



Eastern Macedonia and Thrace Institute of Technology

PROCEEDINGS of the 1st International Workshop for the
“STREAMS-2-SUPPRESS-FIRES-
Utilizing Stream Waters in the Suppression of Forest Fires with the
help of New Technologies” Project
Titled: Innovations in Fire Suppression



Photo by Nikolas Giakoumidis



Photo by Maxim Svolynskiy

Editors: G.N. Zaimes, D. Kaziolas, K. Ioannou, V. Iakovoglou & D. Emmanouloudis



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**1st International Workshop for the
“STREAMS-2-SUPPRESS-FIRES-
Utilizing Stream Waters in the Suppression of Forest Fires with the
help of New Technologies”
Project**

Title: Innovations in Fire Suppression

**Location: Large Amphitheater
Dept. of Forestry & Natural Environment Management,
Drama, GREECE**

DATE: October 17-18 2013



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BIOGRAPHICAL NOTES

Borsuk, Anatolii - From 2002 till 2006 he studied at Shatsk Forestry College named by V.V. Sulko. From 2006 till 2009 has studied in National University of life and Environmental Sciences of Ukraine, where he received his Bachelor and Master Degree. From 2010 till 2011 has studied in the Swedish Agriculture University on Euroforester Master Program. Since 2012 he has been studying as PhD student and working as a Researcher in National University of Life and Environmental Sciences of Ukraine.

Corobov, Roman - Doctor-habillitate in geography, professional climatologist with a long-term experience in regional climate statistical description and mapping. During the last decades he works mainly in the climate change field. A specific interest of his, is vulnerability and adaptation to climate change impacts on different natural and social systems, primarily, on water resources.

Emmanouloudis, Dimitrios - is a permanent full Professor, Director of the Laboratory of Mountainous Water Management and Control and the Laboratory of Geology and Petrography, Department of Forestry, Eastern Macedonia and Thrace Institute of Technology and Director of the MSc in Management of Water resources in the Mediterranean. Some of his scientific and research interests include the use of GIS for the analysis, interpretation and quantitative estimation of geomorphologic and hydrological parameters and the development of different techniques for forecasting, measuring and monitoring the phenomena of erosion, degradation and desertification in mountainous watersheds. He has 60 and more publications in various international journals, congresses and conferences and has been a Coordinator of 12 international projects financed from International organizations like E.U., UNESCO, Hellenicaid etc.

Fesenko, Aleksei - He has a PhD in geology. He is the senior research associate of the “Scientific and engineering center of radioecogeological polygon researches” at the Presidium of National Academy of Sciences of Ukraine (Kiev) and the President of public organization “Research Institute of Geological and Ecological Monitoring and Forecasting”(Ukraine) (<http://ukrgeo.org>). In 2010 he received “the laureate of the state award of Ukraine in the field of science and technology” for his research works in the field of regional engineering geology, geomorphology and



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GIS. From 2004-2013 he has been an associate professor in engineering geology of Odessa national university.

Ghulijanyan, Andranik - is the local manager of the project. He is involved in forestry and environment sectors in the Republic of Armenia for 35 years, conducting activities in forestry and environmental management, as well as other scientific research. He has a doctoral degree in botanical sciences and is an author of 32 scientific papers.

Iakovoglou, Valasia - she has many years of research and teaching experience with the Department of Natural Resource Ecology and Management (NREM) at Iowa State University (USA), the Technological Educational Institute (TEI, Greece) of Kavala and the Forest Research Institute (DEMETER/FRI, Greece). She is a reviewer in many international scientific journals and has a substantial number of peer-reviewed journals and active participation in many research projects. Both, her MS and PhD work emphasized on ecophysiological attributes of forestry species (received at ISU). Some of her research interests are the effects of climate change on plants and ecosystems, forest restoration and reforestation, seeding growth and production as affected by altered environments and plant adaptations/mechanisms under stressed conditions.

Ioannou, Konstantinos - is the Geoinformatics and ITC specialist of the project. He is also an adjunct professor in the graduate and post graduate courses of the Department of Forestry and Natural Environment Management, Technological Educational Institute (TEI, Greece) of Kavala. He holds an MSc, and a PhD and two post doctoral researches from Aristotle University of Thessaloniki with a specialization in the use of informatics for the protection of the environment. His main research interests focus on Artificial Intelligence, development of GIS Applications, Multicriteria Decision Analysis, Visual Programming and Wireless Communication Networks. He has worked in a number of research projects as a junior and senior researcher and has published as lead author or co-author many research papers. He is a council member of the European Federation for Information Technology in Agriculture, Food and the Environment, branch of Greece.



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Kaziolas, Dimitrios - is a Dr. Ing. studied civil engineering at the Aristotle University of Thessaloniki (AUTH) (Diploma (1996), PhD (2000)) and he is Associate Professor of Structural Engineering at the Department of Forestry and Natural Environment Management, Eastern Macedonia and Thrace Institute of Technology. His academic career starts in 2005 when he appointed as Assistant Professor at the Department of Forestry and Natural Environment Management, Kavala Institute of Technology. His research interests, among other, include: Timber Structures, Steel Structures, Aluminium Structures, Composite Structures, Statics and Dynamics of Structures, Nonsmooth and Nonconvex mechanics, Optimization algorithms for the Study of Static Problems and generally Problems of the Science of Civil Engineer, Sustainable Design of Structures. He has many scientific publications (in journals or in proceedings of conferences) and has been involved in many research projects either as a member or as a project manager.

