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# LANDCARE FOR THE FUTURE

Book of Abstracts

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## Organizers



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## Collaborators



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## Organizers

### Organizing Committee

**Agustín Merino**

Department of Soil Science, Sustainable Forest Management Unit, University of Santiago de Compostela

**Beatriz Cebreiro**

Educational Technology Unit, University of Santiago de Compostela

**José Manuel Rebolo**

Entrepreneurship and Transfer Unit, University of Santiago de Compostela

**Patricia M. Rodríguez-González**

Forest Research Centre, School of Agronomy, University of Lisbon, Portugal

**Beatriz Omil**

Department of Soil Science, Sustainable Forest Management Unit, University of Santiago de Compostela

**Pablo Ríos**

Department of Soil Science, Sustainable Forest Management Unit, University of Santiago de Compostela

### Educators Committee

#### Pedagogy and Didactic Methods

**Maria del Mar Lorenzo**

Department of Theory and History of Education, University of Santiago de Compostela, Spain. Specialist on Service-Learning.

**Lorena Casal**

Department of Pedagogy and Didactic Methods, University of Santiago de Compostela. Specialist on e-learning.

**Beatriz Cebreiro**

Department of Pedagogy and Didactic Methods, University of Santiago de Compostela. Specialist on e-learning.

**María José Malmierca**

Galicia Supercomputing Center (CESGA).

#### Employment and Entrepreneurship

**Gloria Cruz**

Employment office, University of Santiago de Compostela. Specialist on employment.

**José Manuel Rebolo**

Entrepreneurship and Transfer Unit, University of Santiago de Compostela. Specialist on entrepreneurship.

**Patricia González Alonso**

Entrepreneurship and Transfer Unit, University of Santiago de Compostela. Specialist on entrepreneurship.

**Land Restoration: Soil Contamination****Xosé L. Otero**

Department of Soil Science, Sustainable Forest Management Unit, University of Santiago de Compostela, Spain. Specialist on Soil contamination.

**María L. Fernández-Marcos**

Department of Soil Science, Sustainable Forest Management Unit, University of Santiago de Compostela, Spain. Specialist on soil contamination.

**Felipe Macías**

Department of Soil Science and Agricultural Chemistry, University of Santiago de Compostela, Spain. Specialist on Soil Contamination.

**Graziana Masciandaro**

Institute of Ecosystem Study, Italian National Research Council (CNR), Pisa, Italy. Specialist on reclamation of agricultural soils and soil contamination.

**Felipe Macías García**

Tratamientos Tecnológicos del Noroeste S.L., Touro, Spain. Specialist on Reclamation of mines.

**Giorgio Virgili**

West System SRL, Pisa, Italy. Specialist on reclamation of highly perturbed areas.

**Miriam Muñoz Rojas**

School of Plant Biology, University of Western Australia, Perth, Australia. Specialist on reclamation of mine in arid areas.

**María Teresa Barral Silva**

Department of Soil Science, Sustainable Forest Management Unit, University of Santiago de Compostela.

**Verónica Piñeiro**

RIAIDT, University of Santiago de Compostela.

**Land Restoration: Restoration of Wetlands****Teresa Ferreira**

School of Agriculture, University of Lisbon, Portugal. Specialist on Riparian forests, and Restoration of River Banks.

**Luisa Pinto**

Empresa de Desenvolvimento e Infra-estruturas do Aalqueva – EDIA (Portugal). Specialist on reclamation of riparian forests and river Banks.

**Patricia M. Rodríguez-González**

Forest Research Centre, School of Agronomy, University of Lisbon, Portugal. Specialist on wetland and riparian forest ecology and restoration.

**Ramón Díaz-Varela**

Department of Botany, University of Santiago de Compostela.

---

## Land Restoration: Reclamation after Wildfires

### **Alberto Ledo**

VIII Forest District Xunta de Galicia.

### **Miguel López**

VIII Forest District Xunta de Galicia.

### **Otilia Reyes**

Department of Cellular Biology and Ecology, University of Santiago de Compostela, Spain. Specialist on Reclamation after wildfires.

### **Cristina Fernández**

Lourizán Forest Research Center, Consellería de Medio Rural. Xunta de Galicia, Pontevedra, Spain. Specialist on Reclamation after Wildfire.

### **María T. Fonturbel**

Lourizán Forest Research Center, Consellería de Medio Rural. Xunta de Galicia, Pontevedra, Spain. Specialist on Reclamation after Wildfire.

### **Cristina Santín**

Department of Geography, College of Science, Swansea University, Swansea, UK. Specialist on reclamation of soils after wildfire.

### **Jorge Mataix-Solera**

Spanish society of soil science (President). Specialist on reclamation after wildfire.

### **José Antonio Vega**

Lourizán Forest Research Center, Consellería de Medio Rural. Xunta de Galicia, Pontevedra, Spain. Specialist on Reclamation after Wildfire.

### **Montserrat Díaz Raviña**

President of Biology Section of the Spanish Society of Soil Science (IIAG-CSIC), Santiago de Compostela. Specialist in Microbial Ecology, the use of bioindicators as soil quality changes after different disturbance processes.

## Land Restoration: Reclamation of Coastal Areas

### **Niki Evelpidou**

Faculty of Geology and Geoenvironment, National and Kapodistrian University of Athens, Greece. Specialist on Reclamation of Coastal Degradation.

### **Anastasia Miliou**

Archipelagos Institute of Marine Conservation, Samos, Greece. Director of multiple educational programs based on volunteering.

### **Pablo Ramil**

Department of Botany, University of Santiago.

### **Ana Karkani**

Faculty of Geology and Geoenvironment, National and Kapodistrian University of Athens, Greece. Specialist on Coastal System Degradation and Restoration.

## Land Restoration: Ecological Restoration

### **José M. Rey-Benayas**

International foundation for the Restoration of Ecosystems, Ecology Department, Alcalá University, Alcalá de Henares, Spain. Specialist on Ecological Restoration.

### **Felipe García Oliva**

Institute of Ecosystems and Sustainability Research, Universidad Nacional Autónoma de México, Morelia, Mexico. Specialist on Forest management and global warming.

### **Julio Campo**

Institute of Ecology, Universidad Nacional Autónoma de México, Mexico City, Mexico. Specialist on Forest management and global warming.

### **Jordi Cortina**

Society for Ecological Restoration (European Chair). Specialist on Ecological Restoration.

### **Carolina Martínez**

Association for Terrestrial Ecology (Coordinator of the working group on ecological restoration). Specialist on Ecological Restoration.

### **Pablo Ríos**

Department of Soil Science, Sustainable Forest Management Unit, University of Santiago de Compostela. Student of the LandCare project. Specialist on reclamation of tropical and arid areas.

### **Beatriz Omil**

Department of Soil Science, Sustainable Forest Management Unit, University of Santiago de Compostela. Manager of the LandCare project. Specialist on Forest Management and biomass.

### **Paola Sangalli**

President of the European Federation for Soil Bioengineering, Sangalli Coronel y Asociados S.L, Spain. Specialist on Bioengineering.

### **Eva Hernández Bruguera**

Programa ENDESA EDUCA, Fundación ENDESA.

## Students Delegates

### **Pablo Ríos**

University of Santiago de Compostela, Spain

### **Colleen Fugate**

University of Santiago de Compostela, Spain

### **Eirini Koumoutsea**

Kapodistrian University of Athens, Greece

### **Pietro Bertolotto**

University of Pisa, Italy

### **Madalena Dias Ferreira**

University of Lisbon, Portugal

**Joana Filipa Jorge Marinheiro**

University of Lisbon, Portugal

**Noemi Santiago**

University of Santiago de Compostela, Spain

**Ignatios Bafas**

Kapodistrian University of Athens, Greece

**Patricia Domenech**

University of Santiago de Compostela, Spain

**Marta Matínez Carril**

University of Santiago de Compostela, Spain



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LANDCARE FOR THE FUTURE is the final multiplier event of the LAND DEGRADATION AND REHABILITATION IN MEDITERRANEAN ENVIRONMENTS PROJECT (LANDCARE)- Erasmus +- Strategic Partnership K2032015-1-ES01-KA203-016214 (<http://www.landcare.es>).

The LANDCARE partnership is a cooperation network to provide better quality education, training and youth employment in relation to Ecological Restoration. This is necessary to preserve our environment and also to fulfil the demands of an emerging labour market and create novel job opportunities.

The meeting aims to bring together specialists on environment, education and employment from around the world to share their different approaches and insights.

LANDCARE FOR THE FUTURE will consider examples of Educational and Training paths related to global environmental threats (wildfire, contamination of soils and water, degradation of wetland ecosystems, coastal degradation, and overexploitation of agricultural and forest landscapes). It will also consider the application of innovative technologies and tools in education and good practices to improve employability and entrepreneurship skills.



# 1. Prologue

## 1.1 Landcare Project Prologue

It is hard to believe that three years have already passed since the start of the LandCare Project. Many people gathered at this conference have participated in LandCare training courses or internships in Southern Europe over the past three years. For others, this is their first LandCare experience, and we are thrilled to have you here.

Over the past years, LandCare has been more than an Erasmus + Project – it has been a collaborative experience among enthusiastic and motivated individuals from different nationalities and backgrounds working together to learn, understand, and make a real difference in the world. This included the chance to meet European colleagues, work side by side facing environmental issues (such as rehabilitation of contaminated soil, coastal erosion, agricultural practices, or improving wetland ecosystems, among others) and through an internship abroad to gain practical experience managing real case studies.

As environmentalists, conservationists, scientists, and educators, we know that healthy, uncontaminated land is becoming scarcer over time. We believe that it is possible for society and ourselves to change our relationship with natural resources and the natural world. We often say that LandCare is our project: a way of experiencing the environment, a way of seeing the world, and a way of taking responsibility for the changes that we envision. When we say “our” we mean not just the new generations, but we consider all those who believe in taking care of the planet. These changes start by using the most powerful tool humans have: education.

The LandCare for the Future Conference is the culmination of the multicultural educational and training experiences from the past three years. The aim of this conference is to put in touch students and educators from all around the world who are interested in environmental issues and give them the chance to share their own experiences and learn from others. We are thrilled that there are so many new faces and

we know that we all have a lot to learn from perspectives that come from outside of Europe.

During the conference, participants will get information about new courses on land restoration and conservation. Our hope is that we are all able to share ideas, experiences, and best practices so that LandCare for the Future will not just be a singular event, but the start of years of collaboration among an international community dedicated to improving our environmental practices.

Thank you to all the people who have participated in LandCare these past few years and thank you to all those who have come to this conference. We look forward to getting to know everyone these next few days.

*The Landcare Students*



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## 2. Schedule

### 2.1 MONDAY 16 JULY 2018

8:30-9:30 REGISTRATION	
9:30-10:15 PRESENTATION	
	<p>MAR LORENZO - Vice-Rector University of Santiago de Compostela</p> <p>CARMEN FERNÁNDEZ MORANE - Dean of the education faculty.</p> <p>CECILIA VÁZQUEZ SUÁREZ - Director of the Department of Youth, Social Engagement and Volunteering, Xunta de Galicia; Spain</p> <p>PIETRO BERTOLOTTI - Landcare Student Delegate-Agronomy, University of Pisa, Italy</p> <p>COLLEEN FUGATE - Landcare Student Delegate-Education, University of Santiago de Compostela, Spain.</p>
	<p>Land Degradation and Rehabilitation in Mediterranean Environments-Landcare Project - AGUSTÍN MERINO, Coordinator of the LandCare project, University of Santiago de Compostela, Spain</p> <p>Society of ecological restoration mission in Europe - JORDI CORTINA, Chair of the Society for Ecological Restoration</p>
10:15-11:30 METHODOLOGIES AND TOOLS FOR EDUCATION AND TRAINING ON LANDCARE	
Chair person: Madalena Dias Ferreira, Landcare Student, University of Lisboa	
10:15-10:30	Understanding ecological restoration with hand-drawn videos - JORDI CORTINA, University of Alacant, Spain
10:30-10:45	Methodologies and ICT: New ways of learning in Landcare Project - BEATRIZ CEBREIRO AND CAROL GILLANDERS, University of Santiago de Compostela, Spain

10:45-11:00	Active, self-reflective and active student learning: the portfolio - ANDREA GHONEIM, Danube University Krems, Austria
11:00-11:15	Keys to success and challenges of the Master's Programme on Ecosystem Restoration - JOSÉ M. REY-BENAYAS, University of Alcalá de Henares, Spain
11:15-11:30	DISCUSSION  <b>Presentation of the poster session: Colleen Fugate</b>
<b>11:30-11:45 COFFEE BREAK</b> (not included in the conference fee)	
<b>11:45-12:30 POSTER PRESENTATIONS: THE VISION OF THE STUDENTS</b>	
<b>Chair person :</b> Colleen Fugate, Landcare student, University of Santiago de Compostela	
Poster 1.1	Enhancement of the abandoned chestnut woodlands by quality swine productions - PIETRO BERTOLOTTI, University of Pisa, Italy
Poster 1.2	Terraces degradation and restoration in the Cinque Terre National Park - PIETRO BERTOLOTTI, University of Pisa, Italy
Poster 1.3	Soil indicators to assess the recovery and restoration strategies in <i>Pinus canariensis</i> c.sm. ex dc. ecosystems - IRENE DE LARA DEL REY, University of Pablo Olavide, Spain
Poster 1.4	Rewilding in rural areas and conflictual coexistence with population: the case of feral horses in Aveto regional park (Italy). communication and scientific approach - EVELINA ISOLA, University of Genova, Italy
Poster 1.5	Vermicomposting as a sustainable tool for environmental equilibrium - EVA LÓPEZ, University of Vigo, Spain
Poster 1.6	Sowing and contribution of organic matter, a route of recovery of fire floods - XURXO VÁZQUEZ MONTENEGRO, University of Santiago, Spain
Poster 1.7	Microplastics in water sources of Samos, Greece - JOANA MARINHEIRO JORGE, University of Lisboa, Portugal
Poster 1.8	Degradation of forest ecosystems by fire and alien species in Galicia. germinative behaviour of <i>Daucus carota</i> (native) face to <i>Oenothera glazioviana</i> and <i>Helichrysum foetidum</i> (alien species) - SHEILA RIVEIRO, University of Santiago de Compostela
Poster 1.9	Coastal erosion and land uses in Mediterranean countries, in the context of The Landcare Project - ELINA VASILAKI, National and Kapodistrian University of Athens
Poster 1.10	Application of geophysical methods in the solution of environmental issues - IGNATIOS BAFAS, National and Kapodistrian University of Athens
Poster 1.11	Assessment of the post fire erosion in a planted site - MADALENA DIAS FERREIRA, University of Lisbon, Portugal
Poster 1.12	Landcare project: an involving experience - LORENZO DOMENICHINI, University of Pisa, Italy

<b>12:30-13:30 DEGRADATION AND RESTORATION OF ENVIRONMENTS: THE VISION OF THE STUDENTS</b>	
<b>Chair person:</b> : Pablo Ríos, Landcare Student, University of Santiago de Compostela	
12:30-12:45	The young georgofili blog: sharing ideas for the agriculture of the future - PIETRO BERTOLOTTI, University of Pisa, Italy
12:45-13:00	Landcare project, Pisa 2018 - IGNATIOS BAFAS, National and Kapodistrian University of Athens, Greece
13:00-13:15	Biochar as amendment for trace elements contaminated soils: The Guadiamar case study - PALOMA CAMPOS, Instituto de Recursos Naturales y Agrobiología de Sevilla, Spain
13:15-13:30	Toxicological bioassays to evaluate the effectiveness of a decontamination technique for arsenic contaminated waters - ANTONIO AGUILAR, University of Granada, Spain
13:30-13:45	DISCUSSION
<b>13:30-15:00 LUNCH BREAK</b> (not included in the conference fee)	
<b>15:00-16:00 ENVIRONMENTAL EDUCATION AND AWARENESS</b>	
<b>Chair person:</b> Ignatios Bafas, Landcare Student, University of Athens	
15:00-15:15	Involvement of small farmers in developing new agronomic technologies to prevent soil degradation and to increase food production and income - JORGE ETCHEVERS, Colegio de Postgraduados, Mexico
15:15-15:30	Coming to terms with ecological grief and walking to reconnect - ANNA PIGOTT, Swansea University, , United Kingdom
15:30-15:45	LandCare conversations for Tour Guides - SARA BARRENTO, Swansea University, United Kingdom
15:45-16:00	Learning about coastal areas rehabilitation in the Landcare project - ANNA KARKANI, University of Athens
	DISCUSSION
	<b>Organization of the Campfire session: Pablo Ríos</b>
<b>16:00-17:30 CAMPFIRE SESSION: LANDCARE FOR THE FUTURE</b>	
<b>Chair person:</b> Colleen Fugate, Pietro Bertolotto, Pablo Ríos, Madalena Dias, Patricia Domenech, Ignatios Bafas, Noemí Santiago; Joana Marinheiro Jorge	
16:00-17:00	The attendants will work in groups to discuss the following questions: <ul style="list-style-type: none"> <li>• Land degradation and their causes and consequences are properly perceived by the society?</li> <li>• There is enough restoration effort of degraded lands carried out in your country?</li> <li>• Is the teaching of land restoration properly addressed (university/country/...)?</li> </ul>

17:00-17:30	<ul style="list-style-type: none"> <li>● Are the available teaching material appropriated to address the current environmental problems in Europe. What do you miss</li> <li>● Might Land restoration be an emerging labor market and source on employment?</li> <li>● What should be the role of stakeholders (companies, NGO, research center, universities, association, administration,...)?</li> <li>● Do you think that an international network for education and training might contribute to improve the environment quality and fulfil the demands of an emerging labour market.</li> </ul> <p>GENERAL DISCUSSION</p> <p><b>Presentation of the poster session: Madalena Días</b></p>
<b>17:30-18:30 POSTER SESSION: ENVIRONMENTAL EDUCATION AND AWARENESS</b>	
<b>Chair person: Madalena Días, Landcare Student, University of Lisboa</b>	
Poster 2.1	Landcare trips on the edge of reality - SARA BARRENTO, Center for Sustainable Aquatic Research (CSAR), Swansea, UK
Poster 2.2	Educational activities in the center of conservation and study of nature "Casa das Insúas" - ROSARIO BASANTA, I. E.S. Frei Martín Sarmiento, Pontevedra, Spain
Poster 2.3	The desertification is a global environmental problem, but it requires a local education training - FELIPE GARCÍA-OLIVA, Universidad Nacional Autónoma de México (UNAM), México
Poster 2.4	Landscape restoration for leisure parque do Lago: mount Gaiás, city of culture. Santiago 2015 - MERCEDES MÁQUEZ, Research Group Escola Galega da Paisaxe da Fundación Juana de Vega, Spain
Poster 2.5	The restored mine of As Pontes (Spain): the educational possibilities - AGUSTÍN MERINO, University of Santiago de Compostela, Spain
Poster 2.6	Combining scientific analysis and education to raise awareness about environmental contamination and degradation - VERÓNICA PIÑEIRO, University of Santiago de Compostela, Spain
Poster 2.7	Fire impacts and soil painting: a teaching project ESTELA MINTOS MOREU, I.E.S. Pontepedriña, Santiago de Compostela, Spain
Poster 2.8	The traveling forest: taking the preservation of biodiversity out for a field trip - CONCHI SÁNCHEZ, Instituto de Investigaciones Agrobiológicas de Galicia (IAG-CSIC), Santiago de Compostela, Spain
Poster 2.9	Lessons learnt after mining restoration: success and failure through PBL cases in el Bierzo coalfield (NW León, Spain) - SARA ALCALDE, University of León, Spain
Poster 2.10	Heritage based restoration of a former mining site, Rudabánya, Hungary - GABRIELA SÓGOR, Jardim Botânico da Ajuda, Lisboa

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Poster 2.11	Activities of the teaching section of soil science in relation to soil knowledge and protection - MARÍA D. SORIANO, Universitat Politècnica de València, Valencia, Spain
Poster 2.12	The educational challenges in environmental degradation, in the framework of the LANDCARE PROJECT - MARTA MARTÍNEZ, NOEMÍ SANTIAGO, University of Santiago de Compostela
Poster 2.13	When teens meet toads: secondary school students and the conservation of amphibians - SEBASTIANO SALVIDIO, DISTAV, Earth Science, Environment, Life Department, University of Genova, Italy (Presented by SILVIA OLIVARI)
Poster 2.14	Land conversion and animal husbandry: increasing anxieties on soil and ecosystem health - GINA PANGGA, University of the Philippines Los Baños, Laguna, Philippines
Poster 2.15	Indigenous and restorative farming technologies for the improvement of soil quality: learning experiences with farmers - GINA PANGGA, University of the Philippines Los Baños, Laguna, Philippines
Poster 2.16	Student network of ecological restoration: a scientific niche for young Costa Rican researchers interested in endemic species vulnerable to climate change - WALTER HERNÁNDEZ, Student Network of Ecological Restoration, San José, Costa Rica
Poster 2.17	Tourism opportunities along the berg river – a journey from source to sea - NICOLE WAGNER, Western Cape Department of Agriculture, Western Cape, South Africa
Poster 2.18	Macao's Mangroves: from scientific research to environmental education - KAREN TAGULAO, University of St. Joseph, Macao SAR China



## 2.2 TUESDAY 17 JULY 2018

<b>9:00-10:30 DEGRADATION AND RESTORATION OF ENVIRONMENTS: THE VISION OF THE EDUCATORS</b>	
<b>Chair person:</b> Noemí Santiago, Landcare Student, University of Santiago de Compostela	
9:00-9:15	Bringing soil- and geo-sciences to society from different positions during an academic career - JORGE MATAIX SOLERA, Spanish Soil Science Society
9:15-9:30	The AEET working group on ecological restoration - CAROLINA MARTÍNEZ, Spanish Association of Terrestrial Ecology
9:30-9:45	Learning to argue about socioenvironmental issues through the practices of modeling. the case of bees - BLANCA PUIG, University of Santiago de Compostela, Spain
9:45-10:00	FLUVIO: a breaking-through international training doctoral program to restore rivers and riverscapes - TERESA FERREIRA, University of Lisbon, Portugal
10:00-10:15	Learning about contamination and decontamination in the framework of the LANDCARE Project - GRAZIA MASCIANDARO, University of Pisa and ILARIA MINARDI, West System, Italy
10:15 - 10:30	DISCUSSION  <b>Presentation of the poster session: Ignatios Bafas and Xurxo Vázquez</b>
<b>10:30-11:00 BREAK</b>	
<b>11:00-12.00 POSTER SESSION: 1) THE VISION OF EDUCATORS AND 2) THE SOCIETY ENGAGEMENT</b>	
<b>Chair person:</b> Vicente Otero, Landcare student, University of Santiago de Compostela	
<b>Chair person:</b> Xurxo Vázquez, Landcare student, University of Santiago de Compostela	
	<b>1) THE VISION OF EDUCATORS</b>
Poster 3.1	Ecological restoration in Mexico: Efforts and perspectives - JULIO CAMPO, Universidad Nacional Autónoma de México (UNAM), México
Poster 3.2	Educational actions related with the effects of wildfire and different rehabilitation techniques on the soil-plant system (Galicia, NW Spain) - MONTSERRAT DÍAZ-RAVIÑA, Instituto de Investigaciones Agrobiológicas de Galicia (IIAG-CSIC), Santiago de Compostela, Spain
Poster 3.3	The territorial delegation of the Spanish soil society in Galicia (NW Spain): educational activities - MONTSERRAT DÍAZ-RAVIÑA, Instituto de Investigaciones Agrobiológicas de Galicia (IIAG-CSIC), Santiago de Compostela, Spain
Poster 3.4	Degraded land rehabilitation experience in the republic of Rwanda - MARIA L. FERNÁNDEZ MARCOS, University of Santiago de Compostela, Spain
Poster 3.5	Experiences in research & post-graduated education in latin-America - JUAN F. GALLARDO, C.S.I.C., Ex-Prof. & Senior Researcher, Salamanca, Spain

Poster 3.6	Testing the short-term hydroseeding effect on plant diversity after mining restoration - CAROLINA MARTÍNEZ, University of Valladolid, Spain
Poster 3.7	Innovative soil strategies for addressing knowledge gaps and enhancing training capabilities in post-mining restoration - MIRIAM MUÑOZ-ROJAS, University of Western Australia, Crawley, Australia
Poster 3.8	The educational activities of the Galician institute of agrobiological research (IIAG) - CONCHI SÁNCHEZ, Instituto de Investigaciones Agrobiológicas de Galicia (IIAG-CSIC), Santiago de Compostela, Spain
Poster 3.9	Designing your own experiment on fire effects on soils - CRISTINA SANTÍN, Swansea University, Swansea, United Kingdom
Poster 3.10	Designing of educational activities in Nature, Master at the USC - EUGENIO OTERO URTAZA, , University of Santiago de Compostela, Spain
Poster 3.11	Teaching land restoration at the Department of Soil Science-USC - MARÍA T. BARRAL, University of Santiago de Compostela, Spain
Poster 3.12	The application of sewage sludge for soil remediation: the educational possibilities of young soil scientists - COLLINS OGUTU MIRUKA, Sol Plaatje University, Kimberley, South Africa
Poster 3.13	Water movement and potential conductivity in the root zone of agricultural soils - AMEER ABDELMONEM, Menoufia university, Egypt
	<b>2) THE SOCIETY ENGAGEMENT</b>
Poster 4.1	Life evergreen with volunteer-lewo project life - MARÍA J. LÓPEZ CERNADAS, Dirección Xeral de Xuventude, Participación e Voluntariado, Xunta de Galicia, Spain
Poster 4.2	Living Lands, volunteer experience - PABLO RIOS, University of Santiago de Compostela, Spain
Poster 4.3	Ibaitik Badiara, from the river to the bay, soil and water bioengineering and training workshops - PAOLA SANGALLI, European Federation of Soil and Water Bioengineering
Poster 4.4	Forestry volunteering for the recuperation of burned areas in Tourón (Melón, Ourense) - ÁNGEL VÁZQUEZ DORRIO, Amigos da Terra, Spain
Poster 4.5	"Plantando cara ó Lume" university volunteering against wildfires in Galicia - NOEMÍ SANTIAGO, University of Santiago de Compostela, Spain
Poster 4.6	Risk areas for climate stress in coffee crops in Veracruz, Mexico - JOSÉ GERVA-SIO PARTIDA-SEDAS, Universidad Autónoma Chapingo, Veracruz, México
Poster 4.7	OINEZ BASOA: A network of afforested land by schools in Navarre. assessment and development of educational projects - ISABEL DE SOTO, Universidad Pública de Navarra, Spain

**12:00-13:30 DEGRADATION AND RESTORATION OF ENVIRONMENTS:  
THE SOCIETY ENGAGEMENT**

**Chair person:** Joana Marinheiro Jorge, Landcare Student, University of Lisboa

12:00-12:15	Service-Learning and Social Responsibility of the University - MIGUEL A. SANTOS, University of Santiago de Compostela, Spain
12:15-12:30	Collaborative NGO-academic teaching experience in Landcare for native vegetation conservation - PATRICIA RODRÍGUEZ-GONZÁLEZ, University of Lisboa, Portugal
12:30-12:45	Soil and Water bioengineering in the Mediterranean AREA: The ECOMED Project - PAOLA SANGALLI, European Federation for Soil Bioengineering
12:45-13:00	Education in nature and eco-therapy as guides to refugee education - COLLEEN FUGATE, University of Santiago de Compostela, Spain
13:00-13:15	NATURA OBSERVA: an environmental volunteer program in Sintra-Cascais natural park - RITA MARAU, University of Lisboa, Portugal
13:15-13:30	Possibilities of education on River restoration in EDIA in the framework of the LANDCARE Project - LUISA PINTO, Empresa de Desenvolvimento e Infra-estruturas do Alameda-EDIA
13:30-13:45	The design of the arboreum stratum in cafetals based on local knowledge: learning experience in agroforestry - EMILIANO PÉREZ PORTILLA, Universidad Autónoma Chapingo, Mexico
	DISCUSSION

