



Furnas Landscape Laboratory

*Project for the Ecological and Landscape Restoration
of Furnas Lake Watershed*



The Azores

- 9 islands
- 1.500 Km from Europe & 2.700 Km from North America
- 500 Km from Flores to Santa Maria
- 250.000 inhabitants (400 on the smallest – 17,12 Km²; 130.000 on the largest – 747 Km²)
- Economy based: public services; dairy farms; fishing; agriculture; some forestry; tourism



Furnas

Active volcano

Dairy farms

Criptomeria japonica, monospecific forest stands

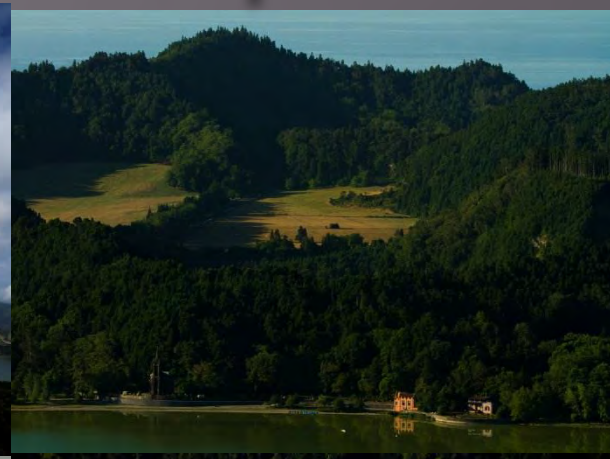
Invasive species

Eutrophicated lake



São Miguel island

Furnas Protected Landscape



The Problem – Eutrophication

RECUPERAÇÃO DA LAGOA DAS FURNAS FURNAS LAKE RESTORATION



A eutrofização da Lagoa das Furnas resultou da entrada excessiva de nutrientes (azoto e fósforo) provenientes dos estrumes e fertilizantes usados nas explorações agrícolas da Bacia Hidrográfica.

The eutrophication of Furnas Lake was a consequence of the excessive intake of nutrients (nitrogen and phosphorus) coming from manure and fertilizers used at the farms within the lake's drainage basin.



Imagens da anterior migração de nutrientes, das pastagens para a Lagoa.
Images from the former nutrient migration, from the pastures to the lake.



Para inverter este processo de degradação foi elaborado o Plano de Ordenamento da Bacia Hidrográfica da Lagoa das Furnas (POBHLF), cujos projectos e acções multisectoriais visam garantir a recuperação desta lagoa.

To reverse this degradation process, the Furnas Lake Watershed Restoration Plan was elaborated, with its diverse projects and actions which seek to contribute and assure Furnas Lake restoration.



Face à degradação da qualidade da água, o Governo dos Açores decidiu adquirir parte dos terrenos agrícolas que constituíam maior risco de escorrência de nutrientes para a lagoa, procedendo-se, posteriormente, à alteração do uso do solo.

Due to increased water degradation, the Government of the Azores decided to acquire some of the most polluting estates in order to effectively stop the nutrient flow, and subsequently proceed to the conversion of land use.



The solutions

European Landscape Convention

Development of laws to manage the landscape and territory:

Furnas Lake Watershed Restoration Plan (2000 – 2005)

Classification – Furnas Protected Landscape (2005 – 2008)

Furnas Landscape Laboratory (2007 – onwards)

Terras do Priolo – European
Charter for Sustainable Tourism

Management Plans

The Solutions: Furnas Lake Watershed Restoration Plan



Figura 11: Planta de Síntese do Plano de Ordenamento da Bacia Hidrográfica da Lagoa das Furnas; Alkins/ Prospectiva (esc.: 1/35.000)

This plan main objective is to restore the water quality.

- Reduce nutrient runoff to the lake;
- Increase biodiversity;
- Safeguard income sustainability;
- Diversify and consolidate the basis of the local economy;
- Promote local values;
- Minimize geotechnical risks.