Koutalakis, Paschalis - is currently a Postgraduate student of the MSc Programme "Management of Water Resources in the Mediterranean," Department of Forestry and Natural Environment Management, Technological Education Institute of East Macedonia and Thrace institute of Technology. He received his B.S. from the School of Geology, Faculty of Sciences, Aristotle University of Thessaloniki, Greece. In addition to being a geologist he currently has expanded his fields of expertise in computer programming and modeling. He has practical experience in the use of the hydrologic model SWAT (Soil and Water Assessment Tool).

Kucuk, Omer - he was born in Trabzon in 1974. In 2000, he graduated from the Department of Forest Engineering from the Black Sea Technical University with a Master Science Degree. Afterwards, he got his PhD also at the Black Sea Technical University in the same program. His research interests are forest fires, wildlife. In addition, he has been an instructor in the Department of Forestry in Kastamonu University since 2008.

Lakyda, Petro - Director of the Institute of Forestry and Landscape-Park management of the National University of Life and Environmental Sciences of Ukraine. He is Leader in the research for carbon assessment in forests of Ukraine. His main scientific fields are: Forestry, Forest phytomass and carbon estimation, Forest policy. His current research interests are: forest carbon and climate change, sustainable forest management. He was awarded the IInd Diploma U.N.O. as co-



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author of “Millennium Ecosystem Assessment” for Scientific and Technological Achievements in Environment (Zayed International Prize for the Environment, 2006). Petro also has an extensive experience in the application of mathematical methods and computers in forestry research.

Mallinis, Georgios - obtained his Ph.D. in Remote Sensing and GIS for forest mapping, at the Aristotle University of Thessaloniki (2006). He is currently an Assistant Professor at the Democritus University of Thrace. His educational duties include teaching courses in remote sensing, cartography and GIS. His research is focused in the field of remote sensing and GIS applications in forest ecosystems. Besides that, his research interests include geomatics application in environmental monitoring. Dr. Mallinis has been involved in various projects, the most recent of which is (as member of the National and Kapodistrian University of Athens team) FUME- Forest Fires under Climate, Social and Economic changes in Europe, the Mediterranean and other fire-affected areas of the world, funded under EU’s FP7 framework. His work has been published in peer-reviews journals, books, and international conferences.

Menemenlis, Dimitrios - is a Lieutenant Operating Officer in Drama Fire Brigade working in the training office, since 2011. He graduated from the Greek Fire Academy of Athens as a Firefighter (2001), a noncommissioned Fire Officer (2003) and a Fire Officer (2007). He worked as an Operating Officer in the 1st Fire Department of Athens, the Fire Brigade of Xanthi and the Fire Brigade of Kavala. He is responsible to train the staff of his Brigade in many categories of first response (Forest fires, city fires, chemical fires). He has been trained in many national schools (National Centre for Public Administration and Local Government), and abroad (GTG Training Specialists - Glasgow Scotland).

Mitsopoulos, Ioannis - received his Ph.D. degree in wildfire science from the Aristotle University of Thessaloniki, Greece, in 2005. He has been working for 9 years as research assistant at the School of Forestry and Natural Environment, Aristotle University of Thessaloniki. His research focused on fuel ignitability, fuel modeling, fire behavior, fuel management, and post-fire effects. Currently, he is a senior researcher at The Global Fire Monitoring Center (GFMC), Freiburg University, Germany. His work focuses on early warning of fire danger and near-



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real time monitoring of fire events, interpretation, synthesis and archive of global fire information, support of local, national and international entities to develop long-term strategies or policies for wildland fire management, including community-based fire management approaches and advanced wildland fire management training for decision makers. His work has been published in peer-reviews journals, books, and international conferences

Risnoveanu, Magdalena - she is licensed in Economic Sciences, has a master degree from the National School of Administrative and Political Studies in Romania. She is the chief of the financial department in the Prefect's Institution Braila County and is a student of the Body of Expert and Licensed Accountants of Romania, which is the representative organism of the accountancy profession in Romania. She is the local financial manager for partner 1 of the Streams-2-SUPPRESS-Fires project.

Saglam, Bulent - He was born in Trabzon in 1970. In 1992, he graduated from the Department of Forest Engineering in the Black Sea Technical University with a Bachelor's Degree. Then, he got his Master Degree in 1995 and Ph.D in 2002 also at the Black Sea Technical University in the same program. His research interests are forest fires, wildlife. In addition, he has been an instructor in the Department of Forestry in Artvin Coruh University since 2004.

Tsaousis, Alexander - He received his Bachelor of Forestry and Natural Environment from Aristotle University of Thessaloniki. He was the Rapporteur of the Department of Protection of Forests and woodlands, Forestry Directorate of Bengal (South Aegean) from 2002-2008. From 2009 until today he is the Rapporteur Protection Department Forestry and woodland, Forest Service of Drama (Decentralized Administration of Macedonia and Thrace). From December 2011 - May 2012 he was the Head of the Department of Protection of forests and woodlands, Forestry Drama (Decentralized Administration of Macedonia and Thrace). He has been trained in Rational management of water resources and environment in island regions (2005), Geographic Information Systems (2006), the Fire tourist islands (2006), Civil protection (2007) and Urban and Semi-urban green (2011). Finally he has worked with Department of Landscape Architecture Department of Landscape Architecture, TEI of Kavala, on the protection of urban parks (2011).



