"Ss. Cyril and Methodius" University in Skopje

FACULTY OF FORESTRY - SKOPJE

International Scientific Conference "Sustainable Forestry: Fact or Fiction?"

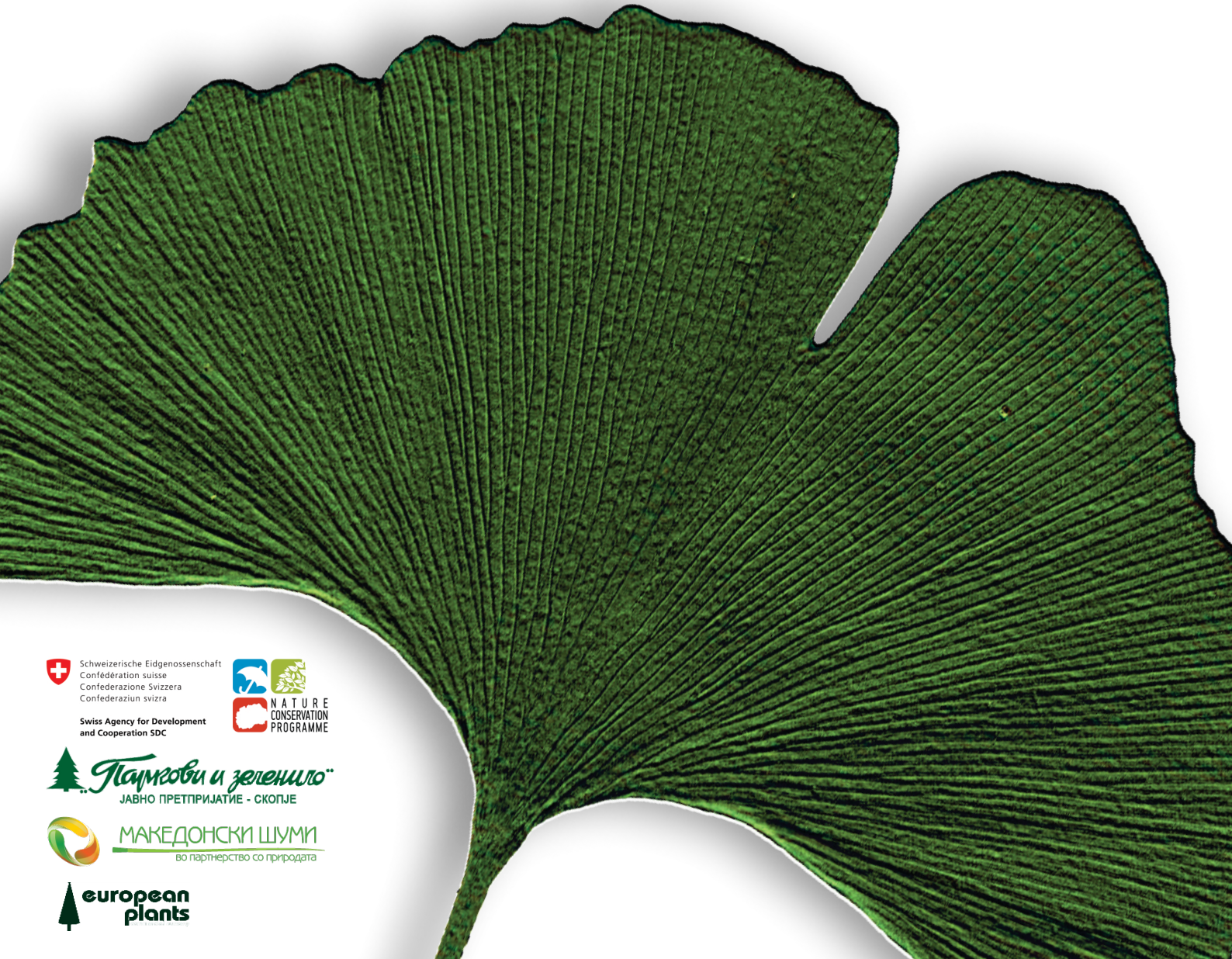
70 years

Faculty of Forestry - Skopje "Ss. Cyril and Methodius" University

BOOK OF ABSTRACTS

4-6th October 2017

Skopje, Republic of Macedonia



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

NATURE CONSERVATION PROGRAMME

Паркови и зеленило ЈАВНО ПРЕТПРИЈАТИЕ - СКОПЈЕ

МАКЕДОНСКИ ШУМИ во партнерство со природата

european plants

“Ss. Cyril and Methodius” University in Skopje

Faculty of Forestry - Skopje

70 years Faculty of Forestry in Skopje

International Scientific Conference:

“Sustainable Forestry: Fact or Fiction?”

BOOK OF ABSTRACTS

4-6th October 2017

Skopje, Republic of Macedonia

Citation
Book of abstracts of the International Scientific Conference “Sustainable forestry: Fact or fiction?”, Skopje, 4-6th October 2017. Ss. Cyril and Methodius University in Skopje - Faculty of Forestry in Skopje.

Publisher
Ss. Cyril and Methodius University in Skopje
Faculty of Forestry in Skopje
Dean
Dr. Kiril Sotirovski

Technical editing and design
Boris Najdovski, MSc
Dr. Bojan Simovski
Daniel Gjenchevski, BSc

Cover page
Boris Najdovski, MSc
Dr. Kiril Sotirovski

Copies: 100

Printed by
Indeks TP, Skopje

Conference web page
www.sf.ukim.edu.mk/UKiM_FoF_70_years.htm

Publisher’s address
Ss. Cyril and Methodius University in Skopje
Faculty of Forestry in Skopje
Ul. 16 Makedonska brigada br. 1
(P.O. box 235)
MK-1000 Skopje
Republic of Macedonia
E-mail: sumarski@sf.ukim.edu.mk
E-address: www.sf.ukim.edu.mk

CIP - Каталогизација во публикација
Национална и универзитетска библиотека „Св. Климент Охридски“, Скопје

378.096:630*(497.711)"1947/2017"
630*(063)

INTERNATIONAL scientific conference (2017 ; Skopje)
Book of abstracts : 70 years Faculty of forestry in Skopje / International scientific conference: "Sustainable forestry: fact or fiction?", 4-6th October 2017 Skopje, Republic of Macedonia. - Skopje : Ss. Cyril and Methodius University, Faculty of forestry, 2017. - 62 стр. ; 30 см

ISBN 978-9989-132-19-3

а) Шумарски факултет (Скопје) - 1947-2017 - Јубилеи б) Шумарство - Собири
COBISS.MK-ID 104313610

Scientific committee

Dr. Dana Dina Kolevska (UKIM Faculty of Forestry, Skopje)
Dr. Dijana Vuletić (Croatian Forest Research Institute, Zagreb)
Dr. Irena Papazova-Anakieva (UKIM Faculty of Forestry, Skopje)
Dr. Jasminka Rizovska Atanasovska (UKIM Faculty of Forestry, Skopje)
Dr. Makedonka Stojanovska (UKIM Faculty of Forestry, Skopje)
Dr. Marina Nonić, (Faculty of Forestry, University of Belgrade, Serbia)
Dr. Mirna Ćurković-Perica (Faculty of Science, University of Zagreb, Croatia)
Dr. Nataša Lovrić (European Forest Institute, Joensuu, Finland)
Dr. Silvija Krajter Ostojić (Croatian Forest Research Institute, Zagreb)
Dr. Bojan Simovski (UKIM Faculty of Forestry, Skopje)
Dr. Duško Ćirović (Faculty of Natural Sciences, University of Belgrade, Serbia)
Dr. Hristo Mihailov (University of Forestry, Sofia, Bulgaria)
Dr. Jean-Luc Peyron (GIP ECOFOR, Paris, France)
Dr. Jean-Michel Carnus (INRA, Bordeaux, France)
Dr. Kiril Sotirovski (UKIM Faculty of Forestry, Skopje)
Dr. Leonidha Peri (Faculty of Forestry Sciences, Tirana, Albania)
Dr. Leopold Poljaković-Pajnik (Institute of Lowland Forestry and Environment, University of Novi Sad, Serbia)
Dr. Milko Milev (University of Forestry, Sofia)
Dr. Miloš Beuković (Faculty of Agriculture, University of Novi Sad, Serbia)
Dr. Mirza Dautbašić (Faculty of Forestry, University of Sarajevo, Bosnia and Herzegovina)
Dr. Pande Trajkov, UKIM Faculty of Forestry, Skopje (UKIM Faculty of Forestry, Skopje)
Dr. Petar Zhelev (University of Forestry, Sofia)
Dr. Stephanos Diamandis (Forest Research Institute, Thessaloniki, Greece)
Dr. Sterja Nacheski (UKIM Faculty of Forestry, Skopje)
Dr. Tomislav Dubravac (Croatian Forest Research Institute, Zagreb)
Dr. Vladan Ivetić (Faculty of Forestry, University of Belgrade, Serbia)
Dr. Vladimir Maletić (UKIM Faculty of Forestry, Skopje)
Dr. Zoran Popović (Faculty of Agriculture, University of Belgrade, Serbia)

Organizing committee

Dr. Kiril Sotirovski (UKIM Faculty of Forestry, Skopje)
Dr. Makedonka Stojanovska (UKIM Faculty of Forestry, Skopje)
Dr. Ratko Ristić (Faculty of Forestry, University of Belgrade, Serbia)
Dr. Saša Orlović (Institute of Lowland Forestry and Environment, University of Novi Sad, Serbia)
Dr. Pande Trajkov (UKIM Faculty of Forestry, Skopje)
Dr. Bojan Simovski (UKIM Faculty of Forestry, Skopje)
Dr. Ivan Minchev (UKIM Faculty of Forestry, Skopje)
Mihajlo Risteski, MSc (PhD student, UKIM Faculty of Forestry, Skopje)
Vladimir Stojanovski, MSc (PhD student, BOKU, Vienna, Austria)
Boris Najdovski, MSc
Vladimir Tanovski, MSc
Daniel Gjenchevski, BSc (MSc student, UKIM Faculty of Forestry, Skopje)
Dr. Biljana Kuzmanovska (UKIM Faculty of Agricultural Sciences and Food, Skopje)

CONTENTS

04/10/2017

The role of forest ecosystems in the process of mitigation and adaptation to the effects of climate change

Ristic R.

Forest ecosystems provide a wide range of environmental services with an important role in the earth’s life-support system. The mono-functionality of forests in the sense of production and direct material benefits (wood mass, hunting, secondary forest products) cannot be treated out of the context of biodiversity preservation, drinking water supply, protective and social-cultural functions. The protective function is related to erosion control, flood prevention, balancing of runoff regime, pollution control and CO_2 sequestration. Forests have a strong impact on the formation of a characteristic microclimate, increase of precipitation, wind and snow protection and air-quality. Sociocultural functions contain a wide range of tourist-recreational activities, education and nature protection. Spiritual and aesthetic fundaments of archetypes, connected with forests lead to the explanation of mentality and habits of entire nations.

The climate change in Southeastern Europe (SEE) and forecasts for the period until 2070 have a huge impact on the present and future planning in forestry and watershed management, due to the observed trends: the increment of mean annual air temperature from 2.4-3.5^{o}C until the end of the XXI century; redistribution of annual precipitation, with much more precipitation in the spring-summer period, during short, intensive rain events; a decrease of annual precipitation and soil moisture of 10-20%, with extreme consequences: drying and disappearance of climatic forests in huge areas of hilly-mountainous regions. The removal of forests leads to a spread of intensive soil erosion, with frequent appearance of torrential floods, mud flows, landslides and avalanches. Southeastern Europe has reached biodiversity within its forest ecosystems, but the increasing demand for forest products, overexploitation, illegal logging or mismanagement with intensive urbanization, endanger numerous rare species and compromise the concept of “sustainable forestry”. Afforestation, in the framework of integrated watershed management, is a means of rehabilitation or restoration of forests with their sophisticated ecological functions. Stable forest ecosystems provide the possibility of sustainable development, repopulation and a way to overcome poverty in mountainous regions of Southeastern Europe. The restoration of forests and “blue-green” corridors (residuals of open streams and fragments of forest vegetation) in urban areas helps the adaptation to climate change, establishment of new recreational areas and biodiversity preservation.

Taking into consideration the present state of climate and the trend of its change, there is a real threat of spreading of the semi-desert areas in SEE, especially in Serbia and Macedonia. From the west to the east of Europe, the drought and fire risk increases. The growth of new forests and care for the existing ones is of strategic importance, and it is necessary to achieve harmony between protection and production. Forest policy in SEE has to deal with watershed management, agro forestry, sustainable rural development and nature protection at different levels: planning, practice, government administration, Public Enterprises and private forest owners. The development of wood processing industry has to be raised to a much higher level of finalization and export of quality products, resulting in a maximum financial benefit and a decrease in the export of semi-products, which will provide a more rational utilization of the growing stock.

Keywords: forest ecosystems, climate change, afforestation, watershed management, flood prevention, desertification.

Structure of the glacial refugia for tree species in Balkans – Challenges and opportunities

Zhelev Petar
University of Fotrestry, Sofia, Bulgaria
e-mail: zhelev@ltu.bg

Modern distribution pattern of biological species in the temperate zone of Europe is the result of post-glacial migrations during the last 12000 years, after the retreat of the ice sheet during the last glaciation. During the glaciation, the southern parts of the continent (mostly the three large peninsulas – Iberian, Italian and Balkan) remained practically unaffected or slightly affected and served as refugia for many plant and animal species. These were called “glacial refugia”. Even within the framework of each glacial refugia the conditions were not homogeneous and isolated “hot spots” appeared and had led to “refugia within refugia”. The glacial refugia were structured into different zones, which are of different importance from the point of view of formation of the present-day biodiversity. The topic is less studied in the Balkan Peninsula, even though the region is considered one of the most important European refugia. The importance of these areas is not only in their role as refugia during the glaciations, but also in their role in the species evolution and in formation of their present gene pool. Tree species are very suitable as model organisms for studying the structure of the refugia, on the one hand, and on the other hand their study is of great importance, because they dominate large parts of the terrestrial biome, they influence the environment and numerous other living organisms rely on forests for their existence. Today the studies are greatly facilitated by the application of DNA-based genetic markers. Identifying and describing the structure of the refugia for particular tree species it will also allow first, to delineate breeding zones for seed collections for the need of afforestation practice, and second, will provide valuable information for the sustainable management and conservation of their genetic resources. The challenges and opportunities for cooperation in studying the structure of glacial refugia of tree species in Balkans are illustrated by recent studies on the species of genera *Quercus* and *Carpinus*.

Key words: Balkan Peninsula, Glacial refugia, tree species, genetic markers

Diversity of ectomycorrhizal types on forest trees in Serbia

Katanić Marina
University of Novi Sad, Institute of Lowland Forestry and Environment, Antona Čehova 13d Novi Sad, katanicm@uns.ac.rs

Mycorrhizal fungi are an important part of belowground biodiversity with considerable influence on functioning of forest ecosystems. Although research of ectomycorrhizal diversity is the basis for evaluation of conditions prevailing in forestry ecosystems, this kind of research has been started in Serbia recently. The aim of this paper is to give an overview of our research on diversity of ectomycorrhizal types on important tree species in Serbia, namely on poplars, beech and spruce from different sites. Identification of fungal partner from ectomycorrhizal types was done using morphological and anatomical characterization in combination with molecular methods based on PCR amplification and sequencing of the ITS regions within nuclear ribosomal DNA. Investigated trees were growing under different management systems and environmental conditions. Influence of pollution and different seasons on diversity of ectomycorrhizal types were studied as well. The analyses finished so far resulted in an important database that gives an insight into the diversity of ectomycorrhizal types and enables its further monitoring.

Keywords: mycorrhiza, fungi, poplar, beech, spruce

Effects of Superabsorbent Zeba™ on survival and growth of Arizona Cypress (*Cupressus arizonica* Greene) seedlings

Kolevska Dana Dina[1], Ivetić Vladan[2], Velickovska Sanja.[3]
[1] University "Ss. Cyril and Methodius" Faculty of forestry – Skopje, Republic of Macedonia
[2] University of Belgrade – Faculty of Forestry, Belgrade, Serbia
[3] Master of Forestry Sciences

During 2012, a research on effects of cornstarch-based superabsorbent Zeba™ in afforestation with Arizona Cypress (*Cupressus arizonica* Greene) seedlings was conducted. The purpose of the experiment was to determine the effect of the superabsorbent on the survival and growth of the seedlings. The experimental plot was established near the village of Mrshevci (Skopje region), on sandy clay loam soil, in region with mixed continental and sub-mediterranean climate.
The experiment was designed as randomized block system on two plots. The first plot was planted in March and the second in April 2012. In this experiment following variants of Arizona Cypress seedling were represented: 1+0 and 2+0 bare root and 1+0 Yucosad container seedlings. A part of seedlings of each variant were shortly soaked in gel of *Zeba* superabsorbent (concentration 100 g/10 L water), and non-treated seedlings were used as a control. During the all vegetation season, once a month, number of survived seedlings per variant was recorded, and the height of the shoot and the root collar diameter of the survived seedlings were measured.
At the end of vegetation season (October 2012), survival of seedlings of all variants was very low, ranged from 0% to 10.3%. Of all the variants, a small increase of root collar diameter is observed only in 1+0 container seedlings (0.15 mm in the control and 0.25 mm in treatment with Zeba).
The high seedling mortality was caused mostly by the long dry and extremely hot weather during the 2012 summer season. The results of this research suggest that in given ecological conditions the superabsorbent Zeba has not had an impact on the survival and growth of seedlings.

Keywords: *Cupressus arizonica* Greene, seedlings, morphological attributes, Superabsorbent Zeba™, afforestation, survival.

Correlation between climate variables and growth of Turkey oak (*Quercus cerris* L.)

Kesić Lazar[1]*, Stojnić Srđan[1], Stojanović Dejan[1]
[1] University of Novi Sad, Institute of Lowland Forestry and Environment, Novi Sad, Serbia
*Corresponding Author: kesic.lazar@uns.ac.rs

The global changes and the climate change have been studied during the last years from different perspectives and by using different methods. Knowledge on the relation between climate variables and the radial growth is important for determination of climate impact on tree growth, as well as creation of long-term management plans. It is assumed that the dieback of oak forests in Europe is caused by climate changes acting over a long period of time. The expected impact of climate change on radial growth and tree-ring width in Serbia is already documented on European beech, Pedunculate oak and Norway spruce. In the present research we studied the influence of two climate elements (temperature and precipitation) and SPI (Standardized Precipitation Index) on Turkey oak radial growth. SPI was developed for defining and monitoring drought for long-term observations, therefore it is possible to analyze the phenomenon of drought for a given time period (month, season, year). Ten dead and ten living trees of Turkey oak were sampled in mixed a stand of Pedunculate oak and Turkey oak in Serbia in 2013. Samples were processed with dendrochronological methods. The time series of the Turkey oak growth were shown, whereas correlation analyses were made using the *bootRes* package in the R statistical software. Climate data was taken from CARPATCLIM database. This research studied Analysis of the correlation between ring-width indices of Turkey oak

and average monthly temperatures (1960-2010), total monthly precipitation (1960-2010) and SPI (3-36 months) showed significant values. Temperature and precipitation showed significant correlation with growth for both dry and healthy trees in some months. Bootstrapped correlation between the growth of dead trees and SPI (16-27 months) from June to November was significant, hence they should be considered in the future understanding of the impact of drought on forests.

Keywords: Turkey oak, tree-ring growth, dendrochronology, SPI Index, Pearson’s correlation, drought.