The Solutions: Furnas Protected Landscape



The *Furnas lake watershed* corresponds to a significant part of *Furnas Protected Landscape*, inserted on São Miguel's Natural Park.

Therefore 3 levels of nature protection policies.

- Preserve an harmonious, natural and cultural interaction through the landscape protection, traditional uses, construction techniques and socio - cultural manifestations;
- Support the development of ways of life and economical activities harmonious with nature, and with the preservation of the local communities tradition;
- Maintain and preserve the landscape diversity, as well as of flora and fauna species, habitats and ecosystems;
- Regulate uses and activities, minimizing menaces to landscape stability;
- Promote touristic and recreational activities according to typologies and appropriate scaling, regarding the local biophysics characteristics;
- Promote scientific and educational activities which contribute to the population well-being, and develop a environmental support by the public;
- Contribute to the local community development through the benefits generated by service providence and natural products sales;

Solutions: Furnas Landscape Laboratory (*Furnas Landlab*)



- Furnas Landscape Laboratory is the homologous of the technological parks, but with a Natural Science vocation, installing full scale plots in the landscape;

How was it born?

- Through the acquisition of public land in 2007;
- *Furnas Landlab* obeys to the watershed measures and protected landscape policies;
- It's a large scale multifunctional landscape;

Objectives:

- Search for ecological, economical and social sustainability;
- Generate practical and scientific knowledge through the watershed plan implementation;
- Research on sustainable alternatives to the existing monocultures;
- Install real scale examples;
- Create a Multifunctional Forest Landscape

Furnas LandLab

From Paper to Action

T E R R E N O S

2007					2008					2009					2010					2011					2012					2013																																																
J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
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Sattel - Prédio 35 (16ha) 22/06/2007					Boca da Grota - prédio 37 (20,8 ha) 14/01/2008					Terras da Cufus - prédio 11 (87,7ha) 13/11/2008					Prédio S/N 1 23 (122ha) 16/02/2009					Pomar - prédio 21 (5,6ha) 29/05/2009					Prédio 31 (1,6ha) 29/11/2010					Margem Sul da Lagoa das Furnas (15,1 ha) 01/2011					Gestão de área dos Cozidos (3ha) 1/06/2012																																											
Boca da Grota - prédio 38 (9,8ha) Galeira "casa calda" - prédio 45 (0,6ha) Terra Cega - prédio 25 (1,58ha) 06/07/2007					Terra Cega - prédio 15 (17,7ha) Grota do Diogo Preto - prédio 39 (41ha) Terra Cega - prédio 10 (23,5ha) 24/10/2007					Prédio S/N 5 (1,4ha) 04/03/2009					Prédio S/N 4 (4,5ha) 28/04/2009					UTV 4x4 (2 lug.) 17/02/2011					Mini Tractor Agrícola					CargoBike 02/2013					4x2 Pick-Up (6+6lug.) 10/05/2013																																											

V E Í C U L O S

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4x4 Pick-Up (5 lug.) 14/06/2007					4x4 Pick-Up (5 lug.) 28/04/2009					UTV 4x4 (2 lug.) 17/02/2011					Mini Tractor Agrícola					CargoBike 02/2013					4x2 Pick-Up (6+6lug.) 10/05/2013																																									

M A Q U I N A S

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E Q U I P A

2007					2008					2009					2010					2011					2012					2013																																				
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- Compras
- Donativos
- Financiamento do projecto
- Trabalhadores Temporários (CTS) / Estagiários