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Tufekcioglu, Aydin - He was born in Trabzon in 1971. In 1991, he graduated from the Department of Forest Engineering in the Black Sea Technical University with a Master Science Degree. Then, he got his Ph.D at the Iowa State University in the same program. His research interests are general ecology, forest ecology and soil science. In addition, he has been an instructor in the Department of Forestry in Artvin Çoruh University since 2001.

Tufekcioglu, Mustafa - He was born in Trabzon, 1977. In 2000, he has graduated from the Department of Forest Engineering in the Black Sea Technical University with a Bachelor Degree. Then, he got his Master Degree in 2006 and Ph.D in 2010 in the Iowa State University in the same program. His research interests are soil and water quality, stream ecology. In addition, he has been an instructor in the Department of Forestry in Artvin Çoruh University since 2010.

Yavuz, Mehmet - Dr. Mehmet Yavuz is an Assistant Professor of Forest Engineering Department at the Artvin Coruh University, Artvin, Turkey. He received his B.S. from Istanbul University, his MS from Purdue University and his Ph.D. from the State University of New York, College of Environmental Science and Forestry, Syracuse, NY, USA. He eventually earned his spot as Senior Support Specialist at the same university for two years. Then, he got a tenure-tracked position at Artvin Coruh University and moved to his home country, Turkey. At the same time, he served as an executive director of the information technologies Department and Associate Dean of graduate school of the same university. He is an author of many papers, member of ASPRS, board member of Forestry Faculty and advisor to the President of Artvin Coruh University. His research interests are remote sensing and GIS applications on forestry and environmental science. He is currently working on a European joint project with colleagues from five countries to suppress fires using new technologies.

Zaimes, George - is a Professor of Technological Application in the management and control of mountainous water with the Department of Forestry and Natural Environment Management, Eastern Macedonia and Thrace Institute of Technology, since 2010. He received his Ph.D. from Iowa State University in 2004 with a specialization in water resources. He was an Assistant Professor in Watershed Rangeland and Riparian Areas Management with the School of Natural Resources and Environment, the University of Arizona from 2004 to 2008. Some of his



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scientific and research interests include: management and restoration of riparian areas, watershed and ecosystem management, stream restoration, management of mountainous waters and erosional processes. He has many scientific publications and has been involved in many research projects either as a member or as the project manager.

Zibtsev, Sergiy - is an international expert in fire management, in particular, in the study of fire management issues in forests contaminated by radionuclides. Much of his life's work has been done in the exclusion zones surrounding the Chernobyl site of the 1986 nuclear disaster. He is an associate professor and senior researcher in forestry and forest ecology at the National University of Life and Environmental Sciences of Ukraine in Kiev. In 2004 and 2005 he was a visiting scientist and a Fulbright scholar at Yale University School of Forestry and Environmental Studies. Since 2008 he has been a member of the UN Economic Commission for Europe's Team of specialists on forest fires, since 2013 - director of the Regional Eastern European Fire Monitoring Center. In 2013 he became a laureate of the Green Star Award (3-d ceremony) established by the Green Cross International, OCHA and UNEP.



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ABSTRACTS

1. Wildfires and Protected Areas

Wildfires are a natural environmental phenomenon that has occurred long before the arrival of humans. Wildfires are also an integral part of many ecosystems. Still, many wildfires are caused by anthropogenic reasons that have major environmental and ecological impacts on ecosystems as well as economic and social impacts to societies. Today, even in regions where wildfires are a natural phenomenon, the frequency and severity of fires have increased due to the more favorable fire conditions. Climate change will continue to be a major driving force that will increase wildfires.

Protected areas are one of the most significant land-use designations by humans. They help sustain life on earth by protecting different landscapes that have rich or rare biodiversity, while also providing many benefits to humans. These areas can range from glaciated sites (e.g. Los Glaciares National Park, Argentina) to cloud forest (Rwenzori Mountains National Park, Uganda), to riverine forest (Jau National Park, Brazil) to deserts (Air and Tenere Natural Reserves, Niger). The IUCN (World Conservation Union) is the largest and most important conservation network. The IUCN has more than 100 nations and governments more than 800 NGOs from 180 countries. In the European Union the ecological network of the Natura 2000 has been established. The purpose of this network is to mitigate the decline in biodiversity.

Finally, it is essential to understand the strong interconnection between protected areas and wildfires. In the past, there was a misconception that protection meant the elimination of fires in the protected areas. The elimination of fires when coupled with minimal management actions in these areas led to the accumulation of forest fuels that could lead to major catastrophic fires. It is essential future management practices of protected areas to incorporate properly the role of fires for long term sustainable management of these areas.

2. Streams-2-SUPPRESS-Fires - Overview

Fires are major threats for all protected areas and can cause irreversible damages to them. In many protected areas the minimal management practices can



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lead to the accumulation of excessive fire fuels that can potentially lead to catastrophic fires.