Response of beech and silver fir to light intensity along the geographical gradient

Matjaž Čater, Slovenian Forestry Institute, Ljubljana, Slovenia.
, Mendel University in Brno, Brno, Czech Republic.
e-mail: matjaz.cater@gozdis.si

Montane forests of silver fir (*Abies alba*) and European beech (*Fagus sylvatica*) in the Dinaric region represent the largest contiguous forest area in Central Europe with continuous cover silvicultural systems. Most of Dinaric beech and fir forests were gradually transformed from old-growth conditions and have never experienced clear-cutting or extensive planting. Silvicultural systems such as selection, irregular shelterwood system or their combination are close to the natural disturbance regime of mixed old-growth forests, characterized by small to intermediate gap size dynamics.
In spite of the high degree of forest naturalness, the regression of fir is one of the major concerns for the whole region. It has varied due to different combinations of causes of decline across the region. Current breast height diameter (dbh) structure and regeneration characteristics indicate its further regression in the coming decades.
Competitive ability of young fir and beech in terms of physiological and morphological responses to increased light intensity has been proven different between two silvicultural systems (Čater and Levanič 2012); the appropriate gap size for indirect promotion of silver fir has been defined (Čater et al. 2014) with predominant diffuse light conditions on Slovenian sites.
Quantum yield and plagiotropic effect to shade in silver fir and beech has been studied on 11 permanent plots along the Balkan peninsula, from Slovenia to Macedonia in same three light categories (complete forest cover, forest edge and open light conditions) over several consecutive growing seasons in managed and old growth forest sites.
Physiological and morphological responses were in accordance; their response also differed between managed and old growth sites. Change in quantum yield followed the ecological distribution of both species, pointing the areas of optimal and also limiting areas of their natural abundance.

Keywords: *Abies alba, Fagus sylvatica*, Balkan peninsula, response to light, physiology, morphology

Natural characteristics of the mountain pastures in the region of Malesh and processes of their afforestation

Najdovski Boris [1], Vasilevski Kole[2], Velkovski Nikolcho[2], Andonovski Vlatko [2]
[1] Master of Forestry Sciences
[2] University “Ss. Cyril and Methodius” Faculty of forestry – Skopje, R. of Macedonia

This paper presents the results of the research of the natural characteristics of the mountain pastures in the region of Malesh and the processes of their overgrowth with forest vegetation. The researches include mountain pastures in the region of Malesh, which are distributed between 1200 and 1932 m above sea level. These mountain pastures until the 1990s were more intensively used for grazing of small and large cattle (sheep and cattle), but after this period, there is a noticeable decrease in the

livestock, especially the sheep, which leads to overgrowing of large areas of these pastures with different shrubs and forest vegetation. The purpose of this paper is to determine the natural succession processes that occur as a result of the afforestation of mountain pastures and the process of their overrun and transformation into young forest plantations.
From the results obtained in the research, it was determined that the natural conditions in the Malesh region are extremely favorable for persistence of large areas of mountain pastures on which a substantial number of large and small livestock can be grown. However, the natural conditions in the particular region are also favorable for the development of forest vegetation, due to which a large number of pioneer species are significantly distributed in the pastures on which no livestock is fed. The strong regeneration ability of these species contributes to intensive afforestation of the mountain pastures, whereto a significant fragment of them lose their function and gradually transform into young forests. This process is assisted by the reduction of livestock in the region and reducing the use of these pastures. Thus, for a period of only 30 years in some parts of these pastures occur intensive overrun processes resulting with a complete transformation of these parts of mountain pastures into young forest plantations.

Keywords: mountain pastures, natural characteristics, afforestation

Variability of morphological and physiological traits of checker tree (*Sorbus torminalis* /L./Crantz.) in Republic of Srpska (B&H)

Mataruga[1], M., Cvjetković[1], B., Daničić[1], V., Gačić[2], A.,
[1] University of Banja Luka, Faculty of Forestry, Banja Luka, Republic of Srpska, B&H
[2] Public Forest Enterprise „Šume Republike Srpske“ a.d. Sokolac, Banja Luka

The checker tree (*Sorbus torminalis* /L./Crantz.) is the species which is on the genepool priorities conservation list in Europe. As the forest fruit tree which presence is sporadic and limited to smaller spaces - the preservation, improvement and appropriate use of the genepool of this species is of the great importance for the overall biodiversity of these areas. In order to be able to work on it, it is necessary to examine the species more detailed and to develop a strategy for its further conservation and use. The results obtained by this research are among the first ones of the checker tree species in the Republic of Srpska (BiH).
Research was carried out in the northern part of BiH, on two different bioecological sites (Čelinac - 2 populations and Teslić - 4 populations), a total of 40 test trees were investigated. Measurement of the height and diameter (DBH) of the trees, as well as the phenological observation of leafing and blooming, were performed. A morphometric leaf analysis was performed by measuring and analyzing 7 different leaf parameters.
Significant differences were found in almost all morphological characteristics of the trees and leaf at the population level, as well as at the level of tests tree. Investigation of the leafing and blooming phenology found greater variation in the Teslić region, while variations in the area of Čelinac are minimal.
The results obtained by this study can be used as a basis for choosing the strategy of in-situ and ex-situ conservation of the species.

Key words: checker tree, variability, Bosnia and Herzegovina

Analysis of the connection between spatial factors with two types of forests in the Cemernica forest management unit, Bosnia and Herzegovina

Trifković V.[1], Govedar Z[2].
[1] Department of Forestry and Renewable Forest Resources, Biotechnical Faculty, University in Ljubljana, Ljubljana, Slovenia
[2] Faculty of Forestry, University in Banja Luka, Banja Luka, Bosnia and Herzegovina
Corresponding author e-mail address: vasilije.trifkovic@gmail.com

The paper presents two types of forest in the area of management unit Cemernica in terms of preservation. Namely, all the forests were divided into two types, primary and modified. In the primary type we included all high forests with natural restoration, other types (coppice forests, culture...) we included in modified type. The results of the logistic regression showed what affects the position of these two types of forest. For this purpose, we included in the analysis the basic topographic variables (altitude, inclination and exposure) as well as the spatial units (the distance of the department from the settlement and the distance of the department from the nearest forest road). An analysis of the position of primary and modified parts shows that increasing the distance from the settlement increases the likelihood of the presence of primary forests, while parts of the forests that are closer to the forest roads are better preserved due to the higher traffic density in the parts of better preserved forests.

Keywords: primary forest, modified forest, logistic regression

Tissue culture in evaluation of white poplar acidity tolerance

Kovačević Branislav[1], Vuksanović Vanja[2], Orlović Saša[1], Miladinović Dragana[3], Katanić Marina[1]
[1] University of Novi Sad, Faculty of Agriculture, Novi Sad, Republic of Serbia
[2] University of Novi Sad, Institute of Lowland Forestry and Environment, Novi Sad, R. of Serbia
[3] Institute of Field and Vegetable Crops, Novi Sad, Republic of Serbia
*Corresponding author: branek@uns.ac.rs

The results of implementation of tissue culture in evaluation of acidity tolerance in white poplar (*Populus alba* L.) are presented. Five white poplar genotypes were tested after 35 days of *in vitro* culture on three experimental rooting media that deferred in the acidy (pH 3.0, pH 4.0 and pH 5.5) buffered with sodium citrate buffer. Rooting medium without sodium citrate buffer, pH 5.5, was used as Control. Because of well-known problems in jellification of agar media with low pH after autoclaving, the sterilization of media was performed in microwave oven. The rooting medium is based on ACM (Aspen culture medium), without growth factors. The genotypes were evaluated according to set of 21 morphometric, biomass, photosynthetic pigment content and biochemical characters. According to the obtained results, the best medium for discrimination between examined genotypes was medium with pH 4.0. The medium with pH 3.0 severely inhibited rooting. The specific inhibition was found on medium pH 5.5 comparing to the Control and in some cases with medium with pH4.0, but we assume that the reason is in high amount of sodium. The best results were obtained for well-known genotype Villafranca, which dominated in all characters except for photosynthetic pigments. Villafranca was particularly better than others by biochemical characters, characters selected to test tolerance to oxidative stress. The next are experimental genotypes L-80 and L-12 that achieved good performance in photosynthetic pigments content. Our results suggest considerable potential of tissue culture methods in evaluation of acidity tolerance in white poplar genotypes, but further research should be performed in field conditions.

Keywords: *Populus alba*, abiotic stress, microwave sterilization

Coppice, new insights for an adaptive forest management

Stojanović Marko [1,2], Szatniewska Justyna [1,3], Stojnić Srdjan [2], Čater Matjaž [3,4,], Pokorný Radek [4]
[1] Global Change Research Institute, Academy of Sciences of the Czech Republic, Brno, Czech Republic
[2] Institute of Lowland Forestry and Environment, University of Novi Sad, Novi Sad, Serbia
[3] Department of Silviculture, Faculty of Forestry and Wood Technology, Mendel University in Brno, Brno, Czech Republic.
[4] Slovenian Forestry Institute, Ljubljana, Slovenia

Drought events are expected to increase in frequency and intensity, and will affect oak forest ecosystems which already showed compromised growth and lack of natural regeneration. To overcome such difficulties, it is necessary to look for new adaptive strategies. Traditional forest management such as coppicing might provide some solutions. Presented study was performed in the south-eastern part of the Czech Republic in two differently managed sessile oak stands: coppice and high. Contrasting to the forest originated from the seed or planted seedlings (referred as high forest), coppice forest develops from vegetative reproduction by re-growth of trees cut down periodically. Consequently, two systems differ in root to shot ratio (R/S), higher in coppice compared to high origin trees. Therefore, we hypothesised that coppice with higher R/S ratio are able to mitigate the effect of water shortages and are less drought susceptible than seedlings. In order to assess the effect of drought on water status of sessile oak seedlings and coppice sprouts, transpiration derived from sap flow measurements and leaf water potential were investigated during extremely dry 2015. Additionally, dendrochronological study was performed on nearby adult high and overaged coppiced trees, aiming to identify main climatic factors affecting the radial growth of coppice and high sessile oak trees. Significantly higher transpiration of coppice sprouts compared to seedlings on tree and stand level was found during entire measurement period indicating better water status of coppice. The midday leaf water potential of seedlings was always found lower (more negative) than in coppice sprouts indicating higher sensitivity of seedlings to drought stress. Dendrochronological data and linear-mixed models showed contrasting growth trends and different sensitivity to climate and drought in high and coppice stands. Presented results attribute young coppice as one of promising adaptable forest forms for future with a presumed drought. However, based on dendrochronological data, the initial growth advantage of coppice is accumulated in first few decades and then subsequently fades away.

Keywords: Coppice, high forest, sessile oak, transpiration, leaf water potential, dendrochronology

Soil erosion rates in two successive reservoir catchments: Spilje and Globocica reservoir

Mincev Ivan[1], Trendafilov Aleksandar[1], Blinkov Ivan[1], Ivanovski Dragan[2]
[1] Ss. Cyril and Methodius University, Faculty of Forestry in Skopje, R. of Macedonia.
[2] Ss. Cyril and Methodius University, Faculty of Civil engineering, Skopje, Macedonia.

The catchments of the reservoirs Spilje and Globocica are positioned in the western part of Macedonia. This part is known for the more than average rainfall (800-900 mm/annually) for the country and large portion of the catchment is consisted of forests and natural grasslands. In the past, this region had been a huge economic center. As a part of the process of migration, many of the mountainous regions of Macedonia have been practically deserted. This had a huge effect on the environment and it largely diminished the human impact. The catchment of the reservoir Globocica is beginning from the outflow of the river Drim from the Ohrid lake. The main water source for this reservoir is the river Drim and some minor tributaries. The catchment of the Spilje reservoir is beginning from the Globcica dam, continuing the flow of the Drim river and also form north the second

main tributary is Radika river. The two catchments were mapped for erosion according to the EPM method by Gavrilovic. The two erosion maps created for the two reservoir catchments show very different results. The catchment of the reservoir Globocica is one of the most preserved catchments from soil erosion point of view with average erosion coefficient (z) of 0.29, specific annual production of erosive sediment is 394 m^3/km^2/ann., and the specific annual transport of erosive sediment is 247 m^3/km^2/ann. On the other hand the catchment of the reservoir Spilje is one of the most erosive areas in the country, with average erosion coefficient (z) of 0.44, specific annual production of erosive sediment is *776* m^3/km^2/ann., and the specific annual transport of erosive sediment is *541* m^3/km^2/ann.

Key words: Soil erosion, erosion rate, EPM, reservoir sedimentation.

Rates of filling up water reservoirs with sediment and where the sediment is deposited

Aleksandar Trendafilov[1], Ivan Mincev[1], Dragan Ivanovski[2], Ivan Blinkov[1]
[1]Ss. Cyril and Methodius University, Faculty of Forestry in Skopje, Skopje, R. Macedonia.
i_mincev@sf.ukim.edu.mk
[2]Sts. Cyril and Methodius University, Faculty of Civil engineering, Skopje, R. Macedonia.
ivanoski@gf.ukim.edu.mk

The artificial reservoirs are multiuse objects and they are very significant for storage of water for drinking, irrigation, protection from floods etc. The destiny of each water reservoir is to be filled with sediment due to soil erosion processes in the catchment of the reservoir. Due to the harmful effects of the water (pluvial and fluvial erosion), there are more than 3×10^6 m^3 deposed sediment, in the existing reservoirs in Macedonia. Every reservoir has designed “dead” storage area in order to be filled with sediment. Contrary to design, according to bathymetric measurements, most of the sediment is deposed in the “live” – active storage of the reservoir, mainly at the inflow of the streams and rivers in the reservoir. This study will be focused on two large reservoirs in the western part of the country: Spilje and Globocica. On one hand, Spilje reservoir has very erosive regime and most of the tributaries (torrential) streams leave the sediment at the inflow in the reservoir and most of the sediment is not transported downstream to the dead storage. On the other hand, Globocica reservoir is much more stable system because the siltation rate is much smaller, but nevertheless the sediment is deposed at the mouth of the streams.

Keywords: soil erosion, intensity of the erosion, siltation regime; water reservoir, dead/live storage

Study on Erosion and Action Plan for the City of Skopje (**project achievements**)

Blinkov Ivan[1], Trendafilov Aleksandar[1], Mincev Ivan[1]
[1] Ss. Cyril and Methodius University in Skopje, Faculty of Forestry – Skopje, Republic of Macedonia

Torrent basins are dynamic systems constituted by a complex arrangement of fluxes between the land and water environment. There are essentially three interconnected fluxes, not only of water but also of sediments, nutrients and pollutant and land management activities have significant influence on pick flow and sediment transport on basins up to 100 km^2. Erosion intensity on Macedonia (6,9 t/ha) is 2,17 times higher than European mean value. Skopje region is significantly prone to erosion and torrents. Last big catastrophe happened in August 2016 when 22 died and almost 100 000 ME was costs of losses and damages. For this purpose, was initiated this project whereas study region was accepted the Skopje statistical region taking in consideration that some of the torrents origin from other municipality out of Skopje. The project will result in strengthening the capacities of the

local government to increase the urban resilience of the city, as well as to design and implement integrated disaster and climate risk reduction plans and programmes. Given the fact that this is a pilot project under which it should serve as a template for such projects in all other municipalities in the Republic of Macedonia, main tasks were: Preparation of Erosion Study, Preparation methodology for delineation actual and potential risk areas, Preparation Action Plan, Uploading of defined hot spots characteristics in web-application of the city Government. After collection of various related data and analysing of erosion and torrent factors, during on-filed activities were mapped visible erosion processes, were defined and measured erosion and hot-spots in torrents bed. Over 130 torrents were delineated 41 landslides and over 60 hot spots in torrents beds. Then was prepared Map of erosion intensity following the EPM methodology using modelling procedures.. To be prepared Erosion Risk Map were extracted the first two category of erosion intensity and was added a layer of land use. From the overlay analyse and modelling, were delineated 4 classes of erosion risk according to the element of risk. The first two classes were extracted and assigned as “Actual erosion risk areas” and identified landslides and hot spots in torrents beds were added on the map. To be defined potential erosion risk areas, тhe previous procedure was repeated, in that when calculating the erosion integrity the parameter for land use was taken with value 1. The final output of modelling were delineated potential erosin risk areas. Cca 3% of the Skopje region were defined as erosive risk areas, while 20% as potential erosion risk areas. For both categories were proposed administrative measures (bans and obligations) and various land management activities were recommended. After GAP analyze, various measures/activities were proposed in the Action plan classified in 3 groups. The first group were measures for “Enabling environment for erosion and torrent control” (various legal institutional and policy measures). In the part of “Protection from Erosion and torrent control” were proposed measures for: erosion control on agricultural, forest and bare land; for erosion control on a construction sites and minefields; for increase of torrent bed conveyance; for reducing transport of sediments; for decrease of exposure to torrent hazard (measures related to urbanism; and measures for torrent control of unmanaged basins. The third group are measures related to Landslides and slope stability. Total 45 measures were proposed and prioritize using multi-criteria analyze according and finally dynamic plan was prepared. With adding a layer with cadastral parcels, will be easy for users (municipality administration) to identify the owner or competent body of the parcels in risky areas or hot spot points, to implement proposed measures.

Acknowledgments: This project is financed by UNDP, REFERENCE: 00089307 ICT for Urban Resilience, project no. 15/2017.

05/10/2017
Wildlife and game

Cultivating truffles - world trends and Balkan challenges

Diamandis Stephanos[1]
[1] Forest Research Institute, Thessaloniki, Greece

Truffle cultivation is now considered as an important agricultural activity in many European countries along the Mediterranean Sea. It is expanding in the Western USA and also in the Southern Hemisphere in Australia and New Zealand. The European truffles, *Tuber melanosporum, T. aestivum, T. uncinatum, T. brumale, T. borchii* and the most valuable *T. magnatum,* seem to be most appreciated and most often cultivated.
In the USA, the state of Oregon seems to have the highest interest in truffles. The Oregon white truffle (*Tuber oregonense*) grows symbiotically with Douglas fir (*Pseudotsuga mensiensii*) throughout the Northwest from southern Oregon north to British Columbia, and from the Cascades west to the Coastal Range. Fresh Black truffles *(Leucangium carthusianum)* from Oregon look somewhat similar to European Black Summer truffles. They too grow prolifically in the Pacific Northwest – especially in Douglas fir forests. Over 100,000 seedlings inoculated with *Tuber melanosporum* (Périgord black truffle) and *T. borchii* (bianchetto truffle) have been planted. These plantations are expected to produce up to 60 kg of truffles per ha annually.
In Australia truffle plantations have been set out in Tasmania, Western and Southern Australia and New South Wales. The first carpophores of *T. melanosporum* were found in Tasmania in 1999. Australia has a long distance to cover before it can claim its place in the truffle markets. However, Australia remains an important truffle consumer.
All commercial species of truffle have been found in the Balkan countries. Truffle production in the Balkan Peninsula has a long tradition, especially in Slovenia, Croatia and Romania. However, truffle production relies mainly on wild truffle picking by dedicated or adventurous hunters. There are no encouraging policies for systematic establishment of truffle plantations and in addition in most Balkan countries there is no legislation for sustainable management of truffles and edible mushrooms in general.
Truffle cultivation in Greece has sprung up in the last 15 years with over 100 ha of small plantations producing mostly black truffles. However, raw truffle consumption on domestic level is relatively low because of lack of tradition and high cost. Fresh and processed truffles are exported to European countries. Exports to the USA, Canada and Australia are not possible because of the lack of a certification mechanism.
The most advanced countries in Europe for truffle production remain to be Italy, France and Spain. The global production of truffles is still limited. The European markets are deficient in European truffles of the genus *Tuber* which are superior to the American and Far Eastern species. Truffles are rising in the American cuisine promising higher consumption in the next decade. Future prospects for truffle farmers of our countries are good, especially for those in mountainous and semi-mountainous areas with marginal soils and limited agricultural and forestry potential.
A major problem is that most of the mycorrhizal plants are imported from Italian and French nurseries, introducing in this way different plant and fungal genome to our countries. Growing truffle plants locally using local genetic resources is absolutely necessary. An urgent necessity is the introduction of legislation for certification of truffles and their sustainable management. Education of our people and promotion of truffles is also urgent so that domestic consumption increases. Those interested should seek scientific support and establish truffle plantations and not focus on hunting natural truffles.