**13:30-15:00 LUNCH BREAK**(not included in the conference fee)

### 15:00-18:00 SHORT TRAINING COURSES

EDUCATIONAL VIDEO PRODUCTION FOR FLIPPED LEARNING AND MOOCS	EMPLOYMENT AND ENTREPRENEURSHIP IN LANDCARE
<p><b>CONTENTS</b></p> <ul style="list-style-type: none"> <li>● Flipped learning.</li> <li>● MOOCs vs SPOCs (Massive Open Online Courses vs Small Private Online Courses)</li> <li>● Educational video basics:           <ul style="list-style-type: none"> <li>- Script, still images, video sequences, sounds.</li> <li>- Audio / video devices to record video and still images</li> <li>- Recording the video: light, focus, sizes, formats.</li> <li>- Chroma effect. Basic use.</li> </ul> </li> <li>- Basic editing video with free / Open Source software</li> <li>- Free image / sound repositories. Licenses and uses.</li> </ul> <p>M. JOSÉ RODRÍGUEZ MALMIERCA, Director of Department e-learning-CESGA, Research Group Educational Technology, University of Santiago de Compostela</p> <p>LORENA CASAL OTERO, Faculty of Education Sciences, Research Group Educational Technology, University of Santiago de Compostela</p> <p>DIEGO NIETO CARIDE, Technical analyst of e-learning CESGA</p>	<p><b>CONTENTS</b></p> <p><u>EMPLOYABILITY</u></p> <ul style="list-style-type: none"> <li>● Job search and internships.</li> <li>● Situation of the labor market.</li> <li>● Labor market demands. university profiles.</li> <li>● Create your: curriculum vitae europass, European skills passport (the Language passport) and cover letter.</li> <li>● European resources for employment, professional practice and training.</li> </ul> <p>GLORIA CRUZ, Labour orientation area, University of Santiago</p> <p><u>ENTREPRENEURSHIP</u></p> <ul style="list-style-type: none"> <li>● Introduction off concepts: what is a start-up; what is a business model?</li> <li>● A new philosophy: lean startup.</li> <li>● Introduction to business model canvas.</li> <li>● Introduction to value proposition canvas.</li> <li>● Practical application with real case studies.</li> </ul> <p>JOSÉ M. REBOLO AND PATRICIA GONZÁLEZ ALONSO, Knowledge transfer and entrepreneurship office, University of Santiago</p>



## 2.3 WEDNESDAY 18 JULY 2018

9:00-19:00 SHORT TRAINING COURSES: FIELD TRIPS (lunch not included)	
<b>SOIL CONTAMINATION: THE TOURO MINE IN PROCESS OF RESTORATION</b>	<b>EDUCATIONAL POSSIBILITIES OF AS PONTES MINE</b>
<p><b>What we are going to learn?</b></p> <ul style="list-style-type: none"> <li>● The environmental problems associated with pyrite oxidation.</li> <li>● The influence of geochemistry on the mobility of heavy metals.</li> <li>● Techniques to restore contaminated areas.</li> <li>● What is a technosol and how it can be used.</li> </ul> <p><b>What we are going to discuss?</b></p> <ul style="list-style-type: none"> <li>● Techniques to work with students in contaminated areas (learning by doing).</li> <li>● Education and awareness strategies to encourage the restoration of contaminated areas.</li> </ul>	<p><b>What we are going to learn?</b></p> <ul style="list-style-type: none"> <li>● The environmental problems associated with pyrite oxidation in mine reclamation.</li> <li>● Techniques to restore large mine areas.</li> <li>● Landform design in mine rehabilitation.</li> </ul> <p><b>What we are going to discuss?</b></p> <ul style="list-style-type: none"> <li>● Techniques to work with students in restored mine areas (learning by doing).</li> <li>● Education and awareness strategies to encourage the restoration of contaminated areas.</li> </ul>
<b>EMERGENCY TREATMENTS AFTER FOREST FIRES: THE CASE OF MONTE FARO</b>	<b>DONIÑOS'S DUNE SYSTEM AND WETLANDS: FACING UP THE GLOBAL CHANGE AND THE TOURISM CHALLENGES</b>
<p><b>What we are going to learn?</b></p> <ul style="list-style-type: none"> <li>● The behavior of the fire and fire fighting strategy.</li> <li>● Some causes of the wildfire in the region: fuel load, forest management, others.</li> <li>● The damages of the fire on the vegetation and wildfires.</li> <li>● To distinguished different soil burnt severities which can will useful to design the emergency stabilization planning and techniques.</li> <li>● The plant revegetation: species and its relation with the soil burn severities</li> </ul> <p><b>What we are going to discuss?</b></p> <ul style="list-style-type: none"> <li>● Techniques to work with students in burnt areas (learning by doing).</li> <li>● Education and awareness strategies to prevent wildfires and encourage the restoration of burnt areas (visits, social engagement, . . .).</li> </ul>	<p><b>What we are going to learn?</b></p> <ul style="list-style-type: none"> <li>● The environmental problems of dune systems associated with global change and tourism.</li> <li>● Strategies to preserve dune systems.</li> <li>● The dynamics of coastal ecosystems as a basis for their sustainable management.</li> </ul> <p><b>What we are going to discuss?</b></p> <ul style="list-style-type: none"> <li>● Techniques to work with students/population in dune systems (learning by doing).</li> <li>● Education and awareness strategies to preserve and restore dune areas.</li> </ul>

## 2.4 LANDCARE FOR THE FUTURE STANDS

### 1. LANDCARE PROJECT

#### UNIVERSITY OF SANTIAGO DE COMPOSTELA-USC

Learning about post-fire treatments in the Landcare project.

LANDCARE STUDENTS

#### FOREST RESEARCH CENTRE OF LOURIZÁN

Educational actions related with the effects of wildfire and different rehabilitation techniques on the soil-plant system.

M. TERESA FONTÚRBEL

#### NATIONAL AND KAPADISTRIAN UNIVERSITY OF ATHENS-UoA

- A flexible personal learning environment to foster learner-centred pedagogical approaches in land rehabilitation.
- Learning about coastal areas rehabilitation in the Landcare project.

NIKI EVELPIDOU, ANNA KARKANI

#### CNR-ISE PISA

- Soil contamination and decontamination in the Landcare project.
- Educational videos as a tool in the Landcare project.

GRAZIANA MASCIANDARO, SERENA DONI

#### UNIVERSITY OF LISBOA-ULISBOA

- Learning about rivers and wetlands conservation in the Landcare project.
- Dissemination activities in the Landcare Project.

TERESA FERREIRA, PATRICIA RODRÍGUEZ GONZÁLEZ

#### EMPRESA DE DESENVOLVIMENTO E INFRA-STRUCTURA DO ALQUEDA-EDIA

- Development of measures to minimize environmental impacts in Alqueva irrigate areas: hedge planting, riparian galleries and intercropping.
- Support in education and sensitization environmental area - alqueva projet.

LUISA PINTO, HELENA BARBOSA

#### ARCHIPELAGO

- Landcare students participating in land restoration, environmental education and marine and terrestrial monitoring.
- Volunteering as a strategy to align youth formation with society and environment.

ANASTASIA MILIOU

#### WEST SYSTEM

- Landfill biogas monitoring: a procedure to evaluate environmental sanitary risk assessment.
- Activities of Landcare students at west systems.

ILARIA MINARDI AND SARA VICIGUERRA

### 2. FUNDACIÓN, FIRE

- FIELDS FOR LIFE

MIRIAM PAJARES

**3. THE EUROPEAN FEDERATION OF SOIL BIOENGINEERING EFIB**

PAOLA SANGALLI

**4. SPANISH SOIL SCIENCE SOCIETY-GALICIA**

MONTSERRAT DÍAZ-RAVIÑA, M. TERESA BARRAL

**5. GAME THEORY AND SOCIAL CARTOGRAPHY FOR LANDSCAPE RESTORATION**

ANTONIO SUÁREZ

**6. XUVENCIENCIA – PROMOTING SCIENCE AMONG YOUNG PEOPLE**

WAJIH AL-SOUFI, University of Santiago de Compostela





### 3. List of Abstracts

#### 3.1 LANDCARE PROJECT PRESENTATION

##### Land Degradation and Rehabilitation in Mediterranean Environments-Landcare Project

Merino, Agustín<sup>1</sup>; Omil, B.<sup>1</sup>; Ríos-Tubio, P.<sup>1</sup>; Fugate, C.<sup>1</sup>; Piñeiro, V.<sup>1</sup>; Díaz-Varela, R.<sup>1</sup>; Cruz, G.<sup>1</sup>; González, P.<sup>1</sup>; Rebolo, J. M.<sup>1</sup>; García-Arias, A. M.<sup>1</sup>; Morante, C.<sup>1</sup>; Guillanders, C.<sup>1</sup>; Fonturbel, M.T.<sup>2</sup>; Fernández, C.<sup>2</sup>; Vega, J.A.<sup>2</sup>; Ferreira, T.<sup>3</sup>; Rodríguez-González, P. M.<sup>3</sup>; de Brito, A.G.<sup>3</sup>; Marques da Silva, A. M.<sup>3</sup>; Dias Ferreira, M.<sup>3</sup>; Pinto, L.<sup>4</sup>; Barbosa, H.<sup>4</sup>; Masciandaro, G.<sup>5</sup>; Doni, S.<sup>5</sup>; Macci, C.<sup>5</sup>; Peruzzi, E.<sup>5</sup>; Bertolotto, P.<sup>5</sup>; Vigili, G.<sup>6</sup>; Minardi, I.<sup>6</sup>; Evelpidou, N.<sup>7</sup>; Karkani, E.<sup>7</sup>; Kotinas, V.<sup>7</sup>; Sakellariou, N.<sup>7</sup>; Saitis, G.<sup>7</sup>; Koumoutsea, E.<sup>7</sup>; Kazantzoglou, A.<sup>7</sup>; Miliou, A.<sup>8</sup>; Delaveri, K.<sup>8</sup>; Malmierca, M. J.<sup>9</sup>; García-Oliva, F.<sup>10</sup>; Campo, J.<sup>10</sup>

<sup>1</sup> University of Santiago de Compostela, Spain; <sup>2</sup> Forest Research Centre of Lourizán, Xunta de Galicia;  
<sup>3</sup> University of Lisboa, Portugal; <sup>4</sup> Empresa de Desenvolvimento e Infra-estruturas do Alqueva (EDIA), Portugal;  
<sup>5</sup> Consiglio Nazionale delle Ricerche, Italy; <sup>6</sup> West Systems SRL, Italy; <sup>7</sup> University of Athens, Greece;  
<sup>8</sup> Archipelagos, Greece; <sup>9</sup> Galicia Supercomputing Center (CESGA); <sup>10</sup> UNAM (México)

Educators and Students

**Keywords:** interactive teaching, internships, videos, learning materials.

##### Abstract

The Mediterranean region is vulnerable to land degradation, which affects important sectors of the economy (agriculture, fishing, tourism) and the supply of vital goods (water, food). Although “actions to restore ecosystems and biodiversity have significant potential to create new skills, jobs and business opportunities”, there is a considerable shortage of skilled workers in this field due to the lack of proper training.

The overall objective of the LANDCARE project is to improve training capacities in relation to Land Degradation and Rehabilitation, in order to fulfil the demands of an emerging labour market and contribute to the green economy. Land restoration is a field that requires training involving real study cases and hands-on experience. For this reason, the education path proposed in the project will combine short-term international mobility and innovative online learning (PLEs, SPOCs). Employability skills will be

enhanced by means of personalized training and hands-on practices. To increase the scope of this strategy, the project reinforces interactions between students, educators, researchers, companies/agencies/NGOs and decision-makers.

The main activities proposed focus on training both staff (from academic and professional partners) and students (HEI, company staff and selected unemployed people). The teacher training will include a) intensive training in innovative online learning tools (PLE, SPOCs) and b) short-term joint events to reinforce training capacities in LD&R. The student training will be based on two types of blended mobility. The concepts of LD&R will be taught by means of an intensive study programme, involving mobility and flexible online training (PLE, SPOC). Practical experience and employment skills will be provided by means of an internship programme combined with solid online and personalised training on employment and entrepreneurship.

### **Society of Ecological Restoration mission in Europe**

Cortina Segarra, Jordi <sup>1</sup>

<sup>1</sup> European Chapter Society for Ecological Restoration. Department of Ecology and IMEM, University of Alicante, Ap. 99 03080 St. Vicent del Raspeig (Alicante), SPAIN. jordi@ua.es; @SER\_Europe

The Society for Ecological Restoration (SER) defines ecological restoration as the assisted recovery of degraded, damaged or destroyed ecosystems. Ecological restoration seeks to protect biodiversity and increase the provision of ecosystem services, contributing to human well-being. This is particularly true in highly humanized areas, as the European continent, where ecological restoration must necessarily integrate socio-economic and cultural dimensions. Ecological restoration involves multiple actors. Collaboration between them, and knowledge generation and exchange is essential to promote restoration programs at all governance levels, and ensure high quality restoration. SER was born in 1986 to promote ecological restoration as a means of sustaining the diversity of life on Earth and re-establishing an ecologically healthy relationship between nature and culture. It comprises 14 regional chapters, including SER Europe (SERE). SERE is organized as a network of networks, linked to national associations and platforms, and European-level organizations sharing the same aims. SERE tools to disseminate good practices in ecological restoration and promote their implementation in Europe include the organization of biannual Conferences and specialized courses, the coordination of scientific and technical publications, and raising awareness and informing policy makers. SERE also provides support to initiatives developed by third organizations, and contributes to the diffusion and improvement of SER International Standards for the Practice of Ecological Restoration and the Certified Ecological Restoration Practitioner Program.

## 3.2 METHODOLOGIES AND TOOLS FOR EDUCATIONS AND TRAINING ON LANDCARE

### 3.2.1 Oral Presentations

#### Understanding Ecological Restoration with Hand-drawn Videos

Cortina-Segarra, Jordi <sup>1</sup>; Sánchez-Montahud, Juan R. <sup>2</sup>; Berdehore, César <sup>3</sup>; Fuentes, David <sup>4</sup>; Sanz-Lazaro, Carlos <sup>5</sup>; Benavent, Mar <sup>6</sup>; Navarro, Marcos <sup>7</sup>; Roselló, María <sup>8</sup>

<sup>1</sup> Department of Ecology, University of Alacant, Jordi@ua.es, Educator; <sup>2</sup> Department of Ecology, University of Alacant, JR.Sanchez@ua.es, Educator; <sup>3</sup> Department of Ecology, University of Alacant, Cesar.Bordehore@ua.es, Educator; <sup>4</sup> Department of Ecology, University of Alacant, David.Fuentes@ua.es, Educator; <sup>5</sup> Department of Ecology, University of Alacant, carsanz@ua.es, Educator; <sup>6</sup> Department of Ecology, University of Alacant, mbo12@alu.ua.es, Student; <sup>7</sup> Department of Ecology, University of Alacant, mnb11@alu.ua.es, Student; <sup>8</sup> Department of Ecology, University of Alacant, mrm126@alu.ua.es, Student

**Keywords:** Socio-ecological restoration, information and communication technologies, youtube, modelling, system's theory.

#### Abstract

Ecological restoration is the process of assisting the recovery of damaged, degraded or destroyed ecosystems. Ecological restoration deals with complex socio-ecological systems, and thus, it requires the use of multidisciplinary approaches. The ability to analyze socio-ecological systems, by identifying their main elements and their interactions, is crucial to understand their functioning, the role of each component and process and, finally, to predict the results of restoration actions. Hand-drawn videos have largely been used in higher education. They allow a chronological follow-up of processes, by combining verbal explanations and graphic representations. In addition, hand-drawn videos generate conspicuous materials, in a medium, the video, which is familiar to most students and can be uploaded to easily accessible platforms. We have developed a series of hand drawn videos to assist students to understand the restoration of socio-ecological systems by identifying their elements, their interactions and their drivers, and foster discussion on the limitations of and opportunities for socio-ecological restoration. Models were designed with Stella® and recorded with VideoScribe®. We have evaluated videos' potential to facilitate students' learning process by means of a survey, and the analysis of the scores obtained by volunteer students of the Biology grade course on Modelling Ecological Systems that previously watched the videos vs. those that did not. Results will be analyzed and used to improve models and videos. After these improvements, models and videos will be uploaded to popular online platforms to facilitate students' access.

#### Design of a Virtual and Personalised Environment - Training for Teachers Landcare Project

Cebreiro López, Beatriz <sup>1</sup>; Fernández Morante, Carmen <sup>1</sup>; Gillanders, Carol <sup>1</sup>

<sup>1</sup> Universidade de Santiago de Compostela

Educator

**Keywords:** teacher training, virtual environment, personalised environment, ICT, education.

#### Abstract

The aim of the project was to offer participating teachers training related to personal learning environments, networks and other virtual tools. At the same time, a bank of materials for independent

learning in different areas of knowledge, especially related to employment and the development of practical skills, was designed. Nowadays teachers must rethink their professional practices, the tools they use to support their work and the ways they integrate ICT in the training they give. Teachers are designers of the methodology which is related to all the elements of the teaching process, where ICT plays a very important role. In the project teachers designed a flexible environment, created activities, guided the process and proposed improvements. The role of the students was that of creators of knowledge as well as materials. They experimented, resolved and reflected upon the learning process undertaken. eLearning 2.0 is seen as a formative, daily, contextualised, meaningful and relevant activity.

### **EPortfolio-A Multimedia Companion for Lifelong Learning**

Andrea Ghoneim <sup>1</sup>

<sup>1</sup> Danube University Krems, Austria

#### **Abstract**

An ePortfolio is a personal learning device for students. In an ePortfolio, a learner can collect learning products – texts, audio products, videos and much more. The ePortfolio is also used to reflect on learning and to collaborate with others. In the presentation, examples from the projects, EUfolio. EU classroom ePortfolios“ and „ATS2020 – Assessment of Transversal Skills“ will show good practices of ePortfolio use. Ideas for the use of ePortfolios for students of environmental studies will give an opportunity to discuss and reflect the possibility of the participant’s own use of such a personal learning companion.

### **Keys to Success and Challenges of the Master’s Programme on Ecosystem Restoration Taught in Madrid**

Rey Benayas, José M. <sup>1</sup>; Escudero, Adrián <sup>2</sup>; García de Jalón, Diego <sup>3</sup>; Jiménez, M. Dolores <sup>4</sup>; Martín Duque, José F. <sup>4</sup>; Rebollo, Salvador <sup>1</sup>; Villar-Salvador, Pedro <sup>1</sup>

<sup>1</sup> University of Alcalá (josem.rey@uah.es); <sup>2</sup> Rey Juan Carlos University; <sup>3</sup> Polytechnic University of Madrid; <sup>4</sup> Complutense University of Madrid

Educators

**Keywords:** employment, strengths, university, weaknesses.

#### **Abstract**

Education, training and capacity building on ecological restoration is critical to meet the objectives of the CBD Action Plan for 2020, the 2030 Agenda for Sustainable Development, the EU Biodiversity Strategy and other major international initiatives. We present here an overview of existing Master’s and other graduate-level degree programmes on ecological restoration and the experience of the multi-institutional Master in Ecosystem Restoration (MER) that is jointly offered by four major public universities in Madrid (Spain) since 2006. We deem the results of the MER as successful in view of the strengths listed below and the various recognitions it has obtained. We explain the motivations that led us to create the MER and the factors that have allowed achieving the results obtained thus far. We identify some strengths and weaknesses observed to date and the major challenges for the near future. The major strengths are the multidisciplinary nature of the programme; expertise, professional reputation, and diversity of research fields of involved lecturers; high number and diversity of involved institutions in the programme; management autonomy of the programme budget; high motivation, diverse background and provenance

countries of the students; high demand for enrolment; and a 78% rate of postgraduate employment in environmental fields. Weaknesses include challenges in teaching students with different backgrounds, training of students in companies, coordination among universities, administrative support, and job opportunities specifically related to ecological restoration for graduates. We operate on the principle that it is the students who “make” their MER. The MER programme has evolved as a network of knowledge and experience that links universities, lecturers, researchers, students, private and public companies, NGOs, and administration centres.

### 3.3 DEGRADATION AND RESTORATION OF ENVIRONMENTS: THE VISION OF STUDENTS

#### 3.3.1 Oral Presentations

##### The Young Georgofili Blog: Sharing Ideas for the Agriculture of the Future

Bertolotto, Pietro <sup>1</sup>; Cropano, Claudio <sup>2</sup>; Bartalozzi, Giulia <sup>1,2</sup>

<sup>1</sup> Young Georgofili blog, <http://blog.georgofili.it/> (pietro.bertolotto1@gmail.com); <sup>2</sup> Georgofili Academy, Firenze, Italy

Educators

**Keywords:** : agriculture, blog, environment, food, Georgofili.

#### Abstract

The Georgofili Academy is a non-profit foundation promoting scientific advancements related to agriculture and supporting the development of technical and economic activities in the primary sector. Founded in Florence (Italy) in 1753 by intellectuals of the time, it is the oldest world's institution of its kind.

From 2015, the Georgofili Academy promotes scientific dissemination among young people through an online platform called “Young Georgofili Blog” ([blog.georgofili.it](http://blog.georgofili.it)). An enthusiast community of young authors encompassing undergraduate and graduate students, young professionals and entrepreneurs regularly contributes to the blog with their articles. Currently, 30 authors published about 150 articles concerning a broad range of topics: from issues related to food and environment to the latest scientific discoveries in the plant and agricultural sciences. Furthermore, the blog disseminates its articles through its social media accounts followed by a network of 1500 people. Embedded in the modernization process that has involved the Academy in the recent years, the Young Georgofili Blog ([blog.georgofili.it](http://blog.georgofili.it)) serves not only as a divulgation webpage but also as a virtual place for youngsters interested in agriculture, food and environment to exchange, explore and spread ideas.

One of the upcoming challenges for the Blog is to broaden its horizons by opening to international young authors to address universal topics related to the future prospects of agriculture.



## Landcare Project, Pisa 2018

Bafas, Ignatios <sup>1\*</sup>; Vasilaki, Styliani <sup>1</sup>

<sup>1</sup> National And Kapodistrian University Of Athens (\* ignatios.b@yahoo.com)

Students

**Keywords:** : Land Degradation, Mediterranean Environments, Green Economy, LandCare Project, Pisa.

### Abstract

Land Degradation and Rehabilitation in Mediterranean Environments is a topic that any Geology and Geo environment Sciences' student should be aware of. This was our initial thought when we applied for the LandCare Project in Pisa.

The overall objective of LandCare was to improve training capacities in order to fulfil the demands of an emerging labour market and contribute to the green economy. For this reason, students and educators from different scientific backgrounds exchange knowledge and were educated in the topics of the Project.

During the field trip to Legoli landfill, Belvedere S.p.A, we learned about the way that core business, in addition to the waste disposal activities, lies in the production of energy from renewable sources. There were also activities of promotion and development of the municipal territory and its economy.

Field trip of Wildfire topic took place in the hilly area of Monte Pisano, a path of 5km in steep slopes, which has been subjected to decades of periodic wild fires. The excursion helped us to observe a mosaic of different vegetation phases surviving the fire as well as the resilience of the different species.

In Coastal systems field trip we visited two places of coastal dunes: San Rossore and Torre del Lago in northern Tuscany, to figure out the factors that affect the erosion of the coastal dunes in each place. As a result, preservation of dune ecosystems should be the continuous awareness of the local communities.

Last field trip was in the Massaciuccoli lake basin, which is a coastal flood plain, which after a century of deep drainage, faces issues of phosphorous leaching and land subsidence. In this area, we saw a pilot experimental field of 15ha, with three management systems. The effectiveness of each system was determined following a multidisciplinary approach evaluating the status and changes of water, soil and plant communities' biodiversity.

In conclusion, lessons in the class improved our knowledge in a very effective way and showed that any environmental issues could be settled only by a multi science approach and collaboration from all the parties that are involved.



## Biochar as Amendment for Trace Elements Contaminated Soils: The Guadiamar Case Study

Campos Díaz de Mayorga, Paloma <sup>1</sup>; López Núñez, Rafael <sup>1</sup>; Fernandez Boy, Elena <sup>2</sup>; Knicker, Heike <sup>1</sup>; De la Rosa, José María <sup>1\*</sup>

<sup>1</sup> Instituto de Recursos Naturales y Agrobiología de Sevilla (IRNAS-CSIC), Seville, Spain; <sup>2</sup> Facultad de Química, Universidad de Sevilla, Seville, Spain (\* jmrosa@irnase.csic.es)

Student

**Keywords:** soil remediation, trace elements, biochar, agricultural residues, valorization.

### Abstract

The tailing-dam spill of Aznalcóllar (SW, Spain) mine on 1998 poured 4.5 Hm<sup>3</sup> of acid water and toxic sludges on the banks of the river Guadiamar and affected 4286 ha of the soils located downriver. Despite the non-precedent cleaning works performed to remove the contaminated soils, over 200 Ha of soils are still unrecovered and the contamination due the high concentration of some persistent elements is present in the subsurface layers.

The major goal of BioReMeC project (CGL2016-76498-R) is to test the efficiency of biochar from agricultural residues as a tool in the restoration of soils contaminated with trace elements. Biochar is the solid material rich in aromatic, low density carbon produced through the pyrolysis of residual biomass.

In this session I would like to present the preliminary results of my PhD thesis, which is performed in the framework of the projects BioReMeC and CarboPeat. In the first step, biochars were produced using 4 agricultural residues as feedstock: rice husk, pruned olive trees, olive pit and “alperujo” (a byproduct of the olive oil). Biochars were produced with temperatures ranging between 350 and 600°C whereas reaction time ranged from 0.5 to 4h. In general pH, water holding capacity (WHC), aromaticity determined by solid-state <sup>13</sup>C NMR spectroscopy and carbon content of biochars increased significantly when pyrolysis temperature was elevated from 400 to 600°C. The WHC and N content were highly influenced by feedstock.

In the second step, the remediation potential of the most suitable biochars was tested in the mentioned soil (*Typic Xerofluvent* from Aznalcóllar). The contaminated soils were mixed with the selected biochars (rice husk and olive pit biochars produced at 400 or 500°C for 1 or 4 hours) and incubated during 60 days (25°C, 60% WHC). Subsequently, germination rates (*Brassica rapa pekinensis*), enzymatic activities and the bioavailability of selected trace elements were determined. Biochar increased soil pH and plant germination rates.

Additionally, a field experiment is being carried out in the “*Corredor Verde del Guadiamar*” to study the restoration capacity of the biochars over trace elements contaminated soils.

Acknowledgements: The Spanish Ministry of Economy, Industry and Competitiveness (MINEICO) and AEI (FEDER, UR) are thanked for funding the projects CGL2016-76498-R and CGL2015-64811. P.Campos thanks the “Fundación Tatiana Pérez de Guzmán el Bueno” for funding her PhD.

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## Toxicological Bioassays to Evaluate the Effectiveness of a Decontamination Technique for Arsenic Contaminated Waters

Martínez, Fco. Javier <sup>1</sup>; Aguilar, Antonio <sup>1\*</sup>; García, Minerva <sup>1</sup>; Martín, Fco. Javier <sup>1</sup>

<sup>1</sup> Departamento de Edafología y Química Agrícola, Universidad de Granada Granada, Spain  
(\* antonioaguilar28@correo.ugr.es)

Student

**Keywords:** Toxicity bioassays, arsenic, decontamination, water, peatland.

### Abstract

The mine wastewaters constitute a source of soil and water contamination since they contain high concentrations of contaminants such as arsenic. In Spain, the mining industry in the Iberian Pyrite Belt represents a potential focus of contamination by mine wastewaters. It is necessary to have effective decontamination techniques in order to avoid possible future contamination events such as the one known as “Aznalcóllar Disaster”. In this regard, some studies shows the adsorption capacity of metals and metaoids by peatland soils.

