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Фото на обложке **Бориса Семавина**

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Содержание

Нагимов З.Я., Михайлов Ю.Е., Фролова Т.И., Березина А.В.	
Международные научно-практические конференции – одна из эффективных форм обучения	4
Мартинек Ярослав	
10 лет сотрудничества с УГЛТУ	6
Podhorná Alena, Orlická Barbora	
Development of ecotourism in the area with high natural value	7
Fišerová Eva, Bilíková Petra	
Environmental education as a tool of development of tourism in the Czech Republic	10
Smetanová Klára, Bartošová Kateřina	
Possibilities of adventure tourism in ecotourism of the Czech Republic	13
Surovcová Petra, Zezula Michal	
Ecotourism on the example of environmental activities at municipal level: Hostětín	15
Мартинек Ярослав	
Проблема эффективного использования материальной базы университета для качественной подготовки менеджеров	17
Andrési Dániel, Lakatos Ferenc	
The methodology of pitfall trapping and the ground beetle community of Zánka	22
Andrési Réka, Tuba Katalin	
Examination of beetle community in tinder fungus	26
Molnár Dénes, Frank Norbert	
Examination of stand structure in an old-established experimental place	29
Facskó Ferenc	
Overview of Informatics Development of Forestry Sector in Hungary	32
Nemes Viktória, Molnár Miklós	
Control experiment against an invasive weed, the Black cherry (<i>Prunus serotina</i>)	42
Parczen Benedek	
Creating natural forests in floodplains	47
Takács András	
The first results of the experimental area of Tündérhegy	50

Содержание

Tóth Bernadett, Kovács GáborChanging forest stand structure management in the Pápa Forest District
of Bakonyerdő Forestry Corporation 53**Váradi Melinda, Tuba Katalin**The fecundity of the poplar leaf beetle (*Chrysomela populi* L. 1758)
overwintering generation under laboratory conditions 57**Луганский Н.А., Луганский В.Н., Луганский Н.В.**Состояние предварительного возобновления
в кедровниках Салымского лесничества (ХМАО-Югра) 59**Maleeva D.S., Shevelina I.V.**Estimation of the Sanitary State of the Pine Trees by Electrophysical Method
in Urban Plantings of Yekaterinburg 63**Менищиков С.Л.**Устойчивость лесных насаждений к аэротехногенному загрязнению
в зависимости от структуры, возраста, состава древостоев
и условий местопроизрастания 65**Mikhailov E.S.**

Greening of lower surfaces of urban constructions 67

Mullagalieva R.Z., Lugansky N.V., Lugansky V.N.

The composition and properties of the ob floodplain 70

Березина А.В.

К проблеме создания этноприродного парка «Сабарский увал» 73

Frolova E.A., Magasumova A.G., Zalesov S.V.

Applications of unconventional fertilizers on forest scots pine nurseries in the Urals 78

Metlev D.V., Serebriakov E.S., Shevelina I.V.

Structure of the Forest Fund of Forest Green Zone in Yekaterinburg 82

Shevlyakova M.I., Luganskaia S.N.The rationale for choosing restoration methods for Monrepos Park natural museum reserve
(Vyborg, Leningrad region) 84**Mikhailov Yu.E., Lobes E.V.**Assessment of feeding niche and phenotypic variation
in the Urals populations of leaf beetle *Chrysomela lapponica* 87

Международные научно-практические конференции – одна из эффективных форм обучения

2014 г. стал годом тесного академического взаимодействия УГЛУТУ с европейскими вузами-партнерами: Университетом им. Менделя в Брно (Чехия) и Западно-Венгерским университетом в Шопроне.

Результатом этого взаимодействия стали две межвузовские конференции, проведенные на базе Института леса и природопользования, одна из которых проходила в режиме видеоконференции, а другая стала результатом предыдущих онлайн-совещаний по вопросам взаимодействия в сфере науки и образования на международном уровне. Объединяет эти конференции то, что обе они были проведены в коллаборационном центре, созданном у нас в рамках международного проекта Темпус.