Keywords: truffles, cultivation, production, Europe, North America, Australia, Balkan, Greece

Importance of tree health and their structural stability in urban environment

Pernek Milan[1]
[1]Croatian Forest research Institute

There are multilevel benefits that trees provide to the urban environment. While the age and size of trees increase, those benefits increase almost proportionally. However, as they grow older and larger they also become more sensitive to negative abiotic and biotic factors, which could cause severe consequences. These threats are somehow expected and thus could be managed using different strategies, which are sometimes more and sometimes less successful. In the last decade, urban forest professionals are facing unexpected threats, e.g. outbreak of invasive pests and diseases, or damages caused by extreme weather conditions associated with climate change. Managing such problems principally require great efforts, and often fails (e.g. Box tree moth or Asian longhorn beetles). It is predicted that these kinds of negative effects will rather increase in the future, rendering the preventive measures to become more and more important for sustainable urban green environment. For the right measures to be performed, the right knowledge is a necessity, but it is still often insufficient.
Beside the mere health, special attention should be paid to the structural stability of the trees. Trees in the urban environment mostly represent a high risk of significant or severe consequences in case of structural failure. Therefore, it is very important to perform professional tree inspection or assessment, in order to assess the appropriate tree risk management. Regular inspection of trees ensures high chance to obviate failure and thus possible damage of property, injuries or even death of people. For example, codominant stems with included bark or a crack at the union are very unsafe, but to record the risk and make a notice of such tree, it needs to be visually inspected. Due to the rise of awareness on tree risk and benefits, increasing number of cities implements regular single or double yearly tree inspection.
As it is impossible to maintain tree free of risk, some level of risk must be accepted in order to experience the benefits that trees provide. Nevertheless, knowledge on minimization of risks of different threats became a very important issue for the near future. Questions like: How to do that? Which knowledge do we need? Who should be responsible? This and many other questions will be discussed.

The economic effects of the release of pheasant in hunting grounds

Popović Zoran[1], Dragić Živković[1], Lavadinović Vukan[2],
Beuković Miloš[3], Beuković Dejan[3],

[1] University of Belgrade, Faculty of Agriculture, Zemun, Serbia
[2] University of Belgrade, Faculty of Forestry, Belgrade, Serbia
[3] University of Novi Sad, Faculty of Agriculture, Novi Sad, Serbia
Corresponding author: zpopovic@agrif.bg.ac.rs

Pheasant is an allochthonous type of game in Serbia which presence depends on mass production nurseries. It is one of the most abundant and important game species in the country, although its number is decreasing. Nowadays, Serbia has capacity to produce almost a million pheasant chicks per year, while in the ‘80s 500,000 were released annually in hunting grounds at the age of 5-8 weeks. The market demand is higher for older pheasant categories, 8-12 weeks old.
The aim of this research was to determine the price of culled pheasants in hunting grounds, based on different survival rates per age category and rearing costs. The research was conducted it the hunting ground 'Barajevska reka' where pheasants from different age categories (5-6, 7-8, 10-12 weeks) and fully grown were bought from nurseries. Recommended diet mixtures for each specific pheasant chicks category were followed, containing 24% of crude protein and coarsely ground wheat grain. The price of culled pheasant was calculated based on their purchase age, the breeding costs

(staff and food) and the healthcare in shelter, divided by the ratio of culled/purchased animals. The lowest price for one culled pheasant is when 5-6 weeks old pheasant chicks are released into the hunting grounds. Depending on the age and the percentage of culling, the price of one pheasant chick can double the value of one fully grown pheasant in nursery. Price of one fully grown pheasant -ready for culling- depends on the quality of hunting ground, the hunt organisation and the hunter’s skills.

Keywords: pheasant, % culling, pheasant price

Management and research of free-ranging ungulates in Slovenia: basic principles, challenges and perspectives

Pokorny Boštjan[1,2,3], Flajšman Katarina[3], Kos Ivan[4], Potočnik Hubert[4]
[1] Environmental Protection College, Velenje, Slovenia;
[2] Institute ERICo, Velenje, Slovenia
[3] Slovenian Forestry Institute, Ljubljana, Slovenia
[4] University of Ljubljana, Biotechnical Faculty, Ljubljana, Slovenia
Corresponding author: bostjan.pokorny@gmail.com

In Slovenia, free-ranging ungulates have been managed adaptively since 1970s. Such management does not rely on population estimates or assessment of carrying capacities; rather, it is based on several indicators in populations, in habitats or in human-ungulates conflicts. With the aim to collect needed data, a unique hunting information system was developed by the Hunters Association of Slovenia. On-line available databases provide several information (e.g. species, sex, assessed age, body mass, antler mass, trophy quality, health status, exact culling location) on all, i.e. >700,000 ungulates that have been either harvested or have died due to any other reason all around Slovenia since 2004. Moreover, mandibles of harvested ungulates have been obligatorily collected for decades, and are linked with the hunting information system. Since 2007, those mandibles have been collected by Slovene researchers, who have established a unique archive of >100,000 mandibles with a great importance for both science and management. These databases and collections also enable comprehensive research on biology, life-history traits, and human-ungulate conflicts along the whole species distribution ranges in Slovenia. Some of the key cases are as follows: (i) spatial and temporal variability of body masses, providing several information on biological processes in populations; (ii) variability in reproductive potential of females and the effects of main influential factors; (iii) patterns in traffic-related mortality and geographic distribution of ungulate-vehicle collisions in a high spatial resolution. By presenting selected case studies, the importance and the applicability of a large-scale hunting information system will be highlighted, and possibilities for its better utilization will be discussed. Moreover, the most important challenges in ungulate management in Slovenia will be discussed as well.

Keywords: free-ranging ungulates, population management, hunting information system, mandibles, Slovenia

Detection of West Nile virus in pheasant farms

Đorđević Milutin[1], Pešić Branislav[2], Despot Dragana[2], Janković Ljiljana[1], Teodorović Radislava [1]
[1]University of Belgrade, Faculty of Veterinary Medicine, Belgrade, Serbia.
[2]Institute for biocides and medical ecology, Belgrade, Serbia.

Pheasant farms are semi-closed production facilities with several production units that are cyclically linked, which are bred different age groups of pheasants. Production units are aviary for the parent flock, a room for storing eggs, a hatchery, and facilities for the breeding of young pheasants and

aviaries with outlets where the young pheasant are bred until they are released to the hunting grounds. Some production facilities within the pheasant farm are open type, which allows the potential direct contact of pheasants and mosquitoes, respecting the fact that *Culex pipiens* mosquitoes are ornithophilic species and they prefer to take their blood meal on birds. The potential contact of mosquitoes as biological vectors of many diseases, including West Nile fever, creates the conditions that pheasants in the pheasant farms to become potential reservoir of the West Nile virus, bearing in mind the fact that pheasant farms often are located in sub rural areas can define them as objects that represent health risk for the health of the population. In Belgrade area West Nile virus is detected each year since 2012. in population of domestic mosquito (*Culex pipiens*). This mosquito is present on pheasant farm and there is a real possibility that due to the contacts between mosquitoes and pheasants, the pheasant farm become potential reservoirs of the West Nile virus. Therefore, in order to investigate this around the pheasant farm “RIT” between april and august we set up mosquito traps with aim to detect presence of virus in mosquito population. The results of mosquito detection in the second phase of the experiment will determine the potential need for virus detection in pheasants.

Keywords: pheasant, pheasant farm, West Nile Virus, *Culex pipiens,* mosquito.

Population ecology studies on the Capercaillie (*Tetraourogallus* L.) in Pirin National Park - Bulgaria

Ilchev Janko[1], Mihailov Hristo[1]
[1]University of Forestry-Sofia, Bulgaria.

The Capercaillie(*Tetraourogallus* L.) in Pirin National Park was studied. Little was known about Capercaillie in Pirin Mountain. It was only clear that Capercaillie occurred there in typical habitats with prevalence of Scots Pine (*Pinus sylvestris*) and in clear Macedonian Pine (*Pinus peuce*) forests. The main study goals were finding display grounds, estimating numbers of male and female birds and their age and sex structure. The main goal in near future will be mapping of the all display grounds in Pirin Mountain and making a thorough population characteristic of the species.
In the last three years 10 display grounds situated in high altitude between 1900 and 2200 m a.s.l. were regularly monitored. They were visited mainly during the breeding season in May and June, and during the hatching and rearing of small chicks – June and July. All climatic data were collected, as well as an overall forest-ecological characteristicof the display grounds was made.
The results show a very low population density, but relatively stable population size in the last 10-15 years, despite current restrictive regulations in the Pirin National Park. The main reason could be the high mortality, especially in the period of hatching and rearing of small chicks, due to extremely low temperatures, pouring rains and even snowfalls. A very high percent of non-hatched eggs (60 %) and high mortality of newly hatched birds (65 %) were observed, showing survival rate in autumn of 1.4 birds per every 10 eggs.

Keywords: *Tetraourogallus*, Pirin National Park, habitats, population structure, mortality.

Home range of golden jackal (*Canis aureus*) during vegetation season in suburban area of Belgrade

Ćirović Duško[1], Plećaš Milan[1], Penezić Aleksandra[1]
[1] Faculty of Biology, University of Belgrade, Studentski trg 16, Serbia
Corresponding author: dcirovic@bio.bg.ac.rs

In the last few decades, the golden jackal (*Canis aureus*) has been spreading across Europe. Unfortunately, this population increase is not accompanied with home range, movement nor habitat preferences studies based on satellite telemetry. A pair of golden jackals was collared with GPS/GSM (male) and GPS/radio (female) collars in the suburb area of Belgrade (Serbia). Agricultural land is the most dominant land type (84%), followed by semi-natural vegetation (12%), and man-made structures (3%). We collected data from collars on the monthly basis during vegetation season 2017, from March to August. ArcMap (ESRI, 2015) was used to calculate home range and distance traveled for each month and sex separately, as well as to produce heat map of spatial density. We than used buffers of various sizes around semi-natural vegetation to establish relationship between jackal presence and vegetation, and to determine preference in habitat selection across season. To test the differences between sexes in home range size and distances traveled, we used one-way ANOVA test from Real Statistics Resource Pack software (Zaiontz, 2017). Calculated home ranges were not significantly different between male and female ($F(1,6)=1.744$, $p>0.05$), as well as distances traveled ($F(1,6)=0.108$, $p>0.05$). Heat map indicated several density clusters near semi-natural vegetation. Analyzing different buffer sizes around semi-natural vegetation we found that 57% of fixations we positioned in buffer zone of 20 m indicating that in about 50% of all cases animals stayed within 20 m of semi-natural vegetation. Finally, using this buffer zone we detected changes in habitat preference across season. About 93% and 82% of fixations during March and April were detected in 20 m buffer zone, while this percentage decreased across season (May 60%, June 46%, July 48%, August 32%) indicating that jackals use semi-natural vegetation as cover earlier in the season while later in the season they venture more into agricultural land.

Keywords: *Canis aureus*, Golden jackal, home range, suburban zone, satellite telemetry.

Main causes of red deer disappearance in Serbia

Filipović Milosav[1], Gačić Dragan[2], Simić Arsenije[2]
[1] FE “National park Kopaonik”, Kopaonik, Serbia
[2] University of Belgrade, Faculty of forestry, Belgrade, Serbia

The current state of red deer is stable and favorable only in the Autonomous Province of Vojvodina, which occupies about 21,500 km^2 in the north of the country. Most of the red deer population can be found in fenced forest hunting areas and small fenced parts of the hunting grounds managed by PE "Vojvodinašume", which are in the Upper Danube Area, Deliblato sands and Bosut and Posavina forests. By contrast, south of the Sava and the Danube, in many forest hunting grounds in Central Serbia, the state of red deer has been a long-standing concern, since it has either lagged behind the natural potentials of the habitats, or lead to complete extermination. Within the SRBREDDEER project funded by the Forest Directorate (Budget Fund for Hunting Development), we investigated the causes of the disappearance of red deer in Central Serbia. We interviewed 10 professionals who had reintroduced red deer in the past, as well as 12 current managers of professional hunting management services. We also analyzed the available hunting magazines and journals published in the period 1930-1970 (e.g. "Lovac" - Serbia, "Lovačko ribarski vjesnik" - Croatia, "Lovački list" - Bosnia and Herzegovina). In the 18th century, rapid destruction of wild game appeared in Serbia, mainly due to cutting and deforestation, as well as massive hunting for the purpose of Turkish military exercises. This trend continued during the period of Austrian rule in Serbia (1718-1739), while in the 19th century abundant red deer population that remained in the territory of eastern Serbia was used for the export of meat and antlers. It can be concluded that illegal hunting, which is also called pouching, is one of the main causes of the disappearance and endangerment of red deer in Serbia, both in ancient times and nowadays, which is similar to the state in various countries throughout Europe. The second most common cause is the loss or degradation of habitats due to intensified agriculture and urbanization.

Key words: red deer, *Cervus elaphus*, illegal hunting, reintroduction

Red deer monitoring system in Serbia – state and problems

Mladenović Slavko[1], Gačić Dragan[2], Filipović Milosav[3]
[1] Ministry of interior, Belgrade, Serbia
[2] University of Belgrade, Faculty of forestry, Belgrade, Serbia
[3] PE “National park Kopaonik”, Kopaonik, Serbia

Red deer spreads over an area of about 7,740 km^2, which is less than 10% of the total area of Serbia. The current Law on Wildlife and Hunting (2010) defines that the Ministry of Agriculture, Forestry and Water Management (Forest Directorate) collects data on all hunting grounds in order to develop and update the Hunting Cadastre and the Central Database. All users of hunting grounds are obliged to submit the processed data to the Forest Directorate on a prescribed form. The Forest Directorate should than prepare and publish an annual report on the state of game and hunting. These activities have not been completed yet, even though the law was passed seven years ago, because of which there is no unified data at the national level, neither by individual regions, hunting grounds, years nor by game species. The research on hunting is carried out by the Statistical Office of the Republic of Serbia (www.stat.gov.rs), which mostly collects the Form LOV-11 every second year and publishes these data in the bulletin Forestry in Serbia, where the data are shown for the entire country and provinces, although since 1999 without the data for Kosovo and Metohija. The data on red deer are: the total count determined by counting or estimation on 1st April of the current year and the total number of culled individuals. However, many important data are missing such as gender (male, female), age, date of culling or loss of the individual, time of culling, weight and meat purchaser, CIC trophy measuring, and total damage from red deer. Every year at the beginning of

the spring, the user of the hunting ground must determine the count and gender and age structure of red deer and the obtained result is the starting point for the development of an annual hunting management plan. In addition to that, he must show planned and executed works in the hunting ground for each hunting year (01.04.-31.03). It can be concluded that the Serbian red deer monitoring system is inadequate and that there is a real need to develop a more efficient system, similar to systems in countries throughout Europe.

Keywords: monitoring, red deer, *Cervus elaphus*, management.

Trophy characteristics of wild boar in Macedonia

Maletić Vladimir[1]., Stojčevski Dejan[2]
[1] Ss. Cyril and Methodius University in Skopje, Faculty of Forestry in Skopje, Macedonia
[2] Master of Forestry

From a scientific point of view, hunting trophies represent diagnostic material for determining the general condition of the quality of the game as a result of the natural conditions and the breeding measures undertaken in the hunting ground, their sex and age structure, as well as the genetic basis of the populations of large game species in a certain area. Unfortunately, in the Republic of Macedonia, due to a number of objective and subjective reasons, and especially because incompetent hunting management of the amenable state institutions, no valorisation has been carried out and there are no records of the quality of the trophies of any kind of game at national level.
For this reason, the main goal in this research was to analyze the quality of trophies and the age of hunted wild boars (as the most numerous and leading species of game, according to the number of shot samples) in several hunting grounds in the Republic of Macedonia. The results obtained in this research will serve in the future as a basis for further investigation and raising quality of the trophy structure. For realization of the set goals was collected material of 85 pairs of canine teeth (tusks) from wild boars shot in the hunting grounds in the Republic of Macedonia. The evaluation was carried out according to an internationally adopted methodology and a formula prescribed by the CIC, while the Brandt’s method was used to estimate the age.
The average length of the cutters (lower tusk) was 19.76 cm ± 2.48, the width of the cutters 23.50 mm ± 1.66, the upper tusk circumference was 7.02 cm ± 0.67. The average trophy value was 106.38 ± 9.46 points. The age by Brandt ranged from 2 to 10 years, and most of the animals were aged 4 to 5 years. The age range of 9 to 10 years has the best point assessment. The examination of the dependence between the measuring parameters of the tusks - the length of the cutters, ie the width of the cutters and the age, as well as the correlation between the trophic value and the age of the boars, showed an intermediate to a strong dependence between the parameters analyzed.

Key words: Wild boar, trophy value, tusks, age.

The presence of pesticides in the fatty tissue of brown hare (Lepus europaeus Pall.): Pilot test in one hunting ground of Bačka territory

Beuković Miloš[1], Beuković Dejan[1], Bursić Vana[1], Krstović Saša[1], Jajić Igor[1], Popović Zoran[2], Lavadinović Vukan[3]
[1] University of Novi Sad - Faculty of Agriculture, Novi Sad, Serbia
[2] University of Belgrade - Faculty of Agriculture, Belgrade-Zemun, Serbia
[3] University of Belgrade - Faculty of Forestry, Belgrade, Serbia
Corresponding author Beuković Miloš, milos.beukovic@stocarstvo.edu.rs

The intensive farming implies active fight against vermin (rodents), especially in the years when there is an outbreak of their populations due to mild winters. Moreover, because of increased costs of crop protection, farmers often use either prohibited chemicals or legal ones, but however, not in the adequate (acceptable) manner. The collateral victim of these procedures is game that have access to the treated fields. Over the past two decades, a lot of mass poisonings were reported in the hunting grounds of Serbia. Brown hare as a species is suitable as a bio-monitor because it has a fast-reproductive cycle adapted to life in the agro-biotope and has a wide distribution. The aim of this pilot test is to determine the presence of pesticides, to make screening of the residue type and concentration level in the fatty tissue of brown hare at a hunting ground in the territory Bačka, district. The results showed that in the analyzed hunting ground individuals with detected values of pesticides in adipose tissue appear. The occurrence of elevated pesticide residues may be the result of intensive agricultural production and high use of pesticides. Using QuEChERS for the extraction of pesticides from adiposity tissue, with the LC-MS/MS determination and using Pearson rank correlation, we found the significance in correlation with the age of brown hares and the levels of detected pesticides. Based on our pilot test The most detected residues were: Cyprodinil (5 keys); Difenconazol (4); Metaxil M, Tebuconazol and Thiamethoxam (3 keys). The higest dected level of hazard was 1,5 mg/g of Tebuconazol. Average level of Cyprodinil was 0,025 mg/g.

