Although the habitat present on the peaks of the mountain may be considered as climax vegetation, its current extent is attributed to past human activities associated with sheep pastoralism, specifically with transhumance of Sarakatsani ethnic group. Nowadays, this extent is threatened by the expansion of the fir forest assisted by the invasion of Dwarf Juniper (*Juniperus communis* spp. *nana*) shrubs in the forest openings as well as by the prohibition of livestock grazing since 1966 when Oiti was declared as a national park.

B. PROJECT ACTIONS

A5. Determination of vegetation composition and structure (Implementing body: UoA)
C3. Grazing management and woody vegetation clearing for restoration (Implementing body: DEMETER)
D2. Monitoring the impact of management (Implementing body: DEMETER)

C. IMPLEMENTATION

Prescribed burning of Dwarf Juniper shrubs was applied as well as mechanical cutting of grass overgrowth, both at the end of the summer. Both treatments imitated traditional activities practiced by the Saracatsani farmers who used to set fires at the end of the summer, just before moving to the winter pastures in lowlands, to control Dwarf Juniper and aggressive grasses. The impact of the treatment on vegetation was evaluated by measuring plant cover and species composition on line transects at the end of the grazing period. In addition, biomass was measured on paired plots (grazed and protected from grazing with exclosures) to evaluate grazing impact.

D. RESULTS

Prescribed burning was the most effective treatment in controlling Dwarf Juniper and expanding the habitat in forest openings. Cutting of grass overgrowth was less effective but controlled the

aggressive grasses in favour of prostrate plant species thus increasing diversity. Despite prohibition, sheep and cattle visited forest openings but their grazing impact was low suggesting undergrazing. Sheep numbers were far smaller compared to those before 1966 while cattle were more, indicating an important change in grazing management of the habitat.

E. CONSERVATION SPECIFICATIONS

It is suggested that extensive sheep husbandry should be reinstituted on Mt. Oiti with at least doubling the current sheep numbers raised in the mountain so that a moderate grazing of the habitat is achieved. This means that the law establishing the National Park of Oiti should be amended to allow livestock grazing since it is important for the habitat conservation. In addition, prescribed burning should be applied to control Dwarf Juniper as well as occasionally aggressive grass cutting in favour of the habitat characteristic species.

Undergrazing by livestock, especially sheep, threatens the habitat to be overgrown by aggressive grasses

Prescribed burning of Dwarf Juniper

Cutting grass overgrowth

Exclosures where biomass was measured

Prescribed burned Dwarf Juniper three years after burning

Cutting favoured prostrate species
and increased diversity (foreground).

The status of the *Juniperus foetidissima* habitat type (9560*)

A. BRIEF DESCRIPTION

Occurrences of the priority habitat 9560* on Mt Oiti are generally limited in size but distributed over a large area, indicating a much wider extent of the species in the past. At the time of project proposal only two sites with populations of *J. foetidissima* were known, at Fakitsa and Trapeza. During the implementation of the project we confirmed its presence in 10 more sites.

J. foetidissima is found within the Mountain-Mediterranean vegetation zone, usually in scattered and degraded stands mixed with Greek Fir (*Abies cephallonica*), at the forest boundaries on slopes with south exposition. It appears sporadically also on rocky limestone formations of the highest peaks of Pyrgos and Greveno, up to 2,000 m.

The stands of *J. foetidissima* usually comprise a relatively small and compact core, while their periphery is mixed and dominated by Greek Fir. Since the area was declared a National Park, in 1963, abandonment of systematic logging of firs within the protected area and the prohibition of grazing have led to expansion of fir forest, which, for decades, has been intruding gradually within the *Juniperus* stands. Like other Juniperus species, *J. foetidissima* is considered a pioneer species for fir forests. The plant communities of Juniperus sp. can be characterized as final only on extreme terrestrial environments, where the Greek Fir cannot survive. It is considered a valuable species for forestry, especially for its aromatic and rot resistance wood, which is used for the construction of posts and agricultural tools.