С 2011 по 2014 гг. наш университет участвовал в реализации проекта № 516796-TEMPUS-1-2011-1-FI-TEMPUS-JPHES «Рамка квалификаций для устойчивого управления лесами и продолженного обучения – SUFAREL» в составе консорциума лесных вузов России и ЕС (координатор проекта – проф. Ю.Е. Михайлов). В результате преподаватели российских вузов лесного профиля познакомились с опытом подготовки специалистов в ЕС на примере Финляндии, Дании, Италии, Франции, Австрии и Греции.

В марте 2014 г. по инициативе руководства Института леса и природопользования (директор Зуфар Ягфарович Нагимов) и факультета туризма и сервиса (декан Ирина Герлесовна Светлова) была проведена первая

международная студенческая видеоконференция с Университетом Менделя в Брно на тему «Особенности организации экологического туризма».

Студенты рассказали о своих достижениях в этой области и о возможностях развития данного вида туризма в Чехии и на Урале. Этот первый опыт показал заинтересованность студентов и профессорско-преподавательского состава в общении и обмене научной информацией. А это один из мотивов академической мобильности. Активное участие в подготовке российских студентов приняли Татьяна Ивановна Фролова, Юрий Евгеньевич Михайлов, Эльвира Тимофеевна Костоусова, Анна Валерьевна Березина, Артем Игоревич Черных. С чешской стороны хотелось бы





отметить профессора, доктора технических наук Либора Грега, доктора философии Наташу Помазалову, профессора, кандидата технических наук Илью Вискота, профессора Иву Живелову, доктора философии Алешу Руда, руководителя отдела Ондржей Конечни.

Участие студентов в конференциях было мотивировано их научными руководителями с той и другой стороны. Это создает эффект дружеского соревнования между ППС в методологии подготовки студентов, студенты получают мотивацию для продолжения научно-образовательного процесса, развивается и закрепляется желание почерпнуть что-то новое и поделиться своим опытом. Надеемся, что опыт проведения видеоконференций будет закреплен и продолжен в дальнейшем.

В сентябре 2014 г. прошла стажировка студентов, аспирантов и преподавателей Западно-Венгерского университета (г. Шопрон) в УГЛТУ. В рамках этого визита 23 сентября прошла двусторонняя научно-практическая конференция «Вклад молодых ученых в развитие лесной науки», на которой были представлены 8 устных докладов студентов и аспирантов Института леса и природопользования и 14 стендовых докладов студентов и аспирантов Западно-Венгерского университета. На общее обсуждение были вынесены вопросы лесоведения, лесной энтомологии, экологии и природопользования, ландшафтной архитектуры. Все доклады были на английском языке. Работы продемонстрировали высокие научные достижения студентов. Всем участникам были вручены сертификаты.

Результатом обеих конференций стало осознание необходимости развития языковой подготовки и навыков межкультурного диалога у студентов и преподавателей вузов.

Совместные конференции студентов и преподавателей могут стать ядром для формирования мотивационных интересов по улучшению навыков межкультурных коммуникаций, началом формирования научных школ и кружков, предпосылкой к дальнейшему развитию международной академической мобильности.

Этот выпуск журнала предлагает вниманию читателей наиболее интересные материалы двух международных конференций, которые печатаются как на русском, так и на английском языках.

**З.Я. Нагимов, Ю.Е. Михайлов,
Т.И. Фролова, А.В. Березина**

10 лет сотрудничества с УГЛТУ

Десять лет назад студенты УГЛТУ из Екатеринбурга впервые посетили Учебное лесное предприятие «Масариков Лес Кржины» (УЛП) Университета им. Г. Й. Менделя в Брно.

Тогда производственную практику здесь прошла группа из 26 человек, сопровождали группу сотрудники университета Т.И. Тарасова и Г.Н. Левинская. Практика длилась 17 дней, студенты работали в лесоводстве и в питомниках. Наше предприятие организовало для них профессиональные экскурсии по чешским лесам, ознакомило с достопримечательностями, также уральские студенты прослушали ряд специализированных лекций, посетили наш университет, в частности факультет лесного хозяйства и лесной промышленности.

Студенты УГЛТУ приехали в ЧР по приглашению директора УЛП, т.е. по моему приглашению, конечно, с разрешения и при поддержке тогдашнего ректора университета и декана факультета лесного хозяйства и лесной промышленности.