In this work, a decontamination technique of polluted water by arsenic at different concentrations (0, 50, 100, 200  $\mu\text{g As L}^{-1}$ ) is conducted. It consists on keeping the water in contact with the horizons of the soil from the peatbog of Padul, which is a terric Histosol and it is characterized by the alternation of both histic and carbonated horizons. Afterwards, the degree of toxicity in water is determined by the root germination and elongation of *Lactuca sativa* bioassay (OECD, 2003); and in soil by the soil respiration bioassay (ISO 17155, 2002) to assess the effectiveness of the aforementioned technique.

It is confirmed that both horizons have the ability to adsorb arsenic due to the reductions in As concentration are higher than 90% in most cases. It is also verified that these bioassays should consider all physico-chemical properties when determining the effectiveness of this decontamination technique, as the reduction of the concentration is not reflected on the bioassays. On the one hand, the root germination and elongation of lettuce in water in contact with the histic horizon is inhibited, whereas the root germinates and elongates in water in contact with the carbonated horizon. In this case, the inhibition is directly related to the acidity of water in contact with the histic horizon, instead of the arsenic concentration. In fact, water in contact with the carbonated horizon, which is not acidic, there are not statistically significant differences in the elongation among the different concentrations of arsenic. On the other hand, in the soil respiration bioassay there are not statistically significant differences between the histic horizon and the carbonated horizon contaminated with As, which confirms that has a low sensitivity to arsenic contamination.

### 3.3.2 Poster Session

#### Enhancement of the Abandoned Chestnut Woodlands by Quality Swine Productions

Pistoia, Alessandro <sup>1</sup>; Poli, Piera <sup>1</sup>; Bertolotto, Pietro <sup>1</sup>

<sup>1</sup> Department of Agriculture, Food and Environment, University of Pisa, Italy (\*alessandro.pistoia@unipi.it)

Educators

**Keywords:** chestnut, enhancement of marginal areas, pig husbandry, quality meat productions, Italy.

#### Abstract

After the second half of the 20<sup>th</sup> century, in many European rural areas were depopulation processes which have caused the abandonment of several marginal territories by farmers who started working into the industry sector. The abandonment of many marginal areas caused a general rewilding of the rural areas and hence several environmental effects related both to the shortage of rural human presence and to the reduction of the mountain activities. The result was a negative impact especially on the hydrogeological balance of the territories. In Italy there was a significant reduction of chestnut cultivation (800.000 ha), whose production decreased from the beginning of 1900 by more than 90%, dropped down from ca. 650.000 t/year to the current ca. 50.000 t/year. This was also due to the spread of chestnut diseases such as *Cryphonectria parasitica* and *Dryocosmus kuriphilus*.

Pig husbandry can be considered one of the possible enhancement ways for abandoned chestnut groves. These animals can be used in woodland and they can provide excellent meat production especially from the organoleptic quality. Moreover, if managed sustainably, the chestnut pig breeding can be an appropriate organic husbandry system. The outdoor pig breeding, although it does not allow to obtain high productive performances, it's a profitable activity for management costs and for the high demand by consumers of great food quality, with emphasis on processed meat.

The typical pork products with specific origin and geographical indications (eg PDO, PGI, TSG) are powerful tools for the local enhancement and development. Let's consider for instance the Italian *Prosciutto di San Daniele*, *Lardo di Colonnata* and *Salame di Felino*. Furthermore, this typical food can provide positive externalities such as:

- job positions related to the whole supply chain;
- agritouristic development through the food popularity;
- maintenance of rural traditions and local gastronomy;
- resettlement of marginal areas and prevention of land degradation processes.



## Terraces Degradation and Restoration in the Cinque Terre National Park

Pistoia, Alessandro <sup>1</sup>; Scarpellini, Patrizio <sup>2</sup>; Perrone, Matteo <sup>2</sup>; Poli, Piera <sup>1</sup>; Bertolotto, Pietro <sup>1\*</sup>

<sup>1</sup> Department of Agriculture, Food and Environment, University of Pisa, Italy (\* [pietro.bertolotto1@gmail.com](mailto:pietro.bertolotto1@gmail.com));

<sup>2</sup> Cinque Terre National Park, Italy

Educators

**Keywords:** Cinque Terre, dry-stone wall, terraces degradation, terraces rehabilitation, Italy.

### Abstract

Terraces and dry-stone walls are absolutely the most prominent human signatures on the landscape of the Cinque Terre National Park (NW Italy). The Cinque Terre protected area is also an UNESCO World Heritage Site because its anthropogenic territory clearly represents a harmonious interaction between people and nature. On the coastal area, close to the mountains, there are the five popular hamlets: Riomaggiore, Manarola, Corniglia, Vernazza and Monterosso al Mare. Here, over the past centuries, man modified deeply the original territory creating thousand kilometers of dry-stone walls. The result was a suitable land for vineyards and olives cultivation.

Since the early 1900s, but especially over the last 50 years, the terracing cultivation in the Cinque Terre area decreased strongly and the original 1400 ha of cultivated terraces nowadays dropped down to less than 100 ha.

The abandonment of the rural activity and the presence of several wild ungulates are the most remarkable causes of the terraced and the soil degradation and this increases the environmental vulnerability. The National Park is involved in terraces rehabilitation in order to contrast land degradation processes and landscape erosion. The support for rural activities is needed to improve the geomorphological and hydrogeological stability of the terraced territory. For this, the National Park Institution has decided to install a monorail system to encourage the wine-growers to reach their steep terraces. Moreover, the Park organizes specific training course on dry-stone walls reconstruction and it funds and provides stones, wooden poles and vine plants to those who need.

The terraces restoration has positive externalities which improve local agriculture, environment and tourism and generally help in spreading the green economy.



## Soil Indicators to Assess the Recovery and Restoration Strategies in *Pinus Canariensis* c.sm. ex dc. Ecosystems

De Lara Del Rey, Irene Ariadna <sup>1</sup>; Arévalo Sierra, José Ramón <sup>1</sup>; Pérez Fernández, María <sup>1</sup>

<sup>1</sup> Department of Physical, Clerical and Natural Systems. University Pablo de Olavide, Seville (iadedel@alu.upo.es)

Students

**Keywords:** *Pinus canariensis*, endemic, fire ecology, soil microorganisms.

### Abstract

Forest fires are a concern in many ecosystems of the world. They are of particular relevance in the endangered *Pinus canariensis* formations, where they recurrence are increasingly year after year, and for what land restoration measurement are needed. Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. An important component of this is the need to have early indicators of the successful recovery. Soil indicators may be useful tools for assessing both land suitability for restoration and the effectiveness of restoration strategies in restoring ecosystem functioning and services.

In this study, I evaluated the interplay between microbial function and composition, vegetation, and microbial composition in burnt and unburnt soils of *P. canariensis*. My experimentation spanned laboratory analyses and field studies in burnt and unburnt stands of the afore mentioned species: (i) soil carbon and nitrogen cycling were examined in natural, damaged and restored lands (ii) the responses of soil microbes to soil collection and time were used to model the system's recovery and (iii) the importance of soil microbial biota in the soil was used to evaluate the rate of plant reintroduction in a *P. canariensis* soil after a fire. Using the above, we have modeled several soil components as indicators to assess the effectiveness of ecological restoration strategies in *P. canariensis* forest ecosystems at different spatial and temporal scales. We have taken as the main basis for the recover, soil fertility induced by microbial activities. Several insights were gained that advance knowledge of the importance of soil biota in the rehabilitation of burnt soils of *P. canariensis*. (i) The success of restoration projects for a particular stand relies on a proper understanding of their ecology, namely the relationships between soil, soil biota, plants, climate and land management at different scales, which are particularly complex due to the heterogeneous pattern of ecosystems functioning; (ii) Restoration of soil fertility may be a prerequisite for forest recovery on sites with severely degraded soils and this fertility is associated to the soil microbiota. Measurements of the soil microbial community may certainly be used to determine biodiversity, ecological processes and structure in the degraded *P. canariensis* forests. In this context we base our model on two main approaches for determining the success of a restoration scheme (i) the return to conditions that approximate a target or reference ecosystem and (ii) the maximization of efficiency of the ecosystem with respect to its function.

## Rewilding in Rural Areas and Conflictual Coexistence with Population: The Case of Feral Horses in Aveto Regional Park (ITLAY). Communication and Scientific Approach

Isola, Evelina <sup>1\*</sup>; Bertolotto, Pietro <sup>2</sup>; Salvidio, Sebastiano <sup>1</sup>; Galli, Chiara <sup>1</sup>

<sup>1</sup> DISTAV, Earth Science, Environment, Life Department, University of Genova, Genova, Italy

(\* evelina.isola@fastwebnet.it); <sup>2</sup> Department of Agriculture, Food and Environment, University of Pisa, Italy

Educators

**Keywords:** Rewilding, Apennine, rural life, feral horses, wet lands, grasslands

### Abstract

The rewilding of wide areas, due to the depopulation of pastures and countryside, is affecting the Apennine and Alpine regions with the return of large predators, but also with animals actually living only in captivity and thought to be extinct in nature. Therefore, many “domestic” animals are now repopulating our mountains. This is the case of a population of feral horses living in the Northern Apennine (hinterland of Tigullio Gulf, Liguria, Italy). This population is the heritage of horses (about ten heads) living in the valleys more than twenty years ago. The release in the wild of these horses created a feral population of *Equus caballus* living without any direct influence with humans on their behaviour, their reproduction and feeding habits.

In Italy, the return of apex predators is often cause of conflict with rural life, but in this case the source of the conflict is represented by large herbivore: rewilding horses. Horses, in fact, during the winter go down from the hills and reach villages and private property. As in many cases, human intolerance culminated in a bold gesture (two horses were shoot in 2009) compromising herds welfare and the equilibrium with rural life. In 2011, was founded by the author the project “WILD HORSEWATCHING – I Cavalli Selvaggi dell’Aveto ®”, with the purpose to disseminate this reality. We organize special guided tour, with a naturalist and environmental hiking guide, creating public events and educational activities with schools (also in collaboration with Jane Goodall Institute Italia – Roots & Shoots Project and National Geographic Italia). We also carry out the monitoring on herds and environment. The approach of the study will be a never addressed approach in Italy: study horses as “wild animals” recognizing their role in habitats equilibriums and their biological value.



The study area is in the Aveto Natural Regional Park and it is included in a Site of Community Importance (SCI IT1331104).

The aim of the work is to study herds’ biology, population dynamics and ethology, and possible effects on predatory behaviour of wolves living in the area, possible consequent relationship with rural life and

natural environment. The most interesting habitats related to herds are beech and breeding areas with *Nardus stricta* (Natura 2000 habitat code: 6230: *Nardus* grasslands formations). In order to evaluate how their presence could be conservative for environment, it will be investigated further the maintenance of this habitat related to natural horse grazing. Similar research experience in other European Country will be promoted in order to create an international network working on the topic.

## Vermicomposting as a Sustainable Tool for Environmental Equilibrium

López Quiroga, Eva <sup>1</sup>

<sup>1</sup> University of Vigo (evalquirolga@gmail.com)

Student

**Keywords:** soil restoration, organic waste, earthworms, circular economy, entrepreneurship.

### Abstract

In many countries, both energy and waste management systems are changing, moving towards recycling because of the scarcity of land and the value of waste. Currently, the importance of sustainability is being emphasized globally and biological processes such as composting and vermicomposting have been widely recognized for converting organic materials into nutrient-rich fertilizers and soil conditioners.

Vermicomposting is an organic waste decomposition that uses earthworms to aid the waste stabilization process. This process involves a symbiotic interaction between earthworms (e.g. *Eisenia Andrei*) and microorganisms to produce a stable, homogeneous and humus-like end product known as vermicompost.

Vermicompost can directly modify the physicochemical properties of agricultural soil, which is advantageous to the development of plants as a whole, and also can be used to replace inorganic fertilizers.

During this last year in my Biology degree, and after studying the critical planetary situation, I decided that the best way to change the problems that surround us is to get involved in the vermicomposting field. This is how I started working in the Animal Ecology Laboratory of the University of Vigo, with the purpose of learning the process of vermicomposting. There I'm conducting an experiment (my bachelor thesis) in order to understand the process of feeding the worms. I would like to share with the assistants the research results.

Finally, I would like to share my experience as an entrepreneur that dreams with a sustainable management of organic waste in the city of Vigo. In a group with 4 more students, we are creating a company - SomosTerra - with the aim to apply vermicomposting as an alternative to the deficient current management.



## Sowing and Contribution of Organic Matter, a Route of Recovery of Fire Floods

Vázquez, Jorge <sup>1\*</sup>; Omil, Beatriz <sup>1</sup>; Merino, Agustín <sup>1</sup>

<sup>1</sup> Department of Soil Science and Agricultural Chemistry, EPS-Lugo. University of Santiago de Compostela. University Campus 27002-Lugo (\* jorgevazquezmontenegro@outlook.es)

### Abstract

The objective of this study is the recovery of soils burned by the contribution of compost and sowing of winter cereal in such a way that the soil is more protected against degradation processes such as erosion.

Galicia is one of the communities that are most affected by forest fires, specifically in 2017, burned more than 35,000 ha resulting in irreparable losses of fertile soil and erosion of the mountains.

Soil is difficult to recover, so the degradation of its physical, chemical and biological characteristics makes the regeneration process very slow.

To try to solve this problem on a plot of ground burned located in Friol (Lugo) barley was planted and organic matter was applied in order to avoid soil loss and start the process of regeneration of it.

In this field, after a shallow preparation of the land, four treatments were installed with four repetitions randomly distributed at random (Control, treatment with contribution of NPK compound fertilizer and treatment with high and low dose of compost) where a winter cereal was planted (*Hordeum vulgare*).

The compost used is a product obtained from the mixture of different residues from the agro-food industries and residual forest biomass, which are subjected to a controlled biological process of fermentation called composting.

On these plots an environmental monitoring was carried out where, periodically, soil samples were taken and the percentage of germination and growth of the barley was controlled.

These test plots are also used to support the program “Plantando cara ao lume”, an initiative that tries to raise awareness among different groups about the severity of fires on the ground, stressing the importance of fire prevention and explaining the different ways of action after the fire to avoid in a greater way the erosion of the soil and explaining the different ways of action for the recovery of these soils.

## Microplastics in Water Sources of Samos, Greece

Marinheiro, Joana <sup>1</sup>; Dos Reis, Patricia <sup>2</sup>

<sup>1</sup> Instituto Superior e Agronomia, Universidade de Lisboa (joanafmarinheiroj@mail.com); <sup>2</sup> Instituto Superior e Agronomia, Universidade de Lisboa (joanafmarinheiroj@mail.com)

Student

**Keywords:** Microplastics, Archipelagos Water Quality, Samos.

### Abstract

In our first year of masters in Environmental Engineering we got the opportunity to participate in the course of LandCare and it soon opened us a door for an internship on the NGO Archipelagos. In this NGO we were part of a water quality project where we assessed different parameters, according to WFD, from different water sources of the island of Samos. Concurrently we were able to learn how to analyze/quantify microplastics in the water samples.

Beside this main project, we were allowed to participate in other different projects that were taking place in this NGO.



This research takes place in the island of Samos and its goal is to determine how disseminated are the microplastics in different water sources. We live in a very dependent plastic society and their impacts are even yet to be fully understood. As so, proper research is needed to evaluate the dimension of the problem.

Through the collection of samples from different water sources, such as wetlands and public water supply, we're able to compare the quality of the water through different parameters and analyse the microplastics from each source. The used method is based on a simple density separation and oxidation of organic matter to a further identification, quantification and measuring of the microplastic (>0,1 mm).

This assessment could help further investigations to develop better methods of monitoring and water treatment to tackle the impact of this emerging pollutant on ecosystems.

### **Degradation of Forest Ecosystems by Fire and Alien Species in Galicia. Germinative Behaviour of *Daucus Carota* (Native) Face to *Oenothera Galzioviana* and *Helichrysum Foetidum* (Alien Species)**

F. Riveiro, Sheila <sup>1</sup>; Cruz, Oscar; Casal, Mercedes; Reyes, Otilia

Área de Ecología. Departamento de Biología Funcional. Facultad de Biología. Universidad de Santiago de Compostela. Campus Vida. 15782 Santiago de Compostela. Spain (sheila.fernandez.riveiro@rai.usc.es)

Student

**Keywords:** forest fires, germination, alien species, reproductive strategies.

#### **Abstract**

Forest fires produce severe effects to the ecosystems they affect. They cause soil degradation and changes in ecosystem structure, affecting flora and fauna. Wildfires are an opportunity for alien species entrance since they create open areas; alien species often have rapid germination which allows them to colonize this new area faster than native species. This work tried to compare regenerative strategies from native species against alien species. We chose three herbaceous: *Daucus carota* L. (native and widely distributed in Europe), *Oenothera glazioviana* Micheli (alien from South Africa) and *Helichrysum foetidum* (L.) Moench (alien from North America). We conducted germination test for the main fire factors (heat, ash, smoke and charcoal) with 5 replicates and 25 seeds for each treatment and species.

*D. carota* presented natural germination close to 30%, in this native species fire acts both maintaining germination and inhibiting it: ash and high heat inhibit germination while charcoal, smoke and moderate heat doesn't modify it. *O. glazioviana* had 12% of natural germination; however it rises to 70% with

moderate heat and smoke, whereas high temperatures and ash inhibit it. *H. foetidum* is characterized by its high natural germination (up to 78%) and is barely modified by fire factors.

Numerous native species result damaged by forest fires, as it occurs with *D. carota*; instead many exotic species are resilient to fire because they had strategies that increment their post-fire germination (like *O. glazioviana*) or resistant (like *H. foetidum*) and they endure fire factors without losing viability.

In the context of land care, as a management proposal facing this alien species in burnt areas, we recommend to take special care in the species selection used to revegetate lands and take control measures against alien species integrated with revegetation and soil erosion control.

## **Coastal Erosion and Land Uses in Mediterranean Countries: A Sustainable Approach**

Vasilaki, Styliani <sup>1</sup>; Bafas, Ignatios <sup>1</sup>; Tsamoura, Jenny <sup>1</sup>

<sup>1</sup> National and Kapodistrian University of Athens

Student

**Keywords:** coastal erosion, sustainability, pressures, conservation, land uses.

### **Abstract**

Coastal areas face increasing pressures, on habitats, on natural resources (land, water, energy, etc.) and on rising demand for infrastructure (ports, transport, sewage treatment plants, etc.) with great environmental, economic, social and cultural importance.

The continuous residential coastal development mainly for tourism purposes and destruction of coastal landforms along with the growing pressures from agriculture and industry require multi scientific study of sensitive coastal areas so that we find appropriate solutions for sustainable protection.

Coastal evolution may become from natural and/or human factors, such as side effects of marine and coastal protection structures. In addition, climate change amends the basic conditions under which coasts are evolving. In both cases, long and short term shifting predictions of the coastline is vital to reduce negative impacts and protect coastal structures from erosion and other processes (tidal phenomena, sea level rise, sediment deposition by rivers) that alter coastal stability.

Gradual changes in coastal geomorphology, requires monitoring and historical reconstitution using a variety of techniques and analytical procedures. The multitude and diversity of the various coastal development factors as well as the varying degree of their impact on the spatial scale are issues that cannot be underestimated.

Recent reports of balancing the future of coasts, argues that European countries need to improve their knowledge to better understand the long-term damaging effects of current human and economic pressures on the coastal environment. Global scientific collaboration and actions relevant to the conservation and sustainable use of marine and coastal resources is the only way to reduce erosion impacts and secure coastal systems. Coastal erosion is an issue that cannot be totally controlled, but there are several ways of managing it with the most effective and sustainable economic approach for all parties involved.

## **Application of Geophysical Methods in the Solution of Environmental Issues**

Bafas, Ignatios <sup>1</sup>

<sup>1</sup> National And Kapodistrian University Of Athens. (ignatios.b@yahoo.com)

Student

**Keywords:** Geophysical investigations, Mediterranean Enviroments, Green Economy, Greece, Italy, Nigeria.

### **Abstract**

Open dumpsite is a common method of waste disposal in all around the world. For tis study, geophysical investigations of ex-landfill areas were held in three different parts of the world. The purpose of these investigations was to examine and give solution in different environmental, hydrogeological and geotechnical problems, such as the level of risk associated with leaking pollutants and shallow groundwater aquifer contamination. The first survey took place in the municipal waste disposal site in Akrotirion Peninsula, about 7 km east of Chania city, Crete isl., Greece. Electrical resistivity tomography (ERT) was applied for the geophysical modelling. ERT offers quick, inexpensive and non-invasive means to help characterize subsurface geophysical characteristics. Data were collected for seven 2D geoelectrical profiles.

The second geophysical investigation took place in the industrial area of 'Terme Romane' in Monfalcone, northern Italy. Ground Penetrating Radar (GPR) with antenna frequency of 250 MHz was used in order to monitor the soil contamination level of this particular area.

The last geophysical investigation arisen around a reclaimed dumpsite in Ilorin city, in North central Nigeria. Very Low Frequency Electromagnetic (VLF) method was deployed to map the extent of leachate contamination.

## **Assessment of the Post Fire Erosion in a Planted Site**

<sup>1</sup> Dias Ferreira, Madalena <sup>1</sup>

University of Lisbon, Higher Institute of Agronomy (maddie.dias@gmail.com)

Student

**Keywords:** Assessment, erosion, natural regeneration, post-fire erosion, wildfire.

### **Abstract**

In my 3rd year of my forestry bachelor's degree I accepted the challenge of my teacher, Teresa Ferreira, to participate in the Landcare project.

To me this was an unique experience where I finally had the contact with damaged ecosystems and how to restore them.

In the end of the course we where challenged to do a final work, where we could put in practice what we learned during those days.

This work is an evaluation of the post fire erosion in a planted site. The investigation method was visual evaluation made in two field trips to the site, seven months after the fire. No obvious signs of erosion were found, and the land had already regenerated vegetation. In the conclusion, recommendations are made in order to monitorize, clean and to do a better land management. Its objectives are to prevent future occurrences as pests, diseases and new fires, which can contribute to the weakening of the ecosystem.

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## Landcare Project: An Involving Experience

Domenichini, Lorenzo <sup>1</sup>

<sup>1</sup> University of Pisa (lorenzodomenichini@hotmail.it)

Student

**Keywords:** LANDCARE Project, Erasmus intensive course, EDIA, environment, drainage and irrigation areas.

### Abstract

I knew LANDCARE Project thanks to my master thesis. It happened by pure chance, but it was an extremely lucky chance.

During March 2017, I were in Naxos (Greece). There I attended an intensive course regarding land rehabilitation and degradation in Mediterranean environments. Naxos' colours, sunsets and intense smells will always remain with me.

The course was an occasion to acquire knowledge on some topics related to environment, mainly freshwater ecosystems, coastal areas, contaminated soils and wildfires. Field trips permitted us to understand how the things work in practice, while visiting amazing places.

Meeting people from different countries and sharing nice moments together were also a part of this experience.

During March 2018, I were in Beja (Portugal) for an internship at EDIA S.A. This company is one of the LANDCARE Project partners and manages artificial lakes, dams and an impressive irrigation network in the centre-South of Portugal.

My internship took place in the Department of Environmental and Property Impacts. It permitted me to comprehend which difficulties have to be overcome with the aim of managing the territory. It involved both fieldwork (situation and clearing needs of the drainage system in hydraulic passageways) and office works (CO2 emissions during the life cycle of pipe materials such as cement, steel and HDPE).

I was hosted in a student guesthouse with people from several European and extra-European countries. Discovering their cultures is something I will not forget. As well as the hospitality of Portuguese people.

Summarizing, as first, I enhanced my knowledge regarding environment and worked in an important company. Secondly, during both activities, I met great people and had the pleasure to make new friends. Moreover, living for some weeks in Naxos and Beja, I appreciated local traditions, in a way that is not easy to happen for a common tourist.

### 3.4 ENVIRONMENTAL EDUCATION AND AWARENESS

#### 3.4.1 Oral Presentations

##### **Involvement of Small Farmers in Developing New Agronomic Technologies to Prevent Soil Degradation and to Increase Food Production and Income**

Etchevers, Jorge D. <sup>1</sup>; Hidalgo, Claudia <sup>1</sup>; Cortés, José I. <sup>1</sup>; Turrent, Antonio <sup>2</sup>; Jiménez, Leobardo <sup>1</sup>; Padilla, Juliana <sup>1</sup>; de León, Aurelio <sup>1</sup>; Acosta, Miguel <sup>3</sup>; Vergara, Miguel Ángel <sup>3</sup>; Estrada, Isabel <sup>3</sup>; González, Lucila <sup>3</sup>; Baez, Aurelio <sup>3</sup>; Balbontín, Claudio <sup>3</sup>; Pieri, Christian <sup>4</sup>

<sup>1</sup> Colegio de Postgraduados, México; <sup>2</sup> INIFAP, México; <sup>3</sup> Former graduate students of Edaphology Colegio de Postgraduados, Mexico; <sup>4</sup> World Bank Consultant

Educators and former students

#### **Abstract**

Near 75% of the small land farming agriculture in Mexico is located on hillside conditions. Hillsides are susceptible to soil erosion and degradation in natural conditions but particularly when under cultivation. The main objective of this collaborative work was multipurpose and oriented to solve problems of small and very poor communities: to stop soil erosion, to increase productivity, to capture more atmospheric carbon, to teach farmers to manage soil crops in a sustainable manner, and to increase farmers income. The strategy includes the participation of communities members and local farm authorities, as well as municipal, state and federal political authorities Regular meetings were conducted with individual and farmers groups to discuss the plans and with authorities to present partial results. The project was developed over six years. Several production alternatives were selected and established in hillside small farms in agreement with the farmer: corn, corn+beans and maize intercropped with fruit trees (peach and coffee) or MIAF.



The local farmers acquired several capacities: (1) experience for producing peach and coffee trees in nursery, planting and pruning the trees for fruit production, (2) to manage erosion control by building

terraces on hillside conditions limited by fruit tree rows, (3) to manage plant residues to form soil filtering walls, (4) the appropriate use of organic and inorganic fertilizers, (5) the use of apparatus A to trace contour curves, (6) to produce canned fruit with excess of production. As a result of the implementation of MIAF: (1) the corn production increased to cover family needs during the whole year as compare to the 5-6 month supply of the years previous to the introduction of the system, (2) soil erosion was almost nil after terraces implementation, (3) family income increased as compared to condition previous to adoption of MIAF system, (4) the experience was used to form MS and Ph. D. The experience was usefull to sensitize people of the communities for protecting the soil, the importance of sequestering carbon to mitigate climate change and for producing food in a sustainable manner. The students learned the importance of involving farmers, communities, researchers and political authorities to achieve success in field projects.

### Coming to Terms with Ecological Grief and Walking to Reconnect

Pigott, Anna <sup>1</sup>

<sup>1</sup> Swansea University, Geography Department Swansea, Wales (a.l.pigott@swansea.ac.uk)

Educator

**Keywords:** ecological grief, walking, Wales, ritual, connection.

#### Abstract

In this presentation I share my experiences as a participant in a four-day group walk called the Land Journey: The Walk that Reconnects, in Wales, UK. The walk was designed as both a physical and an inner journey, with the stated intention of building “motivation, creativity, courage and solidarity for the transition to a sustainable human culture”. I explore how the walk achieved this through a framework known as The Work That Reconnects, which has been developed by the eco-psychologist Joanna Macy. Through this framework I learned that coming to terms with ecological grief is an important—although often very uncomfortable—aspect of personal and collective transformation in response to ecological crises. In this presentation I introduce the four stages of the framework, and show how they structured each day of the Land Journey, helping participants move through their own processes of personal transformation while also moving through the landscape. Along the way, I discuss how we might think about and use walking as an important educational process for fostering land care and for reconnecting with the land and with ourselves. I also show how the Work That Reconnects Framework can be used in contexts where walking is not possible, or time is limited.