Most stands are formed exclusively on limestone with minimal soil or, at best, on a rendzina-type of soil with increased presence of surface rocks. Impressive and very old individuals, reaching 15 m in height are found locally on deep loam soils. Individual trees or larger stands of this species were found at the northern and southern upper slopes of the Gorgopotamos gorge, on limestone and on rendzina-type soil.

The status of the *J. foetidissima* stands is significantly different from our initial estimations prior to the beginning of the ForOpenForests project. In general, we can say that all populations are not in a good conservation status due to inadequate regeneration, but also due to the significant pressures exerted by the fir forest expansion and the illegal logging of Juniper trees for their valuable wood.

In addition, we must emphasize the durability of the species to low temperatures and drought conditions at the sites where we found it, possible indicating an important adaptability to climate changes.

B. PROJECT ACTIONS

A.7: Study of the *Juniperus foetidissima* population and forests (9560*)
C.5: Restoration of *Juniperus foetidissima* forests (9560*)
D.3: Monitoring of the restoration of *Juniperus foetidissima* forests (9560*)

C. IMPLEMENTATION

The measures that were implemented to achieve the restoration and conservation goals for the habitat are as follows:

- Interventions for restricting the extension of fir forests, specifically causing necrosis of large adult Greek Fir trees and cutting smaller individuals to provide sufficient area for the suppressed *J. foetidissima* trees to grow, in order to increase population regeneration.
- Installation of informational signboards in order to prevent illegal logging of *J. foetidissima* trees by locals. The ignorance of the locals regarding the importance of protecting the species has been ascertained as a main threat.
- Enrichment of sites where populations are very small compared to the past, such as Trapeza at the base of Greveno peak at an altitude of 2,000 meters. The young plants were cultured in the plant nursery of the Institute of Mediterranean Forest Ecosystems with vegetative propagation. Specifically, Cypress plants (rootstocks) were grafted with *Juniperus foetidissima* grafts collected from Mt Oiti.

D. RESULTS

In order to monitor the effectiveness of the above measures, sampling plots were installed.

The assessment of the conservation actions' effectiveness is ongoing and will continue after the end of the project. This is necessary because the responses of forest species to the interventions will only be visible in the long-term.

By the end of the project, monitoring showed that the methodology used had positive results and there was a clear recovery of the selected *J. foetidissima* trees, while the trees which continued to grow under the pressure of Fir trees (controls) lagged well behind them.

In order to maintain, and even improve regeneration, monitoring of the stands should continue, in order to implement additional necrosis and cutting of Fir trees in a small scale, every 5 or 10 years if necessary.

Such interventions must be included in the Management Plans of the Forestry Service or the Management Body of the Oiti National Park. They have been included in the legal texts that have been prepared in the context of Action C.10, but they must also be incorporated into the institutional operation framework of the protected area.

E. CONSERVATION SPECIFICATIONS

It is essential to continue monitoring of the measures for the restriction of Greek Fir expansion on the selected experimental plots after the end of the project. The monitoring will provide safer conclusions until the completion of the institutional framework for the permitted interventions.

Finally, we propose that the management authority of the Oiti National Park should establish a small plant nursery for the production of *J. foetidissima* seedlings in collaboration with the Forestry Service, also based on the long-term experience of the Forestry Service of Cyprus in this field. This effort should be intensified, despite the need of collecting large quantities of seeds, under the guidance of the Institute of Mediterranean Forest Ecosystems.


George Mandakas


Aris Vidalis

The Brown Bear (*Ursus arctos**) and the significance of its presence on Mt. Oiti

A. BRIEF DESCRIPTION

The Brown Bear (*Ursus arctos**) is the largest terrestrial mammal living in Europe. Under normal circumstances it can live up to 25 years. It lives mainly in mountainous-forest areas where it can secure food sources and winter sleep. Often, the Brown Bear has to co-exist with humans as its territory can be close to the borders of mountain villages or even include inhabited areas and areas of farming. The Brown Bear is the species with the widest distribution globally. At the area of Mt. Oiti, its presence is only seasonal. Nevertheless, its presence is of great significance for the area as it is added to the list of important species of wildlife. Mt. Oiti is now considered the southernmost distribution area of the Brown Bear's population in the Balkans and Europe (population of Denarian Alpes – Pindos). For these reasons, the harmonious co-existence of bears and humans is crucial, and every conflict or problem created by its presence should be be dealt with efficiently and effectively.