Currently wildfires in many of the countries of the Black Sea Region do not seem to be a major threat. This is changing and the threats of wildfires will increase in the future. The main reason is climate change that is leading to substantially higher temperatures especially during the summer. Examples of large catastrophic fires, in areas that they do not frequent occur, are the forest fires that occurred in 2010 in Russia. Because wildfires are not a major concern in most of these countries they are not prepared for this potential danger. Most countries have not developed extensive management plans to face wildfires and have limited equipment, primarily land vehicles with no air support.

In addition, the limited resources that all these countries have for environmental issues make it a necessity to utilize innovative ways to face fire suppression. In this project this will be accomplished through new technologies and the exchange of best management practices in the fields of scientific, technical and administrative competencies and capacities for environmental protection. Innovative technologies can help management become more cost-effective and allow the sustainable development of natural protected areas in the Black Sea region.

The innovations used in this project will: a) allow to indentify the areas that have the greatest risk of having fires, b) utilize in a sustainable way stream water to suppress fires in protected areas; the water will be for land vehicles during night time when planes and helicopters cannot be use, c) develop software for the optimal location of the water reservoirs and mobilization of fire vehicles, d) establish and operate a neighbourhood network of experts in fire suppression in the Black sea region that will collaborate to suppress fires in protected and other areas and e) enhance the knowledge and awareness on forest fire suppression of the appropriate institutions and general public.

Overall through this project a holistic and complete approach for fire suppression for the Black Sea Region will be developed and implemented on 6 pilot areas all over the region.



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3. Prefect's Institution Braila County- The Natural Park "Small Wetland of Braila"

The Prefect's Institution Braila County is a public organization that was founded in 1992 and has legal personality and its own budget, being led by the

Prefect and helped by a Subprefect. The Prefect represents the Government at the local level and has as basic duties:

- makes sure that the law is well applied in the county and is checking the legality of administrative acts taken or issued by the local public;
- acts in order to be sure that the Government Program objectives will be completed;
- establishes together with other public authorities of the county, its development priorities;
- takes action in order to maintain the social peace;
- establishes and implements the measures and plans for emergency situations;
- is the chief of the civil security;
- decides the cooperation and association with similar institutions from abroad in order to promote the common interests;
- is the head of the decentralized public services of the ministries and the other public central administrative bodies subordinated to the Government, and organized at the local level.

The Natural Park "Small Wetland of Braila" is a complex reservation, placed in the West and South-West of Braila's Pond, between Danube at the West and Valciu branch at the East, being an integrated part of lower Danube. This site is a regional complex ecological system that includes: 2 eco-regions, 16 major types of components (local complexes), at least 67 ecosystems types and 35 non-biotic compartments that ensure the living of over 1688 species of plants and 3735 species of animals. The park integrates all 10 holms placed between Danube's branches. It can be said that it's an inner delta on the lower course of Danube. According to the active legislation, this protected area (Small Wetland of Braila) occupies an area of 17.529 hectares.



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According to some late evaluation realized by a LIFE 99 NAT/RO/006400 project, the area of the natural park is 21.074 hectares (including Danube's branches). The area has various ownership forms. Despite the modifications that occurred, both in the structure of the integrated ecological system and its level, the Small Wetland of Braila preserves important ecological values, as an important part of Lower Danube System, and is placed in the upstream Danube Delta Biosphere Reservation. This area is well known for its ornithological importance because it is placed on the most important lane of bird migration from the lower basin of Danube, at the middle of the migration routes, among nesting places from Northern Europe and wintering refuges from Africa. A large number of bird species has been recorded, of which 169 are internationally protected species by Bern, Bonn and Ramsar Conventions. These are half of typical Romanian migrating bird species. Since a big number of these birds are aquatic species, in 2001, the area was declared Ramsar Site (position no. 1074 on Ramsar list), the second after the Danube Delta.

4. Zikatar Environmental Centre - Arevik National Park

The "Zikatar Environmental Centre" State Non Commercial Organization is an environmental, scientific-research, educational nonprofit organization with a status of a legal entity which was established in 2002 through restructuring of the "Forest Research Experimental Center" closed joint-stock company, and is considered as its legal successor.

The objective of the Organization activities is to ensure the study, preservation, protection, stock-taking, inventory, monitoring of natural ecosystems, landscape and biodiversity, development of nature chronicle, within the areas of the "Zikatar" State Sanctuary. Its purpose is also to ensure the sustainable use of natural resources of the State Sanctuary, implementation of scientific experiments on landscape and biological diversity of natural forest ecosystems, unique nature monuments, ordinary development of natural resources, their preservation, protection, rehabilitation and reproduction, forest management activities, forest-ecological experimental studies, preservation and reproduction of forest genetic resources within the areas of the "Zikatar" State Sanctuary. In addition the centre will help in the guarding of the forested area and prevention of the activities that can disturb the natural balance of the ecosystems while implementing fire safety measures. There are 20 specialists in its personnel,



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including foresters, biologists, zoologists, geographers, agronomists, engineers, cartographers, economists, etc. The “Zikatar” State Sanctuary was established in 2010 and occupies 150 ha area. The Zikatar training center was established within “Zikatar Environmental Center” State Non Commercial Organization in 2007 and is organizing the trainings in the field of forestry and environment.