Естественно, наши гости, воспользовавшись возможностью, во время своего пребывания ознакомились не только с красотами нашего края, но и с Чешской Республикой, а позднее и соседними странами — Словакией и Австрией.

Что же было нашим мотивом для такого сотрудничества?

Во-первых, мы хотели восстановить незадолго до этого пре-

рванные дружеские отношения. Я родом из Западной Чехии и знаю, каким насыщенным было сотрудничество между Западно-чешскими государственными лесными организациями и предприятиями Свердловской области. Многие лесники в Пльзене вспоминают об этом до сих пор.

Во-вторых, нам действительно есть что показать. Мне кажется, наше предприятие следовало бы сделать местом встречи студентов и преподавателей факультетов лесного хозяйства со всего мира. Мы одними из первых внедриli философию длительного устойчивого ведения лесного хозяйства способом восстановления подлеска, близким к естественному. Наше предприятие — первое в Чешской Республике, получившее в 1997 г. престижный экологический сертификат FSC, в 2014 г. министр сельского хозяйства объявил наши леса Лесоводческим парком. В нашей стране три подобных парка.

Я думаю, что посетителям нашего парка интересна и наша философия о максимализации добавленной стоимости на выходе производственного процесса предприятия, на практике охватывающая уход за лесом, проведение лесозаготовок, работу лесопилки, лесную механизацию и т. п.

В-третьих, мы исходим из того, что приезжающие к нам студенты и их преподаватели во время встреч с нашими людьми взаимно обогащаются

новыми знаниями, новыми задумками, что способствует развитию кадров и повышению профессионального и личного роста. По логике вещей получается, что студенты однажды станут менеджерами, которые будут о нас знать. А это должно проявиться и в деловых взаимоотношениях.

Обращаясь снова к прошедшим 10 годам, могу констатировать тот факт, что постепенно нам удаётся выполнять поставленные цели. В отношении УГЛТУ из Екатеринбурга однозначно. В течение 10 лет производственную практику у нас прошло 172 студента, ежегодно сопровождаемых одним или двумя педагогами. Кроме сопровождающих педагогов, наше предприятие посетил также бывший ректор В.А. Азарёнок, нынешний ректор А.В. Мехренцев, проректоры С.В. Залесов и Н.А. Шпак. О том, что производственная практика студентов УГЛТУ на нашем предприятии имеет успех, лучше всего свидетельствует то, с каким желанием они едут к нам в Чехию.

А в будущем? Думаю, после того, как в прошлом году ректоры наших университетов подписали договор о сотрудничестве, наши связи будут только крепнуть и развиваться.

До новых встреч, уважаемые студенты и преподаватели УГЛТУ!

Ярослав Мартинек

УДК 379.85:504.06

Alena Podhorná, Barbora Orlická
(Алена Подхорна, Барбора Орлицка)
Mendel University, Brno
Университет им. Менделя, Брно,
Чешская Республика

DEVELOPMENT OF ECOTOURISM IN THE AREA WITH HIGH NATURAL VALUE (РАЗВИТИЕ ЭКОТУРИЗМА В РАЙОНЕ С ВЫСОКОЙ ПРИРОДООХРАННОЙ ЦЕННОСТЬЮ)

Детально рассматривается понятие экотуризма, выявляются его виды и особенности. На примере национального парка Шумава показывается, как экотуризм становится источником образования не только для посетителей, но и для местных жителей. Также, что не менее актуально и для России, рассматривается зональное строение парка, подчеркиваются особенности рекреационной эксплуатации каждой из его зон.

Introduction

In our paper we would like to focus on ecotourism which becomes still more and more popular nowadays. First, we try to define this term in the context where we would need it in the other parts of this paper. Then, we will continue describing a concrete area which we have chosen. It is The Šumava National Park which is the largest national park in the Czech Republic. We would like to identify some types of ecotourism which are practised here and which are possible to establish in the other countries as well. For example, in some nature areas in Russia.