Estagiária Ecoturismo
01 de jan. - 31 de dec. 2009

Arboricultor
maio - dec. 2009

Estagiária Ordenamento Território
1 de fev. - 14 de maio 2009

Voluntário - Arq Paisagista
fev. - maio 2012

Arq Paisagista
jun. 2012 - atual

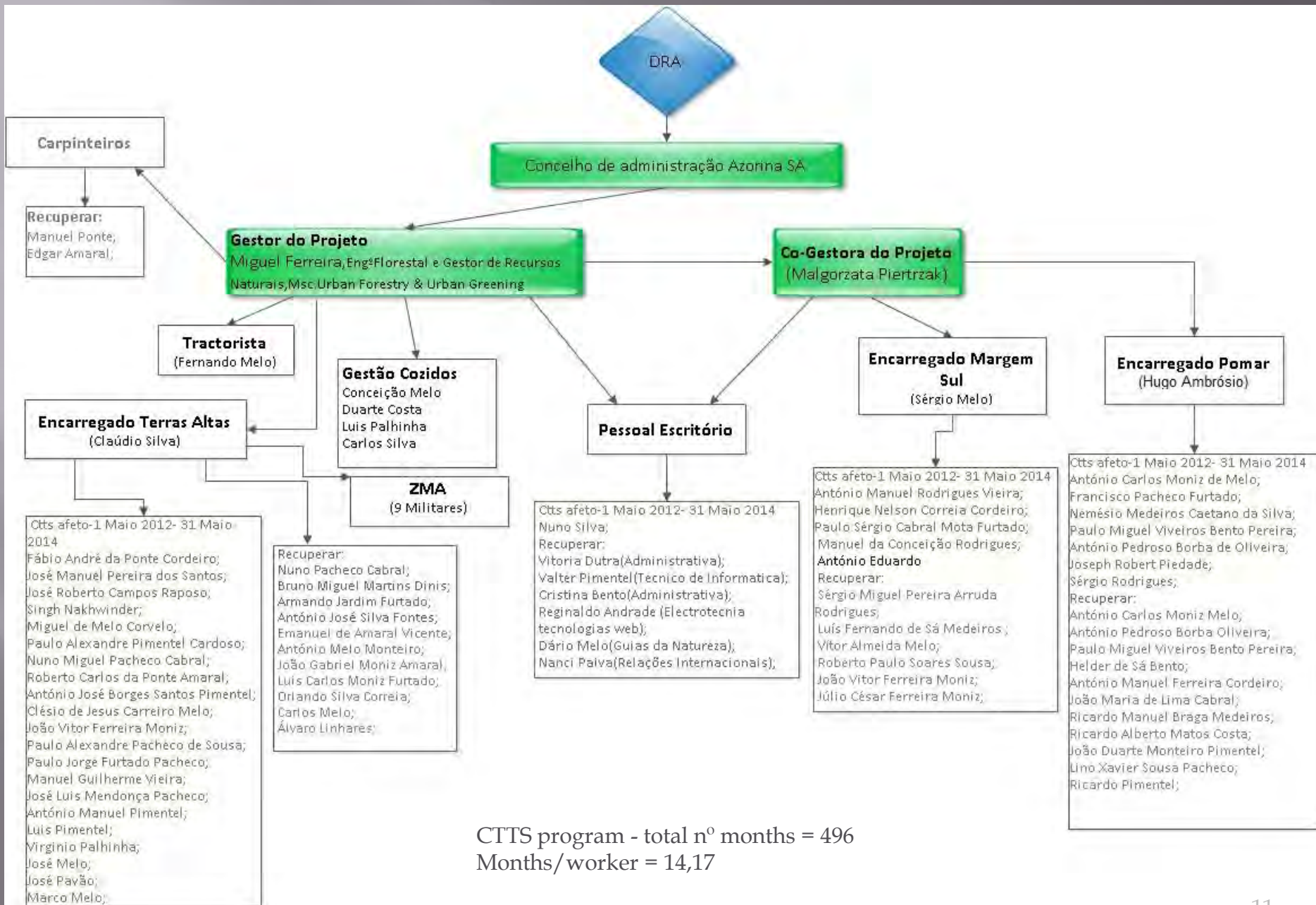
Estagiária Biologia
jul. - ago. 2012 (1)

ago. - set. 2012 (2)

2 Estagiários Ocupações dos tempos Livres
ago. - set. 2012

Estagiária Fotografia
jul. - dec. 2013

Furnas LandLab Staff



Furnas Landlab – paper to action

- ▣ Cleaning the landscape



Removal and cleaning of tons of polluting residues across the landscape (plastics; tires; abandoned vehicles; junk; packages, etc...)