## Landcare Conversations for Tour Guides

Barrento, Sara <sup>1</sup>

<sup>1</sup> Swansea University, Biosciences Department, Center for Sustainable Aquatic Research (CSAR), Swansea, UK.  
(s.i.barrento@swansea.ac.uk)

Educator

**Keywords:** Ecotourism, Field-courses, Nature, Education.

### Abstract

I am a marine biologist and my first job was as a tour guide. I quickly realized that tour guides have a great deal of power over visitors. Whether in museums or natural sites the tour guide can perform LandCare stories and impact visitors. I am currently a lecturer teaching at all university levels (undergraduates and post graduates), but I have a wider interest in transformative learning, and the importance of transformative tour guiding. In this session, I would like to share with you my experience, and my new project: “Science Communication for Tour Guides”. This is a continuous professional development workshop I have created specifically for professionals already in the tourism industry or aiming to be part of this. Tour guide training is an adult education activity. But in addition to the educational aim, tour guiding can attempt - some argue that it should attempt - to modify the attitudes and behaviour of visitors (learners). This is becoming even more relevant given the recent increase in ecotourism - nature based tourism. It is also meaningful in residential field courses. The importance of conserving the rain forest can be a learning objective in a classroom context, but having visitors/learners in a real rain forest provides a unique opportunity for a more sensory experience. In this session I would like to invite the audience to explore the guide’s role as a non-formal educator, facilitator and motivator; the importance of promoting mindful tourism and the resources available to train tour guides. I will also share the model of training I have been using and the importance of inviting visitors/learners to experience a specific place instead of conveying the idea of providing a paid service.

### 3.4.2 Poster Session

#### Landcare Trips on the Edge of Reality

Barrento, Sara <sup>1</sup>

<sup>1</sup> Swansea University, Biosciences Department, Center for Sustainable Aquatic Research (CSAR), Swansea, UK.  
(s.i.barrento@swansea.ac.uk)

Educator

**Keywords:** Ecotourism, Field-courses, Nature, Education.

#### Abstract

Space shapes learning and teaching - it shapes the way our senses engage in the visual and verbal interactions taking place in the lecture room, lab, and computer rooms and in the field. It is key to facilitate engagement, collaboration, creation and inspiration - “teaching and learning spaces are more than the sum of the chairs and tables in a room”. In the biosciences field work is an important and often enjoyable part of learning - students value field work. It provides opportunities for students to develop discipline-specific practical skills in addition to wider, employability skills such as team working, the development of interpersonal skills, self-management and lifelong learning skills (Andrews et al., 2003). Personal development is especially evident when away on residential field-trips (Stokes and Boyle 2009) - even more so at an international level. Its importance to learning in the Biosciences is acknowledged within the Quality Assurance Agency (QAA). But residential field courses, especially international field courses can be a double sword edge - they can be costly and therefore exclusive to students who can afford the trip and field work is also a barrier to disabled students and other minorities (e.g. mature, part-time, etc.). I propose to tackle these two aspects of field work by suggesting the development of a virtual field trip alongside a real field trip. I will explore a case study where students act as co-creators of a field trip which will be both residential and virtual. This talk will need the participation of the audience by sharing their ideas.

#### Educational Activities in the Center of Conservation and Study of Nature "Casa das Insuas"

Basanta Cornide, Rosario <sup>1</sup>; Coira Nieto, Emilio <sup>2</sup>; Pérez Caloto, Mónica <sup>2</sup>; Díaz-Raviña, Montserrat <sup>3</sup>

<sup>1</sup> I.E.S. Frei Martín Sarmiento, Pontevedra, Spain (basantacornide@edu.xunta.es); <sup>2</sup> Centro de Conservación e Estudo da Natureza “Casa das Insuas”, Rábade, Lugo (Asociación Galega de Custodia do Territorio), Spain; <sup>3</sup> Soil Biochemical Department, Instituto de Investigaciones Agrobiológicas de Galicia (IIAG-CSIC), Santiago de Compostela, Spain

Educators

**Keywords:** family activities, the comic Living in the Soil, the Soil Game, soil exhibitions, field trip, soil painting.

#### Abstract

During the months of November and December the soil was present in the “*Casa das Insuas*” a Center that depends on the Galician Association of Territorial Custody and is self-managed by entities and people with concerns on knowledge and conservation of the natural environment (casadasinsuas.blogspot.com.es/). In this Center, coordinated by Emilio Coira Nieto, a “*Workshop on Soils*” take place, which included various actions promoted by the Territorial Delegation of The Spanish Society in Galicia (SECS-Galicia)

(exhibition "*Os solos ea diversidade forestal*", the comic "*Vivir no Solo*" and the "*Xogo do Solo*") and one field activity "*Nature in the family: discovering the soil*" organized by Drs. M<sup>a</sup> Rosario Basanta, Mónica Pérez and Montserrat Díaz-Raviña.

The panels of the exhibition "*textitOs solos e a diversidade forestal*" and the "*Xogo do Solo*" were in the "*Casa das Insuas*" from November 14 to December 5 and had visits by groups of students from different educational levels of Centers of Lugo and also of people with a very diverse profile interested in nature. On December 4th and 5th the presentation of the comic "*Vivir no solo*" and the activity "*Nature in the family: discovering the soils*" took place with a group of parents and children. This included the presentation of the FAO video "*Let's talk about the soil*", and two short talks of Drs. Díaz-Raviña and Basanta on the introduction of the soil (concepts of soil profile and horizons). Then, a successful field trip was made to see a soil profile and collect samples of the different horizons, make a description of soil profile, and later on in the "*Casa das Insuas*" the children, with the help of their parents, carried out different activities such as the determination of the different soil components, classification of the texture, drawing the soil profile with the different horizons, reproducing the profile in a test tube and, finally, painting a picture with the samples of horizons of different colours and textures. The program was very attractive and fun for both children and parents and, above all, it fulfilled its goal of making the soil known for families.

## **The Desertification is a Global Environmental Problem, but Requires a Local Education Training**

García-Oliva, Felipe <sup>1</sup>

<sup>1</sup>Instituto de Investigaciones en Ecosistemas y Sostenibilidad, Universidad Nacional Autónoma de México, Morelia, México. (fgarcia@cieco.unam.mx)

Educator

**Keywords:** Desertification, Ecosystem Degradation, Education training, Global climate Change, International Cooperation of Graduate Programs.

### **Abstract**

The desertification is consequences of the degradation of ecosystems. Unfortunately, this process covers a high continental surface at different latitudes. For example, Millennium Assessment estimated that the actual drylands cover 41% of continental areas. But, the desertificated area could be increased around 60% of continental area by 2050 year. However, the drivers of desertification included two scales: global scales related to Global Climate Change and local scales related to ecosystems managements. At the date, local implementation can not consider the effects of global climate change and vice versa.

Therefore, the management strategies for face up desertification must have considered the local and global drivers. However, the local graduate programs are focused in local effects and local implementations. These efforts are very significant, but they could not be very successfully in the global effects in the local degradation. Therefore, the graduate programs must be considered the global changes effects, including the collaboration of graduate programs of different countries.

In this scenario, I proposed that the link and collaboration of graduate programs of different countries can explore the local experiences of environmental degradations, as well as to improve new educational platform to face up the global aspects. This issue has international priority, because there are different international agencies working with desertification as IPCC, UNEP, etc. It is critical to improve the

collaboration of graduate programs at different regional conditions for construct an integrated model for face up desertification.

### **Landscape Restauration for Leisure Parque do Lago: Mount Gaiás, City of Culture. Santiago de Compostela 2015**

Aguirre, Isabel <sup>1</sup>; Máquez, Mercedes <sup>1</sup>; Moral, Carmela <sup>1</sup>

<sup>1</sup> Research Group Escola Galega da Paisaxe da Fundación Juana de Vega (info@juanadevega.org)

Educator

**Keywords:** land restauration, nature, wetland, heritage, autochthonous vegetation.

#### **Abstract**

In 1999 the Santiago de Compostela council launches an international architectural competition for the City of Culture in Mount Gaiás construction. Until then this environment was a rural space placed in the Santiago de Compostela periphery, linked to the agricultural zones of the O Viso and Sar villages.

From this moment, the public administration was the owner of a big terrain bag to make the City of Culture complex construction. At the beginning of the works, in a peripheral zone belonging to this area, situated in a lower level, was realized an explanation in order to establish a place for material collection, parking, works machinery, debris, etc. In the same parcel there was also carried out an important excavation that served to lodge the waters proceeding from the constructed areas drainage.

Finished the construction works it becomes the environmental regeneration time, and the proposal to return this space to the public use in touch with nature. A minimums intervention was realized with sustainability criteria.

The project starts from a selective harvest of the spontaneous vegetation, and relies on the original rural structure, recovering the main way that was the connection of this agricultural lands with the Viso village, and for the implantation of two different spaces: a carballeira (oaks forest) with urban furniture and jogging elements, placed in the top level, where the big explanation was located; and an intimate space to stay in contact with the water raft by a wooden platform.



## The Restored Mine of As Pontes (Spain): The Educational Possibilities of the New Environments Generated

Merino, Agustín <sup>1\*</sup>; Valle, Ramón <sup>2</sup>; Rodríguez-González, Patricia M. <sup>3</sup>; Blanco, Paloma; Gil, Anibal <sup>2</sup>; Macías, Felipe; Díaz-Pazos, Juan; Rodríguez, Xoan Carlos <sup>4</sup>; Ramil, Pablo; Táboas, Santiago <sup>1</sup>; Pardo, Juana M. <sup>6</sup>; Fernández, Alejandro <sup>1</sup>; Omil, Beatriz <sup>1</sup>; Álvarez, Esperanza <sup>1</sup>; Monterroso, Carmela <sup>1</sup>; Santiago, Noemí <sup>1</sup>; Méndez Lolo, José Antonio <sup>2</sup>; Temboursy, Miguel <sup>2</sup>; Hernández-Bruguera, Eva <sup>2</sup>; Muñoz de Verger, Begoña <sup>7</sup>

<sup>1</sup> University of Santiago de Compostela (\* agustin.merino@usc.es); <sup>2</sup> ENDESA; <sup>3</sup> University of Lisboa; <sup>4</sup> IES Lucus Augusti; <sup>5</sup> IES Castro de Uz; <sup>6</sup> IES Moncho Valcarce; <sup>7</sup> Fundación Endesa

Educators

### Abstract

The restoration of the mine of As Pontes (Spain) was one of the first (1981-2012) and greatest environmental rehabilitation challenges worldwide. The restored area (24 km<sup>2</sup>) is made up by a lake (15 km<sup>2</sup> area and 400 m depth), which coincides with the hole of the lignite exploitation, and a big dump (11.5 km<sup>2</sup> area and 200 m height), currently re-vegetated, generated by the storage of mining tailings. The most important limitations of the tailings for natural revegetation were high acidity and lower porosity. Reclamation was based on the application of organic agricultural and urban residues over the surface dump. Nowadays, the former dump is covered by a great variety of different ecosystems (grasslands, shrub lands, tree systems and wetlands). Due to the great challenge of this restoration, this new landscape deserves to be visited by students, environmental educators and scholars.

The objective of EDUCA AS PONTES Project (<http://restauraspontes.es>) was to develop innovative educational resources to demonstrate the restoration process, to study the biodiversity trajectories and the ecosystem services arising from the new environments, in order to promote society awareness on land degradation. The educational resources were developed through an interactive participatory approach, testing and discussing the materials and activities during dedicated workshops with teachers from secondary schools and vocational studies.

As educational materials, a guide for educators, a field notebook for students and different explanatory panels, were developed. These activities are developed throughout an “educational tour” of 20 km length, which runs through the different environments. The tour is made up by different short footpaths and visits to specific points in which the visitors learn about the limitations of the dump for the vegetation establishment, the restoration techniques that were employed and the characteristics of the current ecosystems. The visitors participate actively in debates (soil formation, biodiversity, trophic chains), explorations (short walks), experimentations (simple analysis of water) and educational games.



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## Combining Scientific Analysis and Education to Raise Awareness about Environmental Contamination and Degradation

Piñeiro, Verónica <sup>1\*</sup>; Gómez-Dopazo, Montserrat <sup>1</sup>; Roca-Real, Carlos Manuel <sup>2</sup> and Seijas-Vázquez, Eva María <sup>1</sup>

<sup>1</sup> University of Santiago de Compostela, RIAIDT, Instrumental Analysis Unit, CACTUS-Lugo (\* veronica.pineiro@usc.es); <sup>2</sup> University of Santiago de Compostela, RIAIDT, NMR Unit, CACTUS-Lugo

Educators

**Keywords:** education, analysis, awareness, students, environment, workshops .

### Abstract

These days, when environmental contamination and degradation is unfortunately so extended, it is vital to disseminate information about the importance of the conservation of our environment (rivers, soils, coasts, wetlands, forests). The Instrumental Analysis Unit (UAI) of the RIAIDT (Rede de Infraestructuras de Apoio á Investigación e Desenvolvemento Tecnolóxico) of the USC participates in two different ways to promote the conservation of the environment. The first approach is to help to solve analytical problems related with this topic. This includes: analysis of metals (ICP-MS) in mine restoration, analysis of organic matter (TGA-DSC and NMR) in soils after wild fires, and a study of the As and Cr toxicity on epipsammic biofilm in rivers (isothermal microcalorimetry IMC).

The other approach is focused on education with young people because it plays a major role on the development of their awareness about land care. This encouraged us to start to participate in educative programs such as: guided visits to our labs for secondary education students, laboratory practices for vocational training students, and finally, five years ago we began to participate in a new educative program in order to contribute to raise youth awareness about environmental care. For this project, we collaborated with Xuvenciencia Summer Camp. During the one week summer camp, which had about 150 participants in each edition, students (ages 14-18) from different parts of Spain participated in several projects and workshops related to science and technology, and some of them related to environmental conservation. The objectives of these workshops are to promote interest in science and to help the students understanding some environmental problems while guiding them to minimize their impact with simple actions that everyone can do in their daily lives. To reach these objectives we tried to make the students participate actively in preparing the materials, analyzing the samples, answering some questions about the importance of what we did and finally, concluding what they have learnt about the topic.

Some examples of these workshops are:

- Comparison of different containers in relation with the type of plastic (recyclable or not) with differential scanning calorimetry (DSC)
- Analysis of metals in water with ICP-MS. Comparison of tap water, mineral water and ultrapure water.

## Fire Impacts and Soil Painting: A Teaching Project

Lucas Domínguez, Nicolás <sup>1</sup>; Pintos Moreu, Estela <sup>2</sup>; Novo Platas, Ángela <sup>3</sup>; Díaz Raviña, Montserrat <sup>4</sup>  
I.E.S. Pontepedriña (Xunta de Galicia), Santiago de Compostela, Spain: <sup>1</sup> Departamento de Bioloxía e Xeoloxía;  
<sup>2</sup> Departamento de Debuxo, (epmoreu@edu.xunta.es); <sup>3</sup> Departamento de Tecnoloxía; <sup>4</sup> Bioquímica del Suelo,  
Instituto de Investigaciones Agrobiológicas de Galicia (IIAG-CSIC), Santiago de Compostela, Spain  
(mdiazr@iiag.csic.es)

Educators

**Keywords:** Soil Painting Competition FAO, burned soils, seeding and mulching, post-fire erosion, winners of first prize FAO Competition.

### Abstract

This report concerns to the winner of the Soil Painting Competition in the Group B Category (12-18 years old) organized by the Global Soil Partnership of the Food and Agriculture Organization (FAO/GSP) to celebrate the 5th December 2017 World Soil Day with the theme 'Caring for the Planet starts from the Ground'. A multidisciplinary team of teachers (Biology and Geology, Art and Design, Technology, English and Galician Languages, Music) from Pontepedriña Secondary School (I.E.S. Pontepedriña, Santiago de Compostela, Xunta de Galicia, Spain) selected two groups of 14-16 years old students to participate in this contest. Joining the competition has been use to motivate and trigger a wider involvement in "After the Fire", an environmental awareness project coordinated by Nicolás Lucas.

Vegetal-derived pigments and those obtained from undisturbed soils samples were combined with ash and charcoal produced in the last October wildfires. With the collaboration of forest researchers, we designed field trip to realize the impact of the forest fires, where the students compared burnt areas with and without implementation of emergency rehabilitation techniques (seeding, straw mulching) carried out by environmental volunteers. These work-in-progress, including lectures given simultaneously with the painting process in a public place, were recorded in a short video whose music score were played by students as well.

The FAO Global Partnership announced the winners in January 2018, being our proposal the first in the secondary and high schools Group. The project is still going on, we have planted seeds of *Quercus* and designed an irrigation system for the summer; next autumn the students will participate in reforestation of burnt soils. This multidisciplinary Teaching Project could be a model for Secondary Schools at National and International level to promote the interest in soils and the need to protect and conserve them, avoiding soil degradation and promoting further recovery.



Winner Picture (3 m x 2 m) of the FAO Soil Painting Competition 2017 in the Group B Category (12-18 years old) of the Spanish team (I.E.S. Pontepedriña, Santiago de Compostela, A Coruña, Spain).

## Traveling Forest: Taking the Preservation of Biodiversity out for a Field Trip

Sánchez, Conchi <sup>1\*</sup>; Covelo, Purificación <sup>1</sup>; Aldrey, Anxela <sup>1</sup>; Vidal, Nieves <sup>1</sup>

<sup>1</sup> Instituto de Investigaciones Agrobiológicas de Galicia (IIAG-CSIC), Santiago de Compostela, Spain  
(\* conchi@iiag.csic.es)

Educators

**Keywords:** biotechnology, conservation, fairs, festivals, trees.

### Abstract

Forests play an essential role in environmental factors like carbon sequestration, soil and water quality preservation and conserving biodiversity. However, deforestation and forest degradation, together with inadequate reforestation practices are contributing to significant losses of forest biodiversity each year.

The group of Biotechnology of Woody Plants of the Galician Institute of Agrobiological Research is committed to promoting environmental awareness by performing educational and divulgation activities.

Besides the activities carried out inside our laboratories, addressed to students of different ages, our group takes our research to the “real world”, seeking the interaction with people of different ages and different scientific background. The core of these divulgation activities is what we call “a traveling forest”. We prepare glass containers and fill them with in vitro cultures of different trees: oak, cork oak, birch, chestnut, willow, wild pear, cherry, etc., to obtain “miniforests” which can travel with us to everywhere.

We use our traveling forest to interact with people and talk with them about plant physiology, ecosystems, biodiversity and its loss, biotechnology and its use for the conservation of biodiversity, etc. The activities are design to promote the participation of the public of all ages. People can see and touch the plants, the culture medium, different laboratory recipients, and can tell us their opinions and feelings about forests, nature, trees... We prepare educational games for adults and children, with seeds, leaves, balloons...

We take our traveling forests to popular festivals, performing "scientific events" at the street, to exhibition fairs with other scientists engaged in divulgation issues, to book presentations and even to bars. Our aim is to show the wonder of nature to all people, since we think that we only preserve what we know and love.

## Lessons Learnt After Mining Restoration: Success and Failure Through PBL Cases in El Bierzo Coalfield (NW León, Spain)

Alcalde-Aparicio, Sara <sup>1\*</sup>; González-García, Adrián <sup>1</sup>; Antolín-Dueñas, Cristina <sup>1</sup>

<sup>1</sup> University of León. Environmental Sciences (\* salca@unileon.es)

Educator and Students

**Keywords:** abandoned sites, mining restoration, PBL cases, AMD, ARD, passive technologies.

### Abstract

Our last year undergraduate students face the challenge of integrating the skills previously learnt in order to design possible plans for the restoration as essential part of their future professional career. Mainly we focused our efforts on degraded spaces affected by mining or other civil works in close areas that can be shown by our own research registers and even visit in a short field trip day. The approach is to make evidence the recovery of contaminated soils and water systems after reclamation, rehabilitation

and restoration projects that have been more or less successfully performed. As we found some problems when we introduce specific methods directly, the idea is to simplify, challenge, engage and get the students involved by PBL (Problem-Based Learning) strategies in the group class. Specifically we introduce the particular case of a stream affected by both ARD (acid rock drainage) and AMD (acid mine drainage) from abandoned coal mining tailings at a glance of the project (Figure 1).

Firstly, we show a typical simple passive system for the treatment of acidic mine drainage. Following to that, we show a graphical schematic picture accompanied always by an explanation in which the students are able to identify any parts of the conceptual model and the reactions including neutralization and attenuation pathways described (Figure 1). Secondly, the students are given some analytical data in order to discuss and we evaluate together graphs, geochemical evolution and mineralogy (Figure 1). Finally, a research paper focused on the performance of an open limestone channel for treating the affected stream is discussed and they are encouraged to look for some other alternatives or possible solutions trying to point out some advantages or drawbacks.



## Heritage Based Restoration of a Former Mining Site, Rudabánya, Hungary

Sógor, Gabriella<sup>1</sup>

<sup>1</sup> Jardim Botânico da Ajuda, Lisboa (sogor.gabsi@gmail.com)

Student

**Keywords:** landscape design, landscape restoration, cultural heritage, mining site, master thesis.

### Abstract

The design proposal's site is a former iron mine north east Hungary, closed in 1985. While operating the mine always brought values to the town and it's inhabitants, after the abandonment, only the meaningless fate can be traced on the landscape. The landscape restoration only consisted a planned mechanical stabilization of the mining terraces and small scale afforestation.

Through research, the societal and cultural effects of the abandonment process are explored. Placing the emphasis on the idea that landscape restoration can not be done without considering the sociological

effects of the intervention. The analysis on the other hand is focused on the succession process of the last three decades taking the micro-site specific circumstances into account.

The scope of the design process is focused on the contemporary restoration of the positive identity, where identity concludes a balanced stage of ecological, societal and historical values. The essential of the concept is the heritage based reinterpretation and functional renewal of the mine, preserving the continuity of the past and the conduciveness. While from an ecological side the possible reintroduction of the native flora and the co-existence of different habitats are studied.

Nevertheless the proposal is experimenting with educational possibilities through a story telling, narrative landscape focusing on mining history, erosion, natural succession, geology and much more.

### **Activities of the Soil Education and Public Safety Section of the Spanish Society of Soil Science in Relation to Soil Knowledge and Protection**

Lull, Cristina <sup>1</sup>; Soriano, María Desamparados <sup>1\*</sup>

<sup>1</sup> ETSIAMN. Universitat Politècnica de València, Valencia, Spain (\* asoriano@prv.upv.es)

Educator

**Keywords:** Micromonoliths, didactic videos, computer applications, educational innovations.

#### **Abstract**

From the ground teaching and public Safety Section of the Spanish Society of soil Science we want to make known the different lines of action of this section. At present, different activities are being carried out at different educational levels to make known the essential role of soils for life, as well as the importance of preserving, protecting and recovering soils for life on Earth.

Among the activities developed are the workshop of micromonoliths (April 2018) with first-year students of the degree in agro-alimentary engineering and the Rural environment, and the degree in forestry engineering and the Natural environment of the Universitat Politècnica de València, Organized by the SECS and the ETSIAMN-UPV. In this workshop the students have learned to build monoliths of soils and describe the characteristics of the horizons. Other activities have been the competitions of videos related to the ground (February-May 2018) and that of photographs of clouds. A series of lectures on soil and climate has also been organized, taught by teaching professionals in Edaphology.



An app of soil profiles has been built (December 2017) where the soils located on the map are shown

with the application. It is an APP open to all floor studies where we accept photographs of soils that will be available for use.

Finally in November 2018 will be held the first symposium of educational Innovations in the Teaching of soil science (EDAFO-INNOVA 2018). The purpose of this symposium is to promote both soil knowledge and creativity and the interaction between students. It will be possible to present works related to experimental works, use of the ICT, documentary research works, etc., that show the creativity of the participants when knowing different aspects of the soils.

### **The Educational Challenges in Environmental Degradation**

Martínez, Marta <sup>1</sup>; Santiago, Noemí <sup>1\*</sup>

<sup>1</sup> University of Santiago de Compostela (\* noemisp3@gmail.com )

Student

**Keywords:** environmental education, awareness, resources, companies.

#### **Abstract**

One of the main challenges companies face is developing environmental policies and implementing activities that favor stimulate awareness in various issues in favor of caring for the Earth.

More and more companies consider environmental education as a tool and a service to be offered to society. This is the case of Empresa de Desenvolvimento e Infraestruturas do Alqueva (EDIA) - Development and Infrastructures Enterprise of Alqueva, in Beja, Portugal.

From the Department of Environmental Impact and Patrimony of EDIA, these awareness actions are carried out for children and farmers, through educational resources and guides of good environmental practices in the field.

We worked as interns in the LandCare project in EDIA. Our work consisted in elaborating diverse educational materials related to water resources, biodiversity and the environment in Alentejo's region.

Marta was the first student from the LandCare project to elaborate educational proposals in EDIA on the environment and Noemí continued with that work, contributing between them various educational resources among which is a story, good practice guides, experiments in school or activities playful in nature.

For us, it was a very enriching experience at a professional and personal level. The opportunity to participate in this project contributed to our ability to work as a team, develop scientific and educational materials and belong to a working group.

### **When Teens Meet Toads: Secondary School Students and the Conservation of Amphibians**

Comenale Pinto, Angela <sup>1</sup>; Girani, Alverto <sup>2</sup>; Olivari, Silvia <sup>3</sup>; Perrone, Matteo <sup>4</sup>; Salvidio, Sebastiano <sup>5</sup>; Scarpellini, Patrizio <sup>4</sup>

<sup>1</sup> Istituto di Istruzione Superiore "B. Marsano", Via alla Scuola di Agricoltura 9, I-16167 Genova, Italia; <sup>2</sup> Ente Parco di Portofino, Viale Rainusso 1, I-16138 Santa Margherita Ligure (GE), Italia; <sup>3</sup> Reparto Carabinieri Parco Nazionale Cinque Terre, Via Fegina 34bis, Monterosso al Mare (SP), Italia; <sup>4</sup> Parco Nazionale delle Cinque Terre, Via Discovolo, 19017 Manarola (SP); <sup>5</sup> DISTAV - Università di Genova, Corso Europa 26, 16132 Genova, Italia

Educators

**Keywords:** amphibians, artificial ponds, secondary school, protected areas, Italy.

## Abstract

According to the International Union for Conservation of Nature, amphibians are the most threatened vertebrates on Earth and their populations are decreasing worldwide. Therefore, several conservation projects are implemented to preserve amphibians and in many cases these projects are involving the contribution of volunteers. In this poster we are describing two amphibian conservation projects that were realized in two Italian protected areas. Both projects have as principal actors secondary school students.

These projects are realized along the Mediterranean coast of Liguria, a North-western Italian region. The first project was completed in 2010 in the Regional Park of Portofino by students from the Nautical Institute of Chiavari. The second one, in which students from Marsano Agricultural Institute are involved, is still ongoing in the National Park of Cinque Terre, an renowned UNESCO site. In both cases, the final aim was to create artificial reproductive sites for amphibians. In addition, ecological awareness and scientific understanding of amphibian conservation issues are developed and disseminated in young people.

In both projects secondary students are formed in the classroom or at the University on amphibian ecology and conservation. Then, students assisted by educators, teachers and park staff dig an artificial pond that is dedicated to the conservation of local amphibian populations. Realizing amphibian ponds in Mediterranean regions has a high conservation value, it is cheap and does not need specific funding, just a cooperative attitude of Institutions.