Ecotourism

To understand particular forms of ecotourism, it is necessary to understand what this term exactly stands for. Ecotourism means responsible traveling to the natural areas. It conserves the environment as well as welfare of local inhabitants (Palatková, 2011). One of the main features of ecotourism is for instance nature-based environmentally benign way to garner funds for conservation and local development. Ecotourism

is also a source of education, not only for visitors but also for local residents. Its purpose is also promoting increased respect for different cultures. “A critical question, however, is whether the ecotourism projects themselves are on a sustainable path in terms of the triple bottom line of economic, environmental and socio-cultural development” (Baral, Stern, Hammett, 2012).

There is a crucial problem which is associated with sustainable development and ecotourism and that is a conflict between conservation of biological diversity, support of economical development and social stability of local community (Perlín, Bičík, 2010).

Considering all mentioned above, it is the reason of establishing protected areas and national parks. By the recreational, aesthetic and scientific valences, there is an exceptional natural area in the Czech Republic the Šumava National Park, which is an important touristic attraction.

The Šumava National Park

The Šumava mountains is a mountain range located along the

south-west border of the Czech Republic, namely along the border with Germany and Austria. “This densely wooded landscape, comprising crystal clear mountain streams, unspoiled marshlands, mires and bog woodlands, and abandoned mountain pastures at high altitudes, is a refuge for many endangered species of animals and plants” (Perlín, Bičík, 2010). There are several endangered species, such as lynx, moose, otter, peregrine or freshwater pearl mussel which are protected by Natura 2000. Overall nature is protected in the Bavarian Forest National Park and in the Šumava National Park (Bláha, Romportl, Křenová, 2013). In view of the fact that the quality of nature in the Šumava National Park is also important in international level, was this national park in 1990 classified into the international network of Unesco Biosphere Reserves (including the whole region of Šumava – NP Šumava, CHKO Šumava).

The Šumava National Park is with its 680 square kilometres the biggest national park in the Czech Republic. It is also named “green heart of Europe” because of the

most extensive uninterrupted complex of forest which we can find here. The Šumava National Park was declared on the 20th March 1991. The area of national park is used for scientific and educational purposes but it is also very popular among tourists. But all utilization of national park is focused on preservation and improvement of natural conditions (Výroční zpráva, 2012).

The national park is divided into three zones, which are different in the level of protection. The first zone is strictly protected nature area including the most valuable and stable natural ecosystem and it is passed down to unaffected progress without human influence. The second zone is represented by a forest and other ecosystems that are necessary to protect in the way of managing to unaffected balance. And the last, third zone includes areas changed by human beings where tourism, recreation and constant housing is allowed and supported. We would like to concentrate especially on the third one.

Tourism and Šumava belong together

Tourism is an economic sector which each day more and more depends on nature to survive. The responsibility for keeping environmental quality of tourist destinations is to be handled by all of us, including the tourists themselves (Tojeiro, 2011). The tourism in Šumava National Park has long-time history. It has always been a part of local economy, even when it used to have a different share on economy during the years. After 1990 the tourism has become a main development factor because of increasing importance of protected area with natural value as

a base for urban recreation (Těšitel, Kušová, Bartoš, 2007)

Since 1996 turnout has increased up three times higher in the Šumava National Park. In that case, there is a need to manage the sustainable development of these areas today. The role of tourism as development factor and the relationship between tourism and protection of biodiversity is such a complex problem that has become a part of many projects which common content is sustainable tourism (for example the project "Conservation and Sustainable Use of Biodiversity through Sound Tourism Development in Biosphere Reserves in Central and Eastern Europe.")

Just in NP there are 500 km of hiking trails and 400 km of bicycle trails which bring an enjoyment to people visiting the largest national park of the Czech Republic (Tourism and biodiversity in the Šumava Biosphere Reserve, 2012). Since 2012 tourists could have used also the "Hiking trails through nature and time". The bicycle trails have the marked trails too which make the large network through the area of national park. On the one hand, the bicycle tourism is an opportunity to ecotourism connected with getting to know the area but on the other hand it represents potential and still more actual danger of damaging the national park's environment, for example in the way of aggressive breakthrough to distantly hard accessible areas and becoming cycling more and more mass character activity (Těšitel, Kušová, Bartoš, 2007). This could be a problem for nature protection and because of this fact there is a trend of ecotourism which becomes very popular nowadays.