Furnas Landlab – paper to action

▣ Invasive Flora Control



- Eradication of invasive flora across 160 ha of pastureland



Furnas Landlab – paper to action

▣ Siltation prevention

Restoration and plantation of 8 erosion gullies, with an area larger then 2 ha, and suppression of active erosion fronts.



Furnas Landlab – paper to action

- ▣ Siltation prevention – Native flora reintroduction



Furnas Landlab – paper to action

- ▣ Siltation prevention – Natural Engineering



Installation of water energy dissipaters with local wood and reeds

Furnas Landlab – paper to action

- ▣ Siltation prevention – Reduction of the hydrological torrential regime



Building of ponds, by blocking previous pastures draining systems

Furnas Landlab – paper to action

- ▣ Siltation prevention – retention basins



Construction of 10 retention basins along stream beds, from where 20.000m³ of sediments/year are removed, preventing it from reaching the lake;

Furnas Landlab – paper to action

- ▣ Sustainable management of public owned pastures and meadows

Over 8000 silage bales, equivalent to 6000 TON of grass and respective nutrients, exported away from the watershed



Rustic Golf



100 bales/cut



Approx. 400 bales /cut
+ honey + scenic views

Furnas Landlab – paper to action

▣ Diversification of forestry economy

Experimental trials of:
Endemic species;
Provenances;
Silviculture techniques;
Concepts;
Planning.



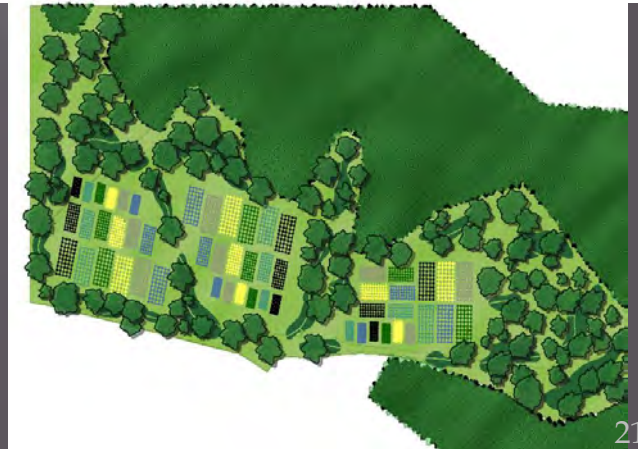
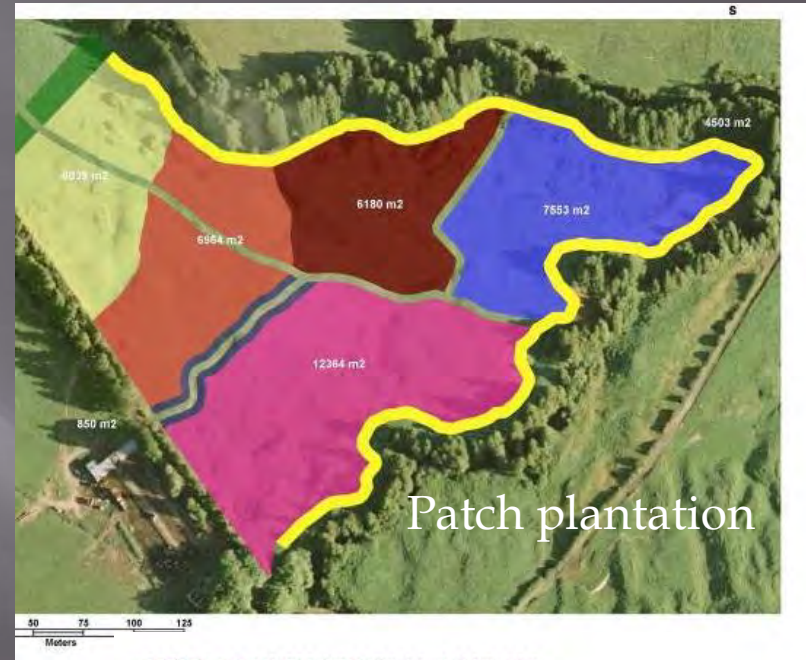
- Plantation of over 130.000 trees and shrubs, over 50 ha of public owned land;
- 34 ha of pastureland planted by estate owners
- Plantation of over 2 Km of vegetation buffers along streams;