In the figure, from top to bottom and left to right: Students from Marsano Institute attending a University class; Nautical college students digging a pond in Portofino; and Portofino regional park: the amphibian pond.

## Land Conversion and Animal Husbandry: Increasing Anxieties on Soil and Ecosystem Health

Pangga, Gina Villegas <sup>1</sup>; Baquiereza, Cecilia <sup>2</sup>; Pangga, Gladys Maria <sup>3</sup>

<sup>1</sup> Agricultural Systems Institute, College of Agriculture and Food Science, University of the Philippines Los Baños, College, Laguna, 4031 Philippines (gvpangga@up.edu.ph); <sup>2</sup> National Research Council of the Philippines, Taguig, Metro Manila; <sup>3</sup> College of Veterinary Medicine, University of the Philippines Los Baños, College, Laguna, 4031 Philippine

Educators

**Keywords:** soil health, ecosystem health, soil quality, water quality, animal wastes.

### Abstract

In the Philippines, the increasing demand for food, fiber and energy vis-à-vis the declining hectareage of arable lands has been pressuring the agricultural sector to be more productive to meet the demand of the rising population. The objective of this paper is to present an assessment of the contribution of land conversion and animal husbandry on soil and ecosystem health in selected sites in Southern Luzon Philippines. The methodology employed in this study included resource evaluation, physical observations and questionnaire surveys that consisted of open- and close-ended questions on land use and cover changes, animal production and management, and their relation to human population. The questionnaire was administered to each of the municipalities included in the study, and information obtained from the surveys was complemented by interviews with local officials in the relevant departments.

Research findings showed that the quantities of land available for agriculture are declining in all provinces studied. The deterioration of agricultural water quality due to commercial and backyard animal production has been rapidly proceeded by the vast increase in population size accompanied by the development and changes in land use. Environmental contaminants, particularly of soil and water, affected the wellbeing of the ecosystem. Results such as these are brought about by the careless dumping of animal wastes, and by the excessive use of chemical fertilizers and pesticides in agriculture. The study revealed that that there was a rapid increase in agricultural activities to meet the people's demand on terms of quantity and quality improvement of agricultural produce and food diversification. With this demand driven by consumer's perceptions of the quality and safety of these foods, it is important that the government, industry and consumer groups carefully examine issues related organic food quality and safety and implement measures necessary to ensure an appropriate level of consumer protection.

In the figure: a) Poultry houses in Farm A. b) Drainage canal on the side of poultry house polluting the soil and waterways.



## Indigenous and Restorative Farming Technologies for the Improvement of Soil Quality: Learning Experiences with Farmers

Pangga, Gina Villegas <sup>1</sup>

<sup>1</sup>Agricultural Systems Institute, College of Agriculture and Food Science, University of the Philippines Los Baños, College, Laguna, 4031 Philippines (gpangga@yahoo.com ;gvpangga@uplb.edu.ph)

Educator

**Keywords:** Green technology, soil quality, indigenous knowledge, soil fertility.

### Abstract

With the challenge of increasing food production, the management techniques which provide opportunities to increase agricultural productivity, play a vital role in agriculture especially in the Asian countries. The demand for agricultural products is deemed to increase greatly in the coming decades, not only for food, but also for production of alternatives for fossil fuels. Soil degradation is already a widespread phenomenon that troubles food production and depresses agricultural incomes and rural livelihoods. Alternative agricultural practices and the ultimate goal of a long-term sustainable agriculture depend largely on the improvement of soil quality.

A field study was conducted to document eco-friendly farming practices and technologies in the communities of Southern Luzon Philippines. The study aimed to increase the capability of farmers and other stakeholders in solving the constraints on soil productivity that will enhance the sustainability of remaining soil resources.

Research findings showed that there were site-specific restorative technologies that have been practiced by farmers for generations; and indigenous farming technologies that were modified to fit the ecological conditions of a given farm setting. Other green technologies representing successful ways by which people have dealt with poor quality soil were also documented. The learning lifted from the farmers' experiences and the adoption of these best management practices would help to continuously maintain and improve the fertility of the soil for future generation. Results were disseminated to a wider audience of stakeholders through education and information exchange activities.



## Student Network of Ecological Restoration: A Scientific Niche for Young Costa Rican Researchers Interested in Endemic Species Vulnerable to Climate Change

Hernández, Walter <sup>1</sup>; Ocampo, Mery <sup>2</sup>

<sup>1</sup> Student Network of Ecological Restoration (whernadez@uned.ac.cr); <sup>2</sup> Green Footprint Project & Institutional Network of Ecological Restoration. Distance Learning State University, San José, Costa Rica.

Student

**Keywords:** Endemism, climate change, seeds, germination, student researcher.

### Abstract

When I completed my B.Sc. in Natural Resources Management, I hesitated about choosing the subject for the Licentiate's Degree Thesis. I later joined the Student Network of Ecological Restoration of the University, where I had the opportunity to learn of many research projects; after participating in field trips with the founder of the Institutional Network of Ecological Restoration of Universidad Estatal a Distancia (Distance Learning State University) and PhD student at Universidad de Santiago de Compostela, I became interested in the ecology of an endemic shrub called *Erythrochiton gymnanthus* Kallunki.

This beautiful plant is restricted to the understory of four mature secondary forests of the Central Pacific and the Nicoya Peninsula. Previous studies show that it does not tolerate direct sunlight, so preventing its distribution from increasing naturally, without there being a medium canopy to protect it. When analyzing in detail the information available on the species, I identified that an allusion is made on the high production of viable flowers and fruits; however, the presence of cotyledons and seedlings in the soil is very scarce. Due to this observation, I proposed the hypothesis that the loss of viability of the seed can represent a determining element for the conservation of the plant.

As a research student, I am developing a study in Carara National Park, which consists of the analysis of the physical characteristics of fresh seeds of *Erythrochiton* and seeds that have been preserved, by applying laboratory techniques and monitoring the success of germination in situ to check for the recalcitrance of the seeds. This research strengthens the efforts of conservation of the species and of endemism in the country, in general. In addition, it promotes the development of scientific competences among the members of the Student Network of Ecological Restoration, as future environmental leaders of the country.



## Tourism Opportunities along the Berg River - A Journey from Source to Sea

Wagner, Nicole <sup>1\*</sup>; Steyn, Francis <sup>2</sup>

<sup>1</sup> Western Cape Department of Agriculture: Agricultural Economics Services: Resource Economist(nicolew@elsenburg.com); <sup>2</sup> Western Cape Department of Agriculture: Sustainable Resource Management: LandCare Manager Private Bag X1 Stellenbosch, 7607, Western Cape, South Africa

Educator(researcher at government institution)

**Keywords:** Green Economy, Agritourism, Partnerships, Community Employment, Berg River Camino.

### Abstract

The Western Cape Department of Agriculture is committed to clearing alien vegetation along the Berg River and restoring the river to a healthy system that will promote human wellbeing and support ecosystem functions. Opportunities exist to support and multiply the impact of the Department's restoration work when economic opportunities are embedded in sustainable resource management. Therefore, as part a Green Economy project, the Department has identified agri-tourism as an opportunity to bring about a sustainable, positive change in how the resource is managed and appreciated, whilst accelerating job creation across skill levels. A Berg River Camino is a suggested project to serve as an anchor route to which other projects and routes can link to support employability and protect the natural resource.

More than 4 million people are dependent on the River for food production, water supply, and recreation; and the River contributes to over R2 billion/year, supporting more than 18 000 workers. As seen with Camino de Santiago, a Camino offers a range of opportunities to communities, small business and individuals by the potentially thousands of visiting pilgrims. Using an estimate of 200 000 users of the route (and linked activities), spending +/-R5000, the estimated value of a Berg River Camino could amount to R1 billion/year. It is further estimated that for every tourist, 8 people are employed.

Developing the Berg River as a tourist destination is dependent on the successful match of resources, activities and marketing. It is an opportune time for government departments and the private sector to connect on shared interests and find ways to be part of the venture. The Department would like to share experiences in our local context and learn from the experience of Camino de Santiago, as a spiritual route of introspection but also a means to protect our natural resources.



## Macao's Mangroves: From Scientific Research to Environmental Education

Tagulao, Karen Araño <sup>1</sup>

<sup>1</sup> Institute of Science and Environment, University of St. Joseph, Macao SAR China, (karentagulao@usj.edu.mo)

Educator

**Keywords:** mangroves, pollution remediation, awareness, education, Macao.

### Abstract

Mangrove forests are one of the most ecologically valuable and biologically diverse coastal ecosystems in the world. Macao, a coastal city situated on the west shore of the Pearl River in the South of China, is at present home to several species of mangroves with many other associated flora and fauna. Extensive land reclamation and massive urban developments in the area over the past decades have significantly reduced the mangroves area. In 2001, the Macao SAR government established a 50 ha fenced ecological zone in which around 40 ha are mangroves, around 33% decline compared to an estimate published in 1998. This ecological zone plays a very important role in Macao's ecological balance and harbors local biodiversity. However, the remaining mangroves in Macao are still vulnerable to threats due to pressures from developments and human activities in the area.

Our team at the University of St. Joseph in Macao have been conducting scientific investigations on the local mangroves ranging from basic ecology, to their role in pollutants remediation of the coastal waters, with the idea that results from these studies will not only help us understand and better manage this important ecosystem but to also use our findings to support our environmental awareness campaigns. We developed a program called "Bringing Science to Schools in Macao: from Genes to Ecosystems", in which we organized talks and guided field visits to the mangroves for local students from different levels (primary, secondary, university) in order to raise awareness in the community. A mangrove booklet developed from one of the previous projects as well worksheets are being used as materials. Some students have also participated in field sampling activities. We have so far organized this initiative with more than 2000 students and have received very positive feedback, with many schools keen to continue working with us in this program.



## 3.5 DEGRADATION AND RESTORATION OF ENVIRONMENTS: THE VISION OF EDUCATORS

### 3.5.1 Oral Presentations

#### Bringing Soil- and Geo-Sciences to Society from Different Positions during an Academic Career

Mataix-Solera, Jorge <sup>1</sup>

<sup>1</sup> GEA (Grupo de Edafología Ambiental), Departamento de Agroquímica y Medio Ambiente, Universidad Miguel Hernández, Elche, Spain (jorge.mataix@umh.es) SECS (Sociedad Española de la Ciencia del Suelo)

Educator

**Keywords:** forest fires, geomorphology, Mediterranean soils, soil restoration.

#### Abstract

The main objective of this presentation is to show some examples of how from different positions in different periods during an academic career, ways can be found to bring the soil science and geosciences to society and to disseminate the importance of land care for future.

As a researcher I will show our experience of how to transfer part of our knowledge and results to society using some catastrophic wildfire events in the Alicante Province (E Spain), where we have been monitoring study sites for research. During last few years we have been organizing activities with stakeholders in two of our study areas, such as students, volunteers, and/or land managers, and planning the activities according to how the landscape is recovering after the fires and using it as an “open laboratory” in the field.

As a university professor I also had the chance to implement some innovative educational projects; and I will show an on-line tool to learn geomorphology through photography.

And as a member of the directive committee of Spanish Society of Soil Science (SECS), Vicepresident for 4 years and President since 2017 we organize and promote many activities to bring soil science to society. During the presentation some competitions will be shown that we organize for students at different levels (secondary school and university), so later they can participate in academic contests at international meetings such as the World Congress of Soil Science or the Latin American Society of Soil Science Congress.



## The AEET Working Group on Ecological Restoration

Martínez-Ruiz, Carolina <sup>1,2</sup>

<sup>1</sup> Coordinadora del Grupo de Trabajo en Restauración Ecológica de la Asociación Española de Ecología Terrestre (AEET); <sup>2</sup> Área de Ecología (Dpto. Ciencias Agroforestales) e Instituto Universitario en Gestión Forestal Sostenible UVA-INIA. ETSIIAA de Palencia, Universidad de Valladolid. Avda. de Madrid 50, 34071, Palencia (caromar@agro.uva.es)

Educator

**Keywords:** Asociación Española de Ecología Terrestre (AEET), multidisciplinary, broad concept of restoration ecology, SER Europe.

### Abstract

AEET, the *Asociación Española de Ecología Terrestre*, currently with more than 800 members, was founded with the objective to promote and disseminate research on the ecology of terrestrial ecosystems, and to promote responsible application of this knowledge to matters of public ecology. Connecting science and society is AEET's explicit aim. To this end, AEET maintains a comprehensive web page in Spanish and English, and publishes the Spanish "Revista Ecosistemas", an open access, scientific and technical journal of ecology and environment.

AEET currently has ten working groups, of which the working group on Ecological Restoration has been active for one decade now, and became affiliated to SER Europe in 2015. Among its activities is gathering knowledge through the publication of thematic manuals or communications presented in workshops (the next in October 2018) organised in collaboration with other organizations with common interests. Its objective is to encourage the transference or information exchange, technology, methodologies and opportunities between researches and agents of the public administrations and companies in the field of the restoration of degraded natural spaces. On the other hand, the AEET working group on ER shares with SER Europe a broad concept of the ecological restoration, which encompasses all those actions that aim to protect the biodiversity and to increase the provision of ecosystem services, contributing to the welfare of our society.

Although the advances in ecological restoration in Europe and Spain have been notorious, it is necessary to strengthen the collaboration of multidisciplinary teams in the restoration projects. Ecological restoration is a fertile ground, where professionals from different fields can work together around a comprehensive environmental planning, with a clear definition and prioritization of the objectives.

## Learning to Argue about Socioenvironmental Issues through the Practices of Modeling. The Case of Bees

Puig, Blanca <sup>1\*</sup>; Gómez Prado, Borja <sup>1</sup>; Evagorou, María <sup>2</sup>

<sup>1</sup> University of Santiago de Compostela (\* blanca.puig@usc.es); <sup>2</sup> University of Nicosia, Cyprus

Educators

**Keywords:** socioscientific issues, scientific practices, argumentation, modelling, honeybees.

### Abstract

Bee populations over the world are struggling according to scientists, which means that the ecosystems and farmers too. During the last 10 years, beekeepers have been informing that their honeybee populations have been dying off at increasingly rapid rates. This study address an explorative case study related with the controversy of the declining population of honeybees.

We define controversial issues as those on which which society, or scientists are clearly divided and significant groups advocate conflicting explanations or solutions based on alternative values. Teaching socio-scientific issues (SSIs), as the environmental problem of bees, through engaging learners in scientific practices goes beyond implementing a new curriculum. It requires a pedagogical shift from a traditional, content-based, and value-free instruction approach to a sociocultural approach that views science as a community practice, and the students as active participants in decision-making processes.

This design case describes the development of a teaching unit, which aims to prepare primary pre-service teachers to address SSIs through students' enactment in the scientific practices. The unit engages the participants in the practice of modeling for explaining and arguing about the causes, consequences and possible solutions related with the problem of the bees. We aim to illustrate how to address the intersections between science, environment and society and to promote scientific practices in science learning and teaching.

## FLUVIO: A Breaking-Through International Training Doctoral Program to Restore Rivers and Riverscapes

Ferreira, Teresa <sup>1\*</sup>; Garcia de Jalon, D. <sup>2</sup>; Winkler, G. <sup>3</sup>; Luz, L. <sup>4</sup>; Egger, G. <sup>5</sup>; Katopodis, C. <sup>6</sup>, Pinheiro, A. <sup>1</sup>

<sup>1</sup> Universidade de Lisboa; <sup>2</sup> Universidad Politécnica de Madrid; <sup>3</sup> University of Natural Resources and Life Sciences of Vienna; <sup>4</sup> Universidade da Bahia; <sup>5</sup> Nature Consult ofg Klagenfurt; <sup>6</sup> Katopodis Ecohydraulics (\* terferreira@isa.ulisboa.pt)

Educators

**Keywords:** River ecosystems, river management and rehabilitation, ecological restoration, environmental education, higher education .

### Abstract

FLUVIO is an international PhD program sponsored by the Portuguese Foundation for Science and Technology, that started in 2012. FLUVIO aims the development and the application of scientific knowledge of environmental sciences, ecology, engineering and urbanism to management and restoration of the fluvial ecosystems, at different spatial scales, from the microhabitat to the river reaches and the drainage basin. Thus it aims to contribute to the sustainable development of human societies and the conservation of natural resources. FLUVIO strengths include multidisciplinary advanced education,

applied training in private companies and Scientific cutting-edge PhD thesis. The students have a first year of training and upgrading, in Lisbon and in the other institutions of the consortium. Each two years, a cohort of eight students is recruited internationally. The assigned scholarships are mixed, i.e, up to half of the scholarship period will be developed in the foreign institutions that are part of the Doctoral Program consortium: Polytechnic University of Madrid (Spain), Federal University of Bahia (Brazil), Katopodis Ecohydraulics (Canada), Boku University of Natural Resources and Life Sciences, Vienna (Austria) and Klagenfurt Environmental Consultants/Nature consult Egger (Austria), or other foreign institutions, if necessary. Each PhD student has an international scientific council for supervision. Among the subjects that are being developed in the moment, there is a special emphasis on topics related to Ecohydraulics and ecohydrology, including; environmental flows (habitat suitability, modelling, etc.), efficient fish passes, restoration of riverine dynamics and functions (vegetation and fish habitat patterns and predictive modelling), barrier removal and its effects, management and sustainable use of rivers (modelling future quality under global climate changes, past and present of fish distributions), and abiotic and ecological monitoring (of diatoms, macrophytes, macroinvertebrates and fish). There are two PhD cohorts in progress (photos) and another being recruited.



### 3.5.2 Poster Session

#### Ecological Restoration in Mexico: Efforts and Perspectives

Campo, Julio <sup>1</sup>

<sup>1</sup> Instituto de Ecología, Universidad Nacional Autónoma de México, 14250, Mexico City, Mexico (email [jcampo@ecologia.unam.mx](mailto:jcampo@ecologia.unam.mx))

Educator

**Keywords:** Active-learning, videos, laboratory analyses, field work experiences.

#### Abstract

Ecological restoration has become an important strategy to conserve biodiversity and ecosystems services. To restore 15% of degraded ecosystems as stipulated by the Convention on *Biological Diversity* *Aichi* target 15, a prioritization framework to identify potential priority sites for restoration in Mexico, a megadiverse country, was used (Tobón et al., 2017). The exercise allowed identify the priority restoration sites distributed across terrestrial ecosystems of Mexico. This spatial prioritization was the first step for informing policy makers and restoration planners where to focus local and large-scale restoration efforts.

On the other hand, a set of selected sites for monitoring the success of restoration practices could be used as field laboratory for education and training of professionals. Moreover, these monitoring sites could be also used to distinguish ecosystem responses to changes in the intensity of climate events from those associated to trends in the climate.

**Acknowledgements:** Julio Campo is grateful to the PASPA-DGAPA Program of Universidad Nacional Autónoma de México for the research support provided during a sabbatical year at the Universidad de Santiago Compostela, Spain.

### **The Territorial Delegation of the Spanish Soil Society in Galicia (NW Spain): Educational Activities**

Díaz-Raviña, Montserrat <sup>1</sup>; Arias Estévez, Manuel <sup>2</sup>; Barral Silva, María Teresa <sup>3</sup>

<sup>1</sup> Bioquímica del Suelo, Instituto de Investigaciones Agrobiológicas de Galicia (IIAG-CSIC), Apartado 122. 15780 Santiago de Compostela, Spain (mdiazr@iiag.csic.es); <sup>2</sup> Departamento de Biología Vexetal e Ciencia do Solo, Facultad de Ciencias de Ourense, Universidad de Vigo, Ourense, Spain; <sup>3</sup> Departamento de Edafología y Química Agrícola, Facultad de Farmacia, Universidad de Santiago de Compostela, Spain

Educators

**Keywords:** didactic resources, conferences, exhibitions and events, field trips, innovative activities.

#### **Abstract**

The Spanish Society of Soil Science ([www.secs.com.es](http://www.secs.com.es)) was founded in 1947 by the Spanish National Research Council (CSIC) with the main objective of promoting the study and knowledge of Soil Science. The Territorial Delegation of Spanish Soil Society in Galicia (SECS-Galicia) was founded in 2009 with the aim to bring the Soil Spanish Society to the territory, to promote collaboration and interaction among all the community members and to try to carry out, among all, different activities that serve to raise awareness among all the sectors of Galician Society on the importance of soil and the need for its protection. Different types of activities are carried out, among which the educational programs stand out and cooperation agreements are established with the different Educational Centers and the Administration of the Xunta de Galicia. This allows the soil to be known among students of different educational levels (Primary and Secondary Education School, University) through the use of different innovative teaching resources that facilitate the work of teachers and, above all, serve to stimulate, in an attractive way, the knowledge of this non-renewable natural resource among students.

In this contribution we will show some examples of recent projects and activities developed by The Territorial Delegation of Spanish Soil Society in Galicia such as: annual activity for members of this association (teachers, researchers and students) concerning different aspects of soil science which can be of interest for Galician Society, including conferences imparted by specialists or field trips to different areas in order to show different soil profiles, their characteristics, the impact of different perturbations and the restoration of degraded areas; the comic "*Living in the Soil*" and its corresponding "*Lesson Plan*" in different languages (Galician, Spanish, English, Italian and Catalan); "*The game of soil*"; different exhibitions and expositions for example "*Soil:Art Painting with soils. Pictures of José Caballo*", conferences in different Institutions or Education Centers; the Facebook "*Falando de solos-SECS Galicia*"; visits to the "Permanent Soil Room" in the Natural History Museum of the Santiago University; organization of different events to commemorate *5th December Mundial Day of Soil, 2015 International year of Soil* as well as *2015-2024 International Decade of Soils*, among others.

## Degraded Land Rehabilitation Experience in the Republic of Rwanda

Fernández-Marcos, María Luisa <sup>1</sup>; Ferreira, Timoteo Caetano <sup>2</sup>

<sup>1</sup> University of Santiago de Compostela, Dep. Soil Science & Agricultural Chemistry, Escuela Politécnica Superior de Ingeniería, 27002 Lugo, Spain (mluisa.fernandez@usc.es); <sup>2</sup> Climate Change Adaptation Specialist

Educators

**Keywords:** land rehabilitation, radical terraces, soil erosion control, watershed management, Karago Lake.

### Abstract

Rwanda is a small country in Eastern Africa, mountainous, landlocked, with a total area of 26,339 km<sup>2</sup>. Known as "the country of a thousand hills", a high percentage of its surface presents steep slopes, particularly in the North and West of the country. The population density is the highest in East Africa and presents an increasing trend in recent years. The hilly topography makes the country particularly vulnerable to erosion and soil degradation processes. The fragile landscapes of Rwanda have suffered severe degradation processes over time, which have affected the quality of livelihoods and the economy of rural communities and, consequently, of the entire country. The vulnerability of the physical environment has been exacerbated by population movements associated with conflict and war as well as by climate change. The population pressure on mountainous areas, deforestation and cultivation of sloping land have led to increasing levels of land degradation and declining agricultural yields along with runoff and siltation into watercourses.

This communication focuses on a case study, within the project "Reducing Vulnerability to Climate Change by Establishing Early Warning and Disaster Preparedness Systems and Support for Integrated Watershed Management in Flood Prone Areas", funded by the GEF (Global Environment Facility) and carried out between 2010 and 2015. Steep degraded lands in the Gishwati ecosystem, in the Western Province of Rwanda, were rehabilitated by constructing radical terraces and promoting agroforestry and reforestation. The rehabilitation of lands resulted in the protection of the Nyabarongo and Sebeya rivers and their watersheds. A notable improvement in the quality of the waters of these rivers and Lake Karago, with a significant reduction of suspended materials, was achieved. Within the project, documentaries were made with concrete innovative activities, as an effective mechanism for demonstration and transfer of knowledge and good practices to stakeholders and to the general public. The use of these documentaries as didactic material for teaching techniques of rehabilitation of degraded lands in University education is proposed.

## Experiences in Research & Post-Graduated Education in Latin-America

Gallardo, Juan F. <sup>1</sup>; González, M. Isabel M. <sup>2</sup>

<sup>1</sup> C.S.I.C., Ex-Prof. & Senior Researcher, Salamanca, Spain (juanf.gallardo@gmail.com); <sup>2</sup> University of Salamanca, Environment Faculty, Area of Soil Science & Agriculture Chemistry, Salamanca 37080 (Spain) (mimg@usal.es)

Educators

**Keywords:** Soil Science, Environmental Biogeochemistry, Agronomy, Bio-elements Cycles, Forest Ecology, Soil Organic Matter, Carbon Sequestration.

### Abstract

Latin-America is a group of countries with different human and geographical realities, i.e., a melting pot of cultures with their own identity and the inheritances, beside the Iberian culture, the common link being only the language. Their educational levels, natural resources, vicinity or interests of the leading countries, etc. have originated unequal progresses in each country; for that, huge differences between scientific conditions of them are found. Then, a similar pattern of scientific and educational cooperation cannot be established, neither for planning as destination for working temporarily or definitively. Accordingly, a simple guideline for that is not possible to indicate, since the situation in Latin America is very variable, in special because the conditions in these countries change very fast.

For example, in universities called 'blackboard', conducted by private funds, is not frequent to find Ph. Dr.; other ones prefer engineers, better than doctors, as teachers; only a few of them, considered as 'University of excellence' according international rankings, have several Nobel prizes (e. g., UBA in Argentina or UNAM in Mexico) can be compared with the best ones. Then, scientific cooperation must be adapted in each case (objectives, level of training or research, university, country, etc.). In some countries there is a strong demand for Ph. Dr. (Chile or Ecuador), while in other ones "senior researchers" are desirable for reinforcing high-qualified scientific groups (Argentina, Chile, Mexico, etc.) and, in this way, obtaining funds for international cooperation programmes.

A review of the Latin-America international cooperation, based in our personal experience (subsequently to multiple and recurrent stays in these countries: Argentina, Chile, Colombia, Cuba, Ecuador, or Mexico; short stays in others), is made, exposing achievements obtained in Soil Science, Environmental Biochemistry, Agronomy, Forest Ecology, etc.



## Testing the Short-Term Hydroseeding Effect on Plant Diversity after Mining Restoration

Martínez-Ruiz, Carolina <sup>1\*</sup>; López-Marcos, Daphne <sup>1</sup>; Fernández-Santos, Belén <sup>2</sup>

<sup>1</sup> Área de Ecología, Dpto. Ciencias Agroforestales) e Instituto Universitario en Gestión Forestal Sostenible UVa-INIA. ETSIIAA de Palencia, Universidad de Valladolid. Avda. de Madrid 50, 34071, Palencia

(\* caromar@agro.uva.es); Área de Ecología, Facultad de Biología, Universidad de Salamanca

Educators

**Keywords:** aspect, natural and man-induced revegetation, semi-arid Mediterranean climate, Shannon diversity index, uranium-mining wastes.

### Abstract

Under semi-arid Mediterranean conditions in Spain, soil stabilization on mining wastes is often achieved by using the hydroseeding of commercial mixtures of non-native seeds. However, the behaviour of these species in providing rapid vegetation cover of exposed substrate in a regime of scarce and markedly seasonal rainfall, and their performance when interacting with colonising species invading from nearby are still poorly understood. Frequently, the prevalence of soil protection criteria in the rehabilitation works is opposed to the target of plant diversity conservation. The hydroseeding technique, which involves spraying a homogeneous slurry of seed, fertilizer, binder and mulch from a high-pressure hose, represents a specialized and costly technique that often contribute to the biodiversity decline whether introduced species became invasive. However, the failure of a high percentage of non-native hydroseeded species under very special habitat conditions, and the high capacity of species from surrounding plant communities to displace the initial vegetation, thanks to the initial amelioration (fertility, moisture), allow numerous species to establish and coexist (high richness and evenness values), improving natural colonisation and, consequently, increasing plant diversity.