B. PROJECT ACTIONS

A.10: Study for the priority mammal species *Ursus arctos** for the determination of management specifications (Implementing body: ARCTUROS).

C.9: Priority conservation actions for Brown Bear (Implementing body: ARCTUROS).

- Distribution of Hellenic Livestock Guarding Dogs
- Distribution of electric fences
- Increase of food availability by enrichment of habitats

D.5: Monitoring the impact of management on Brown Bear population (Implementing body: ARCTUROS).

C. IMPLEMENTATION

The study of the population of Brown Bears in the area has shown that the presence of the species is only occasional and seasonal.

During the study the following actions were performed:

- Mapping and study of the natural environment.
- Determination and recording of the local food sources of the species.

- Recording of damages to producers (farmers, shepherds, bee keepers).

The following actions were implemented for the conservation of brown bears as a priority species:

- 25 Hellenic Livestock Guarding Dogs were given to shepherds of the area.
- 30 electric fences were given to bee keepers.
- 1,000 fruit trees were planted in the area, for the enrichment of the bears' food sources.

The implementation of the aforementioned actions was followed by:

- Field visits for monitoring and record of all data.
- Contact with all agencies and services.
- Recording of all damages.
- Presentation of project actions in 29 schools in the area.

D. RESULTS

The suggested solutions to prevent damages caused by bears to producers were fully efficient as there were no new records of damages to bee keepers and shepherds. Nevertheless, it is important to note that many of the dogs given in the area were lost due to illegal poisoning. The trees planted in the forest have developed and are expectedto bear fruits in the following years.

E. CONSERVATION SPECIFICATIONS

- The way of livestock farming, especially of cattle in the area may possibly affect the food sources of the bears in the future (fruit trees). This would lead the bears to either abandon the habitat to seek new food sources or look for different sources of food (honey, livestock).
- Measures against illegal poisoning in the area. Illegal poisoning constitutes a serious threat for both domestic animals and wildlife.


Nikos Petrou


ARCTUROS


ARCTUROS


ARCTUROS

ARCTUROS

Ornithofauna on Mt. Oiti

A. BRIEF DESCRIPTION

In total 173 bird species have been recorded in the area of Mt. Oiti, of which 124 are breeding, and 5 are possibly breeding. Of them, 21 are included in Annex I of Directive 79/409/EEC and 32 are migratory. Also, 43 are included in international, European or national threat categories, ten of which are threatened at the national level. Part of the area has been designated as a Specially Protected Area (GR244007 Ethinkos Drymos Oitis - Koilada Asopou). In addition to the SPA, part of the area has also been designated as an Important Bird Area (Mount Iti GR104) based on the following species: Rock Partridge (*Alectoris graeca*), Green Woodpecker (*Picus viridis*), Blue Rock-thrush (*Monticola solitarius*), Sombre Tit (*Parus lugubris*) and Ortolan Bunting (*Emberiza hortulana*). The mountain hosts 8 woodpecker species, a fact that indicates the presence of an extensive variety of forest structures, and is unusual in the central and southern Greek mainland.

The project targets five species of Annex I, Directive 79/409/EEC: **Black Woodpecker** (*Dryocopus martius*), **Grey-headed Woodpecker** (*Picus canus*), **White-backed Woodpecker** (*Dendrocopos leucotos*), **Tengmalm's Owl** (*Aegolius funereus*) and **Rock Partridge**. The three woodpeckers and Tengmalm's Owl occur strictly in forests (mixed or confer) and the Rock Partridge occurs in the supra-forest zone and in forest openings.

The **Rock Partridge** is considered a mountain species, even though it has been recorded in a broad range of altitudes, even close to sea level. It is usually found in open, dry, rocky and steep mountain slopes, and feeds on insects, seeds, roots and a variety of plants depending on the season. Its breeding habitat is similar to its feeding habitat and typically within 3 km of a water source. Even though it is an important game species, it has not been studied enough. Tucker and Heath (1994) estimate its national population at approximately 2,000-5,000 pairs, and Birdlife International (2004) at 7,000-13,000 pairs.