The “Arevik” National Park was established by the decision of the Government of Armenia in 2009. The same governmental decision established a management body - “Arevik” State Non-Commercial Organization under the Ministry of Nature Protection to manage the National Park. The “Arevik” National Park is located in the south-eastern part of the Republic of Armenia, in Syunik Province and its distance from the capital Yerevan is 375 km. The area of the park borders the Nakhijevan Autonomous Republic in the west, the Islamic Republic of Iran in the south and Nagorno Karabakh Republic in the east. The total area of the park is 34,402 ha. The average elevation of the area is 2,200 m. The highest point is Baghats peak with a height of 3,256 m, while the lowest point is the Valley of Aras River at 375 m. The purpose and scope of the activities of “Arevik” National Park is to ensure the conservation, natural development, reproduction and sustainable use of natural ecosystems, landscape and biological diversity of unique natural monuments, the transboundary habitats of endemic and rare fauna species. One thousand four hundred and sixty two (1462) species of higher plants grow on the territory of the Arevik National Park. Eighteen (18) endemic species of Armenia grow in Arevik National Park and 92 species are included into the Red Data book of Armenia (2010). Fauna of vertebrate animals are represented by 270 species. There are also 10 species of animals included in IUCN Red Data List.

5. Eco-TIRAS International Association of River Keepers - Codrii Reserve

Eco-TIRAS is an international nongovernmental association incorporating about 60 environmental NGOs from Ukraine and Moldova with the mission to unite their efforts in implementing the Integrated River Basin Management of the Dniester River basin shared by these two countries. Since 2000, the Association has implemented numerous programs supported by the EC, US Civilian Research and Development Association (CRDA), UNEP, UNECE, OSCE, World Bank, BST, as well as projects under different European Ministries of Environment, Foreign Embassies in Moldova, and others donors.



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The “Codrii” Forest Reserve is the first national reserve of Moldova. It was founded in 1971 with the aim to conserve the most representative areas of forests, specific for Moldova, and is subordinated to the Moldova's Forestry Agency “Moldsilva”. The Reserve’s strictly protected zone (720 ha) forms its nucleus and comprises sectors with habitats of rare animal and plant species in terms of their exceptional scientific and conservation values. Here there are protected almost 1000 plant species representing about half of the country-specific flora as well as 52 species of mammals and 151 species of birds. Within this zone any kind of human activity, except scientific and protection research, is forbidden.

6. A close look at Artvin Çoruh University and its EU Project site

Artvin Coruh University continues its educational, research and socio-cultural activities in three main campuses. The first one is located at the city center of Artvin, the second one is located 3 km away from city center at the Seyitler Area and the third one is located at sea coast in Hopa. The main building in Seyitler Campus hosts the President's Office, the Faculty of Forestry, the Faculty of Science and Letters, Faculty of Engineering, Graduate School of Natural Sciences and Graduate School of Social Sciences. Additionally, a “Social and Cultural Center” which includes a cinema, seminar rooms, banks, a hairdresser, a cafeteria for students and university staff, a medical center, and a pharmacy (in order to fulfill the requirements of the students and the staff) is established in Seyitler campus. In addition to the "Social and Cultural Center", a "Sports Center" with an audience capacity of 900 is located in Seyitler Campus. The city center Campus, located near the River Coruh, hosts the Artvin Vocational School, Faculty of Education, School of Health and Cultural Convention Center. The Faculty of Business and Economics, Faculty of Religious Studies and Hopa Vocational School are located at Hopa Campus. The town of Arhavi houses is the temporary building for the Arhavi Vocational School. The Borçka Vocational School can be found in Borçka and Yusufeli Vocational School in Yusufeli as well.

The Faculty of Forestry, Artvin Faculty of Forestry, founded within the scope of the University of Kafkas in 1992, started education in 1993. When Artvin Coruh University was founded in 2007, the name and link of Artvin Faculty of Forestry in University of Kafkas was changed into Faculty of Forestry and became a part of Artvin Coruh University. The department of Forest Engineering started



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education in 1993; the department of Landscape Architecture started education in 2006; the department of Forest Industry Engineering started education in 2009. Our mission is to be an institution that contributes to the sustainable admission and industry of natural resources, notably forestry resources, to train forestry engineers who are the pioneer administrators, managers and entrepreneurs of the public and private sectors and nongovernmental organizations and to train landscape architectures and forest industry engineers. Our vision is to be an institution that offers education, research and consultancy services at an international level notably in local, regional, national, Caucasia and Central Asia; to contribute the development of the environment at a social, cultural, physical and financial level; and to have healthy relationships with its partners.

The Bayam Forest District, in Kastomonu, Turkey lies between the latitude of 41° 27' 24'' N and 41° 35' 11'' N and the longitude of 34° 13' 12'' E and 34° 26' 30'' E. The study site has a total area of 16,006.2 ha of which 80 percent is forested. The remaining 20 percent is used for agricultural, hay production, and residential purposes. The terrain is hilly and the elevation ranges between 500 m and 1800 m from the sea level. The average temperature for the region is 10 °C (min=-4 °C and max=27 °C). The site has an average rainfall of 449.6 mm. The active vegetation period is between April and October. The major species in the site include black pine (*Pinus nigra* subsp. *pallasiana*), Scotts pine (*Pinus silvestris* L.), oriental beech (*Fagus orientalis*), hornbeam (*Carpinus betulus*), field elm (*Ulmus minor* Gill.) and various oak species. The Main soil type of the area is brown forest soils.