Keywords: brown hare, pesticides, fatty tissue, Bačka

Role and potential of hunting grounds in sustainable hunting management

Lavadinović Vukan[1], Popović Zoran[2], Beuković Dejan[3], Danilović Milorad[1], Đorđević Milutin[4]
[1] University of Belgrade, Faculty of Forestry, Belgrade, Serbia
[2] University of Belgrade, Faculty of Agriculture, Belgrade-Zemun, Serbia
[3] University of Novi Sad, Faculty of Agriculture, Novi Sad, Serbia
[4] University of Belgrade, Faculty of Veterinary Medicine, Belgrade, Serbia
Corresponding author: vukan.lavadinovic@sfb.bg.ac.rs

Serbian hunting grounds are corner stone for hunting and wildlife management in Republic of Serbia. Since they cover almost the whole country's surface, hunting overlaps with other industries, especially with forestry and agriculture. In the last decade hunting grounds in Serbia have been re-shaped, while the hunting in the country lacks a comprehensive study for last two decades. In such circumstances, this research tends to identify role and potentials of hunting grounds in Serbia from the aspect of sustainable development.
Findings were based on analysis of the simple random sample for the whole country. Special focus was on variables which represent general information, infrastructure, land use and human resources in hunting grounds. Results indicate the quality of hunting grounds is improved, their role is significant and they have potential to ensure sustainable development of hunting in Serbia. Nevertheless, their management and development are limited with the financial situation.

Key words: hunting grounds, Serbia, sustainable development, role, potential

The establishment of national monitoring of the expanding species, Golden jackal, in Slovenia

Potočnik Hubert[1], Kos Ivan[1], Flajšman Katarina[2], Pokorny Boštjan[2,3]
[1]University of Ljubljana, Biotechnical Faculty, Department of Biology, Ljubljana, Slovenia
[2]Slovenian Forestry Institute, Ljubljana, Slovenia
[3]Environmental Protection College, Velenje; Institute ERICo, Velenje, Slovenia
Corresponding author: hubert.potocnik@gmail.com

In the last decades, golden jackal (*Canis aureus*) has been successfully spreading from the Balkan Peninsula towards Central and Eastern Europe. Spreading of the distribution range is followed by a rapid increase in abundance of jackal in all countries/areas settled by the species, and population size has been rapidly increasing since 1990s. A similar trend is significant also for Slovenia, which is confirmed by more and more often observations of jackals, and the distribution range has been spreading as well. Increase in numbers and spatial distribution of jackal may lead to several conflicts, connected with human interests/activities. Since the presence of golden jackal in Slovenia is a recent phenomenon, there is also a missing knowledge about the species, its ecosystem role, interspecific interactions, and effects on other species, population dynamics and the ability to spread in the suitable environment. Therefore, there is a strong need for a wider social discussion and consensus about the expected population management objectives concerning the species. At the moment, the national legislation considering jackal is in an evident collision – the species was declared as a game species in 2014, but at the same time it is on the list of protected species. Such status disenables active management of the species. In order to provide basic knowledge about the population and to provide scientific background for adequate management a research project has been initiated. One of the main goals of the project is the establishment of nation-wide monitoring in order to determine distribution, abundance, population trends and potential expansion of golden jackal in Slovenia. The important part of the monitoring is based on integration of hunters who are obliged to provide game monitoring as a public service. For this reason, new online monitoring module was developed which enables instant recording of georeferenced signs of jackal presence of various types including photo-material and records from bioacoustic stimulation method.

Keywords: golden jackal, *Canis aureus*, monitoring, wildlife management

Additional nutrition of pheasants depending on age, season and hunting grounds type

Đorđević Nenad[1], Popović Zoran[1], Maletić Vladimir[2], Beuković Dejan[3], Beuković Miloš.[3]
[1] University of Belgrade, Faculty of Agriculture, Belgrade-Zemun, Serbia
[2] Ss Cyril and Methodius University in Skopje, Faculty of Forestry, Skopje, Macedonia
[3] University of Novi Sad, Faculty of Agriculture, Novi Sad, Serbia
Corresponding author: Maletić Vladimir, bergemona@gmail.com

With the goal to achieve better culling body weight, preserving the number of animals and achieving better reproductive pheasant potential it is necessary to provide additional food for pheasants on the hunting ground. Pheasant diet on the hunting ground some or no attention is given and mainly it's just formality, therefore achieved results depend on degree of anthropogenic factor and amount of naturally obtained food.
Researches till the day show that additional food for pheasants on the hunting ground in all seasons, especially winter gives positive results. In latest research, lowest results were obtained during spring because pheasant reproductive season, like for most animals, overlaps with maximal vegetation period as well as with maximal production of food originating from animal and plant sources. However, usage of chemicals and mechanization in agriculture influences the drastic reduction in choice from where to obtain natural food. Therefore, effect of additional spring diet on pheasant

reproduction is questionable and most probably depends on quality of hunting ground and anthropogenic activity.
Additional feeding during summer (after inhabitation) is especially significant for survival of pheasant chicks, their development and growth rate, and that is clearly explained with results from previous researches. Additional protein diet of young pheasants, which were inhabited on the hunting grounds, helps in increase of body weight much more than when using additional energy oriented diet, however the only negative point in using protein diet is high price of such food.
Winter feeding is frequently practiced on the field, which is usually done using grains. Aim of winter feeding is decrease of mortality of game and helping the animals to preserve their body weight and physical condition, which is important for spring reproduction. In order for food to be efficiently used it is necessary to start on time for pheasants to get used to feeding place.

Key words: pheasant, additional feeding, hunting ground, season.

05/10/2017
Forest health

Influence of extremely low temperatures during winter 2016-17 on the populations of pine processionary moth in the Republic of Macedonia

Nacheski Sterja [1], Papazova-Anakieva Irena[1]
[1] Ss. Cyril and Methodius University in Skopje, Faculty of forestry – Skopje, Republic of Macedonia

This paper presents results concerning the impact of extremely low winter temperatures on the mortality of caterpillars of pine processionary moth, *Thaumetopoea pityocampa* in the 2016/2017 generation. Also, the dynamics of pine processionary moth populations and the impact of reduction factors in the period 2007-2017 were monitored. The abundance of its populations is determined by the number of caterpillar nests per tree and and per hectare.
Population density of the pine processionary moth varies during this research period. The number of individuals in the populations from the generations from 2007 to 2010 is growing, and then rapidly decreasing. This is as a result of the control measures taken in 2010, when aviosuppression with Rimmon E-10 was carried out. Afterwards the abundance of *T. pytiocampa* is brought to normal limits in all regions.
From 2011 progradation trend has been recorded as a result of the huge number of individuals from the previous years who were in the pupae stage during the winter diapause. Population density is increasing in the several subsequent years. In conjunction with this the percentage of defoliation increases almost at all sites in Republic of Macedonia from 2011-2015.
Based on the results obtained in this period and predominantly due to the very high population density, recommendations are given with measures for gradual regulation of pine processionary moth populations in the black pine cultures in 2015 and 2016.
The abundance of pine processionary moth populations because no corrective measures were taken, continued to grow in 2016 and in the winter 2016/2017 there was a pronounced retrogradation. The density of the populations came to a latency due to enormous number of dead larvae from the second and third larval stage from the extremely low temperatures that were present for a long period of in January 2017.
This research has identified 100% mortality of caterpillars of pine processory moth in the black pine cultures in the regions near Prilep, Sveti Nikole, Shtip, Kochani and Negotino.

Keywords: pine processionary moth, *Thauamatopoea pityocampa*, black pine (cultures) forests, extremely low temperatures, abundance, population dynamics, mortality.

Distribution of *Hymenoscyphus fraxineus* on *Fraxinus spp*. in Serbia

Keča, N.[1], Keča, Lj.[1]
[1] University of Belgrade-Faculty of Forestry, Belgrade, Serbia.
Corresponding author: nenad.keca@sfb.bg.ac.rs

The problem of Ash decline has been for the first time observed in early 1990's in Poland. In the coming year disease has spread throughout Europe and produced serious damages in naturally established and planted ash stands. The disease has been identified in neighboring countries in 2005 in Romania, in Slovenia (2006), Croatia (western part 2009, eastern 2012) and Bosnia and Herzegovina (eastern part 2009 and central 2013, eastern 2014). In Serbia, the presence of *H. fraxineus* was monitored since 2011. Although decline of ash trees was present, symptoms were usually disguised with the presence of other disturbing abiotic (extreme drought 2012 and 2013, extreme wed 2014) and biotic (*Phytophthora* spp., *Stereonychus fraxini* – defoliation, etc.) factors. The first *H. fraxineus* resembling cultures were obtained in late autumn 2015. Ten cultures from three localities were identified as *H. fraxineus* after morphological and molecular analyses. Presence of *H. fraxineus* was confirmed for both *Fraxinus excelsior* and *F. angustifolia*, which were previously known as susceptible hosts.

During 2016 extensive study of presence of the invasive alien ash dieback pathogen in wide range of forest ecosystems was performed. Forty-two localities were selected throughout Serbia and inspected for the presence of symptoms and tree decline. Variety of symptoms was observed on leaves, shots and in crowns of studied trees.
Obtained knowledge about the symptoms, distribution, aetiology and biology of the ash dieback pathogen *H. fraxineus* will be presented.

Keywords: *Hymenoscyphus fraxineus*, *Fraxinus spp*., ash, Serbia

Viruses in biocontrol: CHV1-affected epigenetic and biochemical changes in *Cryphonectria parasitica*

Jezic Marin[1], Nuskern Lucija[1], Tkalec Mirta[1], Liber Zlatko[1], Krstin Ljiljana[2], Katanic Zorana[2], Mlinarec Jelena[1], Curkovic-Perica Mirna[1]
[1]University of Zagreb, Faculty of Science, Zagreb, Croatia
[2]University of J. J. Strossmayer in Osijek, Department of Biology, Osijek, Croatia

Cryphonectria parasitica is a phytopathogenic fungus introduced from Eastern Asia to North America and to Europe, where it causes chestnut blight, a devastating disease of chestnut trees. A hyperparasitic mycovirus, *Cryphonectria hypovirus* 1 (CHV1), can infect the fungus, causing the change in morphology and virulence of the affected mycelia, indicating physiological changes. In order to elucidate what changes occur after the infection we have transferred six CHV1 strains belonging to three different virus subtypes into three different, but isogenic, *C. parasitica* isolates. Using methylation-sensitive amplification polymorphism (MSAP) we assessed the methylation pattern changes of the *C. parasitica* genome following the infection. The most obvious change was the increase of the number and diversity of methylated, hemi-methylated, and total MSAP markers found in infected fungal isolates compared to virus-free controls. The increase in methylation levels correlated well with the CHV1-induced reduction of fungal growth in vitro, indicating that *C. parasitica* genome methylation upon CHV1 infection, rather than being the defensive mechanism of the fungus, is more likely to be the virulence determinant of the virus. The severity of CHV1 effect on methylation levels of infected *C. parasitica* isolates depended mostly on individual CHV1 strain and on the combination of host and virus genomes, rather than on the virus subtype alone. Furthermore, fungal growth and glutathione S-transferase, catalase and superoxide dismutase activities have been monitored. These enzymes are involved in oxidative stress response and in most cases we observed increase in oxidative stress enzymes’ activity in hypovirulent mycelia coupled with reduced growth of the affected mycelia. However, no clear correlation between the severity of the infection symptoms and virus subtype was determined. The severity of symptoms and the effect on the fungus does not depend on the virus subtype, but rather on the combination of the particular CHV1 and *C. parasitica* genotype.

Keywords: biological control, enzyme activity, genome methylation, hypovirulence

Control of chestnut blight in Greece by mass inoculation with hypovirulence

Diamandis Stephanos[1], Tziros T. George[2]
[1] Forest Research Institute, Thessaloniki, Greece
[2] Aristotle University of Thessaloniki, Faculty of Agriculture, Plant Pathology Laboratory, P.O.B 269, 54 124, Thessaloniki, Greece

Management of forest diseases is immensely different from management of diseases in agricultural crops. In forestry, we deal with long living ecosystems which occupy thousands or millions of ha. A

great deal of biodiversity exists in forest ecosystems and depends on their delicate balance. Application of chemical control is not an option!
The usual path to reducing loss and preventing or slowing down the spread of forest diseases is sylvicultural interventions, salvage cuttings, use of resistant plant material or establishment of mixed forests, etc.
In other words, we MUST use low-cost and environmentally friendly methods or apply biological control.
The disease of chestnut blight in Europe and specifically in Greece is such a case. Chestnut blight was first recorded in Greece in 1963. In the following years, it spread all over the country, reducing remarkably the national nut production. In 2006 the decision was made for applying biological control on national scale by using hypovirulence. The existence of only 4 vc-types and the absence of the perfect stage of the fungus were key factors in funding such a project. In 2007-2009, three million inoculations were applied in 17 Municipalities. A second project implemented in 2014-2016 involved another one million inoculations in 10 Municipalities. The results are beyond any expectation. The disease has declined almost everywhere, however, the success in disease decline and the speed of decline are significantly different from area to area.
When a disease, such as chestnut canker, starts to devastate forest and especially orchards affecting chestnut growers and the national nut production, it is up to the forest manager to decide whether to wait until natural hv appears or to intervene like I did in Greece.

Keywords: Chestnut blight, mass inoculation, hypovirulence, biological control.

The health condition and vitality influence on the aesthetic significance of protected trees (nature monuments) on the territory of Belgrade

Mitrovic Jelena[1], Golubovic Curguz Vesna[1], Glavendekic Milka[1], Stojicic Djurdja[1]
[1] University of Belgrade, Faculty of Forestry, Belgrade, Serbia
Corresponding author: vesna.curguz@sfb.bg.ac.rs

This paper presents the relation between health condition and alsovitality and their impact on the aesthetic value of protected trees - the natural monuments on the territory of the city of Belgrade. A total of 22 botanical nature monuments were classified into 16 taxa consisted of 32 individually protected trees. These trees belong to *Taxus baccata* L., *Pterocarya fraxinifolia*, *Quercus robur, Ginkgo biloba, Pinus wallichiana a*nd *Platanus x acerifolia, Fagus sylvatica, Magnolia x soulangeana, Cedrus atlantica, Cupressus arizonica, Aesculus hippocastanum, Corylus colurna, Koelreuteria paniculata, Vitis vinifera* 'Seibel 1000' *Magnolia x soulangeana* 'Lennei' and *Fagus sylvatica 'Purpurea'* .
The basic dendrometric characteristics, such as tree height, crown width were determined. In addition to this the existence of wounds of trunk and branches, dry branches, drying of leaves, insect damage, fungal diseases and abiotic damage have been recorded.
All of these parameters enabled the formation of 1 – 5 ratings, which were used to estimate decorativity and vitality. Although the average rating of vitality for all individuals is 4.1 and the average rating of decorativity for all individuals is 4.2, there are significant differences among the trees. *Quercus robur* and *Platanus x acerifolia* are distinguished as the most valuable and most conserved species, *Taxus baccata, Cedrus atlantica* and *Corylus colurna* are of poorer health, vitality and decorativity. Unfavorable climatic conditions and anthropogenic factor, have led to disruption of the health condition (for trees *Cedrus atlantica* and *Taxus baccata*), presence of pests (*Pentamerismus taxi* (Haller), *Parthenolecanium fletcheri* (Cock.), *Xestobium rufovillosum* De Geer, *Aegosoma scabricornis* (Scop.), *Parthenolecanium corni* (Bouche), Siricidae spp.), and presence of pathogenic fungi (*Cryptocline taxicola* (Allesch.) Petr., *Phytophthora* spp., *Nectria* spp.). All of these infect protected trees to a lesser or greater degree.

In order to preserve the protected natural assets - the individual trees for as long as possible in good condition, in accordance with the prescribed protection regime, it is necessary to intensify the care of this value through regular allocation of funds for the implementation of all appropriate care, protection and promotion measures.

Keywords: protected tree, tree health condition, tree vitality, aesthetic value of tree

Most frequent aphids in forest and ornamental nurseries and on urban greenery

Leopold Poljaković-Pajnik[1], Milan Drekić[1], Verica Vasić[1], Milka Glavendekić[2], Olivera Petrović–Obradović[3]
[1]Institute of Lowland Forestry and Environment Novi Sad, University Novi Sad, Serbia
[2] Faculty of Forestry, University of Belgrade, Serbia
[3] Faculty of Agriculture, University of Belgrade, Serbia

Aphids occur throughout Serbia on almost all cultivated species in nurseries of forests and ornamental trees and shrubs. They colonize and develop on leaves, young shoots, twigs, bark and buds. Collecting of aphids was conducted in the period from 2005 to 2015. Investigations were carried out in 12 forest nurseries and 25 nurseries for the production of ornamental plants. Aphids were collected in parks and in all other forms of urban green greenery of urban areas.
Based on the collected material, a total of 57 species of aphids were found. Among them two species that are new for entomofauna of Serbia: *Melanaphis donacis* (Passerini) on *Arundo donax* and *Patchiella reaumuri* (Kaltenbach) on *Tilia argentea*.
In forest nurseries 8 species of aphids were found, in nurseries 31 species for the production of ornamental plant material, while 44 species, the highest number, was found on the urban greenery.

Keywords: aphids, nurseries, urban greeneery

Differential effect of '*Ca*. Phytoplasma ulmi' and *Ophiostoma novo-ulmi* on *Ulmus* spp. in Croatia

Katanić Zorana[1], Krstin Ljiljana[1], Ježić Marin[2], Zebec Marko[3], Ćurković-Perica Mirna[2]
[1] Department of Biology, University of J. J. Strossmayer in Osijek, Osijek, Croatia;
[2] Department of Biology, Faculty of Science, University of Zagreb, Zagreb, Croatia;
[3] Department of Forest Genetics, Dendrology and Botany, Faculty of Forestry, University of Zagreb, Zagreb, Croatia
Presenting author: zkatanic@biologija.unios.hr; zorana.katanic@gmail.com

Phytoplasma '*Ca*. Phytoplasma ulmi' is causal agent of elm yellows (EY) and ascomycete *Ophiostoma novo-ulmi* causes Dutch elm disease (DED). These are serious and widespread elm diseases, although for European elms DED is considered major treat compared to EY. In order to investigate influence of these pathogens on significant loss of elms observed in Croatia, samples of three elm species: *Ulmus laevis*, *U. minor* and *U. glabra*, from six location were collected during June and July of 2012. High incidence of infection, around 40% for each pathogen, was observed. Also, mixed infection caused by both pathogens was proven in 5.8% of analyzed samples. However, the frequency of single pathogen infection for individual elm species differed. '*Ca*. Phytoplasma ulmi' was infecting *U. laevis* more often than *U. minor*, while infection of *U. glabra* was not detected. *Ophiostoma novo-ulmi* infection was proven for all three elm species, but the frequency of infection was significantly higher for *U. minor* and *U. glabra* than for *U. laevis*. All trees infected with *O. novo-ulmi* were severely symptomatic, while phytoplasma didn't cause significantly different intensity of symptoms compared to uninfected trees. Therefore, DED could have greater impact on the decline of elm trees in Croatia, especially of *U. minor* and *U. glabra.* Nonetheless, high incidence of EY

phytoplasma should not be ignored and possibility of mutual interactions of these elm pathogens in natural populations should be further studied.

Keywords: elms, elm yellows phytoplasma, Dutch elm disease

Multiregional population structure of *Cryphonectria parasitica*, the causal agent of chestnut blight, in Turkey

Erincik Omer [1]
[1]Adnan Menderes University, Faculty of Agriculture, Aydın, Turkey.
E-mail:oerincik@adu.edu.tr

Cryphonectria parasitica, the causal agent of chestnut blight, has been responsible for the dieback of many chestnut trees in Turkey. Turkey is the largest chestnut producer country in Europe; therefore, chestnut blight has been the subject of great interest since its first report in 1967 in Turkey. In order to draw a complete picture of the contemporary population structure of *C. parasitica* in Turkey*,* data from the subsequent projects conducted in recent years were gathered together. A total of 481 isolates from the Aegean Region, 317 from the Marmara Region, 298 from the West Black Sea region and 347 from the East Black Sea region were used in the evaluations. In the Aegean Region, 56.2% of the isolates were EU-1, 39.3% were EU-12 and 4.5% were EU-2. In the Marmara and West Black Sea regions, all isolates were EU-1. In the East Black Sea Region, only 40% of the isolates were EU-1 and the rests fell into at least 14 different vc types. Both mating types were found in all regions. In the Aegean, Marmara and West Black Sea regions, MAT-1 was dominant comprising of 74%, 73% and 69% of the isolates, respectively. In the East Black Sea region, MAT-1 and MAT-2 ratio was close to 1:1 and 31.8% of the bark samples had perithecia, which proved the widespread occurrence of sexual reproduction. Analysis of dsRNA revealed that 215 isolates from the Black Sea and Marmara regions had dsRNA content. The two subtypes of *Cryphonectria hypovirus 1* (CHV1) were found. Subtype I was dominant comprising of 78.2% of the isolates. Subtype F2 accounted for 11.8% of the isolates and restricted mostly to the Eastern Black Sea Region. It can be concluded that population structure of *C. parasitica* with the low vc-type diversity in most of the regions, except the East Black Sea Region, creates ideal condition for the rapid spread of the natural or artificially introduced hypovirulence in Turkey. However, the increase in vc type diversity in the East Black Sea Region should be taken into account for the future prospects of hypovirulence in Turkey.