Forms of ecotourism

The term "ecotourism" is quite wide and there are many of its forms, for example nature guides, using horses or green buses. The project Horse return in Šumava is based on using horses for hard work in the forest, so there is no hard machinery at all. And for tourist's horse rides in landscape. Another interesting project is Green bus and it means using the ecological buses as a transport in protected area. Thanks to this there is less road transport and exhaust fumes. Also the environmental education is realised in Šumava through 3 specialised centres. And in cooperation with local stakeholders is prepared the brand "Šumava Original Product". The original products are handmade and produced in a traditional way from local materials.

We would like to focus especially on one of them which is typical for the Šumava National Park. It is called "Landscape guides" and it is realized by Administration of the Šumava National Park. As common beneficiaries of ecotourism, guides may provide visitors with a more positive window on ecotourism outcomes. Nature guides are considered to be the "heart of ecotourism" owing to their role in environmental interpretation and ecotourism success (Drumm, Moore, 2005). The main idea of this project is: "A person can not overlook things which he really knows and he can protect everything what he appreciates." This idea is realized by local people who know the Šumava landscape very well and who were specially trained for guiding. Since 2006 there were eighty-one people who went through these trainings and so they have

necessary knowledge for guiding in the Šumava National Park.

Every one of these guides show you local nature from different point of view because he or she has their own close relation which they would try to move on you. Then the best result is when you can identify with their ideas. But there is not only one type of guide who you can pay for professional services. We can distinguish professional, local, boating guides and also

the ones for guiding in Šumava's wilderness. But primary goal is the same for all of them and that is explanation of nature relations and understanding mutual interactions of human and nature. (www.npsu-mava.cz, 2014).

Conclusion

We cleared the background of ecotourism and the Šumava National Park up because we suppose that it is very important when you

want to understand why landscape guides exist. The biggest advantage is that the nature conservation in this way is not very expensive because the only thing which is essential to pay is training of guides. We think that this type of ecotourism is a very useful one and it can definitely be a good inspiration not only for the others national parks in the Czech Republic but also for the others states. And of course Russia is not an exception.

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Eva Fišerová, Petra Bilíková
(Ева Фишерова, Петра Биликова)
Mendel University, Brno
Университет им. Менделя, Брно,
Чешская Республика

ENVIRONMENTAL EDUCATION AS A TOOL OF DEVELOPMENT OF TOURISM IN THE CZECH REPUBLIC (ЭКОЛОГИЧЕСКОЕ ОБРАЗОВАНИЕ КАК ИСТОЧНИК РАЗВИТИЯ ТУРИЗМА В ЧЕШСКОЙ РЕСПУБЛИКЕ)

Обосновывается значение экотуризма не только как формы поддержки экосистем, но и как инструмента социально-экономического развития территорий. Экологическое образование в Чехии имеет давние устойчивые традиции. На примере реализации уникального проекта EDEN – Сосредоточие Зеленых знаний в городе Бистрице – автор рассматривает способы участия местных жителей в организации экологического туризма, приводит примеры реализации государственных программ.

Ecotourism is a form of tourism involving visiting fragile, pristine, and relatively undisturbed natural areas, intended as a low-impact and often small scale alternative to standard commercial (mass) tourism. Its purpose may be to provide funds for ecological conservation, to directly benefit the economic development and political empowerment of local communities, to foster respect for different cultures and for human rights or educate the traveler (Honey 2008).

We can find many definitions of ecotourism, so the definition of ecotourism is not uniform, but usually includes expressions such as: responsible travel, visiting natural areas, economic benefits for local people, respect for the natural environment and culture, nature protection and it is related to studies or education. It also includes the promotion of recycling, energy conservation and creation of economic opportunities for local communities. Ecotourism gives tourists the opportunity to support local people, enjoy nature and appreci-

ate its beauty (Development.upol.cz, 2008).

Apart from the fact that ecotourism maximally respects for the environment, it also aims to educate visitors in the thematic area of sustainable development (Artslexikon.cz, 2013).