Using data from Martínez-Ruiz et al. (2007), students compare natural and man-induced plant community development on uranium waste dumps two years after rehabilitation. The purpose of the practice is to check whether the application of hydroseeding influences the Shannon diversity of the plant community and how (i.e. whether it increases or decreases it), and which of the two components of diversity, richness or evenness, contributes more to the differences of diversity. Students have information on the seeds mixture of hydroseeding, the species found two years later, and other characteristics of hydroseeding (fertilizers, water). They should reflect on the success of hydroseeding in the study area, in terms of increasing diversity, and other alternative options to achieve that goal.

Martínez-Ruiz C, Fernández-Santos B, Fernández-Gómez MJ, Putwain PD (2007). Natural and man-induced revegetation on mining wastes: changes in the floristic composition at early succession. *Ecological Engineering* 30(3): 286-294.

## Innovative Soil Strategies for Addressing Knowledge Gaps and Enhancing Training Capabilities in Post-Mining Restoration

Muñoz-Rojas, Miriam<sup>1,2,3\*</sup>; Bateman, Amber<sup>1,2</sup>; Erickson, Todd E.<sup>1,2</sup>; Chua, Melissa<sup>1</sup>; Merritt, David J.<sup>1,2</sup>

<sup>1</sup> University of Western Australia, School of Biological Sciences, Crawley, 6009, WA, Australia (\* miriam.munoz-rojas@uwa.edu.au); <sup>2</sup> Kings Park Science, Department of Biodiversity, Conservation and Attractions, Kings Park, Perth 6005, WA, Australia; <sup>3</sup> University of New South Wales, School of Biological, Earth & Environmental Sciences, Sydney, 2052, NSW, Australia

Educators

**Keywords:** large-scale restoration, arid and semi-arid lands, direct-seeding, controlled environmental facility, Australian ecosystems.

### Abstract

Global environmental changes and other anthropogenic impacts are rapidly transforming the structure and functioning of ecosystems worldwide. These changes are leading to land degradation with an estimated 25% of the global land surface being affected. In the resource-rich biodiverse semi-arid Pilbara region of Western Australia hundreds of thousands of hectares are disturbed due to established and emerging iron-ore mine operations. The need to develop cost-effective large-scale solutions to restore these landscapes becomes imperative to preserve biodiversity and achieve functionality and sustainability of these ecosystems. The Restoration Seedbank Initiative (RSB) is a five-year multidisciplinary research project that aims to build knowledge, increase training capabilities and skills, and design strategies to restore mine-impacted landscapes in the Pilbara and other arid and semi-arid landscapes worldwide. Within the soil program of the RSB, a series of glasshouse studies and field trials have been conducted in the last five years to advance our knowledge on soil limitations and to provide solutions to effectively overcome these challenges in arid and semi-arid ecosystem restoration. These studies include (i) the analysis of the influence of climate and edaphic factors in the recruitment of arid zone seedlings and (ii) the evaluation of soil physicochemical and microbiological indicators to assess functionality of restored soils in degraded semiarid ecosystems and (ii) the development of nature-based strategies based on bio-tools to enhance soil functionality. Here, we summarize our latest results and propose recommendations for integrating soil science in cost-effective landscape-scale restoration practices in ecosystems worldwide.



## The Educational Activities of the Galician Institute of Agrobiological Research (IIAG)

Sánchez, Conchi <sup>1\*</sup>; Díaz-Raviña, Montserrat <sup>1</sup>; González-Prieto, Serafín <sup>1</sup>; Kidd, Petra <sup>1</sup>; Prieto, Angeles <sup>1</sup>; Vidal, Nieves <sup>1</sup>; Trasar-Cepeda, Carmen <sup>1</sup>

<sup>1</sup> Instituto de Investigaciones Agrobiológicas de Galicia (IIAG-CSIC), Apartado 122. Avda. Vigo s/n, 15780 Santiago de Compostela, Spain (\* direccion.iiag@csic.es)

Educators

**Keywords:** biodiversity, climate change, forest conservation, open days, workshops.

### Abstract

The Galician Institute of Agrobiological Research belongs to The Spanish National Research Council (CSIC), the largest public institution dedicated to research in Spain. The IIAG is located in Santiago de Compostela and composed of two departments, Plant Physiology and Soil Biochemistry. The IIAG research lines are focused on Forest Biotechnology (Plant Physiology Department) and Sustainable management, conservation and recovery of soils in temperate-humid zones (Soil Biochemistry Department). Besides their research activities, the IIAG is actively involved in outreach and dissemination activities with three main objectives: i) to show how human influence alters terrestrial ecosystems, ii) to highlight the role of science in forest management, preservation of plant biodiversity, soil management, conservation and restoration, and iii) to stimulate vocational interest in scientific careers. The most relevant activities of the IIAG are:

- “Biodiversión” which was initiated in 2009 and funded by the FECYT during several years. The activity consists in scientific workshops for primary school students (aged 11-12 years) who perform different experiments within the IIAG labs. Four different workshops are developed at the IIAG to show the research carried out at the Institution through the activities entitled "DNA extraction", "Building a volcano" "In vitro culture of woody species", "Climate change: carbon cycle. Tracking the CO<sub>2</sub>" and "Germination and root elongation assays". Furthermore, the IIAG personnel carried out the same activities in rural schools.
- "Drawing and writing competitions" associated with the "Biodiversión" activities. Students are invited to make a draw or write a story about their thoughts and opinions after carrying out the practical activities.
- Open Days at the IIAG and guided visits for students from high schools, technical colleges and Universities. IIAG researchers give presentations to the visiting students about their research lines and explain the importance of research for developing practical approaches to maintaining the integrity of ecosystems.

## Designing Your Own Experiment on Fire Effects on Soils

Santin, Cristina <sup>1\*</sup>; Fernández, Susana <sup>2</sup>; Doerr, Stefan <sup>1</sup>

<sup>1</sup> College of Science, Swansea University, Swansea, United Kingdom (\* c.santin@swansea.ac.uk); <sup>2</sup> Department of Geology, University of Oviedo, Oviedo, Spain

Educators

**Keywords:** practical, wildfire, litter, water repellency, scientific method.

### Abstract

Soils are among the most valuable non-renewable resources and wildfires can have substantial impacts on them. One of the most studied impacts of fire on soils is the changes in soil water repellency or, in other words, the ability of the soil to absorb water. It has been extensively researched that, in some cases, the increase of water repellency due to fire can result into the enhancement of soil loss via post-fire water erosion.

Here we propose a practical experience for the students to design their own experiment and to evaluate first-hand how fire affects soil water repellency. It is a relatively simple experiment that can be performed with very basic infrastructure and materials and can be adapted to be carried by students across a range of educational levels, from high school to master levels. The basic idea is that the students are the ones leading the practical right from the beginning. They collect the soils and the vegetation litter that they want to study, they come up with their own research hypotheses and design, and they make their own (small-scale) experimental fire. They find out, at the end, if their assumptions were right or not and they discuss the limitations of their experimental setting and ideas for future improvement.

After carrying out this practical with Masters and level-two undergraduate students for several years, both in Spain and UK, we find that it is not only an excellent way for the students to observe first-hand fire impact on soils, but it is also a good opportunity for them to take the lead on designing their own experiment and experience the challenges and wonders of implementing the Scientific Method.

## Master Management of Outdoor Educational Activities

Otero Urtaza, Eugenio <sup>1</sup>

<sup>1</sup> University of Santiago de Compostela (otero.urtaza@usc.es)

Educators

**Keywords:** Outdoor Education, Experiential Learning, Hiking in Nature, Educational landscapes, Nature-Deficit Disorder.

### Abstract

The landscape and the natural environment present syntheses help to understand very complex realities in daily life. No doubt the city educates, because in it there is a cultural framework that offers anyone a set of options that can satisfy their vital needs, but nature educates in what the city does not do. In particular, the contact with nature presents a world of emotions that make up the "higher reason" of the person, because in consciousness there is a "experience of meaning" that is expressed strenuously when people have to explain to themselves their own existence. Living is not lazy in a medium that is always favorable and comfortable. People have to face dangers and sufferings that we must overcome on a day-to-day basis. Trust in civilization does not guarantee perpetual prosperity for itself.

The exhaustion of resources, the uncontrolled consumption of energy, the greenhouse effect and all the major environmental problems that were already denounced by the Club of Rome in 1968, are today more present in the conscience of citizens, who have seen the growth of cities and its corollary of cement, asphalt and brick, in a vortex that opposes abandoned and dirty neighborhoods, to ruined houses and factories, to a poverty that emerges in prosperous cities. The bad living of the city is a consequence of the abandonment of the countryside, of a rural life that stopped having its own springs before the advance of a machinism that destroyed its thousand-year-old wisdom.

The purpose of this master's degree is to train educators to deal with these problems and know how to manage them, providing answers to the absence of nature in people's lives, promoting outdoor education as a central axis of experiential learning.



## **The Application of Sewage Sludge for Soil Remediation: The Educational Possibilities of Young Soil Scientists**

Collins Ogutu, Miruka <sup>1</sup>

<sup>1</sup> Sol Plaatje University, Kimberley, South Africa

Educators

**Keywords:** Soil Pollution, Sewage Management, Soil Remediation, South Africa.

### **Abstract**

In the recent past, there have been frequent reports of fires breaking out at Homevale Wastewater Treatment Plant (HWWTP) sewage storage ponds. One such fire incident lasted just over a month. There were confusing reports as to whether the sludge ponds self-ignited or the combustion was caused by veld fires. Effects of continuous smoke from smoldering sludge around nearby houses made for very uncomfortable living quarters. There is also a chance that even the municipal workers who were handling the sludge at this stage may have been exposed to health risks as this is not part of their usual routines.

I am a trained civil engineer with post graduate degrees in Management Sciences. Presently, I am employed as Professor and Head of the School of Economic and Management Sciences at Sol Plaatje University in Kimberley South Africa. I obtained permission from the local municipality, Sol Plaatje, to undertake the research to provide information that would be useful in providing solutions around the issues of handling, storage, and environmental impact of the sludge ponds.

What I have learnt so far is that the HWWTP was designed without an appropriate sludge management option. Ideally, the dried sludge could have been incinerated or prepared for agricultural use rather than

just disposed of as landfill which is the least desirable option according to the extant literature on sewage management. I am now working with the management to explore ways of processing the dried sewage sludge for soil remediation given the poor state of natural soils in the Northern Cape Province. This proposal has been received favorably and I would like to share with you my experience in the project given its potential for replicability across the African continent where similar plants are the norm.



Figure: Municipal workers containing sludge fire at Homevale

## Water Movement and Potential Conductivity in the Root Zone of Agricultural Soils

Abdelmonem Mohamed Amer <sup>1</sup>

<sup>1</sup> Soil Science Dept., Faculty of Agriculture, Menoufia University, 32511 Shebin EI-Kom, Egypt.  
(amer\_abdel@hotmail.com)

Educator

**Keywords:** moisture conductivity, diffusivity, conductivity potential, soil pores.

### Abstract

The unsaturated condition of soil water is a major state in nature after irrigation process or rain fall. The effects of the unsaturated flow of water on minimizing the moisture gradients within the root zone are worthy of further investigation for agricultural processes and land care. The drainable and capillary pores are the main factors that affect water movement from a wet point to a dry one depending on moisture gradients. The vertical and lateral flow of water by gravitational forces occur through the large, non-capillary drainable soil pores, while redistribution and upward movement of water occur through capillary soil pores. The ability of pores to conduct water is controlled by soil pore volume, size, shape, type, continuity, and distribution in soil. The soil pore sizes could be classified into non-capillary pores, coarse capillary pores and fine capillary pores (FCP). The non-capillary pores represent the volume of the large pores or rapidly drainable pores (RDP), while the coarse capillary pores (CCP) represent the slowly drainable pores (SDP) and water holding pores (WHP). The pressure head that is corresponding to the cutoff between capillary and non-capillary pores could be specified as  $h=10$  kPa. Quantifying unsaturated water flow into soil pores requires knowledge of hydraulic conductivity  $K(\theta)$  and soil water retention  $h(\theta)$ . It would be advantageous to estimate unsaturated conductivity function from the retention curve without the need for any further measurements.

The aim of this study was to propose equations to predict soil water movement parameters such as unsaturated hydraulic conductivity  $K(\theta)$  [ $LT^{-1}$ ], water diffusivity  $D(\theta)$  [ $L^2T^{-1}$ ] and intrinsic permeability,  $k$  [ $L^2$ ] in plant-root zone. Three agricultural (alluvial clay) soils located at middle and northern Nile Delta were used to apply the assumed equations. Two soils were planted with cotton yield during 2015 season and the third was uncultivated. The soil profiles were different in their salinity, clay % and source of irrigation water. The equations which assumed to predict soil water movement parameters considered only the matric potential as a driving force in capillary pores, and gravitational potential that is critical for the large, non-capillary pores. New equation for predicting so called potential conductivity of soil pores  $K_p(\theta)$  [ $ML^{-1}T^{-3}$ ] (erg.  $cm^{-3}.sec^{-1}$  or joule.  $m^{-3} sec^{-1}$ ) was derived in vadose zone. Data of pore size distribution were obtained for the investigated soil profiles using water retention data. The calculated  $K(\theta)$ ,  $D(\theta)$  and  $k$  values were conformable to the common measured ranges, indicating the applicability of the proposed equations for predicting water movement parameters in clay soils.

### 3.6 DEGRADATION AND RESTORATION OF ENVIRONMENTS: SOCIETY ENGAGEMENT

#### 3.6.1 Oral Presentations

##### Service-Learning and Social Responsibility of the University: "*Plantando Cara ao Lume*"

Santos Rego, Miguel A.<sup>1</sup>; Lorenzo Moledo, Mar<sup>1</sup>; Mella Núñez, Ígor<sup>1\*</sup>

<sup>1</sup> Research Group ESCULCA – University of Santiago de Compostela (\* igor.mella@usc.es)

**Keywords:** Service-Learning, University, Innovation, Social Capital, Methodology, Civic Responsibility..

#### Abstract

Service-Learning (SL) at university level is understood as an educational action in which students, after identifying a need in the nearby community, perform a service which allows them to improve their theoretical knowledge, and optimize their degree of civic-social responsibility.

Considering such an understanding of the SL, a research project has been set up under the auspices of the University of Santiago de Compostela, in collaboration with five other Spanish universities. The goal of this project is to evaluate the effectiveness of such methodology, looking for improving students' learning, and their civic and social competences.

To this end, a training-action strategy has been developed with the teaching staff, which favored the assessment of 18 Service-Learning projects implemented in big areas of knowledge (academic year 2016-2017): 1 in Humanities, 2 in Technology, 3 in Health Sciences, and 13 in Social and Legal Sciences; 32 teachers, 996 students, and 19 community partners had a degree of involvement in this strategy. In the 2017-2018 academic year, 21 projects are currently underway, out of which 8 are new proposals, which we consider a magnificent indicator of the quality of the action developed.

Among these projects, defined as good practices of SL, there is *Plantando cara ao Lume*, which started as an initiative linked to two subjects of different academic degrees. This is currently an interdisciplinary project, which has led to new channels of action, including certain partnerships with the Regional Government, aimed at training and raising the public awareness against fires in the Galician mountains.

Specifically, this paper specifies the reasons that justify the fact that the *Plantando cara ao Lume* project can be defined as a good SL practice, following the criteria established by UNESCO, and can, consequently, be generalized to other contexts.

Our conclusion is that these types of projects are those which optimize students' learning processes, in addition to improving their social competences and civic skills. This is how the University could support a solid development of its third mission, linking it to innovation, entrepreneurship and social responsibility.

## Collaborative NGO-Academic Teaching Experience in Landcare for Native Vegetation Conservation

Rodríguez González P.M. <sup>1\*</sup>; Caldeira, M.C. <sup>1</sup>; Peixoto, R.P. <sup>2</sup>; Ferreira, M.T. <sup>1</sup>; Gomes Marques, I. <sup>1</sup>; Costa, J.C. <sup>3</sup>

<sup>1</sup> Centro de Estudos Florestais (\* patri@isa.ulisboa.pt), Instituto Superior de Agronomia, Universidade de Lisboa; <sup>2</sup> Corpo Nacional de Escutas; <sup>3</sup> LEAF, Instituto Superior de Agronomia, Universidade de Lisboa, Portugal

Educator

**Keywords:** case-based teaching, ecological restoration, environmental education, higher education, Mediterranean upland and riparian forest, scouting.

### Abstract

Education for ecological restoration within current environmental threats is such a broad endeavour that it requires the full involvement of different educational organizations and civil society while exposing students to real-world problems. In Natural sciences, case-based teaching enables students to develop skills in analytical thinking and reflective judgment by reading and discussing complex, real-life scenarios.

Management and Conservation of Vegetation and Agro-forestry systems is an optative discipline available for several Master Programmes currently taught at Instituto Superior de Agronomia, University of Lisbon (ISA/ULisboa), including a joint Programme between ULisboa and UEvora (Management of Natural Resources), the International Master Erasmus Mundus MEDFOR (Mediterranean Forestry and Natural Resources Management), and several ISA MSc (Forestry and Natural Resources Engineering, Biology, Environmental Engineering).

In the academic year 2017/2018 (with 32 students and 11 nationalities), the teachers of the discipline launched a collaborative experience with the Portuguese Scouts NGO Corpo Nacional de Escutas (CNE) by developing a case-based teaching approach and by contributing to the nature-based environmental education of children and public awareness mission of CNE.



The case-study involved the characterization and assessment of Mediterranean riparian and upland forest ecosystems in CEADA, a 5ha land property of CNE located within Arrabida Natural Park as a basis to outline demonstrative conservation/restoration measures used to develop environmental education practices by CNE. The student activities were implemented through team-work in groups blended by their complementary academic background, favouring mixture of student geographic origins and gender balanced. The educational approach comprised 1) identification of the study problem and discussion of goals through interaction of students and educators with CNE; 2) learning of general principles of

ecological restoration and scientific tools while applied to the case study; 3) a team-of-teams field sampling to characterize plant communities degradation across areas subject to different pressure intensity within the CEADA; 4) collaborative online database creation and data analysis; 5) elaboration of proposals, publicly presented as posters; 6) the assessment of outputs for management and environmental education jointly with students, educators and CNE; 7) the incorporation of proposals for environmental education activities in CEADA.

### **Soil and Water Bioengineering in the Mediterranean Area: The Ecomed Project**

Sangalli, Paola <sup>1\*</sup>; García, Jose Luis <sup>2</sup>; Tardío, Guillermo <sup>1</sup>, Giménez, Martín

<sup>1</sup> Sangalli Coronel y Asociados (<sup>1\*</sup> sangalli@sangallipaisaje.com); <sup>2</sup> Polytechnic University of Madrid

**Keywords:** ecological restoration, Mediterranean ecoregion, Erasmus +, training courses.

#### **Abstract**

The ECOMED project aims at supporting and promoting the specialization level of the Soil and Water Bioengineering sector in the Mediterranean ecoregion **Soil and Water Bioengineering:** is a discipline than combines technology with biology, making use of native plants and plant communities as construction material for protecting soil and and contribute to restore degraded environments. The Mediterranean particularities are related to the aridity of the climate and the selection of both plant material and planting techniques. The aim of this project is to generate a sector-specific theoretical and practical syllabus essential for the specialization process of the Mediterranean Soil and Water Bioengineering sector.

Also, to jointly develop a long-term interaction scheme among the stakeholders of the Soil and Water Bioengineering sector and to deliver a training courses programme technology enhanced in "Soil and Water Bioengineering, in Mediterranean Environment".



The Ecomed project is co-funded by the Erasmus+ project of the European Union and the project consortium includes academic entities and enterprises from 8 different countries (Italy, France, FYROM, Greece, Portugal, Spain, Turkey and United Kingdom). The use of the accumulated experience within the sector is a featured element into the sector specialisation process strategy. This strategy can be articulated from different perspectives:

- By analysing the sector current needs, strengths, weaknesses and opportunities.

- By analysing existing soil and water bioengineering works.
- By improving the existing design routines and protocols.
- By reinforcing the sector by a know-how transfer strategy (generation of new interactional schemes and dynamics within the sector).
- By generating an improved syllabus and sector specific training modules.
- By generating an improved syllabus and sector specific training modules.

In this presentation we will show part of the conclusions of the Ecomed Project, specially the conclusions about the training and the formation in this discipline, a tool for restore degraded lands.

## **Education in Nature and Eco-Therapy as Guides as Refugee Education**

Fugate, Colleen <sup>1</sup>

<sup>1</sup> University of Santiago de Compostela (colleensfugate1@gmail.com)

Student

**Keywords:** refugees, outdoor education, eco-therapy, resilience, empowerment.

### **Abstract**

As of December 2015, according to UN data, the global number of refugees, asylum-seekers and internally displaced people topped 65 million, the highest in recorded history (UNHCR, 2016). Of those individuals, upwards of 15 million of them are children (UNICEF, 2014). During this forced migration process, children are especially harmed. Not only are they faced with the trauma of violence and leaving their homes, but they are also often deprived an education. With the average armed conflict lasting 17 years, many children spend their entire youth engulfed in the chaos of war, interrupting or preventing access to formal education (Dryden-Peterson, 2015).

It is clear that more attention, resources and energy need to be placed not only on the refugee crisis as a whole, but specifically on refugee education. This paper explores the potential of outdoor education and eco-therapy to address some of the specific educational needs faced by refugees. These approaches have been shown to provide positive outcomes in youth dealing with trauma and mental health disorders (Ungar, Dumond, & Mcdonald, 2005), yet there is little discussion in the literature of how these approaches could benefit refugees. In this paper, I explore the potential of outdoor education and eco-therapy as ways to foster a sense of belonging, place, resilience, reconciliation and empowerment among refugees.

In order to do this, I draw upon literature and first-hand experience working with refugees as part of a one-month LandCare internship on the island of Samos, Greece. During this experience, I helped design, implement, and evaluate an outdoor education project with a group of refugee youth. Through combining academic literature and experiential knowledge, my goal for this paper is to highlight the potential that outdoor education has for refugee youth.

### **References:**

Dryden-Peterson, S. (2015). *The Educational Experiences of Refugee Children in Countries of First Asylum*. Migration Policy Institute.

Ungar, M., Dumond, C., & Mcdonald, W. (2005) Risk, resilience and outdoor programmes for at-risk children. *Journal of Social Work*, 5(3), 319-338.

United Nations Children's Fund (UNICEF), "15 million children caught up in major conflicts" (press release: December 8, 2014). [https://www.unicef.org/media/media\\_78058.html](https://www.unicef.org/media/media_78058.html)

United Nations High Commissioner for Refugees (UNHCR). (2016). "Global Trends: Forced Displacement in 2015". Retrieved at: <http://www.unhcr.org/576408cd7.pdf>

## Natura Observa: An Environmental Volunteer Program in Sintra-Cascais Natural Park

Marau, Rita <sup>1</sup>

<sup>1</sup> Environmental Engineer, Natura Observa Coordinator, Cascais, Portugal (rita\_marau@hotmail.com)

Educator

**Keywords:** Environmental education, Nature conservation, Volunteering, Sintra-Cascais Natural Park.

### Abstract

Cascais City Council (Cascais, Portugal) develops a volunteer program in the field of environment and nature conservation – *Natura Observa* – address to young people between 16 and 30 years old, resident or not in the county.

Since 2007, *Natura Observa* aims to fill the leisure time of youngsters during summer, fostering volunteering and education for sustainable development through service to the community, in the conservation and management of Sintra-Cascais Natural Park.

The 2018's edition is being even more special, because Cascais is the European Youth Capital of the year. Therefore, *Natura Observa* is already counting with a young team of: one manager, two base coordinators and eight field coordinators and before now open almost 280 positions for volunteers in six different projects: *Germina*, *Javali*, *Pilrito*, *Raposa*, *Falcão* and *Texugo*.

In *Germina* Project, the main objectives are identification of endemic plants, field trips for seed collection and their cleaning and storage. *Javali* is the project where volunteers work on identification and control of invasive alien flora species, selective deforestation and improvement of native plants natural regeneration. *Pilrito* is about identification and control of invasive alien flora species in the coastal area; in this project, the volunteers also install dune regenerators thought environmental engineering technique. *Raposa*'s volunteers work on ecological restoration of degraded costal trails, controlling the erosion by natural engineering techniques. In *Falcão* project, the volunteers make the same kind of ecological restoration of *Raposa* project, but in the forest area trails. Last, but not least, *Texugo*'s volunteers work on the maintenance and/or construction of wooden structures useful for the different activities held in this Natural Park.



## Possibilities of Education on River Restoration in the Landcare Project

Barbosa, Helena <sup>1</sup>; Pinto, Luisa <sup>2</sup>

<sup>1</sup> Superior Technical of Environmental and Archaeological Department Impact of Alqueva Project (hbarbosa@edia.pt); <sup>2</sup> Director of Environmental and Archaeological Department Impact of Alqueva Project (lpinto@edia.pt)

Educator

**Keywords:** Minimization and compensation of Impacts, rehabilitation, irrigation, exploration phase.

### Abstract

The irrigation project of EFMA, located in Alentejo region of Portugal, has the purpose to increase the practice of irrigated agriculture at least in 120 000 ha of the region. The project involves abduction and storage of the water that is then distributed by infrastructures related to primary and secondary networks. With the introduction of irrigation, new plantations and agricultural practices tend to alter the traditional dryland regime.

The associated cultural intensification translates into greater use of resources and factors of production, resulting in profound change in the pre-existing agricultural ecosystem.

More intensive crop exploitation regime and greater extension of irrigated areas (particularly in monoculture), increase the environmental impacts of agricultural activity.

Taking into account the regional dimension of the Alqueva Project Area, the need to implement measures that cancel or minimize related negative impacts emerged; moreover, these measures might be helping to counteract the widespread perception of the sustained lack of irrigated agriculture.

The streams mitigation impacts is a recurring theme related to the Environmental Impact Assessment procedures, namely through the legal obligation referenced in different Environmental Impact Declarations issued for the Alqueva Projects.

The Environmental and Patrimonial Department Impacts of Alqueva Project, as a partner in Landcare project, propose internships related to streams rehabilitation and management and with the minimization measures of environmental impacts caused by intensive agriculture (conversion of dry to irrigation farming), more specifically:

- A trainee specialist in Agronomy area, from University of Pisa (Italy), in 2016, develop a theme about "*Alert/sensitizing farmers about the importance of good agricultural practices adoption and a support in environment sensitization area*";
- From the University of Santiago Compostela (Spain) in 2016, comes a trainee (hidrology specialist), that develop a theme about "*Guidelines for the drainage system maintenance and recommendations proposal for the maintenance of the drainage system (related with streams)*";
- In 2017, from a Educational Area a trainee from the University of Santiago Compostela who worked in "*Environmental Education by Sensitization (pedagogical activities preparation) especially in Streams Rehabilitation*";
- From the University of Athenes (Greece), in 2017, comes a trainee specialist in Geology and Environment that develop a theme about "*Sedimentation pattern in EFMA agricultural streams*"
- In 2018, from the University of Santiago Compostela (Spain) a trainee specialist in Biology and Education Area and in Natural Resources Management and Agricultural Engineering developed a very specific work in the "*Environmental Education Area*", specifically in the following topics: education and sensitization support in environmental area; Streams Rehabilitation Manual for Alqueva Project farmers and preparation of Environmental Education Actions";

- From the University of Santiago Compostela (Spain), in 2018 a trainee specialist in Forest and Natural Resources and Landscaping developed a intership about "*Quercus Compensation*";
- A trainee from University of Pisa (Italy), in 2018, develops a theme about "*Methodology for verifying the situation and clearing the drainage system in hydraulic passageways, according to the recommended regulation for the EFMA reward perimeters. Impacts of CO2 emissions into the atmosphere from pipe materials such as cement, steel and HDPE (extraction and supply of materials, production of the pipes, installation and use*";

In 2018, a trainer specialised in agronomy from the Pisa University (Italy), develop measures to minimize the environmental impacts, with the theme "*Development of Measures to Minimize Environmental Impacts in Alqueva Irrigate Areas: Hedge Planting, Riparian Galleries and Inter-cropping*";

- From the Athens University a trainee specialist in Geology and Geoenvironment developed a traineeship about "*Analysis of potential maintenance/rehabilitation of ecological corridor in the EFMA area*".