Keywords: Chestnut, Chestnut blight, *Cryphonectria parasitica*, population structure, hypovirulence, CHV1

Cydalima perspectalis – new defoliator threat to natural populations of boxwood in the Skopje region

Nacheski Sterja[1], Papazova-Anakieva Irena[1], Lazarevska Stanislava[2]
[1] Ss. Cyril and Methodius University in Skopje, Faculty of forestry – Skopje, R. of Macedonia
[2] Ss. Cyril and Methodius University in Skopje, Faculty of Agriculture and Food, Skopje, R. of Macedonia

Cydalima perspectalis, box tree moth was recorded for the first time in Republic of Macedonia on box seedlings in parks, gardens and other urban green spaces in the city of Skopje in 2014. In the natural *Buxus* populations it was first time recorded on the mountain Vodno in 2015. Since then, its population started to have a trend of progradation in Vodno. It has expanded almost everywhere, with evident deflation in 2016 and 2017. In the spring of 2017, total defoliation was detected on the locality Sredno Vodno. It was also registered in the natural *Buxus* populations on Matka in 2017. Box

tree moth is not registered only on the top of mountain Vodno, but due to its rapid spread it is expected that it will soon be present in this part of the mountain.
Strong defoliations were recorded at the base and the middle of the mountain Vodno, in July and August. Particularly numerous were the second and third generation of box tree moth populations.
This research presents results concerning the dynamics of the abundance of populations of this economically very harmful defoliator from generation to generation in the period from 2015, 2016 to 2017. Accordingly, the population representation of the box tree moth varies from generation to generation over the years when the research was carried out. The number of the first generation is the lowest in contrast to the second and third, when the number is multiplied. The most numerous is the generation that appears in the middle of the summer, i.e. August - September.
Based on the results obtained, and especially due to the high population of *Cydalima perspectalis*, recommendations are given with measures for gradual regulation of the box tree moth populations on Vodno.

Keywords: Box tree moth, *Cydalima perspectalis*, box (Buxus), defoliator, damages, abundanca, population.

Possibilities in forestry for promotion of rural development - The potential of non-wood forest products in Malesh region

Bozhinova Hristina[1], Stojanovska Makedonka[2]
[1] Bachelor in Forestry
[2] Ss. Cyril and Methodius University in Skopje, Faculty of forestry – Skopje, Republic of Macedonia
Forests in Macedonia are characterized by rich biodiversity, and despite the large number of insects, plants, animals, algae and fungi, as a potential resource, the country is not paying enough attention to these non-wood products including: herbs, mushrooms, berries, etc... Many people in the rural areas may find their own source of existence participating in these activities of forestry collection of non-wood forest products, and this trend begins to be more cherished on the territory of Macedonia too.
This diploma thesis describes the current ongoing state of the policy framework in Macedonia about the NWFP, respectively a subject of analyses are the possibilities (the potential) of these forest products that contributes to the development of the rural areas in the Bregalnica region. The research was done using two semi-structured questionnaires, one for the collectors and one for the buyers/ resellers working with NWFP, analyzed with statistical methods as well as a secondary data collected from various different documentation.
The results show that the interest of collecting NWFP is constantly increasing, knowing the fact about the poor socio-economic situation in Macedonia and the huge disorganization among the stakeholders. The traditional knowledge and practice the collectors have is under the pressure of modern lifestyles and it is disappearing as the time goes. The ideas of opening a private business can not be realized as well, because of not having any help from the institutions and in addition to that, many of them are collecting illegally knowing the legal regulations that are in action.

Keywords: RM, NWFP, Bregalnica region, gatherers, buyers.

Ailanthus altissima in the Bregalnica region in R. of Macedonia

Nikolov Blagoj[1]
[1] Bachelor in Forestry

There was no written documentation when, where and how the invasive alien plant species *Ailanthus altissima* was introduced to the Bregalnica Region in Republic of Macedonia, yet only assumptions for the early 20th century as a species suitable for erosion control, and in certain urban areas for

ornamental purposes. This article represents the first research on this species in the mentioned region. Most of the research activities were conducted in 2016 during the preparation of a MSc thesis titled: ‘Predicting the potential distribution of invasive species *A. altissima* due to climate change in the Bregalnica Region’. At all sites of *A. altissima* in the Bregalnica Region, GPS coordinates were taken. Basic bio-ecological features of the highest individual trees were noted, and core samples for determining the age were taken for laboratory analyses. All collected data were imported in an attribute database to be displayed on a map using QGIS software, thus giving us a detailed picture of the current distribution of the species in this region. The principal findings show that there are single trees, groups and populations with *A. altissima* with different growth and distribution characteristics, due to the diversity of the environmental conditions found it the Bregalnica region. The invasive alien plant was found in urban and peri-urban areas, as a part of the ruderal vegetation (pioneer species), along main roads, introduced as an ornamental species, afforested for erosion control or planted by mistake by local population instead of other species (Juglans sp.). The oldest specimen (with DBH of about 86 cm, a height of 15 m, and age of about 85 years) was found in the city of Kocani. The species appear to thrive up to the elevations of about 925 m a.s.l.

Keywords: *Ailanthus altissima*, invasive alien plant species, Bregalnica region.

Root-rot fungi shaping mountain pine forests in the Alps

Rigling Daniel[1]
[1] WSL Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), Birmensdorf, Switzerland.

Annosum *and* Armillaria root rot are responsible for widespread mortality of mountain pine (*Pinus mugo* subsp. *uncinata*) in the Swiss National Park often creating canopy caps in the forest. Among 42 forest gaps investigated, 31 were associated with *H. annosum* s.str. and six with *A. ostoyae.* Two other *Armillaria* species*, A. cepistipes* and *A. borealis* were also found in the study area, but seem to play only a minor role in gap formation. Somatic incompatibility tests and microsatellite analysis indicate that *A. ostoyae* formed large genets with the largest genet extending over 37 ha. This *A. ostoyae* genet represents the largest fungi so far found in Europe. In comparison, *A. borealis* and *A. cepistipes* formed significantly smaller genets. To study the impact of the root diseases on forest dynamics we assessed tree regeneration along transects running across disease centers into the adjacent forest. The mountain pine regeneration was significantly more abundant in the disease center than in the forest. In contrast, the density of Swiss stone pine (*Pinus cembra)*, a more shade-tolerant and late-successional tree species than mountain pine, did not differ between the disease centers and the adjacent forest. The incidence of root rot and mortality among the regenerating mountain pines was low, indicating that the regeneration is hardly threatened by the two pathogens. The results suggest that root-rot fungi slow down succession towards stands with a higher proportion of *P. cembra* by creating forest gaps that favor regeneration of the early-successional mountain pine.

Keywords: *Armillaria, Heterobasidion*, *Pinus mugo*, forest succession, large fungal genets

06/10/2017

Mycorrhizae – the underappreciated symbiosis with the potential to save the planet

Sotirovski Kiril[1]
[1] Ss. Cyril and Methodius University in Skopje, Faculty of Forestry – Skopje, R. of Macedonia

Ever since its first sparks on Earth, between 3,7 and 4,2 billion years ago, life has been constantly changing and evolving, passing a myriad of milestones throughout its entire history on this planet. Many of those milestones were achieved via cooperation, be it between complex molecules, or between unrelated single celled organisms, or even, in many instances, between complex organisms. I point out several cases which, as much as improbable they seem, have guided life to ever higher steps in the stairway called evolution.

Single celled prokaryotic organisms not only ruled the planet for at least 1 billion years, but were in fact the only type of life for so long – about 1/4th of history of life. It is now considered that mutations made it possible for cells of the same species to stay together, and not only survive, but thrive from the newly formed relationship. Other than this, there have been instances of cooperation between micro-species which have allowed for formation of larger and more complex cells. The endosymbiotic theory points to mitochondria as remnants of bacterial cells finding a niche for life within single celled eukaryotes, and to plastids in plant cells as descendants of single-celled algae finding refuge, or barely surviving, in other cells. It is not a matter of whether bacteria and algae were a supposed meal for the larger cells but survived, or were actively seeking to parasite host cells but instead found refuge within, but it is important that both host and guest turned their newly formed relationship into a mutually beneficial enterprise. Those “enterprises” would become superior to their predecessors and allow for further evolution of ever-more complex life forms. Another miraculous form of cooperation between species are lichens, formed from a closely-knit community of algae living within fungal cells. Their collaboration allows them to survive in some of the harshest environments on our planet, even on bear rock or in regions with very little rainfall.

Mycorrhizae are another of the symbiotic/mutualistic relationships which form between species which are not only non-related, but are vastly different one from the other. In mycorrhizae, fungi and plants form associations which are mutually beneficial, and for different purposes. The plants benefit mainly for the absorption of otherwise unreachable organic or mineral nitrogen, inorganic phosphorous, amino acids and other nutrients, but also get easier access to moisture, especially in arid soils. That is much easier to comprehend after it has been revealed that in a handful of soil from an average forest with established mycorrhizae the vast network of hyphae from the fungal symbiont would form lengths expressed in kilometers. This allows both symbionts to explore even the most minute pores in soils for both water and nutrients. On the other hand, the fungi receive ready available carbohydrates from the plants – and having in mind that they live heterotrophic lifestyles, for them this is of lifesaving importance. Recent fossils have revealed that mycorrhizae appeared at least 460 million years ago, before the appearance of vascular plants. Furthermore, there are hypotheses that plants would have never moved to land without partnering with fungi in mycorrhizae. We have to consider this mode of collaboration as very successful because there are a vast number of interactions between plant and fungal species registered by science, and up to 95% of all plant species are considered to form mycorrhizae. On the other hand, there are numerous fungal species which only survive through this type of symbiosis and have never been registered to live on their own.

All plant types – from mosses, through grasses, to shrubs and trees are better equipped to survive harsh, dry, non-fertile environments, and are resistant to transplant shock when they have an established mycorrhizae. Not less important is that the fungal partners in mycorrhizae improve the immediate surrounding environment of roots, having direct and indirect positive impact on other beneficial life forms, boosting the immune systems of plants, and making them less prone to soil-born pathogens and pests.

From a practical point of view, forestry needs to recognize that mycorrhizae must become, sooner better than later, standard procedure for mass planting projects, reforestation, land reclamation etc., in order to improve their success. During these dire times for the planet, when headlines are dominated by the terms “global climate change”, “6th mass extinction of species”, “invasions of alien

species”, “deforestation”, if we want to get another chance to continue civilization, mycorrhizae might be our last hope. Furthermore, in context of climate change, latest research has found that in some types of mycorrhizae plant biomass increases under drought conditions, while fungi themselves also elevate their biomass under conditions of elevated atmospheric CO_2.

Overview of forest and heaths habitats in NATURA 2000 in the Republic of Macedonia

Kostadinovski Mitko[1], Mandžukovski Dejan[2], Ruiz Ernesto[3], Nikolov Blagoj[4]
1. Institute of Biology, Faculty of Natural Sciences and Mathematics, Ss. Cyril and Methodius University, Skopje, Macedonia
2. Public enterprise Makedonski šumi, Skopje, Macedonia
3. ATECMA SL Isla de la Toja Nº 2 Esc. Izda. 3º A Collado Villalba Madrid, Spain
4. str. Srecko Puzalka no. 30-5 1000 Skopje, Macedonia
* Corresponding author: d_mandzukovski@yahoo.com

During the 2016th, the project "Strengthening the capacities for implementation of Natura 2000" was realized, which took the first steps for implementing Natura2000 in the Republic of Macedonia.
The desktop analysis proposed a working (preliminary) list of habitats, according to which the scrubs and forest habitats are represented with 21 habitats of the following three groups:
4 - Temperate heath and scrub (tree habitats; one of them is priority habitat),
5 - Sclerophyllous scrub; matorral (two habitats) and
9 – Forests (sixteen habitats; four of them are priority habitats).
During the field work it has been shown that it should be explored the option to be added two habitats in the list, but the presence of a one habitat from the list was proved to be suspicious.
The working list of potentially present habitats of these groups was developed by consulting around 40 articles, two phytocenology monographs, and analysis of nearly 177 Separate forest management plans and about 10 Plans for forest management in the National Parks. Based on data from desktop analysis in QGIS program were made maps of the distribution of habitats.
For more precise determination of the actual conditions, over 48 (+ 62) working days, a large number of sites were explored and great recordings / entries were made that were entered in a separate Memento base.
Gaps in the knowledge that still remain at the end of the project can be divided into three groups:
- unsolved status of some habitats,
- potentially present habitats that were not recognized on the field,
- insufficiently studied range of some habitats.
Understanding and recognizing of the proposed habitats in forests will be of high importance in the management and suitable measures that will be taken.

Overview of Natura 2000 grassland habitat types on the territory of the Republic of Macedonia

Matevski Vlado[1,2], Ćušterevska Renata[1]
[1] Institute of Biology, Faculty of Natural Sciences and Mathematics, University of Ss. Cyril and Methodius, Arhimedova 3, 1000 Skopje, Republic of Macedonia
[2] Macedonian Academy of Sciences and Arts, Bul. Krste Misirkov 2, 1000 Skopje, Republic of Macedonia

Natura 2000 is a network of protected natural areas in the territory of the European Union, established under the Habitats Directive and the Birds Directive.In the course of 2016, the initial activities in the territory of the Republic of Macedonia related to the implementation of the Natura 2000 network were realized, within the project "Strengthening Natura 2000 Capacity for Implementation of Natura 2000 Capacity".

Among the many goals that were taken into consideration for this project was the assessment of the total area and distribution of water and marsh habitats, grasslands and other low grass vegetation, to propose national reference list of habitats, maps of distribution, as well as a plan for future research to fill the shortcomings.
A variety of geomorphologic forms allow such a diversity of habitats in a relatively small country like Republic of Macedonia. As a result of the undertaken researches 33 grassland habitats (habitat types) of Annex 1 of the Habitat Directive from the territory of the Republic of Macedonia were registered. In addition, the established methodology and structure of the text for each individual habitat was followed.
Our team has defined the following habitats in more detail and for each separate habitatare listed: the code, name and descriptions of the habitat, characteristic plant species, classification (according to EUNIS: Cod-Name, EuroVegChecklist, Annex 1, Emerald, IUCN), site of dissemination, localities, ecological characteristics, pressures and threats, conservation and management.
1310 : *Salicornia* and other annuals colonizing mud and sand; 1530 : Pannonic salt steppes and salt marshes; 6150: Siliceous alpine and boreal grasslands; 6210: Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*)(*important orchid sites); 6220: Pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea*; 62D0: Oro-Moesianacidophilous grasslands; 6230 Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and sub mountain areas in Continental Europe); 6430: Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels; 6520: Mountain hay meadows; 6540: Sub Mediterranean meadows with *Molinio-Hordeion secalini*; 8140: Eastern Mediterranean screes; 8210: Calcareous rocky slopes with chasmophytic vegetation; 8220: Siliceous rocky slopes with chasmophytic vegetation.

Keywords: Natura 2000, grassland habitats, Republic of Macedonia

Distribution and ecological conditions of heaths in Republic of Macedonia

Mandžukovski Dejan[1], Ćušterevska Renata[2], Teofilovski Aco[1]
[1] Public enterprise Makedonski šumi, Skopje, Macedonia
[2] Institute of Biology, Faculty of Natural Sciences and Mathematics, Ss. Cyril and Methodius University, Skopje, Macedonia
* Corresponding author: d_mandzukovski@yahoo.com

In this article distribution and ecological conditions of heaths in Macedonia are discussed. For that purpose, we have analyzed more than 775 vegetation relevés 55 are from the territory of Macedonia especially mountain of Jakupica, Shar, Jablanica and Galičica. All these vegetation formations are located close to the timberline (boreal heaths) and higher in alpine zone which demonstrate different ecological conditions as well as they show transitional level of succession of vegetation near timberline. Heaths are listed as Natura2000 habitat, unfortunally affected by grazing, burning and meliorative activities as well as natural penetration of solitary and group of trees mostly conifer, but also and shrub which cause changes in their floristic composition.
For better understanding of heaths, we made chorological spectrum and life forms for all groups of relevés, as well as for major environmental conditions were used average of Ellenberg indication values.
Syntaxonomical solution are discuses and we propose sintaxonomical scheme of heaths in Macedonia on this stage of research.

Forestry sector in Bulgaria before and after the reform in 2011 Main Considerations and inter-sectorial relations

Dobrichov Ilko, Neykov Nikolay, Dobrichova Anna

After the reform in 2011 the economic base for forestry functioning changed. Sector was split in six autonomous enterprises. They do their businesses like any other enterprise in the private economy. This gave capabilities to enterprises to gain profits as a result of efficient managerial decisions. All these features determine the future improvement of the entire forestry and consequent problems and the need of their solving. Current paper aims to reveal the differences and similarities between sector before and after the reform in quantitative manner. To generalize the imperfections of the system and to outline the directions for diminishing their negative effect.

Key words: forestry, system, reform.

Forest Policy Strategic Regional Research Agenda – Why is it important and how it was developed?

Dr.sc. Dijana Vuletić, *Chair of the COST TN1401 Action, Croatian Forest Research Institute, Croatia*
Prof. dr. sc. Mersudin Avdibegović*, Vice Chair of the COST TN1401 Action, University of Sarajevo, Faculty of Forestry, Bosnia & Herzegovina*
Prof. dr. sc. Špela Pezdevšek Malovrh, *University of Ljubljana, Biotehnical Faculty, Slovenia*
Prof. dr. sc. Stjepan Posavec, *University of Zagreb, Faculty of Forestry, Croatia*
Dr. sc. Silvija Krajter Ostoić*, Croatian Forest Research Institute, EFISEE, Croatia*
Prof. dr. sc. Nenad Petrović, *University of Belgrade, Faculty of Forestry, Serbia*
Prof. dr. sc. Makedonka Stojanovska*, University St. Ciril and Method, Faculty of Forestry, Macedonia*
Dr. Bernhard Wolfslehner, *BOKU, EFICEEC, Austria*

Forest Policy Strategic Regional Research Agenda is one of the main results of the CAPABAL COST Action which brings synthetized list of research topics relevant for the forest policy research in WBs countries. Those topics should be addressed by different research project in coming two decades.
Forest policy research is still not fully recognized in the region as important as a foundation for sustainable forest management or any forest-related decision making. This is mainly due to weak forest educational programs in this topic and also weak role of forest-related policy, economics and governance in forestry.
Currently national policy in forest and natural resources is driven almost entirely by external changes at the international and EU level. The Western Balkan countries, with the assistance of international donors and IPA funds, have incorporated the language of these policy agreements into national laws, but have not yet transformed forest management to achieve the terms of these new policy reforms.
To address those topics, we need more forest policy and governance research and stronger involvement of practise and policies in those researches. This principle was applied in process of development of SRR Agenda as continuation of efforts from FOPER* and FP7 ROK-For* projects finally completed during COST CAPABAL* Action. SRRA as document consist of challenges of WB Forestry described as the main research priorities in area of forest policy and economics. Bringing those topics into the life via different projects and research will improve mutual understanding of methodologies, thresholds and boundaries for making better policies and bringing better decisions on how to manage, use and distribute natural resources of national, regional and global importance.