Environmental education leads to thinking and acting which is consistent with the principle of sustainable development, a sense of responsibility for maintaining the quality of the environment and its individual components and respect for life in all its forms (Česko, 1992).

Environmental education has in the Czech Republic long tradition. The interest in the conceptual support of environmental education has become much more noticeable in the end of nineties. The basic point was the admission of the basic strategic document providing long term development of environmental education in the Czech Republic – The state program of environmental education in the year 2000.

The document shortly introduces readers to the issues and defines the necessary terminology. It moves the concept of the educational process from the plane of ecology as a science of relationships between organisms and the environment to the environmental level, where the points are basic system connections in the context of accelerated anthropocentric influence of the natural environment. It sets goals, tools and tasks divided by the target groups (Mzp.cz, 2012).

The improvement the environment was one of the highest priorities of our government in the process of admission of the Czech Republic into the European Union.

The Government was aware that the permanent care of the environment was closely linked with the state of environmental awareness and education of residents and sought to Czech Republic become a full partner meeting the entry requirements of the European Union.

In the environmental education of the public participate government institutions in the field of

Environment (MoE (MINISTRY OF ENVIRONMENT), district offices, administration NP and PLA) and some other institutions, such as universities, scientific institutes, medical or educational, cultural and educational facilities and more (Mzp.cz, 2000).

Bystřicko is part of the Vysočina Region and is comprised of 34 member towns and villages with 20,163 inhabitants. It is located in the north-eastern tip of the Czech Moravian Highlands, known for their exceptional rough beauty, their abundance of rivers, creeks and dams, and unique flora and fauna.

The region belongs to the drainage basin of the Black Sea, and the entire region is drained by the river Svratka with its tributaries. Whilst exploring these rivers by foot or boat, you will find many preserved castle ruins. Further, the dominant water feature of the Bystřicko Region is the Vír dam which has the third-highest dam wall in the Czech Republic reaching a staggering 76.5m.

It is the perfect destination for an unforgettable holiday, especially for those looking to combine peaceful rivers and lakes with something more active. Rowing, swimming, fishing and other water-related activities will ensure good mood and a positive experience from your holiday. The Bystřicko micro-region is unique because of its location within the Svratecká Uplands natural park which is rich in natural heritage (Ec.europa.eu, 2011).

The uniqueness of this area is reflected in the fact that in 2010 won Bystřicko in the competition, which lists the European Commission and was awarded EDEN = European Destination of Excellence (Kudyznudy.cz, 2013).

The project “European Destinations of Excellence” (EDEN) launched in 2006 aims at awarding Europe’s hidden gems and helping them to uncover their tourist potential. Destinations that EDEN awards are those non-traditional, unique locations which maintained their charm, but which often remain neglected due to the popularity of commercial touristy spots. These are the places where you will not have to worry about beaches being overcrowded, waiting in long lines to enter a museum or finding a table in a restaurant. There are the places where you will be able to feel the local traditions, contemplate the serenity and purity of the scenery and enjoy all the sustainable nature and history that the destinations have to offer (European Commission Enterprise and Industry, 2011).

Czech Republic has participated in the project since 2009 and the national coordinator is the agency CzechTourism (Eden-czechtourism.cz, 2014).

The awarded destinations have not only created new value from locations in decline, they have also re-imagined local heritage, bringing it to life for a new generation and providing a catalyst for wider local regeneration. The focus on sustainable and quality-based development ensures that local inhabitants are consulted and involved in the process, protecting in local history and cultural heritage. And because EDEN destinations are non-traditional and have lower visitor ratings, the award promotes lesser-known attractions, helping to redress the imbalance in tourism flows (European Commission Enterprise and Industry, 2011).

Bystřicko fulfilled by the professional jury, the best conditions of

competition EDEN. “It is a small, undiscovered location whose attendance is below the national average. Destination respects the sustainable development of tourism. The representatives of Bystřicko are trying to maintain the current nature in the best possible condition, they are interesting in ecology, involving local people in the development of area. In addition, here is a well-functioning partnership between the city, businesses and water managers and conservationists”, says general manager EDEN project in Czech Republic Hana Fojtáčková. (Bystricenp.cz, 2010).