7. National University of Life and Environmental Sciences of Ukraine - Yalta Mountain-Forest Natural Reserve

The National University of Life and Environmental Sciences of Ukraine (NULESU) was established in 1898 year. Over 37,000 students and more than 600 Doctoral students and Students-seekers are studying at 21 faculties of NULESU. The Institute of Forest and Landscape-Park Management (IFLPM) of NULESU was established in 1840 year and now is the leading institution of forestry education and research in Ukraine. The Yalta Educational-Scientific Centre for Ecobiotechnology of Subtropical Plants and Landscape Architecture (Crimean Peninsula) are the basis for the practical training of students and research.



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Of special interest is the Regional Eastern European Fire Monitoring Centre of NULESU (REEFMC). In 2012 the NULESU, Institute of Forestry and Park Management, in cooperation with the Global Fire Monitoring Center (GFMC) and the UNECE/FAO Team of Specialists on Forest Fire decided to establish the REEFMC. Among the aims and objectives of the REEFMC that should be mentioned are: conducting and coordinating wildland fire research; implementation of research results into fire management policies and practice in the interests of concerned ministries and specialized agencies of Ukraine and neighbouring countries in Eastern Europe.

Yalta Mountain-Forest Natural Reserve (Yalta MFNR) was established in 1973. The area of Yalta MFNR is 14,523 ha. Its territory is a strip along the Black Sea from town Foros in the west to the town Gursuf at the east with a length 40 km, maximum width (north-south) is 23 km. The Yalta Mountain-Forest Natural Reserve occupies the southern slope of the main ridge of the Crimean Mountains composed with rocks of all ages: from dark gray Triassic shales, overlain by Jurassic limestone, which actually form the ridge to modern Quaternary loess. The upper and middle parts of the slopes are steep (30-40°) often precipitous, lower parts of the slopes are flat (10-20°) and strongly fragmented by deep valleys and ravines. The upper part of the ridge named yaila (translated from Tatar - "pasture") is a hilly plateau of several hundred meters to 5-7 km wide with karst caves and descent. Within the reserve are 194 karst cavities (the cadaster of karst caves of Crimea recorded more than 1000 cavities). The climate of the Yalta MFNR is close to the Mediterranean in its lower part. With increasing altitude the climate moves to moderately cool and humid in the yaila. In a sub-Mediterranean climate brown soils are formed, while within the middle and upper zones it has changed into the dark brown soil. Under dense grass cover on limestone in yaila, humus-carbonate mountain-steppe soils have formed.

The vegetation of the Yalta MFNR varies very much and forms four altitudinal zones. From the coast to a height of 400 - 450 m above sea level (ASL) *Quercus pubescens* forests with some areas of *Juniperus excelsa* and *Pistacia mutica* grow. At altitudes of 400 - 900 m ASL wide stretches of forest of *Pinus nigra* var *pallasiana* grow. Sub-Mediterranean species in the lower part and nemoral species at the upper part (*Quercus petraea*, *Carpinus betulus*, *Fraxinus excelsior*) are dominant. Between 900 - 1200 m ASL the third zone of forests is formed where



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Pinus kochiana (near Gurzuf) combined with *Pinus sylvestris* and typical *Fagus sylvatica* forests (on flat areas) are present. Flora of the reserve includes 1,364 species of vascular plants belonging to 509 genera and 100 families. There are also 183 species of moss growing, which is 60% of the Crimean Bryophyte species, 154 species of lichens and 1,733 species of fungi. There are 78 rare plant species listed in the Red Book of Ukraine grow in Yalta MFNR: *Cheilanthes persica* (Bory) Mett., *Adiantum capillus – veneris* L., *Juniperus excelsa* M.Bieb., *Pulsatilla taurica* Juz., *Cerastium biebersteinii*, *Silene viridiflora* L., *Paeonia daurica* Andrews, *Viola oreades* Bieb., *Cistus tauricus* C. Presl, *Sobolewska sibirica* (Willd.) P.W.Ball, *Arbutus andrachne* L., *Chamaecytisus wulffii* (V. Krecz.), *Pistacia mutica*, *Prangos trifida* (Mill.) Herrnst. et Heyn., *Onosma polyphylla* Ledeb., *Adenophora taurica* (Sukacz.) Juz., and many species of *Orchidaceae* in the flora of the reserve. There are 24 species listed in the European Red List and 8 species listed in the Appendix 1 of the Bern Convention growth in Yalta MFNR. There are 18 plant associations (78% of Crimean rare plant association) listed in Green book of Ukraine. A variety of environmental conditions and vegetation leads to the richness of fauna. There are 37 species of mammals, 150 of birds, 16 of reptiles, 4 of amphibians, 90 of insects and 119 of mollusks in Yalta MFNR.