### **The Design of the Arboreum Stratum in Cafetals Based on Local Knowledge: Learning Experience in Agroforestry**

Pérez-Portilla, Emiliano <sup>1</sup>

<sup>1</sup> Centro Regional Universitario Oriente-Universidad Autónoma Chapingo, Huatusco, Veracruz; Mexico(ac3913@chapingo.mx)

Educator

**Keywords:** ethnoecology, coffee, agroecosystem, trees, plantations.

#### **Abstract**

In the Universidad Autónoma Chapingo, the interdisciplinary course "Sustainable Integral Coffee Growing" it's offered, in which students, extensionists and producers participate, it has duration of 120 hours. In the first part of the course, theoretical and practical sessions are exposed. In this part, is present a first approximation to the knowledge of the coffee growing, in a perspective that goes from the environmental, through the agronomic and reaches the aspects economics and of the international market. In the second part a research project it's develop, considering the needs of coffee producers.

From the problems that have the coffee regions of Mexico, the relevance that the environmental crisis and the emergence of coffee market niches, arise the need to improve the management of the trees that provide shade to the coffee plants. The main purpose was to identify in the plant diversity that exists in the coffee farms, those trees that have the structural and functional characteristics that will improve the productivity of the agroecosystem, based on natural processes.

It's considered that coffee producers possess empirical knowledge on tree species, it related to their growth, development and interaction with coffee plants. In such a way that through interviews and statistical procedures, the suitability of the different species it's identified as an element of the coffee agroecosystem.



Eleven students of different educational programs and producers who belong to the “Coordinadora Nacional de Organizaciones Campesinas (CNOOC) and “La Unión de Productores de la Montaña de Ocozaca SSS” participated in the research. Based on ecological criteria (altitude), 12 assemblages of arboreal species it identified for four production purposes (only coffee, coffee and wood, coffee and biodiversity conservation, multipurpose coffee).

In the figure: Application of an interview semi-structured to coffee producers.

### 3.6.2 Poster Session

#### LIFE Evergreen with Volunteer-LEWO Project LIFE16 ESC ES 001

López Cernadas, María J. <sup>1</sup>; Otero, Vicente <sup>2</sup>; López García, Martín <sup>2</sup>

<sup>1</sup> Dirección Xeral de Xuventude, Participación e Voluntariado. Xunta de Galicia (erasmus.xuventude@xunta.gal);

<sup>2</sup> Universidad de Santiago de Compostela

Organisation

**Keywords:** volunteer cooperation, environmental awareness, natural resources, leisure and ecotourism activities, citizenship participation.

#### Abstract

Over the last last 15 years we have witnessed strong signs of global climate change. The European Union is at the forefront of promoting environmentally friendly policies and seeks, through concrete measures, to raise awareness and guide European citizens about the effects that climate change can have on our daily lives. Contributions of citizens are essential today as never before they are necessary to contribute to the environment preservation and maintenance.

LEWO project was born with the specific aim of reducing the impact of human action on natural heritage, making sustainable use of natural resources and promoting environmental education and citizenship participation.

- Contribute to create training opportunities for 300 young Galicians who can make a significant contribution to society and help by showing solidarity in order to develop their own potential.
- Increase the number of young people enrolled in the European Solidarity Corps.
- To carry out volunteering activities of protection, preservation, awareness and maintenance of 17 Natura 2000 and special bird protection areas from Galicia region.

- Promote a citizen's environmental awareness through the promotion of a participation model able to connect stakeholders and contribute to a better conservation of the natural heritage of Galicia and a local socio-economic development.
- Raise awareness on citizenship rights, sense of common understanding and promote values as volunteering and common opportunities as European values for young people.

The active citizen participation in the activities of preservation and maintenance of the Galician natural heritage will be essential to guarantee the long-term natural resources survival, indispensable for the environmental balance.

Through this project the Xunta de Galicia wants to help the Galician community to re-discover its own natural heritage, one of the best preserved in Europe, for which every year economic and human efforts are needed.

## Living Lands, Volunteer Experience

Ríos Tubío, Pablo <sup>1</sup>

University of Santiago de Compostela (pabloiro\_92@hotmail.com)

Student

**Keywords:** volunteer program, ecological restoration, semi arid areas, Fynbos vegetation, South Africa.

### Abstract

In my last year of the bachelor on Forest Engineering and Natural Environment, I travelled to South Africa to enrol in a volunteer program with Living Lands, a South African NGO. Living Lands is active in four different areas around South Africa (Cape Town, Langkloof, Baviaanskloof and Sneeuberg). It has the capacity to implement large-scale rehabilitation projects collaborating with local stakeholders.

Living Lands receives every year undergraduate, graduate and PhD students and also researchers from different countries to conduct their researches in South Africa. The background of the students is different. I shared work with tourism, agronomy, forestry, water management and economy students during the three months that I lived in the Baviaanskloof. I worked on the rehabilitation of the Baviaanskloof catchment under the supervision of Otto and Maya Beukes who always helped me and finally inspired me to continue working with ecological restoration in remote areas. I would like to share with the assistants my unforgettable experience with Living Lands in South Africa.



Talking about the work that I developed there, I was responsible of the plantation of more than 200 Spekboom (*Portulacaria afra*) with different dosis of TerraCottem(0g, 20g, 40g, 80g). To test the influence of the soil traps in the growth of the Spekboom we decided to plant them in two treatments with and without soil trap. The aim of the soil traps is to retain the soil and decrease the strength of the water which are flowing downstream of the hill. I also conducted an experiment in the nursery with Spekboom to test if there is difference between the field and the controlled conditions on the growth of this species. Other variable measured was the recruitment of new individuals on the holes where the Spekboom were planted to determinate if TerraCottem or the soil traps can influence on the recruitment and the cover soil.

### **Ibaitik Badiara, from the River to the Bay**

Sangalli, Paola <sup>1</sup>; Tardío, Guillermo <sup>1</sup>

<sup>1</sup> European Federation of Soil and Water Bioengineering (efbioengineering@gmail.com) Asociación Española de Ingeniería del Paisaje www.aeip.org.es

Educators

**Keywords:** ibaitik badiara, DSS2016 Europe Capital Culture, river restoration , Training workshops.

#### **Abstract**

Soil and Water Bioengineering: is a discipline than combines technology with biology, making use of native plants and plant communities as construction material for protecting soil and and contribute to restore degraded environments.

The term "Engineering" refers to the use of technical and scientific data for constructive, stabilization and erosion control purposes and "bio" because the functions are related to living organisms, mainly native plants with biotechnical characteristics and with the purpose of restore ecosystems and increasing the biodiversity.

Sol and Water Bioengineering is a It is a multi and interdisciplinary discipline, which requires diverse knowledge of botany, geology, geotechnics, hydrology and hydraulics ecological restoration ...and its necessary to learn this in the field and not only in the classrooms , learning by doing.

From the European Federation of Bioengineering, and in the associations that belong to this , we have been working for more than 25 years in the training in Bioengineering techniques organizing practical workshops like the workshops we have realized during the European Culture capital at San Sebastian, Spain in the project called *ibaitik badiara, del río a la bahía from the river to the bay* , a participative proposal project ,when the river as a system was the main argument to connect the people with its river . More than 30 Activities and 1000 People involved.



Four European experts in water restoration and members of the European Federation of Soil and Water Bioengineering had share and practice their knowledge through various activities: Freddy Rey (IRSTEA-AGEBIO), Bernard Lachat (BIOTEC-Verein für Ingenieurbiologie), Paolo Cornelini (AIPIN Tuscia) and Florin Florineth (University of BOKU) This is an example on how the ong contribute to the education both the professionals and the citizen.

## Forestry Volunteering for the Recuperation of Burned Areas in Tourón (Melón, Ourense)

Vázquez Dorrió, Angel <sup>1</sup>

<sup>1</sup> Amigos da Terra (info@amigosdaterra.com)

Educator/NGO

**Keywords:** volunteer program, environmental restoration, Tourón, Ourense.

### Abstract

Last October of the year 2017 was devastating for Galicia, which suffered a fire wave in which more than 47,000 hectares has burned. As a result from Amigos da Terra and in collaboration with the community of Montes de Tourón and Vergasta Association, we organized several sessions of forestry volunteering for environmental restoration in the mountains of Tourón.

We started the forestry volunteering actions in November 2017, which we continue to develop during the first five months of 2018, with more than 200 participants from different locations in Galicia.

We mainly carry out two types of measures for the recovery of burned areas:

- Containment of erosion: Straw was scattered and physical barriers were built throughout the area, with branches and trunks, to retain the dragging of ashes and soil by the action of rainwater. In this way, a large part of the organic matter was prevented from reaching the river Cerves, in this way the impact of water pollution was reduced.
- Forest regeneration: In the following months, several tasks have been done to restore forest in some of the affected areas. Plantation of carballo seeds (*Quercus robur*) and also placement of forest saplings of this same native species.

Nowadays, we try to ensure that these actions are planned in the medium and long term, in partnership with the owners of the mountain to act together and to demonstrate that another way of managing the mountain is possible.

We also disseminate information and environmental awareness about the problem of forest fires, through the reissue and elaboration of various documents that are available on our website [www.amigosdaterra.net](http://www.amigosdaterra.net).



## "Plantando Cara ó Lume" University Volunteering Against Wildfires in Galicia

Santiago Parada, Noemí<sup>1</sup>; Abella, Carlos<sup>1</sup>; Badia, Carmen; Besteiro, Roberto<sup>1</sup>; Blanco, Rocío<sup>1</sup>; Blanco, Paula<sup>1</sup>; Bustamante, Victoria<sup>1</sup>; Cámara, Virginia<sup>1</sup>; Casas, Alicia<sup>1</sup>; Casas, Lucía<sup>1</sup>; Comuñas, Jesús<sup>1</sup>; Cores, Ana Lis<sup>1</sup>; Faginas, Lucía<sup>1</sup>; Fugate, Collen<sup>1</sup>; González, Ana<sup>1</sup>; González, Patricia<sup>1</sup>; Irusta, Leire<sup>1</sup>; Laguña, Eduardo<sup>1</sup>; Lareo, Gloria<sup>1</sup>; Molano, Diana Manuela<sup>1</sup>; Munilla, Lucía<sup>1</sup>; Omil, Beatriz<sup>1</sup>; Otero, Eugenio Manuel<sup>1</sup>; Otero, Vicente<sup>1</sup>; Reyes, Otilia<sup>1</sup>; Ríos, Pablo<sup>1</sup>; Rodríguez, Martín<sup>1</sup>; Rodríguez, Xoan Carlos<sup>2</sup>; Ruíz, Ana Daría<sup>1</sup>; Sánchez, Naomi<sup>1</sup>; Sotelino, Alexandre<sup>1</sup>; Túñez, Miguel José<sup>1</sup>; Lorenzo, María del Mar<sup>1</sup>; Merino, Agustín<sup>1</sup>

<sup>1</sup> University of Santiago de Compostela (noemisp3@gmail.com); <sup>2</sup> IES Lucus Augusti

Student

**Keywords:** University volunteering, environmental education, wildfires, awareness, environmental problem.

### Abstract

Wildfires are a significant environmental problem in the Iberian Peninsula, where Galicia is one of the regions most affected by fire. The consequences after wildfires are numerous, including damage to the natural environment, a loss of habitats, soil degradation and erosion, and harm to the local population and economy.

Faced with these environmental problems, there are many scientific studies that analyze the consequences of wildfires including its effects on biodiversity, soil and hydrography and the socioeconomic context. These consequences are reduced by preventive measures and restoration of burned areas. Some of these measures have recently begun to be implemented, based on more efficient methodologies to address the treatment of large burned areas.

Despite this abundant scientific documentation, there are few educational documents that work on this issue. There is a lack of educational material that addresses the negative effects of forest fires on the environment and rural development and the role that education can play in combating this environmental problem.

*Plantando cara ó lume* is a volunteer program of the University of Santiago de Compostela that arises from the need to address the problem of forest fires from the perspective of environmental education and formation.



The project is made up of university students and professors and collaborating entities from different areas of knowledge: journalism, biology, education and forest engineering. This interdisciplinary team is

responsible for developing and disseminating informational and practical materials as well as conducting field trips.

These journeys are planned for two types of recipients: school-aged/youth populations and forest communities/associations. The activities with these groups are carried out in natural areas recently affected by wildfires, trying to give greater visibility to this environmental problem while promoting environmental awareness, and offering resources and tools for further prevention and restoration.

*Plantando cara ó lume* is an initiative that began in 2016 and has experienced progressive growth since then. Currently, *Plantando cara ó lume* receives funding from the Xunta de Galicia and European Union through the LEWO Project, reflecting the importance of the project for the local communities of Galicia.

### **Risk Areas for Climate Stress in Coffee Crops in Veracruz, Mexico**

Partida-Sedas, José Gervasio <sup>1,2</sup>; Pérez-Portilla, Emiliano <sup>2</sup>; Pérez-Jiménez, Edith <sup>2</sup>; Herrera-Nava, Isauro <sup>2</sup>; Romero Rodríguez, Ma. Ángeles <sup>1</sup>

<sup>1</sup> Facultad de Ciencias, Campus Terra, Universidad de Santiago de Compostela, Lugo, España; <sup>2</sup> Centro Regional Universitario Oriente, Universidad Autónoma Chapingo, Huatusco, Veracruz, Mexico (gpsuac@gmail.com)

Student

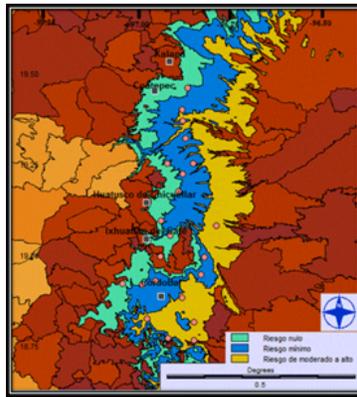
#### **Abstract**

Coffee (*Coffea arabica* L.) has specific requirements of temperature and humidity for optimal development. An alteration in the environment affects the physiology of the plant (Pereira et al, 2008; Ruiz-Cárdenas 2015). It is required to know more precisely what, how, where and when these climatic factors affect. The cultivation of coffee in the central region of Veracruz (Mexico) is currently at risk by climate alteration. The study focuses on the study of the hydrothermal behaviour of air and its effect on the coffee phenology to locate areas of risk due to climatic stress.

In 23 coffee plantations in the central zone of Veracruz (Mexico), the temperature and relative humidity of the air were registered during a year, by means of the installation of data recorders. At the same time, the coffee phenology data were recorded. With this information a climatic stress index was established and by means of regression models, cartographic models were elaborated to delimit the areas with the highest probability of risk.

The temperature and relative humidity of the air affect the coffee cultivation phenology differentially according to its location. Floral abortion may occur due to the decrease in relative humidity and the increase in temperature. The development of the fruit is affected to a greater extent by temperature and relative humidity. Areas of probability of risk of affectation by climatic stress were delimited finding areas with high risk (Figure 1).

The temperature and relative humidity of the air affect the coffee phenology. An increase in temperature and a decrease in relative humidity outside the comfort zone of the plant can cause abortions of flowers and poor development of coffee fruits. It is located a zone of greater risk that represents 32.5% of the zone of crop.



In the figure: Map of climate stress risk for coffee cultivation in Veracruz, Mexico.

- Pereira, R. A., Camargo, P. A. y Camargo, M. B. Agrometeorología de cafezais no Brasil. Campinas: Instituto Agronômico 2008.
- Ruiz-Cárdenas, R. 1. A cafeicultura e sua relação com o clima. In: J. Braz Matillo, F. Carlota Nery & R. Pereira Venturin, eds. A cafeicultura e sua relação com o clima. LavrasMG, Brasil: Projeto Gráfico e Editoração, Artes Gráficas Formato Ltda, 2015

### **Oinez Basoa: A Network of Afforested Land by Schools in Navarre. Assessment and Development of Educational Projects**

Virt, Iñigo <sup>1\*</sup>; Antón, Rodrigo <sup>1</sup>, de Soto, Isabel <sup>1</sup>, Imbert, Bosco <sup>1</sup>, Peralta, Javier <sup>1</sup>, Igoa, Marta <sup>2</sup>, Olite, Mauricio <sup>2</sup>, Arias, Isabel <sup>2</sup>, Urrutia, Rexu <sup>2</sup>

<sup>1</sup> Departamento Ciencias. Universidad Pública de Navarra, Pamplona, Navarra, Spain (\* inigo.virto@unavarra.es);

<sup>2</sup> Nafarroako Ikastolen Elkarte (NIE), Pamplona, Navarra, Spain

Educators

**Keywords:** : Afforestation, climate change mitigation, soil functions, education, Basque language.

#### **Abstract**

NIE, the association of *ikastolas* (primary and secondary schools using Basque as a vehicular language for education) leads, starting in 2008, a network of afforested forests in the region of Navarra, aiming to compensate the CO<sub>2</sub> emissions associated of their annual festival (Nafarroa Oinez, see at <http://www.nafarroaoinez.eus/basoa/indexES.asp>). Because of the geographical distribution of these schools, and the marked climate and soil gradient existing in the region from North to South, this has created a network of seven afforested forests on lands with contrasted biophysical conditions. As these forests are created and kept by the network of schools, they offer a perfect framework for both the assessment of different ecosystem services provided by these forests, and for developing different educational projects and tools on the natural environment.

In one of these forests, located in Tafalla, a study on the evolution of soil organic C and other soil properties allowed for assessing the effect of afforestation on different supporting and regulating ecosystem services provided by the soil. This was done using a space-for-time approach by comparing soil condition in the afforested soil with those in an agricultural field and a mature Mediterranean forest located on the same soil unit. These two sites represent the condition of the soil before afforestation, and

the potential future situation of the forest. In particular, a positive effect on soil organic C storage, erosion control, water storage and microbial biodiversity was observed. A new project including biodiversity studies and the introduction of citizen science tools aims to expand the possibilities of using this network of forests in educational programs and of involving other components of the educative community in their use.



### 3.7 LANDCARE FOR THE FUTURE STANDS

#### Learning about Post-Fire Treatments in the Landcare Project

Merino, Agustín <sup>1</sup>; Fontúrbel, María T. <sup>2</sup>; Fernández, Cristina <sup>2</sup>; Athanasiou, Miltiadis <sup>3</sup>; Miliou, Anastasia <sup>4</sup>; Delavei, Kleopatra <sup>4</sup>; Bertacchi, Andrea <sup>5</sup>; Omil, Beatriz <sup>1</sup>; García-Oliva, Felipe <sup>6</sup>; Vega, Jose A. <sup>2</sup>

<sup>1</sup> University of Santiago de Compostela, Spain (agustin.merino@usc.es); <sup>2</sup> Forest Research Centre of Lourizan, Xunta Galicia, Spain; <sup>3</sup> Register of the Hellenic General Secretariat for Civil Protection (Greece); <sup>4</sup> Archipelagos, Institute of Marine Conservation; <sup>5</sup> University of Pisa (Italy); <sup>6</sup> UNAM (México)

Educators

**Keywords:** wildfires, interactive teaching, internships, videos.

#### Abstract

Although wildfires have a long history in the Mediterranean and neighbouring Atlantic coastal regions, from the 60's a dramatic increase in fire activity has taken place. Human activity is a major driver of wildfires; afforestation schemes with flammable plantations, the encroachment of shrubs after rural depopulation and urbanization close to forests are identified as main causes. In addition, there are evidences that the global warming favours the occurrence of fires and increased their intensities.

Wildfire causes severe disturbance to ecosystems, increasing erosion, sediment transfer to surface waters and nutrient depletion. Different ecosystem properties and functions, such as ecosystem structure, microbial dynamics and nutrient and cycles, are strongly affected, with strong negative consequences not only for the environment, but also for the economy and rural development.

During the LANDCARE project a group of specialists from four countries have been working to design a series of activities and materials to improve the teaching capacities about this important topic. About the materials, we have written a handbook chapter explaining the main degradative processes and the most common techniques for soil conservation after wildfire. Both educators and students have also recorded different short videos. These materials have been used in three international intensive courses,

carried out in Spain (Lugo), Italy (Pisa) and Greece (Samos Island) and in a field trip in Portugal (Lisbon). The teaching in the classroom was carried out by promoting the active participation on the students and the participation of teachers from different countries and backgrounds. In the field trips the students developed different practices in burnt areas to learn about the different strategies of soil conservation. All this learning was applied in internships carried in two professional partners of the Landcare Project, in Greece (Archipelago, NGO focused on environmental conservation) and in Spain (Forest Research Center of Lourizan, focused on wildfires).



In the figures, from top to bottom and from left to right: Santiago de Compostela, Spain (2006); Samos Island, Greece (2017) ; and Rocca della Verruca, Tocana, Italy (2017).

### **Educational Actions Related with the Effects of Wildfire and Different Rehabilitation Techniques on the Soil-Plant System (Galicia, NW Spain)**

Fontúrbel, María Teresa <sup>1</sup>; González-Prieto, Serafín <sup>2</sup>; Martín Jiménez, Ángela <sup>2</sup>; Fernández, Cristina <sup>1</sup>; Carballas, Tarsy <sup>2</sup>; Vega, José Antonio <sup>1</sup>; Díaz-Raviña, Montserrat <sup>2\*</sup>

<sup>1</sup> Centro de Investigación Forestal-Lourizán (CIFL), Consellería de Medio Rural. Apdo 127, 3680 Pontevedra, Spain; <sup>2</sup> Departamento de Bioquímica del Suelo, Instituto de Investigaciones Agrobiológicas de Galicia (IIAG-CSIC), Apartado 122, Avda de Vigo s/n, 15780 Santiago de Compostela, Spain (\* mdiazr@iiag.csic.es)

Educators

**Keywords:** fire effects, acid soils, seeding and mulching, post-fire erosion, soil quality.

### **Abstract**

In the last decade the aim of the research projects carried out by the Group of Forestry Protection (CIFL, Xunta de Galicia) and the Group of Biochemistry and Quality of Soils (IIAG-CSIC) were focused on the evaluation of the effects of wildfires of different severity on forest ecosystems (soil-plant systems) as well as to study the implementation of different emergence rehabilitation techniques (seeding and

mulching): their efficacy to control post-fire erosion as well as their effects on soil quality. In order to do this, we performed numerous studies under field conditions in experimental areas affected by fires of different level of severity: wildfires and prescribed or experimental fires and the results of numerous soil burnt properties and vegetation cover as well as the erosion were measured and compared with the corresponding unburnt control soils. The results showed that wildfire effects and the recovery of soil-plant system are variable depending mainly on fire severity. With respect to post-fire stabilization treatments, data showed that the straw mulch was the most effective emergence treatment to control post-fire erosion since they reduce soil losses around 70-90% and have no effects on soil quality. The optimization of this technique was established controlling the way of straw application and different straw doses trying to find the minimum effective dose.

In both Institutions different courses at different educational levels were organized, which include conferences and visits “in situ” to the experimental areas. These have focused on several aspects related to a fire (treatments for forest fire prevention, the use of fire retardants, effects of prescribed and wildfires on forest ecosystems, implementation of different soil rehabilitation techniques, recovery of forest ecosystems). Likewise an International Workshop was organized (<http://www.iiag.csic.es/fuegored/libro.pdf>) and different didactic resources such as videos (<http://www.crtvg.es/informativos/no-ano-internacional-dos-solos-o-csic-e-o-iiag-organizan-visitaa-montes-queimados-1419235>) and guides of actuaciones following the fire were elaborated and used in the educational program.

[http://fuegored.weebly.com/uploads/2/2/2/8/22283836/guia\\_planificacion\\_galicia.pdf](http://fuegored.weebly.com/uploads/2/2/2/8/22283836/guia_planificacion_galicia.pdf)

[http://sghn.org/Publicacions/Non\\_SGHN/Guia\\_de\\_actuaciones\\_en\\_una\\_zona\\_quemada\\_2018.pdf](http://sghn.org/Publicacions/Non_SGHN/Guia_de_actuaciones_en_una_zona_quemada_2018.pdf)

### **A Flexible Personal Learning Environment to Forest Learner-Centred Pedagogical Approaches in Land Rehabilitation**

Evelpidou, Niki <sup>1\*</sup>; Kotinas, Vasilis <sup>1</sup>; Karkani, Anna <sup>1</sup>

<sup>1</sup> Department of Geography and Climatology, Faculty of Geology and Geoenvironment, University of Athens, Panepistimioupoli, Zografou, Athens, GREECE (\* [evelpidou@geol.uoa.gr](mailto:evelpidou@geol.uoa.gr))

Educators

**Keywords:** land rehabilitation, education methods, innovation, employability skills.

#### **Abstract**

Land degradation is a process that causes undesirable changes to the land and the biophysical environment (e.g. soil and coastal erosion). In Europe, the Mediterranean countries are mostly affected by land degradation (LD). Land Degradation has a huge impact on the economy (agriculture, fishing, tourism) but also in the supply of goods (water and food). Actions for the Restoration of ecosystems and biodiversity are essential and require many resources, research on methods to be applied and properly trained people; however, there is a considerable shortage of skilled workers in LD&R due to the lack of proper training. LD&R education requires constant updating of knowledge and technologies and study with real cases amongst other things, but only a few European Universities offer high quality study programs on LD&R, using mostly traditional methods for education.

To address this issue Landcare Project focuses on improving teaching and training capacities in LD&R in Southern Europe, in order to fulfil the demand of an emerging labour market through the enhancement of the employability skills of people and to contribute to the economy of the region. Training teachers, staff and students is a main priority. This can be achieved by combining traditional education methods, sharing of expertise, innovative online learning, short-term international mobility, enhancement

of employability skills through blended mobility and synergies between students, educators, researchers, university structures, companies/agencies/NGOs and decision-makers. Teachers/staff/students, but also any person with interest in LD&R are expected to benefit, by having better and more flexible education opportunities.

### Learning about Coastal Areas Rehabilitation in the Landcare Project

Karkani, Anna <sup>1</sup>; Evelpidou, Niki <sup>1\*</sup>

<sup>1</sup>Department of Geography and Climatology, Faculty of Geology and Geoenvironment, University of Athens, Panepistimioupoli, Zografou, Athens, GREECE (\* evelpidou@geol.uoa.gr)

Educators

**Keywords:** coastal zone, dunes, coastal erosion, field training.

#### Abstract

The coastal zone is a naturally dynamic changing environment due to coastal geomorphological processes. At the same time, climate change, sea level rise, the increase of storm surges and other extreme events along with the increasing population have a serious impact on the coastal zone, modifying the system dynamics and balance.

As a consequence a number of coastal features are degraded, e.g. coastal dunes, wetlands, and natural habitats are lost. At the same time, coastal erosion constitutes a global issue, as 70% of the shorelines are retreating), while in Europe it is estimated that 15 km<sup>2</sup> of shorelines are retreating annually. A large variety of activities are hosted in the coastal zone, which support the economy and serve many needs.