Entrepreneurship in forestry in Macedonia

Vladimir Stojanovski[1], Makedonka Stojanovska[2]
[1] PhD student University of Natural Resources and Life Sciences BOKU Vienna, Austria
[2] Faculty of Forestry in Skopje, University Ss Cyril and Methodius

Micro, small and medium-sized enterprises are the engine of the European economy. They are an essential source of jobs, create entrepreneurial spirit and innovation in the EU and are thus crucial for fostering competitiveness and employment. The data from statistical office of Republic of Macedonia from 2004-2014 shows that between 1,9% and 2.3% of the total number of active SMEs are coming from forestry sector. The main goal of this paper is to analyses the possibility for entrepreneurship in forest sector in Macedonia. For the paper purposes the forest sector was dived in three business fields: 1. Forest harvesting companies; 2. Companies dealing with non-timber forest products; 3. Nature-based and recreational companies. All three business fields were analyzed separately and also cross fields analysis were done as well. The results shows that markets for field 2 non-timber forest products and field 3 Nature-based and recreational companies are undeveloped. The analysis shows existence of potential in this business fields especially in the Nature-based and recreational sector which is new in Macedonia and it is very fast growing in EU. The general findings indicate that the micro, small and medium-sized enterprises play a central role in the employment of rural people in local processing, recreation and forest-based tourism activities. With increasing the entrepreneurship in the markets can bring value added to rural areas and closer to the origin where trees are growing and can contribute to rural development.

Keywords: entrepreneurship, small and medium enterprises, nature-based, non-timber forest product, forest harvesting

Market research and business models for sustainable forest management in Bulgaria

Tsvetelina Simeonova-Zarkin[1], Emil Kitchoukov[2]
[1,2] University of Forestry, Sofia

To be competitive and to be able to support sustainable forest management forest enterprises need effective business models to offer certified products. The article analyses the results of marketing research carried out in two important forest regions in Bulgaria. It aims to identify and characterize potential markets for certified wood. The current status of forest certification in the country is presented. Business models are developed to meet the market needs.

Keywords: sustainable development, forest certification, marketing research, economic analysis
JEL: Q01, Q23

05/10/2017
Poster presentations

Accuracy of age structure assessment of Autumn hare population based on regression analysis of climatic parameters on the territory of Backa

Beuković Dejan[1], Popović Zoran[2], Beuković Miloš[1], Đorđević Nenad[2], Maletić Vladimir[3], Lavadinović M. Vukan[4]
[1] University of Novi Sad, Faculty of Agriculture, Novi Sad, Serbia
[2] University of Belgrade, Faculty of Agriculture, Belgrade-Zemun, Serbia
[3] Ss Cyril and Methodius University in Skopje, Faculty of Forestry, Skopje, Macedonia
[4] University of Belgrade, Faculty of Forestry, Belgrade, Serbia
Corresponding author: dejan.beukovic@stocarstvo.edu.rs

In previous studies, which applied multiple regression stepwise analysis, the amounts of monthly rainfall and mean monthly temperatures from March to September (which is the duration of the reproductive cycle of hares) were analyzed to identify the key independent variables, with coefficients determining the effects of the above listed factors on the percentage of juveniles in autumn population of hares. The model was verified using the data from the territory of Bačka. The values of the independent variables for the analyzed years were inserted in the regression formula, after which the values obtained for each year were compared to the real values of the percentages of leverets obtained by analyzing the samples collected in the field. The results of percentage of juvenile brown hare has been grouped gr by meteorological stations (m.s.): Bečej, Suborica, Rimski Šančevi, Sombor The results indicated that the assessment of the autumn age structure, i.e. the share of leverets, after the calculation should be corrected – reduced by on average for following m.s. 7,43% Bečej, 12,55% Subotica, 6.96% R. Šančevi and 6,86% Sombor. This corrective factor is valid only for the territory of Bačka. Application of this model with the described corrective factor can indicate the trend of the share of leverets in the population, if a formula is used to include the abovementioned meteorological data in the analysis.

Keywords: brown hare, age structure assessment, climatic parameters, Bačka

Charactheristics of natural regeneration of beech and fir in the developmental stages offspring and young forest on Korab mountain

Gegoski Milan[1], Velkovski Nikolco[2], Andonovski Vlatko[2], Vasilevski Kole[2], Rizovska-Atanasovska Jasminka[2].
[1,2]Ss. Cyril and Methodius University in skopje, Faculty of Forestry in Skopje, Republic of Macedonia

This paper presents research on the characteristics of natural regeneration of beech and fir in the developmental stages offspring and young forest. Research is conducted in the natural forests of beech and fir represented on Korab mountain. Data collection was performed through direct field research methods of test surfaces. The obtained data were processed through mathematical and statistical methods and are made appropriate analyzes, of which the results are displayed in tables and graphics. The paper includes data on natural conditions of the investigated area, and the situation with the parent plantation. Out of the carried research the analysis was performed on the structure and development of the natural regeneration of beech and fir in the developmental stages offspring and young forest. It was found that on the mountain Korab the natural regeneration is in different stages of development but most of it is in the developmental stages offspring and young forest. While most encountered individuals are with age ranging between 5 and 20 years. Depending on the forest stand density the participation of offspring in the total numbers of natural regeneration ranged from 59% with forest stand density of 0.5-0.6, 68% with forest stand density of 0.7 to 0.8 to 91% with forest stand density of 0.9 to 1.0, or about 85% of natural regeneration. The share of the individuals at young forest development phase ranges from 41% with forest stand density at 0.5-0.6, 32% with forest stand density of 0,7-0,8 to 9% with forest stand density between 0.9 to 1.0 or an average of 15%. At the same forest stand density and the same age, the individuals from natural regeneration of beech have some greater heights from individuals of natural regeneration of fir.

Overall natural conditions, and the application of silvicultural and regenerative measures affect quality and structure of natural regeneration. With rising forest stand density of 0.5 to 1.0 increases the number of individuals with poor quality, especially in fir. Of great importance for the survival and future sustainable development of beech and fir forests on the Korab mountain is to grow quality and numerous natural regeneration of both tree species without compromising the quality structure of the parent trees and without jeopardizing the ecological, economic, landscape and other features of these forests.

Keywords: beech, fir, developmental stages, Korab Mt.

Development, management and sustainability of Macedonian Pine forests in National Park Pelister

Tanovski Vladimir[1], Trajkov Pande[1]
[1] University “Ss. Cyril and Methodius” Faculty of forestry – Skopje, Republic of Macedonia
Corresponding: *vladimirtanovski@yahoo.com*

Macedonian pine, *Pinus peuce* Gris. is a tertiary relict and an endemic species for the Balkans, identified in 1839 by German botanist Grisebah. Besides its economic and ecological value, this species is of cultural and national importance for Macedonia and was the main factor for the establishment of the National Park Pelister (NPP) in 1949. Despite this status, environmental changes, succession processes and management methods endanger sustainability of these forests. Modern society, progress of technology and industry as well as new knowledge, should create and provide conditions for development and sustainability for this species as well as for the stands of *P. peuce* at NPP.

The main goal of our research was to investigate the development and sustainability of Macedonian pine forests at NPP. Since the establishment of NPP until today thinning have been exclusively applied without regard to the age of the stands. Regarding stand development, we analyzed diameter and height development. From the aspect of renewal of the stands, an analysis was made of the natural regeneration of these stands and the crown covered area.

Investigations were executed on 41 circular experimental plots (EP) with radius of 12,62m, and area of 500m^2. Of the total 41 EP, 10 were considered as main, while the remaining 31 were cluster plots of the main EP’s. EP’s were placed in stands of Macedonian pine at different altitudes and different ages. According to altitude, EP’s were categorized into 3 groups (from 1050mHsl to 1250mHsl, from 1251mHsl to 1450mHsl and from 1451mHsl to 1650mHsl, first to third respectively). According to age, EP’s were established on stands in 4 age groups - 40, 60, 90 and 140 years old. In the investigated stands, we measured the diameter at breast height and the height of all trees in all experimental plots. In main EP’s natural regeneration plants were counted and categorized in three groups by height (up to 30cm; 31 to 130cm and above 130cm). Also, 4 radii (perpendicular one to the other) of all trees were measured, and data were used for determination of crown covered area.

From the analyses and the results obtained, it can be concluded that the stands of *P. peuce* in the National Park Pelister have good growth in diameter and height, while the regeneration is very low as we registered extremely low numbers of seedlings. Crown covered areas in the investigated stands range from 0,39 to 0,68 independently of age. From our data and results, we have concluded that the management system is not serving well for regeneration, therefore in general for the sustainability of these stands.

Keywords: Macedonian pine, *Pinus peuce*, growth, diameter, height, regeneration, management system.

Social innovation: The case study in forestry sector in Macedonia

Vladimir Stojanovski[1], Makedonka Stojanovska[2]
[1] PhD student University of Natural Resources and Life Sciences BOKU Vienna, Austria
[2] Ss Cyril and Methodius University, Faculty of Forestry in Skopje

Social innovations are new strategies, concepts, ideas and organizations that meet (satisfy) social needs of different elements differentiating фrom education or working conditions up to local (rural) community development in order to extend and strengthen civil society. Nowadays the sustainable forest management in EU is understand as forest management practice that should satisfy the society needs the current and future need the society had. The main goal of this paper is to compare the societal needs and the "traditional forestry needs" observing throughout the horse riding case study in NP Mavrovo. Although the social innovation includes the social process of innovation such as methods and techniques and innovations which have social purpose (activism, microcredit, volunteering etc) in this paper the inclusion of local rural population in some company activities was identified as social innovation. The findings indicate that there is possibility the rural population to be beneficiary and to the certain extend to contribute in environmental protection. The general findings can contribute in bridging the gap between economic development and socio-economic interconnectivity.

Keywords: social innovation, sustainable forest management, forestry, societal needs

Photosynthetic efficiency of invasive species *Amorpha fruticosa* in Županja area (Croatia)

Mlinarić Selma[1], Vincetić Monika[1], Ožura Marko[2], Žuna Pfeiffer Tanja[1], Krstin Ljiljana[1]
[1] University of Osijek, Department of biology, Osijek, Croatia
[2] Karlovac University of Applied Sciences, Karlovac, Croatia
Presenting/corresponding author: smlinaric@biologija.unios.hr

Amorpha fruticosa is invasive alien species deliberately introduced to Europe from North America, primarily to prevent soil erosion. It is often planted for decoration and for honey production. Due to its rapid growth and reproduction as well as its allelopatic activity that negatively affect nearby vegetation, uncontrolled expansion represents significant threat to native species. The aim of this study was to examine the influence of seasonal changes of environmental factors, such as temperature, light intensity or water availability on photosynthetic efficiency of *A. fruticosa* and accompanying woody species (*Populus alba* or *Cornus sanguinea*). Therefore, photosynthetic performance was analysed by measuring direct chlorophyll fluorescence twice during vegetation season, in May and July. *A. fruticosa* seedlings grows in the wide area of the city Županja (Croatia) in stands of varying size and age. For this investigation, three locations (sites) were chosen that were about same size and age. All results were compared to ones measured in May. Our results showed that overall photosynthetic performance (PI_{total}) of *A. fruticosa* increased in July while both, *P. alba* and *C. sanguinea* revealed decline of the same parameter. The PI_{total} parameter indicate the integral functional activity of photosystem II (PSII), photosystem I (PSI), and intersystem electron transport chain. In addition, the quantum yields (QY), namely maximum QY of primary photochemistry (TR_0/ABS), QY of electron transport (ET_0/ABS) and QY for reduction of end electron acceptors at the PSI acceptor side (RE_0/ABS) as well as efficiency that an electron moves further than primary electron acceptor Q_A^- (ET_0/TR_0) increased in *A. fruticosa* in July at all three sites. At the same time, both accompanying species did not follow increase of those parameters. Therefore, our results suggested that invasive species *A. fruticosa* follows seasonal variation of environmental factors better than native species.

Morphological traits of invasive plant species *Amorpha fruticosa* L. in Pokupsko basin (Croatia)

Marko Ožura[1], Tanja Žuna Pfeiffer[2], Ljiljana Krstin[2], Selma Mlinarić[2], Dubravka Špoljarić Maronić[2], Ivna Štolfa Čamagajevac[2], Tamara Jakovljević[3]
[1]Karlovac University of Applied Sciences, Croatia,
[2]Department of Biology, Josip Juraj Strossmayer University of Osijek, Croatia
[3]Croatian Forest Research Institute, Croatia
Presenting author e-mail: marko.ozura@vuka.hr

Indigo bush (*Amorpha fruticosa* L.) is considered as invasive plant species in Central Europe and Mediterranean areas. Due to its fast growth and high productivity, it poses a significant threat to autochthonous species and biodiversity. The aim of this study was to investigate the distribution of indigo bush in the area of Pokupsko basin (near Karlovac, Croatia), with special focus on variation in indigo bush morphological traits. At the three chosen sites, characterized by dense stands of indigo bush, shrub height, leaf length and width, as well as the number, length and width of the leaflets were measured. The results showed that this invasive species thrives on a variety of habitat types in a wider area of Pokupsko basin, in stands of different size and age. In addition, most of the measured morphological parameters varied widely between sites indicating that indigo bush can be adapted to a variety of environmental conditions due to the changes in morphological traits. This highlights the importance of measures to control and reduce its spreading in Croatia and also at European level.

Keywords: Croatia, invasive plants, indigo bush

Substrate type influences freezing tolerance of olive leaves

Štolfa Čamagajevac Ivna[1]; Žuna Pfeiffer Tanja[1]; Žanić Mate[2]; Cesar Vera[1]; Lepeduš Hrvoje[3]; Pavičić Nikola[4]
[1]Josip Juraj Strossmayer University of Osijek, Croatia,
[2]Geront d.o.o., Croatia
[3]Faculty of Humanities and Social Sciences, Josip Juraj Strossmayer University of Osijek, Croatia
[4]Faculty of Agriculture, University in Zagreb, Croatia, professor emeritus
Presenting author e-mail: ivnastolfa@biologija.unios.hr

Olive (*Olea europea* L.) is an evergreen, Mediterranean plant highly valued for its nutritional properties which has positive impact on human's health. Due to the higher olive production demands, breeding areas are expanded to alleviate altitudes with specific climate characteristics: low temperatures and frost in winter and early spring. In the present investigation, we studied the frost tolerance of two olive cultivars (*Olea europea* cv. Leccino and cv. Oblica) growing on different substrate types - soil and coconut fibres. Two-year old olive plants were exposed to -5 °C in the dark for different time periods. The parameters of oxidative stress (concentration of hydrogen peroxide and lipid peroxidation) as well as the activities of some antioxidant enzymes (ascorbate peroxidase and catalase activity) in olive leaves were measured spectrophotometrically. Leaves of both cultivars growing on coconut fibres showed a better antioxidative response to freezing temperature probably due to the higher nitrogen and phosphorus concentration established in this type of substrate. In addition, the leaves of cv. Leccino showed more pronounced antioxidative response, indicating that the genotype has important role in freezing tolerance.

Key words: olive, leaf, frost tolerance, antioxidative response

The effect of heat stress on photosynthetic efficiency in *Ginko biloba* L. and *Liriodendron tulipifera* L.

Begović Lidija, Mlinarić Selma, Cesar Vera
University of Osijek, Department of Biology, Osijek, Croatia
Presenting/corresponding author: lbegovic@biologija.unios.hr

Ginko biloba and *Liriodendron tulipifera* can be found in urban environments as a street trees and park trees. Solitary street trees in city centers, compared to trees from city parks, which grow in community with other species, can have different response to stress conditions. The aim of this work was to investigate and compare photosynthetic performance of two species subjected to heat stress. After dark adaptation of plants for 24 h, leaf discs were exposed to varying temperatures (25°C, 30°C, 40°C and 50°C) in a water bath for 10 minutes. Results showed that overall vitality index (PI_{abs}) decreased with higher temperature in both plant species, with *Ginko biloba* being more tolerant in comparison to *Liriodendron tulipifera*. Ginko plants growing in streets, as opposed to park, exhibited higher tolerance to increased temperature while Liriodendron showed the opposite pattern. Changes of ratio of trapping excitons and dissipation (TR_0/DI_0), and of electron transport beyond primary acceptor Q_A^- ($ET_0/(TR_0-ET_0)$) were shown to be the main reason for the observed differences in PI_{abs} between two species. The selection and use of suitable tree species present important elements in a successful urban landscaping. City's visual appearance depends on the choice of plant species that could be adapted to urban environmental conditions.

Key words: *Ginko biloba*, *Liriodendron tulipifera*, photosynthetic performance, heat stress

Partial correlations of current annual increment and growing stock, topographic and Sentinel 2A data on Bosnian and Macedonian forest sites

Čabaravdić Azra[1], Pande Trajkovi[2], Besim Balić[1], Merisa Osmanović[3], Mirsada Starčević[1]
[1] University of Sarajevo, Faculty of forestry, Sarajevo, Bosnia and Herzegovina
[2] University "Ss. Cyril and Methodius" Faculty of forestry – Skopje, Republic of Macedonia
[3] University of Sarajevo, Institute of forestry and greenery, Sarajevo, Bosnia and Herzegovina

The aim of this research was to determine fraction of the current annual increment (CAI) variation related to growing stock as structural variable and topographic conditions and Sentinel 2A vegetation indices as environmental variables on forest stands in the northeast Bosnia and the east Macedonia using partial linear regression.
Sample data contains geo-referenced forest inventory data (CAIv and growing stock m^3 per ha), extracted values from digital terrain model (altitude, slope and aspect) and derived vegetation indices from Sentinel 2A satellite image (chlorophyll's based indices, NDVI and RVI). Chosen forest stands in Bosnia (Konjuh and Igman) are situated on heterogeneous stand conditions with different forest types (pure beech, mixed beech and fir stand and pine dominated stand) while Macedonian site (Mavrovo) has homogenous stand conditions and beech forest with low participation of other broadleaves.
Here is applied multiple linear regression using stepwise procedure in order to identify significant predictors and environmental explanatory set for each test site. Then the variance decomposition using partial regression analysis was carried out identifying percentage fractions of variation related to growing stock and environmental explanatory set solely, their inter-correlated impact and unexplained part of variation.
Applied stepwise regression analyses identified growing stock as the predictor with the highest effect on CAIv for all sites. Environmental explanatory sets differ between sites. Partial regression analysis showed that interactive effects of structural and environmental factors were higher on heterogeneous stands with mixed beech and fir forest or pine dominated stand affecting from 3 to 10% of total CAIv variation. Negative fraction of variation (-10%) was obtained for pine dominated stand pointing out

that poor environmental conditions hinders the contribution of growing stock on CAIv. The highest coefficient of determination and structural fraction was obtained in protected Mavrovo beech forest (R^2=73%). Coefficients of determinations range from 41% to 72% in Bosnian forest sites. Proportions of CAIv variations related to growing stock and environmental explanatory sets in Bosnian stands emphasize importance of adequate management treatments that could support positive effect of environmental conditions or compensate their negative impact. Applied analysis show potential to qualify forest stands related to their structural and environmental contribution to the current annual increment of volume. In further research could be included additional structural variables, canopy, tree mixture, soil properties, climate data, and other environmental variables.