After eight years of preparation the town Bystřice nad Pernštejnem started implementation of a unique project EDEN – Centrum of green knowledge. It is one of two strategic projects of Vysočina region. The project is also unique on the European scale – the closest similar center in the UK (Edencentre.cz, 2012).

The long-term project has three partners: the city Bystřice nad Pernštejnem, Higher Vocational School, Secondary schools of agro-technical Bystřice nad Pernštejnem and ECEAT (European Centre for Ecology and Tourism). The aim is to have the unique center of sustainable tourism, knowledge and education create in the European context which will further promote and strengthen the position of the city as a great European destination and Vysočina Region.

In March 2006, the three partners signed a so-called memorandum of understanding. It was the first document, in which was the idea of the Centre formulated (Edencentre.cz, 2012).

In this document were identified the main branches of centre of green knowledge which are: green tourism, renewable energy, non-food and organic farming. "Other aims of the Centre is to collect and provide training and information about these branches to all interested persons, to motivate the public administration and local authorities to implement these perspective methods and technologies into practice, to initiate and develop in these branches the necessary research and development tasks and participate in their practical solutions and ultimately operate model examples and operational applications in these branches.

They expect that this project, exceptionally even in the European context, will bring for Bystřice at least 50,000 visitors a year and thereby contributes to the prosperity of the city, its residents and entire region. There will be created at least 5 new job positions in the Centre. They also expect to significantly improve conditions for the practical education of the young generation in our city and the school will strengthen its position in today's stiff competition.

Bystřice n.p. has a unique position in the Czech Republic and

Europe in fields of study related to environmental technologies, renewable energy, friendly tourism. The center will include.

Farmyard (now Eden Farm – described below) – will be completely renovated for exhibition of agricultural equipment, demonstrations wood and iron, green pharmacy, a wine cellar, samples the manor living, a small brewery and a seminar room.

There will be created replica of folk village living with displays of folk crafts – building of a potter, a beekeeper, a mill, a working farm, yard animals and more near the farm.

Contrast will be will futuristic glass pyramid building full of modern technologies for housing and other interesting exhibits in terms of the technology park will hippotrail and sets of traditional fruit trees of Vysočina will be follow, there will be repaired the farm buildings for horse stabling and other large farm animals for the use of the school.

Everything will be interactive and it will encourage visitors to the game – "touch, try and participate in" (Centrum zelených vědomostí, 2006).

The Eden Farm – the first part of the project of Centre – was es-

tablished in September 2012. It is located – as the whole Centrum of green knowledge – in the old farmhouse of agricultural school, which was the small chateau of family Mitrovský. Cattle, pigs, goats and sheep, growing potatoes can be found there and they prepare the other products. There is also the riding stable for public (Eden-farma.cz, 2013).

Farm Eden provides animals and plants the best conditions to offer the highest quality of products. You can buy potato salad, side-dish, castle and feed for animals, the menu includes homemade egg (Kudyznudy.cz, 2013).

In September 2013, there was held the event called The festival of potatoes. This was an ideal destination for families with children, which provided the special encryption potato game, kids' potato playground, horse riding, baking potatoes in the fire, and there were plenty of cruise attractions (Kudyznudy.cz, 2013).

This event also served as the opening ceremony of the reconstruction of the farm and the Center of green knowledge. This despite the chilly weather awoke the interest of many people (Televizevysočina.cz, 2013).

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Klára Smetanová, Kateřina Bartošová
(*Клара Сметанова, Катержина Бартошова*)
Mendel University, Brno
Университет им. Менделя, Брно,
Чешская Республика

POSSIBILITIES OF ADVENTURE TOURISM IN ECOTOURISM OF THE CZECH REPUBLIC **(РЕСУРСЫ ПРИКЛЮЧЕНЧЕСКОГО ЭКОТУРИЗМА В ЧЕШСКОЙ РЕСПУБЛИКЕ)**

Дается определение приключенческого туризма и его дифференциация по нескольким направлениям, рассматриваются примеры приключенческого туризма, соответствующие нормам и правилам экологического туризма в Чешской республике, и перспективы их развития.