The **Black Woodpecker** is a stocky, crow-sized bird, preferring mature forest that have reached a "climax community" stage and form extensive unbroken stands. In Greece it is a rather scarce but widespread resident. On mounts Oiti and Kallidromo it is restricted to mature conifer forests ay high altitude. It excavates its nest in large trunks, and is consider the forest "constructor", as many cavity-nesting species, including the Tengmalm's Owl, use its old or abandoned nests. It is widely distribute in the Fir forests and is the most common woodpecker at altitudes of 1,100-1,850 m.

The **White-backed Woodpecker** is a common resident of European temperate forests. It feeds mainly on insects, which it digs out of dead and rooting wood with its strong bill; occasionally it feds on fruit and berries, but not during the breeding period. It is dependent on the presence of dead or dying trees, and its distribution in Europe has shrunk considerably after the advent of modern forest management practices that remove dead wood. Its population in the EU is fragmented and declining. In Greece it is a rare resident with a total population estimated at approximately 500-2,000 pairs.

The **Grey-headed Woodpecker** is a medium-sized bird, widely distributed in boreal and temperate forests of Eurasia, from France to Japan. It is fond mostly in open deciduous or mixed forests, but also in urban gardens and parks. Its population in the EU is estimated at approximately 20,000-25,000 pairs. In central and northern Europe it rarely occurs above 600m., but in some areas it may be found as high as 1,000 m. and, locally even 2,000 m. In Greece it is a rare and localised resident with a fragmented population estimated at approximately 50-200 pairs. The population of Mt. Oiti is the southernmost in the country and cut off from northern ones.

The **Tengmalm's Owl** is a small nocturnal raptor. It lives in pine and fir forests with very old trees, up to 1,900 m., and is mostly found along the edges of forest openings where it hunts its prey. It is directly dependent on the presence of prey (small mammals) and appropriate nesting sites. It is widely distributed over northern Europe, but further south it is a localised resident. In Greece

it is rare, recorded only in 7 locations; the Greek birds are present at the southernmost limit of the species' current distribution, and are considered as a "rear end population" and vulnerable to abiotic changes, especially climates change. There are only three records of Tengmalm's Owl from Mt. Oiti.

B. PROJECT ACTIONS

Action A.10 (Implementing body: HSPN)
This Action was implemented between 2013-2014 and included the study of the five target species. In addition to population size assessment, the main result was that the study area hosts a large number of trees of suitable age and size to provide plentiful nesting sites for all forest species, because logging has been prohibited in most parts. Following this, the project team decided to install fewer artificial nests (50 rather than 100 as originally proposed), mainly for the Tengmalm's Owl. A few nest boxes were placed experimentally in stands with young trees in the peripheral zone of the National Park, for Grey-headed and White-backed woodpeckers. Several incidences of poaching were recorded during the field visits, even in the core area of the National Park; poaching seems to be the most important threat for the Rock Partridge.

Action C.8 (Implementing body: HSPN)
This action aimed at:

- Maintaining natural nesting sites through guidelines for forest management, and provide additional artificial one through the placement of nest boxes for Tengmalm's Owl and, experimentally, for the two woodpecker species. According to the recommendations of Action A.10, 50 nest boxes were placed: 30 in the SPA «GR244007 Ethinkos Drymos Oitis - Koilada Asopou» in 2014, and 20 in young stands (with guidance from the Forestry Service) in 2015.
- Maintaining adequate open hunting sites for the Tengmalm's Owl through the actions limiting fir forest expansion.
- Improving feeding sites for the Rock Partridge, through the removal of hard and spiny shrubs so that more edible leguminous species would grow, thus increasing food sources and availability.