The Chronicle of Nature (1998, 2001, 2003) indicates that wildfire is the main factor of the ecosystem disturbances of the Yalta MFNR. Ground fires destroy brush layer and change forests into simple, poor association of *Pinetum brachypodosium* (Rupeste) with a relatively weak cover of herbaceous plants. Crown fire usually completely destroys forest stands and lead to the change of the plant association.

8. Spatiotemporal presentation of the forest fires in the area of Drama

This study presents the forest fires in the area of Drama, Greece for the period 2003-2012, compared with the time of the year, the size and the number of forest fires. The total burnt area in the last decade was 14.7 km² and was the result of 192 cases. The months with the most forest fires are August and September, while the months with the fewest are May, June and December. During August, September and July the burnt areas are also larger. Eighteen percent of the area burnt in the last decade was forest, 72% woodland and the remaining 9 %



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grassland. The results of this study can lead to the more effective planning of the prevention and control of the forest fires.

9. Organization and Effective Management of Forest Fires

First, indicated the institutional Framework of confrontation of forest fires. The General Response Plan for forest fires is called "Xenocrates" and is the main plan that is designed by the General Secretariat for Civil Protection to address the risk/causes of forest fires across the Greek Territory. This general plan provides the direction and coordination in the response of stakeholders in their actions in support of suppression operations of the Greek Fire Department. The involved administrations, regions and municipalities are required to plan a Special Response Plan forest fires based on specific instructions provided by the General Plan (analysis, expertise, harmonization).

The General principle of operational engagement is divided into three stages. Phase 1 - *Ordinary Preparedness*, Phase 2 - *Increased Readiness* and Phase 3 - *Immediate Mobilization - Intervention*.

The deployment for the repression and control of forest fires is achieved with firefighters, fire trucks, earth movers and aerial forces. In the fire Brigades of Drama, Nevrokopi, and Paranesti, there are serving a total of 68 employees, and there are 19 fire fighting vehicles and personnel carriers. Also in the work of the fire service, assist two planes PZL from Chrisoupolis Airport, one helicopter from the airport of Alexandroupoli, 81 cars and machinery work of regional units of Drama, 20 water sources throughout the mountainous region and 10 voluntary groups of Drama. Finally, depending on the risk index, an additional seven fire engines can be used and five fire observatories are operated in Drama to prevent the outbreak and spread of fire in forest.

10. Streams-2-SUPPRESS-Fires Neighbourhood Network

One of the major activities of the "Streams-2SUPPRESS-Fires" project is the establishment of a Neighborhood Network. The aim of the Network is to enhance the collaboration of the institutions related to fire suppression with an emphasis on protected areas and provide more effective management in facing forest fires.



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Firstly this will be accomplished by establishing a sharing Network among peers of the Black Sea regions. The Network will: a) promote true collaboration among the institutions, b) develop more efficient and effective management plans for wildfires, c) lead to faster and more effective mitigation of wildfires, d) increase the region's resilience to wildfires, e) enhance the protection of forested areas, f) support peer learning, g) create tools and resources, h) facilitate communications among institutions and i) facilitate countries to assist each other in the planning of protected areas and mitigation of wildfires.

Secondly, the Network will create mechanisms to inform the general public of the region. These will be achieved by: a) developing written (brochures) and online material (website) for the general public and d) hosting informative events (e.g. workshops, awareness events). These activities will enhance the general public knowledge on: a) protected areas and their importance, b) and best management practices and the mitigation on wildfires.

Participants of the network will include governmental fire protection and environmental agencies and departments, city and town planners, community and environmental associations, economic operators, management bodies for protected areas (including parks, reserves and biospheres), individual local experts, and stakeholders in each participating country. This will be done by recruiting key actors in suppressing forest fires and/or protecting protected areas from all six participating countries (Armenia, Greece, Moldova, Romania, Turkey and Ukraine).

The creation of the neighbourhood network will strengthen and expand cooperation between existing institutions. This will allow the communication among authorities managing natural protected areas and authorities responsible for fire protection in order to exchange expertise, best management practices and innovation in technical and scientific methodologies. This will also provide support for the monitoring, protection and conservation of natural resources and biodiversity. The purpose of the network is to be long lasting and to provide visible assistance.

11. The Hydrologic Model SWAT

Water is considered as the most precious natural resource of Earth and it is required for all living organisms. The fresh water is really rare according to the



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total amounts of water in Earth. Hydrology is an important field of science and water resources management plans are necessary in order to protect and preserve the available water resources. Useful tools for this approach are the hydrologic models. In addition, models give the opportunity to make future predictions of water quantity or quality. The Soil and Water Assessment Tool (known as SWAT) is a hydrologic model developed by Dr. Jeff Arnold for the USDA Agricultural Research Service. SWAT was developed in order to predict the impact of land management practices on water, sediments and agricultural chemical yields in large complex watersheds with varying soils, land use and management conditions over long periods of time. SWAT requires spatial (land-use, soils, topography) and temporal data (weather) in order to simulate the hydrological cycle on multiple watersheds. Also, it has the capability to simulate the distribution of nutrients and pesticides in streams. SWAT is used worldwide and has many different applications. Finally, it is a free product and can be used through ArcSWAT which is an interface for ArcGIS.