Furnas Landlab - paper to action

▣ Multifunctional Forest Landscape



Reinforce - European project



Furnas Landlab – paper to action

- Restoration of Furnas traditional Fruit Orchard



Furnas Landlab – paper to action

▣ New fruit orchards

Apple orchard with 21 traditional varieties



Native blue berry (*Vaccinium cylindraceum*) orchards with 800 identified genetic units



Furnas Landlab – paper to action

- Production of thousands of herbaceous endemic (25.000)



Malfurada- *Hypericum foliosum*

Patalugo-menor – *Leontodon rigens*

Labaca-das-ilhas – *Rumex azoricus*

Trovisco-macho- *Euphorbia stygiana*

Malvavisco- *Pericalis malvifolia*

Angelica lignescens

Lysimachia azorica

Queiró- *Calluna vulgaris*

Feto-do-botão- *Woodwardia radicans*

Azorina vidalii



Furnas Landlab – paper to action

- Pretty natives replace pretty invaders

Plantation of *Viburnum treleasei* after the removal of *Hydrangeas* at Furnas Protected Landscape



Furnas Landlab – paper to action

▣ Biodiversity promotion - Fauna

Endemic bat shelters
(at our sites and all partner head offices)



Migratory birds



Native and
endemic birds

Furnas Landlab – paper to action

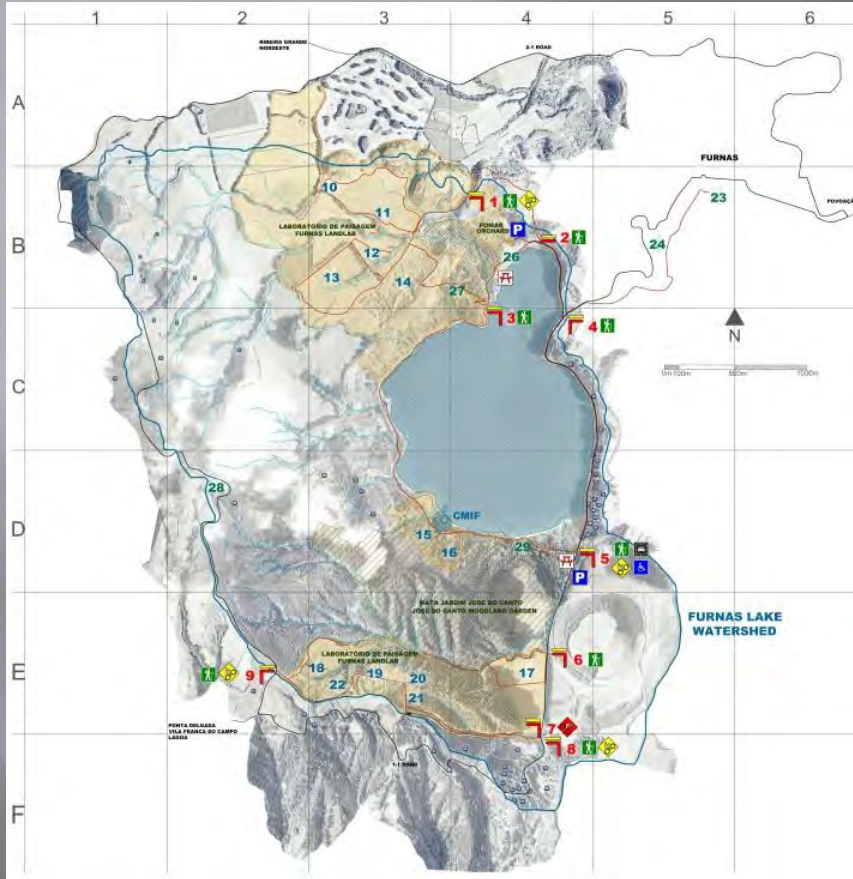
- ▣ Willow collection restores stream bank