Action D.4
This Action included evaluation of the five species'


Tengmalm's Owl (Nikos Petrou)


Rock Partridge (Nikos Petrou)


Black Woodpecker (Nikos Petrou)

populations after implementation of Action C.8, and the factors affecting them, as well as assessment of the efficacy of the interventions. Monitoring of the nest boxes (2014-2019 for the first 30, and 2014-2019 for the remaining 20) did not detect signs of use. This is attributed to the existence of plentiful natural nesting sites, and the very small population of the Tengmalm's Owl. In two of the intervention sites for the Rock Partridge, monitoring detected bioindicators of presence (droppings, feathers) and on two occasions partridges were also seen.

C. RESULTS

The results of Action A.10 include:

Rock Partridge: a total of 10 records, involving 25 individuals, most of them in the peripheral zone of the NP, a few in the core area, and very few outside the NP, in the area of Pyrgos peak, usually in forest openings, and, to a lesser extent, in rocks and stony meadows, at altitudes of 730-1,950 m. Its population is estimated at 40-60 pairs. During the monitoring visits (Action D.4) Rock Partridges were detected twice in supra-forest meadows, in one of the areas of interventions. The distribution of this species is localised, and seems to be dependent mostly on hunting and poaching pressure, and less so on habitat conditions.

Black Woodpecker: a total of 97 records, involving 116 individuals, most of them in mature fir forest, some along forest edges and very few in middle aged fir forest, openings and pine forest. The species was recorded at altitudes of 920-1,870 m. (mean 1,519 m.). It is common in all mature forests and no factors limiting its presence were identified. Its population in the National Park is estimated at 40-60 pairs; in the broader area of Mt. Oiti it possibly reaches the area's carrying capacity.

White-backed Woodpecker: a total of 27 records, involving 29 individuals, most of them in mature fir forest, but also along forest edges, middle aged fir forest, oak forest and pine forest. The species was recorded at altitudes of 890-1,870 m., but with scattered presence. It is estimated that the NP may host approximately 20-25 pairs; this is probably an underestimation, as this species does not always respond to taped calls.

Grey-headed Woodpecker: a total of 16 records, most of them in the peripheral zone of the NP, one on the southern side outside the SPA, and two in the NP core area. Most sightings occurred in mature fir forest, but also along forest edges, middle aged fir forest and oak forest. The species' usual habitat is a mosaic of fir forest and meadows, usually at middle altitude (range 920-1,760 m.) with a shallow grade. Its population on Mt. Oiti is estimated at 5-10 pairs.

Tengmalm's Owl: there was only one record, on November 6, 2013, when an individual replied to playback call in the area of Alykaina, near the forest limit, at an altitude of 1,870 m. This record occurred approximately one kilometre away from the latest previous record (6/2010), and probably involves the same territory. A single record does not encourage conclusion, but the species' population is estimated at no more than 1-5 pairs.

The use of **nest boxes** had no effect. Forests are mostly in good condition, with a large number of mature and old trees, providing plentiful natural nesting sites for all three woodpeckers and the Tengmalm's Owl.

The presence of bioindicators in the **sites of habitat improvement** for the Rock Partridge indicates that this measure can be beneficial for the species. Because of the scattered distribution, a systematic study of this species is necessary to determine its ranges so that this type of intervention can be effectively applied. Elimination of poaching pressure is an important factor for the conservation of Rock Partridge.

Maintaining the forest openings through the various measures to limit fir expansion as implemented under Actions C.3 and C.5 is expected to benefit in the long term both the Rock Partridge and the Tengmalm's Owl.

D. RECOMMENDATIONS

Use of nest boxes is not recommended because there exist plentiful natural sites for the three woodpecker species and the few Tengmalm's Owls.

- Removal of dying and dead, standing and fallen, trees should be avoided in areas where logging is still carried out, to preserve feeding and nesting sites for the woodpeckers, especially the White-backed Woodpecker.
- Limiting the expansion of the fir forest, especially near the forest limit through the interventions proposed by the project will benefit the Tengmalm's Owl by maintaining hunting areas.
- Removal of hard and spiny shrubs improves feeding areas of the Rock Partridge. It is imperative to control poaching.