12. Optimal Reservoir Location and Vehicle Routing

The purpose of this work package is the optimal allocation of water reservoirs and the determination of vehicles routes for the fastest access to these reservoirs. The implementation will be done using Multi-criteria Decision Analysis (M.C.D.A.) tools and Geographic Information Systems (G.I.S.). In detail at the beginning we will determine the criteria which affect the proposed goals, along with the parameters that affect the participating criteria. All of these primary data will be weighted using a methodology of M.C.D.A. which is called Analytical Hierarchy Process (A.H.P.). Following that the results from the A.H.P. model will be visualized using the GIS, by reclassifying the already digitized maps. At the end, the final map will be created by using a combination of spatial techniques and the equation which will be created from the weight coefficients calculated by the A.H.P.

The optimal path will be calculated as a combination of the Reservoirs Dataset, the Road Network Dataset and the Limitations Dataset. The last Dataset will include all these parameters that affect vehicle movement along the pilot area, parameters of this type can be the road slope, the road dimensions, the



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vehicle dimensions etc. After determining these constraints, the optimal path will be calculated using the Shortest Path tool.

13. Forest Fuel Sampling

Given the spectacular increase in the number of wildland fires during the recent decades in the countries of South Eastern Europe, effective fire management strategies are needed to minimize fire hazard and the adverse impact of wildland fires such as environmental, economic, and human losses. An important component of forest fire hazard reduction strategies is related to the accurate prediction of fire behavior and growth, considering predominantly the fuel parameters, weather conditions, and topography. Vegetation composition and structure referred to under the term “fuels” by the fire science community is of particular interest to wildland fire management. Based on the knowledge of the spatial extent of the fuels, national authorities and land managers can design fire prevention, detection, suppression, and fire effects assessment strategies. The wide range of natural fuels’ physical characteristics found within an area and the need for standardization in fuel description across different areas in terms of fuel type maps that are used as input to fire behavior modeling, have resulted in the development of fuel models. Fuel models can be described as simulated complexes of fuel elements with physical and chemical parameter values representative of the typical fuel conditions (combustible materials) of a certain vegetation type. The aim of this report is to present the methodology used and the results for fuel types developed in all study areas of the participating countries in Streams-2-SUPPRESS-Fires project.

14. Forest Fuel mapping

Fuel maps are essential to fire management at many spatial and temporal scales. Coarse scale fuel maps are integral to global, national, and regional fire danger assessment to more effectively plan, allocate, and mobilize suppression resources at weekly, monthly and yearly evaluation intervals. Regional-level digital fuel maps are important in rating ecosystem health, locating and rating fuel treatments, evaluating fire hazard and risk for land



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management planning and aiding in environmental assessments and fire danger programs. Finally local scale fuel maps are essential for local fire management because they also describe fire potential for planning and prioritizing specific burn projects.

Remote sensing, along with Geographic Information Systems (G.I.S.), are important components of fuel models mapping efforts and fire hazard mitigation. Several studies have examined the contribution of remote sensing to fuel type mapping on global, regional and local scales either using direct or indirect mapping approaches.

In recent years, the development of new improved sensors (i.e. LiDAR, radar, VHR and hyperspectral) and techniques able to handle heterogeneous data sources, had considerably improved fuel mapping tasks. The aim of this lecture is the present of the current evolution in the field of forest fuel mapping based on remote sensing methods that could be used in the Streams-2-SUPPRESS-Fores project.

15. Using the Hydrologic Model SWAT on Menoikio Mountain

The pilot area of the Streams-2-SUPPRESS-Fires project is the Menoikio Mountain range situated in Northern Greece. Menoikio belongs to the greater hydrological basin of Strymonas River. The existing fauna and flora of the Menoikio Mountain is unique. For this reason, it has been designated as a protected area in the “Natura 2000” Network. ArcSWAT is the software that was used for the hydrological assessment of the Menoikio Mountain watersheds. ArcSWAT is a GIS interface for the Soil and Water Assessment Tool (SWAT). SWAT requires data such as topography, land-use, soils and weather in order to model the hydrological cycle. Four topographic maps 1:50.000 were used for the study of Menoikio Mountain Range (SERRES, PROSOTSANI, AXLADOCHORI and NEVROKOPI). Firstly, the topographic maps were geo-referenced to the GGRS 1987 Coordinate System. The layers develop from the topographic maps were: 1) the boundaries of the area, 2) the hydrographic network and 3) the main contour lines (contour interval = 100m). These data are required features in order to create the Digital Elevation Map (DEM). The next step is the watershed delineation module which identifies streams and drainage divides of the watersheds based on DEM. The Hydrologic Response



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Units (HRU) definition module identifies unique combinations of soil and land use within each sub-basin. The model requires the land-use map and the soil map in order to create the HRUs. The CORINE 2000 land cover vector files (provided by the European Environment Agency website) are used in order to create the land-use map of Menoikio. The soils are grouped according the World Reference Base for Soil Resources (1998) which is based on the Food and Agriculture Organization of the United Nations (FAO) classification (1974). SWAT has the capability of generating synthetic time series of precipitation, temperature, solar radiation, wind speed, and relative humidity for each sub-basin based on weather station data. The weather data that was collected includes the daily precipitation rate, daily maximum/minimum temperature through many regional weather stations and institutes as there are no weather station in Menoikio range.



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