Workshop supported by members from the *English Basket Makers' Association*, for local basket makers, schools and curious apprentices

Furnas Landlab – paper to action

Planning of a multiuse trail network



Furnas Landlab – paper to action

Restoration of Furnas lake degraded margins through European cohesion funds: Proconvergência, POVT



Ruin demolition and removal of invasive flora



CMIF's Construction and planting of thousands of endemic plants



6.000 visitors in 2012
17.000 visitors in 2013

New accommodation for visiting partners, researchers, interns, artists and volunteers



Furnas Landlab – paper to action

Restoration of Furnas lake degraded margins through imagination



Furnas Landlab - PARTNERSHIPS

A Social project:

Involving the community in the betterment of the landscape

Local community

Research institutions

Partnerships

Companies & enterprises

Associations & NGO's

Public entities

Furnas Landlab - PARTNERSHIPS

Local community



Local Furnas school – plantation of endemics



Furnas Scouts – Maintenance of a granted area



Furnas Landlab - PARTNERSHIPS

Companies & Enterprises



Regional Airline SATA - SATAForest



Fundação PT - LogoPT



Grupo Bensaúde - GreenPrint



EEG Lda, Grupo EDA -
Study of Pollens



STIHL, A.S. Maia - Furnas
Woodcarving Events



Furnas Golf Course - Driving
Range

Furnas Landlab - PARTNERSHIPS

Research Institutions



Azores Biotechnology Center –
Micropropagation of woody
endemics



Azores University– field classes and projects



Insect Monitoring



European Forest Institute – Climate change
study

Furnas Landlab - PARTNERSHIPS

Parcerias – Associativas



Portuguese Society for Birds (SPEA)



Outdoor Activities enthusiast club (Calag)



Geoparque Azores



Azores Amateur Photographers Association (AFAA)



International Congress and Conference Association (ICCA)



Azores Biking Association



Azores Archery Association (ARATA)

Furnas Landlab - PARTNERSHIPS

Public entities



Azores Military Zone (ZMA)
2009 National Defense and
Environment Award



Employment Office
(24 unemployed workers on social welfare)



Azores handicraft Centre
(CRAA)



Azores water management body
(AHA)



São Miguel's Agricultural Services



Azores Forest Services (DRRF)

The project in numbers during 6 years

- 2 National Awards
- 30 plus partner institutions
- 31 trainees, national and international
- 70 field workers through unemployment programs
- 300 young militaries collaborated on the project
- 5 International and National Presentations in congresses, in 2013 alone

2013 Budget, e.g.

Cost (except wages & visitor centre): 74.000€
Income (except visitor centre & donations): 65.000€
Balance: -9.000€

Donations: 8.000€ machinery & tools + 2nd hand Pick Up truck
New protocol for 19.000€/Year

Thank you to all our partners!

Promoter:



Partners and Sponsors:



Furnas
Scouts

Arqt. Of
Arqt.
PROAP



Ass. de
Proprietários e
moradores da
Lagoa das Furnas



Escola básica
das Furnas



Zona Militar dos Açores

Thank you!



Furnas Landscape Laboratory

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Portugal's National Landscape Award 2012

http://www.coe.int/t/dg4/cultureheritage/heritage/landscape/prix/session2013_EN.asp