Continued monitoring of the five target species of LIFE ForOpenForests is recommended, as follows:

- Monitoring of the population trends and distribution of the Rock Partridge as well as of the existing pressures, including hunting and, primarily, poaching, observed even in the core area of the National Park.
- Monitoring of the population trends and distribution of the Grey-headed Woodpecker and Tengmalm's Owl, both reaching on Mt Oiti the southernmost limit of their distribution, according to recent findings. The single record of a Tengmalm's Owl, and the absence of Grey-headed Woodpecker records during the "Monitoring of species and habitat types" project carried out in 2015, makes continued study of these species imperative.
- Monitoring of the population trends and distribution of the White-backed and Black woodpeckers. We propose that these two species be included in the planned programme of avifauna monitoring on Mt. Oiti, to be undertaken by the Management Body of the National Park. These species have a wide distribution and sizeable populations, so adequate data can be collected with the appropriate methodology, leading to safe conclusions about their population trends and their connection to habitat conditions and human activities.


Grey-headed Woodpecker
(Νίκος Πέτρου)


White-backed Woodpecker
(Νίκος Πέτρου)

Grazing Management (6210*,62A0, 6230*)

A. BRIEF DESCRIPTION

Both habitats 6210* and 6230* are important grazing resources for livestock and they have developed in the Greek Fir (*Abies cephalonica*) forest openings of the mountains Oiti and Kallidromo as a result of pastoral activities over centuries. For their conservation, it was considered necessary to study their current grazing management.

B. PROJECT ACTIONS

A5. Determination of vegetation composition and structure in the mountain grasslands (6210*, 6230*) (Implementing body: UoA)
C3. Grazing management and woody vegetation clearing for the restoration of mountain grasslands (6210*, 6230*) (Implementing body: DEMETER)
D2. Monitoring the impact of management on mountain grasslands (6210*, 6230*) (Implementing body: DEMETER)

C. IMPLEMENTATION

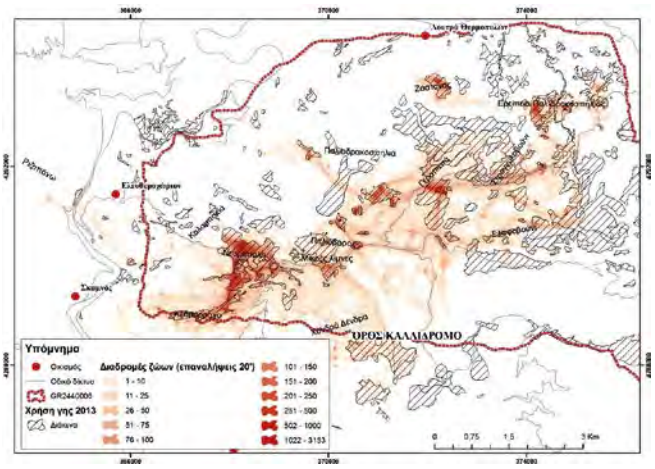
A special questionnaire was prepared and all livestock farmers grazing in the habitats of both mountains were interviewed in their villages, so that information was collected regarding the number and kind of animals they own, the grazing system they apply and the specific area they are using. The latter was subsequently transferred to a map, digitized, measured, and the stocking rate was calculated. Particularly on Mt. Kallidromo, 10 cows were collared with GPS and their day and night grazing activity was recorded from April to November.