During the LANDCARE project, we had a number of activities aiming to improve the teaching capacities about this important topic and to improve the skills of young scientists. Our activities had

two main directions: scientific background and training in the field. The scientific background was covered through presentations, educational videos as well as a handbook chapter discussing issues of coastal processes and coastal rehabilitation. During the International training schools (Lugo, Naxos, Pisa), the students were first taught in the classroom the basic theory, and were in the following days trained in the field. The students were encouraged to actively participate in groups during the classroom teaching, aiming to raise discussions in related topics and approach coastal rehabilitation topics from different disciplines and countries. During the international training schools, students were also trained in modelling coastal erosion using Geographic Information Systems and furthermore the process on how to build their own model depending on the topic they wish to address.

### Soil Contamination and Decontamination in the Landcare Project

Masciandaro, Grazia <sup>1\*</sup>; Peruzzi, Eleonora <sup>1</sup>; Macci, Cristina <sup>1</sup>; Virgili, Giorgio <sup>2</sup>; Barral, María Teresa <sup>3</sup>; Piñeiro, Verónica <sup>3</sup>; Martiñá, Diego <sup>3</sup>; Doni, Serena <sup>3</sup>

<sup>1</sup> National Research Council, Institute of Ecosystem Study, Pisa, Italy (\* grazia.masciandaro@ise.cnr.it); <sup>2</sup> West Systems S.r.l., Firenze, Italy; <sup>3</sup> University of Santiago de Compostela, Spain

Educators

**Keywords:** Active-learning, videos, laboratory analyses, field work experiences.

#### Abstract

Innovative means to improve student learning and engagement have been implemented in the LAND-CARE project. This educational tool has been based on blended learning courses, in which the student participation has been converted from a passive to an active-learning.



Among the different topics in which the LANDCARE project has been organized, CNR-ISE has been involved in "Soil Contamination and Decontamination", with particular attention to innovative strategies to recover contaminated soils and sediments. The teaching theoretical activity carried out by the CNR-ISE educators has been reinforced by a choral discussion on some soil contamination study cases chosen and presented by the students. A significant part of the soil contamination lessons has been based on visits in contaminated and/or restored sites, such as As Pontes mine (Spain) and Belvedere landfill (Italy). During these visits, some summary videos about the learning experience were performed by the students, as assignment. In addition, knowledge on soil properties, pollutants behavior and bioavailability affecting the choice of the decontamination technologies, have been transferred to the students through practical activities, such as laboratory analyses (total and available heavy metals in different soil samples) and

field work measurements (CO<sub>2</sub> emission from soil). Finally, an orienteering practical activity with study questions at each step has been introduced as a highly innovative and effective educational tool.

In the figure: a) Discussion study cases (Italy 2018); b) As Pontes mine (Spain 2016).

### Videos as Educational Tool in the Landcare Project

Masciandaro, Grazia <sup>1\*</sup>; Peruzzi, Eleonora <sup>1</sup>; Macci, Cristina <sup>1</sup>; Doni, Serena <sup>1</sup>

<sup>1</sup> National Research Council, Institute of Ecosystem Study, Via Moruzzi 1, 56124 Pisa, Italy

(\* grazia.masciandaro@ise.cnr.it)

Educator

**Keywords:** Learning tools, video structure, blended courses, educational video.

#### Abstract

The LANDCARE educational paths have been based on a blended learning approach, combining intensive face-to-face with e-learning tools. In particular, educational videos addressing the project topics have been integrated in the LANDCARE blended courses as a highly effective information-delivery mechanism. The Erasmus students recorded and edited some videos, as assignment, related to the field work experiences of the intensive courses. They found the preparation of the videos enjoyable and more satisfying and motivating than traditional learning. They also reported that the video preparation helped them to advance their technology skills and enhance their teaching and learning experience. Similarly, the project partners (teachers and private companies) created some learning videos according to their own skills and knowledge combining the PowerPoint slides with footage, still images, animations, or other media useful to make their videos more visually interesting. They filmed activities and scenes from different perspectives to obtain a structure able to get the student's attention or raise their curiosity.

The dissemination of the formative videos through internal links in universities, social media and public web sites have contributed to obtain a larger audience on the LANDCARE courses and project outcomes.



## Learning about Rivers and Wetlands Conservation in the Landcare Project

**Keywords:** education, ecological quality, degradation, freshwater ecosystems, restoration.

### Abstract

Freshwater ecosystems are among the most valuable ecosystems in the planet, yet widespread degradation threatens the maintenance of their ecological functions and ecosystem services. In addition to their inherent complexity (diversity, processes, dynamics), freshwater ecosystem impairment is increasingly driven by multiple stressors operating at different spatial and temporal scales across hydrographic basins. Thus, preserving functional rivers and wetlands and improving their ecological condition requires a good understanding of their ecological functioning.

The three editions of the Landcare project Intensive courses developed an integrative teaching approach combining theoretical concepts about the ecology and management of freshwater ecosystems with case-based teaching and innovative technologies. Student participation was promoted with a strong component of field practices across a diversity of wetland types, and using the approaches and tools developed through the project lifetime, including interactive presentation formats, virtual platform and videos.

Peer learning was stimulated both among students and educators. On the one hand, in every expositive session of the courses, students were encouraged to present and discuss case-studies from their own regions benefiting from blended mobility across participant countries. This enabled analytic reflection from common challenges on freshwater ecosystem management across water-scarce regions. Educator's capacity was enhanced from mutual exchange of best practices between visitors and local researchers who hosted wetland restoration projects.

Personalized learning was addressed by creating groups of students especially interested in deepen learning and becoming leaders of the topic. The "wetland team" conducted a more detailed study on wetland degradation and management, and their members were responsible of teaching their colleagues specific tasks, both in the class (DPSIR analysis) and in the field (application and critical discussion of an ecological quality index in rivers). Finally they produced videos integrating the knowledge acquired during the course.

### Dissemination in the Landcare Project

Rodríguez González, Patricia

**Keywords:** dissemination strategy, education, multiplier events, outreach, social networks.

### Abstract

Knowledge sharing is at the foundation of LANDCARE overall objectives about improving training capacities in relation to Land Degradation and Rehabilitation (LD&R). For this purpose, the project developed an integrated dissemination strategy by combining different tools, and producing several outputs to reach the largest target audience. Dissemination events were open to all academic community (LANDCARE partners and non-partners), educators, employers, civil society and decision-makers dealing with hot issues on LD&R (research priorities, education innovation, educational awareness).

The first level involved the cascading dissemination of best practices and innovative tools through partnership and collaborator organisations, comprising academic, professional and civil society. This dissemination component was rooted on the development of the International Intensive courses, and the

Teaching Staff Training activities, carried out in Santiago (Spain), Naxos (Greece) and Pisa (Italy). Also, the development of blended mobility across professional partners in Greece, Italy, Spain and Portugal served to enhance the outreach of LANDCARE goals while promoting young employability.

The Dissemination strategy includes a main tool based in the website ([www.landcare.es](http://www.landcare.es)), coordinated with the social media (<https://www.facebook.com/landcareproject/>) where all information related with the project, activities, events and outputs are regularly updated. In addition, every activity was published in local press.

Among the dissemination events, three International Workshops and Conferences, developed in Santiago de Compostela and Lisboa, functioned as multiplier events, pursued to achieve a larger societal impact by involving a larger audience into the activities and outputs of the project.

The dissemination outputs include diverse formats, including an open access virtual platform for LD&R teaching, videos (MOOC) and documents such as the publication of the first Handbook linking Land Restoration Educational challenges and Employability Opportunities.

The follow-up contribution of LANDCARE is towards the creation of a Network for Education and Training in LD&R with peer-teachers and experts. The network will contribute to raise awareness on the correct use of the land by society at large, and will also become a forum for educators and researchers

### **Development of Measures to Minimize Environmental Impacts in Alqueva Irrigate Areas: Hedge Planting, Riparian Galeries and Intercropping**

Barbosa, Helena <sup>1</sup>; Pinto, Luisa <sup>2</sup>

<sup>1</sup> Superior Technical of Environmental and Archaeological Department Impact of Alqueva Project ([hbarbosa@edia.pt](mailto:hbarbosa@edia.pt)); <sup>2</sup> Director of Environmental and Archaeological Department Impact of Alqueva Project ([lpinto@edia.pt](mailto:lpinto@edia.pt))

Educator

**Keywords:** Minimization and compensation of Impactes, rehabilitation, irrigation, exploration phase.

#### **Abstract**

The irrigation project of EFMA, located in Alentejo region of Portugal, has the purpose to increase the practice of irrigated agriculture at least in 120 000 ha of the region. The project involves abduction and storage of the water that is then distributed by infrastructures related to primary and secondary networks. With the introduction of irrigation, new plantations and agricultural practices tend to alter the traditional dryland regime.

The associated cultural intensification translates into greater use of resources and factors of production, resulting in profound change in the pre-existing agricultural ecosystem.

More intensive crop exploitation regime and greater extension of irrigated areas (particularly in monoculture), increase the environmental impacts of agricultural activity.

Taking into account the regional dimension of the Alqueva Project Area, the need to implement measures that cancel or minimize related negative impacts emerged; moreover, these measures might be helping to counteract the widespread perception of the sustained lack of irrigated agriculture.

The streams mitigation impacts is a recurring theme related to the Environmental Impact Assessment procedures, namely through the legal obligation referenced in different Environmental Impact Declarations issued for the Alqueva Projects.

The Environmental and Patrimonial Department Impacts of Alqueva Project, as a partner in Landcare project, propose interships related to streams rehabilitation and management and with the minimization

measures of environmental impacts caused by intensive agriculture (conversion of dry to irrigation farming), more specifically:

- A trainee specialist in Agronomy area, from University of Pisa (Italy), in 2016, develop a theme about "*Alert/sensitizing farmers about the importance of good agricultural practices adoption and a support in environment sensitization area*";
  - From the University of Santiago Compostela (Spain) in 2016, comes a trainee (hidrology specialist), that develop a theme about "*Guidelines for the drainage system maintenance and recommendations proposal for the maintenance of the drainage system (related with streams)*";
  - In 2017, from a Educational Area a trainee from the University of Santiago Compostela who worked in "*Environmental Education by Sensitization (pedagogical activities preparation) especially in Streams Rehabilitation*";
  - From the University of Athenes (Greece), in 2017, comes a trainee specialist in Geology and Environment that develop a theme about "*Sedimentation pattern in EFMA agricultural streams*";
  - In 2018, from the University of Santiago Compostela (Spain) a trainee specialist in Biology and Education Area and in Natural Resources Management and Agricultural Engineering developed a very specific work in the "*Environmental Education Area*", specifically in the following topics: education and sensitization support in environmental area; Streams Rehabilitation Manual for Alqueva Project farmers and preparation of Environmental Education Actions;
  - From the University of Santiago Compostela (Spain), in 2018 a trainee specialist in Forest and Natural Resources and Landscaping developed a intership about "*Quercus Compensation*";
  - A trainee from University of Pisa (Italy), in 2018, develops a theme about "*Methodology for verifying the situation and clearing the drainage system in hydraulic passageways, according to the recommended regulation for the EFMA reward perimeters. Impacts of CO2 emissions into the atmosphere from pipe materials such as cement, steel and HDPE (extraction and supply of materials, production of the pipes, installation and use)*";
- In 2018, a trainer specialised in agronomy from the Pisa University (Italy), develop measures to minimize the environmental impacts, with the theme "*Development of Measures to Minimize Environmental Impacts in Alqueva Irrigate Areas: Hedge Planting, Riparian Galeries and Inter-cropping*";
- From the Athens University a trainee specialist in Geology and Geoenvironment developed a traineeship about "*Analysis of potential maintenance/rehabilitation of ecological corridor in the EFMA area*".

### **Support in Education and Sensitization Environmental Area - Alqueva Project**

Pinto, Luisa <sup>1</sup>; Barbosa, Helena <sup>2</sup>

<sup>1</sup> Director of Environmental and Archaeological Department Impact of Alqueva Project (lpinto@edia.pt); <sup>2</sup> Superior Technical of Environmental and Archaeological Department Impact of Alqueva Project (hbarbosa@edia.pt)

Educator

**Keywords:** Environmental impacts, educational area, river ecosystems.

#### **Abstract**

The Alqueva Muti Purpose Project located in Alentejo region of Portugal, involves abduction and water storage infrastructures (of the primary and secondary network) with the purpose of increasing the practice of irrigated agriculture (at least 120 000 ha). This Project based on an environmentally sustainable

policy, promote the identification and evaluation of environmental impacts through Environmental Impact Studies attending to the infrastructures implementation which causes soils, biodiversity, waste and water impacts, particularly on streams and inevitably on their river ecosystems.

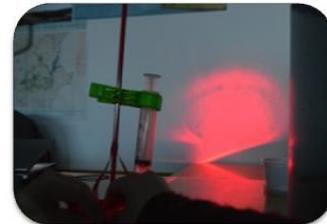
The streams mitigation impacts is a recurring theme related to the Environmental Impact Assessment procedures, namely through the legal obligation referenced in different Environmental Impact Declarations issued for the Alqueva Projects.

In order to promote and value river ecosystems, reinforcing the importance of maintaining and conserving them, EDIA has been carrying out environmental educational actions in the school community, calling for more sustainable changes in attitude and values and attitudes that lead to an "environmentally more sustainable culture".

In this context the Environmental and Patrimonial Department Impacts had the possibility to have a traineeship specialist in Biology and Education Area, that developed a very specific work in the Environmental Education Area, specifically in the following topics:

- Education and sensitization support in environmental area;
- Streams Rehabilitation Manual for Alqueva Project farmers;
- Preparation of Environmental Education Actions.

In order to promote environmental awareness, encourage the discovery of biodiversity associated with river ecosystems fauna and flora, and provide all students with the sharing of pleasant moments, well-being and learning, the trainee had the opportunity to prepare and participate in a fifth year students action (see image).



Materials



Education action

## Landcare Students Participating in Land Restoration, Environmental Education and Marine and Terrestrial Monitoring Projects

Miliou, Anastasia <sup>1\*</sup>; Pietroluongo, Guido <sup>1</sup>; Quintana, Belén <sup>1</sup>; Gheorghiu, Ana <sup>1</sup>

<sup>1</sup> Archipelagos Institute of Marine Conservation, P.O. Box 42, Pythagoreio, Samos 83103, Greece  
(\* a.miliou@archipelago.gr)

**Keywords:** land restoration, environmental education, chameleons, jackals, marine mammals.

### Abstract

The collaboration between Archipelagos Institute of Marine Conservation and the Landcare program provides students with the opportunity to take part in multi-disciplinary environmental projects with a clear conservation aim. These took part on the island of Samos and in the eastern Aegean Sea. One such project provided an important opportunity for students to work along scientists on research focusing on land degradation. The project included the monitoring of the vulnerability and the recovery rate of the areas which had been impacted by a recent fire. This included assessment of flora coverage and biodiversity, as well as analysis of the nutrient content of the soil in the zones where the fire was put off using seawater.

Another project Landcare students engaged in was the design of educational programs, including lesson plans, interactive activities and education games for school groups of various ages. The aim of these activities was the engagement of children in several environmental topics, such as wildlife conservation and awareness of microplastics in the environment. Furthermore, the education team also worked with children of refugee families, who were living in a nearby hotel as part of the EU Humanitarian Program. These activities designed by the Landcare students included nature walks, arts and crafts, beach clean-ups and English lessons.

In addition to the aforementioned main projects, Landcare students part of the terrestrial and marine mammal teams had the opportunity to assist in research projects focusing on the golden jackal (*Canis aureus*), the Mediterranean chameleon (*Chamaeleo chamaeleon*), as well as endangered marine mammals, including various dolphin, whale and sea turtle species. In these projects, they took part in terrestrial and marine surveys, monitoring local populations, habitat preferences and related conservation issues. In addition, data on several anthropogenic impact factors (deliberate killings, fishing activity, debris) was also collected, with the aim to better understand and monitor the status of marine and terrestrial wildlife around the eastern Aegean islands.



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## **Volunteering as a Strategy to Align Youth Formation with Society and Environment**

Miliou, Anastasia <sup>1</sup>

<sup>1</sup> Institute of Marine Conservation, P.O. Box 42, Pythagorio, 83103 Samos, Greece (a.miliou@archipelago.gr)

### **Abstract**

The design and implementation of targeted research and conservation projects for young graduates and undergraduate students through targeted internship and research volunteering, can result to win-win scenarios, providing both a great support to the implementation of these projects, as well as an invaluable learning experience for the participants who are in the start of their career. These targeted internships offered by Archipelagos Institute, address to a wide range of backgrounds, through an intergrated multidisciplinary approach. In this manner students and graduates of environmental, marine, biological and other related sciences, carry out research on numerous related projects (marine mammal research, ornithological research, marine conservation, GIS, herpetology, environmental management, terrestrial mammals, taxononomy, botany, microplastic research, invasive species monitoring, fisheries, aquaculture and many more), while they closely cooperate with students/graduates of other disciplines e.g. environmental law, media and communication, graphic design, environmental education, environmental photography and filmmaking, journalism, social media communications and other. While working closely with young people of similar career stages, the participants of such voluntary projects, realize the need for cooperation and team work, when the expected outcome is more than a scientific result but one that can positively affect and influence the natural environment and very importantly the local communities that live in the same region.

## **Landfill Biogas Monitoring: A Procedure to Evaluate Environmental Sanitary Risk Assessment**

Minardi, I. <sup>1</sup>; Giovenali, E. <sup>1</sup>; Virgili, G. <sup>1</sup>

<sup>1</sup> WEST SYSTEMS via Don Mazzolari 25, Pontedera, Italy

### **Abstract**

The environmental risk assessment is a process that engages several competences and consists in the critical collection of data and information useful to estimate, qualitatively and quantitatively, the impact of dangerous substances on the environment and the effect on human health. Landfills are often regarded as important sources of atmosphere contamination. As known landfill gas (LFG) is composed by greenhouse gases, i.e. CH<sub>4</sub> and CO<sub>2</sub>, and other compounds present in trace with toxic and malodorous characteristics. LFG tends to escape from landfill cover even when LFG collection and combustion systems are installed. To evaluate the risk related to the atmospheric emissions of special waste landfills, West Systems has developed a complete procedure that consists in several steps: the quantification of biogas emission from capping and the chemical characterization of biogas, the application of air quality models, the identification of exposure pathways and migration routes, the recognition of potential receptors, and then the assessment of sanitary risk.

Among the numerous techniques available to quantify the flux released from landfill (gas survey, eddy correlation, etc.), the technique, here presented, is the static non-stationary accumulation chamber ([1],[2],[3]). A portable integrated instrumentation based on the method of accumulation chamber, named FLUX-meter and realized by West Systems, allows to measure the CO<sub>2</sub>, CH<sub>4</sub>, H<sub>2</sub>S, VOC flux at the air-soil interface and permits to quantify the total amount of LFG (as the total flux of the gas species listed

above). A dedicated software package acquires the GPS position and gives the operator the evaluation of the initial slope of the gas concentration – time line which is proportional to the gas emission from soil. The speed of this instrument, approximately 2-3 minutes per measurement, allows the operators to carry out numerous measures inside the whole investigated area located in a grid as regular as possible [4]. In order to quantify a specific gas released from the investigated area and to recognize the presence of zones characterized by anomalous fluxes, statistical and geostatistical approach are adopted. In particular, the methodology based on partitioning the flux data by means of cumulative probability plots, formalized by Sinclair ([5],[6],[7]) is used for the estimation of the total amount of biogas discharged into the atmosphere. For the chemical characterization solid traps are used. Solid traps consist of stainless steel tubes packed with three-phase (carbosieve 111, carboxen B, carboxen C) absorbent material that are analyzed through GC-MS upon thermal desorption. The biogas sampling is performed by means of “wind tunnel”. The analytical chemical results (more than one hundred carcinogenic compounds) are implemented in the procedures in order to estimate the population exposure and to the evaluation of environmental and sanitary risk.

#### **References:**

- [1] Parkinson K.J. (1981) An improved method for measuring soil respiration in the field, *J. Appl. Ecology*, 18, 221-228.
- [2] Chiodini G., Frondini F., Raco B. (1996) Diffuse emission of CO<sub>2</sub> from the Fossa crater, Vulcano Island (Italy), *Bull. Volcanol.*, 58, 41-50.
- [3] Chiodini G., Cioni R., Guidi M., Marini L., Raco B. (1998) Soil CO<sub>2</sub> flux measurements in volcanic and geothermal areas, *Applied Geochemistry*, 13, 543-552.
- [4] Virgili G., Continanza D., Coppo L. (2008) Il FLUX-meter: implementazione di una strumentazione integrata portatile per la misura dei flussi di CO<sub>2</sub> e CH<sub>4</sub> diffusi dal suolo, *Giornale di Geologia Applicata*, 9 (1), 73-84.
- [5] Sichel H.S., (1966) The estimation of means and associated confidence limits for small samples for lognormal population, *Proc. 1966 Symp. South African Institute of Mining and Metallurgy*.
- [6] Sinclair A.J., (1974) Selection of threshold values in geochemical data using probability graphs, *Journal of Geochemical Explorat.*, 3, 129-149.
- [7] Sinclair A.J., (1991) A fundamental approach to threshold estimation in exploration geochemistry: probability plots revisited, *Journal of Geochemical Explorat.*, 41, 1-22.

## **Activities of Landcare Students at West Systems**

### West Systems

The participants of the Landcare course, during their traineeships at West Systems, carried out many activities varying from laboratory tasks, such as calibration of tools, to bibliographic documentation on legislation and environmental guidelines. In particular, the bibliographic research activity included the study of the Italian and European legislation in force in the environmental sector, with a special focus on the UK EPA Guidelines which describe the application of the storage chamber method for interstitial gas sampling.

Subsequently, the students were introduced to the use of the West Systems fluxmeters for the measure of gas fluxes at the soil-air interface, viewing the instrument manual and personally carrying out the calibration procedure of the device in a suitable laboratory.

Once they became confident about the operation of the instrument, they were accompanied by a West Systems technician on a site close to the company and carried out some CO<sub>2</sub> and CH<sub>4</sub> fluxes measurements from the ground.

Finally, they received basic notions on the geostatistical elaboration of the data collected in the field by means of the ordinary kriging method which allows to define isoflow maps of the concentration of a gaseous species investigated.

## Fields for Life

Pajares Guerra, Miriam <sup>1</sup>

Technician of The International Foundation for Ecosystem Restoration (FIRE)([miriam.pajares@fundacionfire.org](mailto:miriam.pajares@fundacionfire.org))

Educator(NGO)

**Keywords:** land restoration, environmental education, chameleons, jackals, marine mammals.

### Abstract

The International Foundation for Ecosystem Restoration (FIRE) is a NGO that was born in 2006. We work for ecosystem restoration and conservation, transferring scientific knowledge to operative projects with high social efficiency. For further information, please visit our web page: <http://www.fundacionfire.org/>

Agriculture is essential for the human being, but at the same time, it is the main driver of negative anthropogenic impacts on the Planet. Moreover, farmlands occupy almost 40% of the Earth's surface. Thus, we need to find solutions to reduce the negative impact of agriculture on the environment (e.g. contamination, erosion or biodiversity loss), in order to achieve agriculture sustainability. Conciliating agricultural production with biodiversity and ecosystem services is an essential challenge for humanity. Strategic agroecological restoration can help to achieve this goal, through improving biodiversity and ecosystem services in farmlands without competing for land use. Some of the actions that can be carried out are: planting native species hedgerows, creating temporary ponds or placing nest-boxes.

The main objective of the Fields for Life project is to transform the current agricultural fields into more sustainable ones, by using strategic ecological restoration actions based on scientific and technical knowledge, and also by transmitting this knowledge and involving farmers and society as a whole. The latter is also achieved by using tools such as Land Stewardship.



## Game Theory and Social Cartography for Landscape Restoration

M. D. S. Suarez Bonilla, Antonio <sup>1</sup>; Bouchain, Rafael César <sup>1</sup>

<sup>1</sup> NATIONAL UNIVERSITY OF MEXICO, UNAM (Economic research institute, Mobility and green infrastructure lab)

Educators

**Keywords:** Landscape, Game theory, Green infrastructure, Cartography, Social Coodesign.

### Abstract

Often used as a tool for conflict analysis and resolution, Game Theory and Social Cartography appear as a powerful combo tool for co-designing urban landscapes in which people can now plan restoration for the city environments and rethink the relevance of XXI st. century infrastructure models and its reconversion according to new existing cultural, demographic and environmental challenges.

While trying to develop tools for conservation and restoration of an urban reserve a think thank comes with the idea of finding and building a collective imagination in which several and diverse groups of the community can interact to design and negotiate restoration initiatives which can include public use, natural and social connectivity in a way to approach to long term conservation.

Usually urban ecology restoration initiatives implies an extremely complex process of negotiation between biologist, urban planners, administrators, and society making of it an expensive and less effective process in which nature and humans are loosing by equal.

The project of "Game theory and social cartography for landscape restoration" at UNAM develops a tool to make more effective restoration and preservation of the original landscape known as "Pedregal" one of the last relicts of a volcanic eruption in the south western part of Mexico City where university settled 50 years ago and today a population of 150,000 live their daily academic, administrative and research activities, a landscape of different priorities for diverse groups and individuals in which local governments along with citizens and authorities can accomplish social, administrative and environmental demands.

Landcare is a good opportunity for interacting with a multidisciplinary hands on work environment where key conservation players interact.



## Xuvenciencia - Promoting Science Among Young People

Al-Soufi, Wajih <sup>1\*</sup>; Fernández Lorenzo, Juan Luis <sup>2</sup>; Valcárcel Armesto, Montserrat <sup>2</sup>; López Alonso, Marta <sup>3</sup>; Quiroga Berdeal, María Isabel <sup>3</sup>; de Azevedo Gomes, Ana Manuela <sup>3</sup>; Losada García, Ana Paula <sup>3</sup>; Piñeiro Maseda, Lucas <sup>1</sup>; Martínez Cabaleiro, Miguel <sup>2</sup>; Novo Rodríguez, Mercedes <sup>1</sup>

University of Santiago de Compostela, Xuvenciencia, Campus Terra, Lugo, Spain; <sup>1</sup> Faculty of Science; <sup>2</sup> Higher Polytechnic Engineering School; <sup>3</sup> Faculty of Veterinary Medicine (\* wajih.al-soufi@usc.es)

Educators

**Keywords:** Summer Science Camp, Scientific Culture, Science Kits, Teacher Training.

### Abstract

*XuvenCiencia* was born in 2013 as an educational initiative of researchers of the University of Santiago de Compostela at the *Campus Terra* in Lugo. *XuvenCiencia* combines three closely interrelated activities: the summer science camp *Campus XuvenCiencia*, the teacher training *Xornadas para Profesorado*, and the science kits *XuvenCiencia na Aula*.

The *Campus XuvenCiencia* is a residential science camp of one-week duration with more than 80 different activities, in which 150 young people aged between 14 to 18 years get into contact with diverse branches of science and technology, but also of humanities, economics, law, archaeology, nursery or arts. The participation of nearly 100 researchers and of many private companies and public institutions makes it possible to offer a big variety of practical and multidisciplinary content. *XuvenCiencia* represents an excellent platform for environmental education and includes several activities related to this topic.

*XuvenCiencia na Aula* develops and distributes science kits which provide teachers with experimental material within a clearly defined didactic framework. Three of these kits, *Animal CSI*, *Vitroplant*, and *AquaLab*, include topics related to the care of the environment.



*Xornadas para Profesorado* offer regular workshops where high school and university teachers meet and exchange experiences and training regarding specific topics. These training sessions also serve to instruct the teachers in the use of the science kits.

*XuvenCiencia* is financed by the USC, the Xunta de Galicia, the Ministry of Economy, the Deputación Provincial and the Concello de Lugo, and by private companies. It is member of the European Children's Universities Network - EUCU.NET and of the Scientix community. (More information: [www.usc.es/xuvenciencia](http://www.usc.es/xuvenciencia))