Key words: current annual increment, growing stock, topography, Sentinel 2A vegetation indices, partial correlations, fraction of variation

Management and regeneration potential on over-mature coppice sessile oak forests stands, case study in Bushava Planina

Pande Trajkov[1*], Tomislav Dubravac[2], Vladimir Tanovski[1], Ljupco Nestorovski[1], ZdravkoTrajanov[1]
[1]University “Ss. Cyril and Methodius” -Skopje, Faculty of Forestry, Skopje, Macedonia
[2]Croatian Forest Research InstituteJastrebarsko, Croatia
Corresponding author: ptrajkov@sf.ukim.edu.mk

Coppicing is a dominant silviculture system in Macedonia and coppice forests cover cca 70% of forest cover area. According to Forest Management Plans (FMPs), sessile oak coppice forest (SOCF) cover 163.037ha (in 2017). They are divided into four types: i) quality sessile oak coppice stands (SOCS) on quality sites, on 39.306ha, ii) low-quality SOCS on quality sites, on 11.2179ha, iii) low-quality SOCS on poor sites, covering 9.443ha and iv) SOCS in which other species are introduced, deciduous or coniferous, on 2.109ha. Generally, for SOCF as an object of management coppice systems are planned on 114.447ha; indirect conversion to high forests on 16.409ha; direct conversion with substitution on 3.749ha, while for 28.432ha objectives are not defined.
We investigated the re-sprouting ability of over-mature SOCS on mountain Bushava Planina, in May 2015, on type i) aged 85 to 90 years in which clear cut was done. We set 12 experimental plots (EPs) in two departments: 6 EPs in department 4 in which there was cutting in the winter 2012/2013, exactly 2 years before measurements (2 growing seasons) and 6 EPs in department 61 in which there was cutting in winter 2013/2014, exactly 1 year before measurement (1 growing season). On each EP dead stools were counted and the height was measured of the remaining living stools’ sprouts and categorized by height.
Generative regeneration seedlings were counted on 4 subplots in every EP and categorized by height.
Of the average 726 stools per hectare, only 275 on average werere-sprouting. From the data obtained and further analyses it can be concluded that most of the1 year old sprouts are with height of 31 to 60cm, while and the two-year-old sprouts are 61to 150cm. Generative regeneration was recorded in both groups of stands. However numerous sprouts of hazelnut trees which reach height up to 3 meters after two growing seasons, suffocate the oak seedlings both of vegetative and generative origin.

Keywords: sessile oak, over-mature, forest management, regeneration

Forest attributes spatial dependence evaluation based on inventory and Sentinel 2A data in Bosnian and Macedonian beech forests

Čabaravdić Azra[1], Trajkovski Pande [2], Mahmutović Galib [3], Osmanović Merisa [4], Starčević Mirsada [1]
[1] University of Sarajevo, Faculty of forestry, Sarajevo, Bosnia and Herzegovina
[2] University "Ss. Cyril and Methodius" Faculty of forestry – Skopje, Republic of Macedonia
[3] JP "Šume TK" dd Kladanj, Bosnia and Herzegovina
[4] University of Sarajevo, Institute of forestry and greenery, Sarajevo, Bosnia and Herzegovina

Geo-statistical approach opens possibility for more detailed forest structure analysis relevant for forest management. The aim of this research was to evaluate spatial dependence of the main forest attributes estimates obtained by the nearest neighbor's method using inventory, topographical and Sentinel 2A data in two beech forests located on the Bosnian mountain Majevica and the Macedonian Mavrovo region. Here was used k nearest neighbors' method for k=1 in order to estimate the highest spatial variability of forest attributes. Compiled data sets were divided on two subsets: training and test. Test sets were used to create semi-variograms of observed and estimated values of forest attributes. Spatial dependence is evaluated using spatial dependence index (SDI) for spherical semi-variograms. Two forest attributes were evaluated: total growing stock per ha and aboveground biomass per ha. We found strong SDI on Bosnian site (SDI>15%) for both attributes. Spatial correlations between observed and estimated values were very high (r=0.99) with high adjusted determinations about 92%. Obtained results showed strong to weak spatial dependences in Macedonian forest. Strong spatial dependence was found for the growing stock in sample (SDI=38%) while dependences in test subsets were moderate mainly. Spatial correlations between observed and estimated values were high (approx. r=0.77) with moderate adjusted determinations about 42%. Semi-variograms of test subsets showed similar shapes preserving better estimated spatial variability in short distances and underestimate variability in wider distances in all cases. In conclusion, we found that applied method provided better insight in spatial variability of forest attributes presented on thematic maps. Obtained results could be used as additional information as in forest production planning so for other forest functions (protection, carbon cycle, tourism and others).

Keywords: spatial dependence index, inventory data, Sentinel 2A, nearest neighbors' estimation method, semi-variograms

Structural characteristics of the autochthonous and allohtonous forest plantations on the Karadzica mountain and the optimum measures for their silviculture

Delov Kiro[1], Velkovski Nikolco[2], Andonovski Vlatko[2], Vasilevski Kole[2]
[1] Public enterprise "Macedonian Forests", Skopje,Republic of Macedonia,
[2] Ss. Cyril and Methodius University, Faculty of forestry – Skopje, Republic of Macedonia
e-mail[1]:k.delov@yahoo.com

The establishment of forest stands from the allohtonous origin on the mountain Karadzica has a decades-long tradition. Some of these forest plantations are already about 50 years old and have clearly differentiated structural features. They differ greatly between each other, as well as with allohtonous forest plantations depending on the type and origin of the plantations, although they develop in identical natural conditions. The research in this paper, which is based on direct field measurements according to the methods of test surfaces, reveals significant differences in relation to their characteristics. This was largely influenced by the applied or insufficiently applied silvicultural measures in the younger development stages of the forest plantations. These differences were separately analyzed on the basis of which the optimum measures for their further silviculture were determined.

Keywords: silviculture, forest plantations, optimal measures

LIFEGENMON: LIFE for European Forest Genetic Monitoring System

Vlatko Andonovski[i], Dalibor Ballian[ii], Davorin Kajba[iii], Heino Konrad[iv], Saša Orlović[v]
[i]University Ss. Cyril and Methodius – Faculty of Forestry in Skopje;
[ii]University of Srajevo – Faculty of Forestry;
[iii]University of Zagreb – Faculty of Forestry;
[iv]Austrian Research Centre for Forests, Vienna, Austria;
[v] Institute of Lowland Forestry and Environment, Novi Sad,Serbia;
and the core LIFEGENMON team:
Hojka Kraigher[1], Barbara Fussi[2], Filippos Aravanopoulos[3], Monika Konnert[2], Fotis Kiourtsis[4], Živan Veselič[5], Veronika Vodlan[6], Marjana Westergren[1]
[1]Slovenian Forestry Institute, Ljubljana, Slovenia;
[2] Bavarian Office for Forest Seeding and Planting;
[3]Aristotle University of Thessaloniki;
[4]General Directorate of Forestry and Agric. Affairs– Decent. Adm. of Macedonia – Thrace;
[5]Slovenian Forest Service;
[6]Centre for information service, co-op. and development of NGOs

Management and conservation of forest genetic resources need to consider all processes which might affect their genetic variability under increasing threats from climate change and other direct and indirect effects of human related activities. The information on actual genetic variation through time can be obtained through genetic monitoring, which serves as an early warning system of a species response to environmental changes at a long-term temporal scale. By genetic monitoring, temporal changes in population genetic variation can be measured by appropriate parameters, contributing to biological conservation. Within the project LIFEGENMON (LIFE ENV/SI/000148) six partners are testing the suitability of a set of indicators and verifiers for genetic monitoring. For this forest genetic monitoring (FGM) sites for European beech and Silver fir were established in Germany, Slovenia and Greece, FGM guidelines for these two and five additional species of different biology are to be developed, a Manual for FGM and a Decision support system are to be discussed in, and developed for, all transect countries between Germany and Greece, depending on the needs of policy makers and forestry practitioners in the region and wider. Issues related the identification of communication systems with key stakeholders and policy makers regarding FGM and formation of future action plans to establish a discussion line with policy makers on development and implementation of the FGM system shall be addressed.

Acknowledgements: The project LIFEGENMON is financed through the EU LIFE financial mechanism, and co-financed by the Ministry of the Environment and Spatial Planning and the Ministry for Agriculture, Forestry and Food of the Republic of Slovenia, the Bavarian Ministry of Food, Agriculture and Forestry, the Green Fund in Greece, and the Slovenian Forestry Institute. The National Focal Points from the transect countries are supported by their national funds for providing their expert advice.

The historic development of Skopje City Park

Apostolovska Iskra[1], Rizovska Atanasovska Jasminka[2], Velkovski Nikolcho[2], Andonovski Vlatko[2]
[1]PE Parks and greenery, Skopje
[2] Ss. Cyril and Methodius University, Faculty of Forestry - Skopje

The City Park in Skopje was established in the early XX century. There is no precise data for its foundation, only few documents could be found in the period between the two world wars. Considering the fact that in the previous decade some parts of the park were reconstructed, now there is more relevant data about it.
In this work, there are historical data and photo documentation from the period of the early establishment of the City Park. There are exposed documents of vegetation and other elements of

the park from the beginning of its creation. Though the years it has changed and developed to today’s borders.

Keywords:Skopje City Park, historical data, establishment, vegetation, park elements

Spatial distribution of EU-2, the new vegetative compatibility type of *Cryphonectria parasitica* for the Western Turkey.

Omer Erimcik[1], Müzeyyen Daldal[1], Jefrey Wall[2] and Cemhan Bucak[3]
[1]Adnan Menderes University, Faculty of Agriculture, Aydın, Turkey.
[2]Cornell University, Department of Natural Resources, Ithaca, NY, USA.
[3]Aegean Forest Research Institute, The Ministry of Forestry and Water Affairs, Urla, Izmir, Turkey
E-mail:oerincik@adu.edu.tr.

The spatial structure was used to make inferences about pathogen spread and biology. *Cryphonectria parasitica*, the causal agent of chestnut blight, is a complex pathogen with diverse population characteristics such as vegetative compatibility (vc) types, mating types and hypovirulent strains. There is a distinct geographic distribution pattern of vc types in each country with specific vc types being frequent in some areas but rare or absent in others. The vc types, EU-2, has recently been detected in one and only location in the Aegean Region. In this study, spatial distribution analysis was used to understand the appearance of EU-2 in the region.
In 2013, a total of 48 chestnut blight bark samples were collected from the chestnut growing site where EU-2 has been detected in Tire, İzmir. Vc types of the isolates were determined by pairing the isolates with the European vc testers of *C. parasitica*. Among 48 isolates, 24 (50%) were EU-2, 13 (27%) were EU-12 and 11 (23%) were EU-1. Geographical distributions of vc types were illustrated on the surface maps created by indicator kriging geostatistical analysis was performed to define the spatial distribution of vc types. Results indicated that there was a distinct aggregation of each vc type in specific sites. Results suggested that the dispersal of the pathogen most likely occurs via localized short distance transport of the rain splashed-asexual conidia, rather than the long distance dispersal of wind-borne ascospore. There was no evidence that EU-2 was generated by the sexual cross between EU-1 and EU-12. EU-2 was found in higher frequency (50%) comparing to both EU-1 and EU-12 and it was probably introduced to the site much earlier than these two vc types.
This research was financially supported by the Scientific Reseach Fund of Adnan Menderes University through the project no: ZRF-15077.

Keywords: *Cryphonectria parasitica*, chestnut blight, chestnut, spatial analysis, vegetative compatibility

Clone dependent reaction of chestnuts to infections of hypovirulent *Cryphonectria parasitica* isolates

Sotirovski K.[1], Srebrova R. [1], Papazova Anakieva I.[1] Kuzmanovska, B.[2], Risteski M. [1],
[1] Ss. Cyril and Methodius University, Faculty of Forestry, Skopje
[2] Ss. Cyril and Methodius University, Faculty of Agriculture and Food Sciences

The devastating effects of the chestnut blight fungus *Cryphonectria parasitica* have been controlled with relative success in Europe due to the natural spread of hypovirulence. This phenomenon is caused by dsRNA viruses named CHV, and in particular the Italian subtype of type CHV1 has proved to be with best results.
In our study, we investigated host dependency at clonal level to canker size and morphology/fructification, as well as if hypovirulent isolates of differing virulence will cause significantly different sizes of cankers, and possibly variability in conidiation (hypovirus-isolate dependent). For this purpose, we converted 1 virulent isolate (Smo062B) with 2 hypovirus clones (J12 and Sk28, labeled HV1 and HV2 respectively, for this study) previously described as being of different virulence towards the host fungus. The obtained hypovirulent isolates were used for inoculations of thin chestnut (1,5 – 5cm diam.) stems within chestnut clusters. The trials were performed on 2 separate sites, on a total of 78 inoculation (39 pairs) in Brezno (25 clusters), and 68 (34 pairs) on 10 clusters in Kalishte. For comparison of the reaction of the host plants to hypovirulent isolates, both hypovirulent isolates were inoculated in stems of exact width on the same chestnut clusters (i.e. stems), multiple times per cluster, up to 18 (i.e. 9 pairs) in Kalishte and 6 (i.e. 3 pairs) in Brezno. Control inoculations were with virulent isolate Smo062B. 140 days after inoculation cankers were assessed for conidiation and their width and length were measured. Stromata were collected from all fruiting cankers, and used for reisolation. Obtained cultures were determined as hypovirulent or virulent depending on culture morphology.
Canker surface area was highly dependent on the host clone. In Kalishte, surface area of cankers caused by HV2 ranged on average per cluster from 408mm^2, up to 3020mm^2. In Brezno, the range was even more pronounced with HV2 cankers ranging from 131mm^2 up to 3159mm^2 on average per cluster of chestnut stems.
Cankers caused by HV1 were on average with a significantly smaller surface area when compared to cankers caused by HV2. The extreme case was in cluster 9 in Kalishta, were the average surface of cankers caused by HV1 were 560mm^2, while HV2 caused cankers with nearly 4 times bigger area (3020mm^2). Similarly, in Brezno, canker area in clonal stems for HV1 on average was 245mm^2, and for HV2 was 1677mm^2. Counterintuitively, the smaller cankers, caused by HV1 containing the more virulent hypovirus (J12) produced as often or more spore baring stromata as isolates containing the less virulent hypovirus. This partially explains the spread and sustainability of even very virulent hypoviruses within populations of *C. parasitica*.

Keywords: Cryphonectria parasitica, chestnut blight, hypovirulence, dissemination, CHV1.

Phytopthora spp. isolated from chestnut populations in the Republic of Macedonia

Risteski, M.[1], Kuzmanovska B.[2], Rigling D. [3], Jezic, M.[4], Sotirovski, K.[1]
[1] University "Ss. Cyril and Methodius", Faculty of Forestry – Skopje, Republic of Macedonia
[2] University "Ss. Cyril and Methodius", Faculty for Agricultural Sciences and Food – Skopje, Republic of Macedonia
[3] WSL Institute, Birmensdorf, Switzerland
[4] University of Zagreb, Faculty of Science, Zagreb, Croatia

Symptoms specific for *Phytophthora spp*. on sweet chestnut (*Castanea sativa*) have been previously reported in Macedonia, but have never been confirmed by isolation of cultures or molecular techniques. We surveyed 15 chestnut populations, aged 15 to 70 years, at sites: Skudrinje, Osoj, Knezino, Straza, Recane, Vrutok, Kale, Kalista, Trebenista, Vratnica and Smolari throughout Macedonia. We assessed for presence of collar and root rot and lesions, as well as crown and seedlings symptoms. Over 130 soil and bark samples were collected from both symptomatic and asymptomatic chestnut plants. Using the bait method, and culturing on PARPNH and CMA+ Phytophthora-selective nutritious media, we isolated 71 Phytophthora-like cultures. We extracted DNA from all cultures, and DNA samples were amplified and sequenced using ITS4 and ITS 6 universal *Phytophthora* primers. Using online *Phytophthora* database blast, we identified 5 isolates of *P. cambivora* and 4 of *P. cactorum.* We tested the pathogenicity of one random isolate representative for each of the two species, on excised chestnut sticks collected from a single coppice. We tested on 40 sticks per isolate, 20 per two sets of diameters (5-10 mm and 10-15 mm) of the same length (10 cm). The tests pointed out *P.cactorum* as more pathogenic than *P. cambivora*, both on thicker and thinner sticks. This is the first report in Macedonia about identifying these species through cultures and partial sequencing and assessment of their pathogenicity.

Suppression of oak lace bug *Coruthucha arcuata* Say

Drekić, M.[1], Poljaković – Pajnik, L.[1], Pilipović, A.[1], Pekeč, S. [1], Katanić, M.[1], Vasić, V.[1], Nikolić, N.[2]
[1]Institute of Lowland Forestry and Environment Novi Sad, University of Novi Sad, Serbia
[2] Faculty of Sciences, University of Novi Sad, Serbia

Oak lace bug *Corythucha arcuata* represents a new pest insect in Serbia. It is a new pest of oaks in Europe, introduced in 2000 from North America, while in Serbia it was identified in 2013. Damage is caused by beetles and larvae that feed on the underside of leaves by sucking plant juices. This is a significant pest of oaks and recently introduced and there was a need to explore the possibilities of application of insecticides for its suppression. The paper presents the results of investigation of five insecticides for suppression of adults and larvae of *Corythucha arcuata*. Insecticides based on buprofezin and abamectin did not show sufficient efficacy in controlling oak lace bugs. The tested insecticides based on fenthion, bifenthrin and thiamethoxam have high efficiency for control of adults and larvae of oak lace bug, and we recommending them for control this harmful insect.

Keywords: *Corythucha arcuata*, control, efficiency

How to solve problems in forestry by biofungicides

Rajkovic Snezana[1], Rakonjac Ljubinko[1], Miroslava Markovic[1]
Institute for Forestry,
Corresponding author email: srajkovic1@gmail.com

It was studied the fungicidal activity of AGROSEPT at concentrations of 2% and 3%, the exposure times of 5, 15 and 60 minutes, and culture age from one to the fourteenth day of the fungi: *Mucor spp., Rhizopus spp., Monilia spp., Aspergillus spp. and Penicillium spp*. Evaluation of efficiency of

AGROSEPT was performed after 1, 3, 5 and 7 days. Also, it can be used to disinfect soil watering (aqueous concentrations of 0.1-0.5%), before planting, immediately after sowing and germination of plants. Test results are of the efficacy of pathogens of pathogen decay of seeds and seedlings. AGROSEPT had fungicidal activity of all tested strains at concentrations of 2-3% aqueous solution if achieved mycelial contact with the substance. AGROSEPT can be used to disinfect soil watering (aqueous concentrations of 0.1-0.5%), before planting, immediately after sowing and germination of plants and disinfection of equipment and tools, container and other vegetation objects (dipping or spraying multiple consecutive minutes) 2 - 3% aqueous solution. AGROSEPT is effective for surface disinfection of seeds of many plants.

Keywords: AGROSEPT, disinfectant, fungicidal effect

Enlargement of the pine processionary moth (*Thaumetopoea pityocampa*) range in Bulgaria

Mirchev Plamen[1], Georgiev Georgi[1], Georgieva Margarita[1], Matova Maria[1], Zaemdzhikova Gergana[1]
[1]Forest Research Institute, Bulgarian Academy of Sciences, Sofia, Bulgaria
Corresponding author: plmirchev@hotmail.com

In 1906, the pine processionary moth (*Thaumetopoea pityocampa*) was first established for Bulgarian fauna. From 1950 to 1971, the average attacked area amounted to 5100 ha. Their gradual increase began at the end of the XXth century when the affected area was over five times larger. The expansion of the pest occurred in the region of its natural range where the deciduous forest species were replaced by *Pinus nigra* and *Pinus sylvesrtis* plantations. Since 1999, the expansion of pine processionary moth population has begun in Central Bulgaria. The boundaries of its occurrence have moved along the southern slopes of the Balkan Range and Sredna Gora Mt. with 44 km to the east, with an average of 2.6 km yearly.
In recent decades, the problem with the pine processionary moth's economic, environmental and social impact within its existing distribution has increased in the country. In high population densities, the pest is a serious defoliator in pine plantations. In addition to the direct economic losses in attacked stands, the pest has hazardous effect due to its potential to cause an allergic and toxic reaction in human and animals in forests and recreational forest parks. For example, *Thaumetopoea pityocampa* was established in many urban areas, such as city parks of Sandansky Spa Resort, Tyulbeto Park in Kazanlak city, etc. The success of pest's spreading into new geographical areas requires favourable climatic conditions, presence of large areas afforested by *Pinus nigra* and *Pinus sylvesrtis* and the occurrence of the ecological form of *Thaumetopoea pityocampa bulgarica* which completes its larval stage in late autumn and hibernates in the soil overcoming the low winter temperatures. Among the biological factors, the egg parasitoids appear to be the most important regulators of the pest numbers.