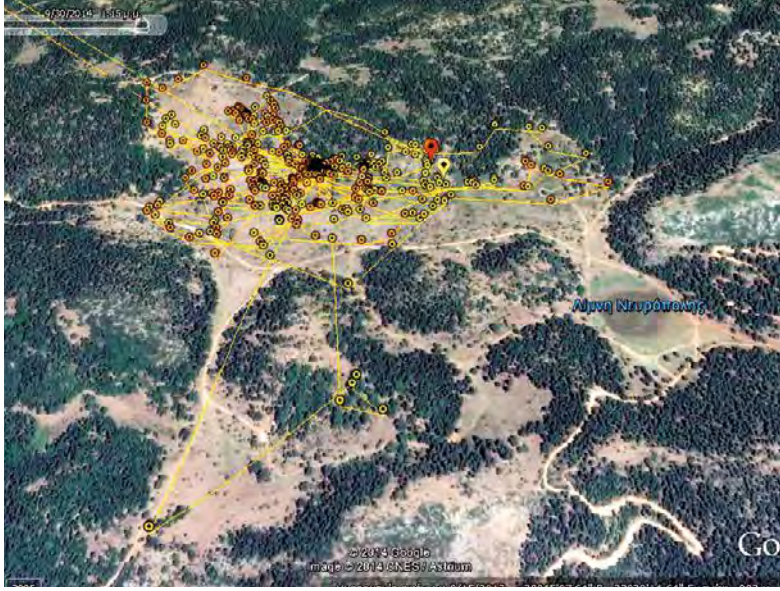
D. RESULTS

On Mt. Oiti, 20 farmers are grazing their animals, including sheep, goats and cattle, in the summer period with a stocking rate 0.8 sheep/ha. On Mt. Kallidromo, 17 farmers are grazing their animals including only goats and cattle, in the summer period with a stocking rate of 0.9 sheep/ha. Although this overall rate indicates proper grazing, forest openings are overgrazed because they are more productive and attract cattle, during both day and night, more than dense forest stands. On the other hand, since openings comprise less than 20% of the forested area and the forage production of dense forest stands is minimal, cattle are forced to travel up to 11 kilometers every day to find grazing thus trampling and disturbing the whole ecosystem.

E. CONSERVATION SPECIFICATIONS

Cattle on Mt. Oiti but especially on Kallidromo have replaced sheep that moved to the lowlands. This change has occurred over the last few decades and its long term impact on the habitats which were developed through the presence of sheep is not yet known. However, there is already a negative impact in Kallidromo where the habitat in the large openings is infested with spiny, woody and herbaceous weeds, including the alien species *Xanthium spinosum* due to overgrazing. Therefore, there is an urgent need to reduce the number of cattle grazing in Kallidromo, particularly around the temporary ponds at Nevropolis, Mourouzos and Mourouza.





LEFT: A map showing cattle distribution in Kallidromo with the highest one in the forest openings
RIGHT: Recorded animal distribution in the forest opening of Nevropolis in Kallidromo

Fencing of Mourouzos pond

A goat shed in Kallidromo

Interviewing a farmer in his shed in Kallidromo

A collared cow (foreground)
grazing in a forest opening in Kallidromo

Cattle in a forest of Oiti

Permanent installations

During the implementation of the project, the following installations were created:

- Two (2) meteorological stations, one in each of the project sites
- Two (2) environmental visitor information centres (at Ypati and Palaiochori)
- Six (6) environmental information kiosks for visitors
- Twenty four (24) informational panels for the project around both sites
- Thirty three (33) notice boards for target species and habitats
- Two (2) water tanks for fire-fighting
- Two (2) fire-fighting observation stations
- Eight (8) parking sites
- Five (5) recreation sites
- Six (6) fences to prevent entrance of vehicles in temporary ponds
- Flood control works around the pond of Nevropoli on Mt. Kallidromo
- One thousand (1,000) fruit trees planted to enrich food sources of the Brown Bear
- Fifty (50) artificial bird nests

Moreover, two paths (one on Oiti and one on Kallidromo) with a total length of 24 km were maintained and improved.


Όρος Καλλίδρομο
Χάρτης


Δάση Μαυρόπε
Λιτοδίαιτα, αλλά θρε
Ζώνες βλάστησης
Πανίδα


ΗΛΕΚΤΡΟΦΟΡΟΣ ΠΕΡΙΦΡΑΞΗ

Public awareness and education

- Project website (www.foropenforests.org)
- Production of leaflets, posters and video
- Promotion of the project through local and national mass media
- Presentations at scientific conferences and publications in scientific journals
- Consultation with stakeholders
- Student visits
- Educational and training seminars for farmers, stock breeders and bee-keepers
- Enviromental education seminars for school teachers
- Training workshops for in situ habitat and species monitoring and restoration
- Layman's report in printed and electronic format


Nikos Petrou