Key words: *Thaumetopoea pityocampa*, expansion, pest, pine plantations

Assessment of harmful impact and spread of fungal pathogens causing damages on *Pinus nigra* plantations in Bulgaria

Hlebarska Sianna[1], Georgieva Margarita[1],
[1]Forest Research Institute, Bulgarian Academy of Sciences, Sofia, Bulgaria
margaritageorgiev@gmail.com

The impact of fungal pathogens causing damages on *Pinus nigra* plantations was evaluated in the vegetation period of 2017. The identification of species *Cenangium ferruginosum*, *Cyclaneusma niveum*, *Diplodia sapinea*, *Dothistroma pini*, *Lophodermium pinastri*, *Lophodermium seditiosum* and *Sclerophoma pithyophila* was based on the morphology data and associated with the damages on

needles, cones, shoots and branches. The harmful impact of established pathogens was determined according to their virulence and aggressiveness, degree of tree crown defoliation and discoloration, physiological condition of host plants and opportunities of wide disease spreading. Among the established pathogens, the most common and widespread were *Diplodia sapinea, Lophodermium* spp. and *Cyclaneusma niveum*. The most aggressiveness virulent were the invasive species *Dothistroma pini* and *Diplodia sapinea* caused needle and shoot blight diseases, tree dieback and degradation of forest landscape. Recently emerging infections by these pathogens developed rapidly throughout the country as a consequence of long-term drought conditions during the last growing seasons. The current high existence of invasive pathogen *Diplodia sapinea* outbreaks contributed considerably to physiological weakness of established pine trees and they became more susceptible to attack by aggressive xylophages.

Key words: *Pinus nigra*, invasive pathogens, harmfulness

Decline of sycamore maple trees in the urban forests and parks in Belgrade, Serbia

Keča Nenad[1], Keča Ljiljana[1]
[1] University of Belgrade-Faculty of Forestry, Belgrade, Serbia
e-mail: nenad.keca@sfb.bg.ac.rs

Sycamore maple (*Acer pseudoplatanus* L.) is European native tree that forms associations of noble broadleaves with beech in hilly and mountain regions. Because of its tolerance to low temperatures, resistance to pollution and salt it is widely planted in urban areas as amenity tree. Species requires deep soils and is quite susceptible to drought and extreme temperatures, which are almost unavoidable during summer in urban areas.
Earlier studies from Serbia reported *Verticillium albo-atrum* Reinke & Berthold, and *Nectria cinnabarina* (Tode) Fr. as a cause of wilt of shoot, twigs and branches. This species causes chronic decline of tree. However, from autumn 2012, and during 2013 - 2014 vast number of trees died in urban forests and parks throughout Serbia. Summer 2012 was the second driest since temperature is measured in Belgrade.
Reports of declining trees, because of drought begin to arrive in October 2012, but keep coming during spring and summer 2013. Samples taken during cutting trees were covered with mass of brown-black powder. Analyses revealed mass of spores-conidia, belong to the species *Cryptostroma corticale* (Ellis & Everh) P.G. Greg & S. Waller (*Xylariaceae*). All inspected trees showed symptoms of wilting of twigs and branch dieback at the beginning and later peeling of the bark. Dark stroma covers wood and conidia are spreaded by wind or mechanical disturbance of bark. In the whole studied area between 25-75% sycamore trees died. Because of canopy cover disturbance, changes in management are needed and consideration of further use of sycamore maple in urban forests.

Harvesting problems and solution facilities in Turkish forestry

Hasdemir Mesut[1]
[1] University of Istanbul, Faculty of Forestry, Department of Forest Construction and Transportation, Istanbul, Turkey
mesdemir@istanbul.edu.tr

The production of wood raw material is formed in various stages from the productive place to market centre. These work stages depend on each other like rings of a chain. Success and failures in each stage had effect on the next stage. The transport of forestry products is realized in two stages. The first one is the primary transport stage which involves the hauling(skidding) of timbers, while the second one is the secondary transport stage involving the main stage of transport of timbers,

generally realized by trucks on forest roads. However recently, there is increased interest for forest products. Currently the harvesting is still performed with old patterns, such as sliding, throwing, circling transport with human, skidding with animals on direct ground. Also, besides skidders, the harvesters and skylines are used in some areas.
The rate of mechanization in the production of Turkish forestry is around 15%. Although it has been 32 years since the international production mechanism and granting symposium in Turkey, the rate of mechanization in production has not be significantly improved. The most important reasons for not achieving adequate development are the cheap labor force and the managers' generic production methods. The application of variable policies in forestry production and the lack of sustainability cause the capital that develops the production technology to be insufficient in Turkey. Contemporary production techniques and technologies need to be developed in order to produce qualitative wood raw materials which the market demand with environmentally sensitive production techniques in Turkey. The distribution of land use classes over the country area is 27.6%. Approximately 75% of this forest area is on a 30% slope. Therefore, the demands and conditions of the mechanization should be determined and implemented as soon as possible in Turkey. The paper is summarizing the utilization of mechanization in exploitation and problems of mechanized harvesting in Turkey.

Keywords: Harvesting, Mechanization,Turkish forestry

Hazardous trees assessment and management: Case study the Wilson’s Promenade'

Omanović Mersad

Wilson’s promenade is 111 years old linden alley consisted of 490 trees planted at 8m distance in four incomplete tree lines. Several negative pressurefactors have been identified: traffic in between tree lines, tree mechanical damage caused by vehicles, vandalism, installation ditch construction or war etc. Phytopathological and entomological pressures have been identified also. Consequently, there is significant number of risk trees characterized by dangerous dead and declining branches, cavity and advanced rottingprocess. Plus trees are rare. To overcome unfavorable condition the action plan has been brought.
This poster presents some results on risk tree statical stability assesmet and the Action plan concept as management tool.

The health condition and vitality influence on the aesthetic significance of protected trees (nature monuments) on the territory of Belgrade

Mitrovic Jelena[1], Golubovic Curguz Vesna[1], Glavendekic Milka[1], Stojicic Djurdja[1]
[1] University of Belgrade Faculty of Forestry
Corresponding author: Vesna Golubović Ćurguz, vesna.curguz@sfb.bg.ac.rs

This paper presents the relation between health condition and alsovitality and their impact on the aesthetic value of protected trees - the natural monuments on the territory of the city of Belgrade. A total of 22 botanical nature monuments were classified into 16 taxa consisted of 32 individually protected trees. These trees belong to *Taxus baccata* L., *Pterocarya fraxinifolia*, *Quercus robur, Ginkgo biloba, Pinus wallichiana* and *Platanus x acerifolia, Fagus sylvatica, Magnolia x soulangeana, Cedrus atlantica, Cupressus arizonica, Aesculus hippocastanum, Corylus colurna, Koelreuteria paniculata, Vitis vinifera* 'Seibel 1000' *Magnolia x soulangeana* 'Lennei' and *Fagus sylvatica 'Purpurea'* .

The basic dendrometric characteristics, such as tree height, crown width were determined. In addition to this the existence of wounds of trunk and branches, dry branches, drying of leaves, insect damage, fungal diseases and abiotic damage have been recorded.
All of these parameters enabled the formation of 1 – 5 ratings, which were used to estimate decorativity and vitality. Although the average rating of vitality for all individuals is 4.1 and the average rating of decorativity for all individuals is 4.2, there are significant differences among the trees. *Quercus robur* and *Platanus x acerifolia* are distinguished as the most valuable and most conserved species, *Taxus baccata, Cedrus atlantica* and *Corylus colurna* are of poorer health, vitality and decorativity. Unfavorable climatic conditions and anthropogenic factor, have led to disruption of the health condition (for trees *Cedrus atlantica* and *Taxus baccata*), presence of pests (*Pentamerismus taxi* (Haller), *Parthenolecanium fletcheri* (Cock.), *Xestobium rufovillosum* De Geer, *Aegosoma scabricornis* (Scop.), *Parthenolecanium corni* (Bouche), Siricidae spp.), and presence of pathogenic fungi (*Cryptocline taxicola* (Allesch.) Petr., *Phytophthora* spp., *Nectria* spp.). All of these infect protected trees to a lesser or greater degree.
In order to preserve the protected natural assets - the individual trees for as long as possible in good condition, in accordance with the prescribed protection regime, it is necessary to intensify the care of this value through regular allocation of funds for the implementation of all appropriate care, protection and promotion measures.

Keywords: protected tree, tree health condition, tree vitality, aesthetic value of the tree

Assessment of vulnerability of genetic diversity of Serbian spruce (*Picea omorika* Pančič / Purkyne) using ForGRAS software in Bosnia and Herzegovina

Cvjetković[1], B., Mataruga[1], M., Šijačić-Nikolić[2], M., Daničić[1], V.
[1]University of Banja Luka, Faculty of Forestry, Banja Luka, Bosnia and Herzegovina
[2]University of Belgrade, Faculty of Forestry, Belgrade, Serbia

Serbian spruce is located at almost 20 sites that are geographically close, but ecologically well isolated. It inhabits higher altitudes, northern and northeastern expositions, steep, hardly accessible terrains in the mid-course of the Drina River. It is considered to be endangered species.
In order to determine the degree of vulnerability of the genetic diversity under the influence of climate change, the ForGRAS software has been experimentally applied, and a vulnerability assessment was evaluated based on 5 main variables and sub-variables. The main variables were: (i) the distribution of the species (3 sub-variables), (ii) the reproductive capacity (5 sub-variables), (iii) the affinity for the habitat (4 sub-variables), (iv) the adaptive genetic variability (3 sub-variables) and (v) resistance to biotic and abiotic causes of damage (2 sub-variables). The field data collection was carried out in 2016 and 2017 at 13 sites. Based on collected data, the risk factors were calculated.
The obtained results categorized the Serbian spruce as an endangered species in relation to other species and climatic changes with the largest risk factor determined by data collected and calculated for 4 variables: (i) species distribution - the species has a small frequency of occurrence, (iii) affinity for the habitat: species in the category "nowhere to go“, Serbian spruce is suppressed by other species, there is no natural renewal; (iii) the specificity of the habitat - the species does not spread to new habitats; (iv) adaptive genetic variance - populations are isolated and the fluctuation of the genes among populations is poor; (iv) the resistance of the species is low, the large scale dieback has been noticed.
Data collection for this paper and the comparison with the future results could provide an insight into the dynamics of declining processes occurring in the forests of Serbian spruce. The software can be the used for the future assessment of its vulnerability.

Keywords: Serbian spruce, vulnerability assessment, ForGRAS

Influence of climate factors on the occurrence of different macrofungal genera in selected forest habitats on Kopaonik Mt.

Miroslav Marković, Milana Rakić, Zoran Galić, Saša Orlović, Maja Karaman, Predrag Pap

In the period of four years (2010-2013), the study of macrofungal occurence influenced by the air temperature and the soil moisture was conducted on Kopaonik Mt (locality Metodje). Experimental areas were set in the forest stand of spruce and fir. Monitoring of fungal sporocarps was carried out 3-4 times per year. The climate factors were measured within experimental plots as well, with the air temperature measured throughout the year and the soil humidity only on the days when monitoring was carried out. Total of 109 macrofungal species, belonging to 80 genera, were identified. It was noted that the observed meteorological parameters have important influence on the occurrence of macrofungi - air temperature during the winter months, while the soil moisture in the vegetation period.

Survival and growth of different provenances of Scots pine (*Pinus sylvestris* L.) in the international trial "Kupres"

Ballian Dalibor[1], Kraigher Hojka[2], Andonovski Vlatko[3]
[1] Slovenian Forestry institute, Faculty of forestry, University of Sarajevo, Bosnia and Herzegovina
[2] Slovenian Forestry institute, Ljubljana, Slovenia
[3] Faculty of forestry, University "Ss. Cyril and Methods" in Skopje, Macedonia

This paper presents the results of survival and growth of different provenances of Scots pine (*Pinus sylvestris* L.) in the international trial Kupres. The provenance trial was established in 2012, and the starting material comes from 15 provenances across Europe. Each block of provenance is represented by 36 seedlings, with 5 repetitions per each provenance. Each provenance is planted according to a random pattern scheme. Measurements were carried out during 2014, and the total number of seedlings measured was 1974, which survived.
The highest number of surviving seedlings has provenance of Austria A1 with 88.33% followed by Ukraine U1 with 86.80% and Austria A2 with 83.89% followed by Austria A3 and Poland P1 with 81.11% and Bosnia B1, and Germany Nj1 with 75% surviving plants, out of total planted 180 seedlings by each provenance. The highest number of dried seedlings is found in the provenances of Italy I1 with 53.33%, and Norway N1 with 47.22%.
By descriptive analysis of the root neck diameter, shows that provenance of Norwey N1 2,62 mm has the lowest diameter and the largest average diameter of the root neck is found in provenance of Austria A1 with 5.44 mm. By descriptive height analysis, the lowest average height is found in provenance Norway N1 with 5.87 cm and the largest provenance of Romania R1 with 20.09 cm.
Measurement of height has shown that the mean height ranges from 0.5 cm to 38.00 cm, with a mean value of 16.00 cm; While the root door diameters ranged from 1 mm to 11 mm, with a mean value of 4.36 mm.
By analyzing the variance of the different provenances of Scots pine for both traits, statistically significant differences were found between the investigated traits.

Keywords: Scots pine (*Pinus sylvestris* L.), survival, height, root neck diameter.

Studies of defoliation on ICP sample plots level I for the period 2012-2016 in Republic of Serbia

Stefanovic Tomislav, Gagic-Serdar Renata *, Đorđević Ilija, Goran Ćesljar, Momirović Natalija, Nevenić Radovan, Živanović Ivana
Institute of Forestry, Belgrade, Republic of Serbia
*Corresponding author: e-mail:katas96@hotmail.com

Project of forests condition monitoring (ICP Forests) operates as an international European project in which, on grid of ICP sample plots (bioindication points) condition of forests has been monitored annually in continuity, including recording data on defoliation with evidencing any damage to the trees. This paper analyzes the data on defoliation as part of the results of the forest conditions monitoring on ICP sample plots on the territory of the Republic of Serbia, in the period 2012 - 2016. The main goal of the program is monitoring of condition of forests on a permanent, representative surfaces, arranged in a systematic grid distributed on the territory of of Europe. The assessment of defoliation is performed on the experimental fields regardless of the cause of loss of leaves, because the results are not aimed to determinate the cause-and-effect relationships, but only to represent the state of defoliation on this study sample plots in the researched period. Assessment and analysis of the degree of crown defoliation has been presented for most common tree species as the most noticeable crown health indicators. Linking these results with other indicators of environmental conditions will provide more concrete informations, and draw conclusions about the vitality of the plants depending on ambient conditions.

Keywords: defoliation, ICP sample plots, forests condition monitoring

Biological control of chestnut blight - Efficiency of natural hypovirulence

Janine Schwarz[a], Marin Ježić[b], Mihajlo Risteski[c], Mirna Ćurković-Perica[b], Simone Prospero[a], Kiril Sotirovski[c], Daniel Rigling[a]
[a] Swiss Federal Institute for Forest, Snow, and Landscape Research (WSL), Switzerland
[b] Department of Biology, Faculty of Science, University of Zagreb, Croatia
[c] University “Ss. Cyril and Methodius” Faculty of forestry – Skopje, Republic of Macedonia

The mycovirus *Cryphonectria hypovirus 1* (CHV-1) infects the ascomycete fungus *Cryphonectria parasitica*, the causal agent of chestnut blight, an introduced disease of *Castanea sativa* in Europe. CHV-1 reduces the virulence of *C. parasitica* against its host tree – a property used in the biological control of the pathogen. The hypovirus is transmitted between fungal strains of the same vegetative compatibility (vc) type, but only at reduced rates between strains of different vc types. The aim of this study was to test the efficiency of naturally occurring hypoviruses to infect virulent *C. parasitica* strains in the field. For this, a common field experiment was conducted in chestnut coppice forests in Switzerland, Croatia, and Macedonia. The main results of the experiment can be summarized as follows: (1) Natural hypoviruses infected virulent cankers of common vc types faster and more efficiently than cankers of rare vc types, (2) Hypovirus infection significantly reduced canker growth in Switzerland and Macedonia, but not in Croatia, and (3) Virus infection was associated with the immigration of new *C. parasitica* genotypes into the cankers. The study demonstrates that CHV-1 is an efficient natural biological control agent of chestnut blight in many regions of Europe.

Keywords: Chestnut blight, *Castanea sativa*, natural biological control, field experiments

Determination of the optimal density of forest roads for skidding by method of minimal cost

Zdravko Trajanov[1], Ljupcho Nestorovski[1], Pande Trajkov[1]
[1]University “Ss. Cyril and Methodius” -Skopje, Faculty of Forestry, Skopje, Macedonia

This paper presents the methodology for theoretical determining of the optimal density of skidding roads by method of minimal cost skidding of wood assortments. This research developed a model of skidding with a tractor in real work in mountainous conditions in the Republic of Macedonia. An analysis is made of all the costs that are made in the phase of skidding and the costs of making and maintaining skidding roads. The optimal density of the road network for skidding is calculated using differential estimations from the total costs for skidding. According to the research, a connection is made between the density of the skidding roads and the volume of wood to be used when managing the forests.
This paper reviews the impact of already built skidding roads on the environment as a factor that must be considered when choosing the optimal density skidding roads.
In a situation where the horse skidding in the forest practice is gradually abandoned, there is a need of displacement with skidding mechanization. Hence, the determination of the optimal density of skidding roads Gdp and the optimal distance between skidding roads Rdp represents a useful tool in the designing of skidding roads in practice.

Keywords: skidding roads, optimal density, tractor, minimal cost, forest.

Investigation of the density and volume reduction of the wood from some introduced species in Republic of Macedonia

Ljupco Nestorovski[1], Mitko Nacevski[2], Borce Iliev[2], Basri Aziri[3]

[1]Ss Cyril and Methodius University, Faculty of Forestry – Skopje, Macedonia, nestorovski@sf.ukim.edu.mk;
[2]Ss Cyril and Methodius University, Faculty of Design and Technology of furniture and interior – Skopje, Macedonia,
[3]MAFWE -Skopje, Macedonia

Wood density is determined in standard dry condition and total volume reduction from artificial stands of *Cupressus arizonica, Sequoiadendron giganteum, Pinus strobus* and *Larix europaea* at around 30 years age.
Methodology was adapted with the need to prepare satisfactory number of samples to investigate the wood quality in known diameter and height of the model trees. Samples that were used to determine wood density were used also for determination of the wood volume reduction, which help us to speed up the procedure and rationalize usage of the material.
Average values of wood density in standard dry condition and total volume reduction of the wood from those species were 0,516g/cm^{3}and 10,9%; 0,322 g/cm^{3}and 6,0%; 0,319 g/cm^3 and 9,6% and 0,455 g/cm^{3}with 12,2%, respectively.

Keywords: introduced species, wood density, volume, reduction