Definition of Adventure Tourism

A broad spectrum of outdoor tourist activities, often commercialized and involving interaction with the natural environment away from the participant's home range and containing elements of risk, in which the outcome is influenced by the participant, setting and careful management of the experience. (Hall, 1992)

Characteristic of adventure traveler

Adventure travelers often seek unique or new travel destinations and activities. It is often believed that a percentage of this sector is willing to accept limited tourism infrastructure with the promise of an exceptional, authentic experience. Given their penchant for exploring new destinations and seeking new experiences, they are frequently coveted by emerging destinations at the early stages of tourism development and also in more mature destinations that have protected and/or developed appropriate product. (Stowell, 2010)

Types of Adventure tourism

Adventure Tourism can be differentiated in several ways; the one most commonly used is its classification in 'Soft Adventure' and 'Hard Adventure'. As Fig. 1 illustrates, the levels of involved risk as well as the technical skills required are what differentiates hard from soft adventure activities (Hill, 1995).

While soft adventures devote limited skills and commitment levels and are distinguished by low risk demands, hard adventures commit higher levels of skills and technical expertise as well as the acceptance

of personal risk (Beedie & Hudson, 2003, Muller and Cleaver 2000). Buckley (2006) explains that the majority of inexperienced adventure tourists start with those commercial soft adventures where they just need to show up at a given time and place, in common street cloths, and the operator will be the one in charge of providing experience, transportation, appropriate cloths, specialized guides and discrete 'on the spot training' in order for the tourists to experience a safe and commonly short adventure. The market trend behind this type of products is risks, remoteness and expertise needs reduction so to increase and easily reach a wider market demand. Soft adventures are stimulated by motivations of escapism from every day and urban life, willingness to discover new settings, self-discovery (Lipscombe, 1995) and the opportunity to meet new people in a controlled environment (Ewert, 1989). Examples of soft adventures are bird watching, canoeing and horseback trekking. On the other end of the continuum there are those offers for more skilled tourists, requiring stronger commitment levels, advanced competencies (Hill, 1995) and are physically and mentally challenging (Swarbrooke et al., 2003).

Example of adventure tourism in Czech Republic which comply principles of ecotourism

Rychleby trails is mountain resort specialized for mountain biking. Resort of Rychleby trails are located in Jeseníky mountains in north of Moravia.

Rychleby trails are also name of non-profit organization which created trail network. Frontman, Pavel Hornik, who is both the town's mayor and master trail builder. The sys-

tem Hornik created features nearly 60 kilometers of all-weather, sustainable trails that follow streams, pass by an old castle, wind through meadows and eventually climb over 470 meters to a mountaintop overlooking Černá Voda. From there you can choose from a number of rocky descents or soar down on a buttery-smooth flow trail.

Why is part of sustainable developing activity?

Rychleby trails are resort deeply respecting nature and environment. Creators of trails are using only natural materials as wood and stone and dirt. No artificial materials as asphalt. Even process of making new trails is in compliance with nature. Creators are not using any burden technology or heavy machines. Work is by the form of voluntary workshop for which are invited enthusiastic bikers and other volunteers whom are in co-operation slowly making a new trail.

Main Trails are reconstructed and adapted old, stone paved, hunting paths built over a century ago into a great set of mountain biking trails. They offer an exciting experience over 60 km, beginning and ending in Černá Voda.

The Rychlebské trails run through scree fields and across fords, sometimes they're just a faint groove in the mud, in other places built of stone slabs.

Each of trail has own name and sign. All resort is well arranged. Down near the city is located biking base with small buffet and information center, where you should pick up a map showing the trails. Here you'll also find a Cyklopoint shop and a Test Centre for Merida bikes with full suspension, including a cycle and equipment hire center, and a service area.

At the base here are always very willing people from organization with very personal and helpful attitude. Thanks to this people who are giving to visitors' also environmental education whole resort stay clean in spite on growing number of visitors.

Potential of adventure tourism

A research conducted in 2010 by the Adventure Travel Trade Association (ATTA), displayed that

26 % of international travellers are adventure tourists and predicted that commercial adventure activities will represent by 2050 the 50 % of all travel motivations (Xola Consulting Services). The same study showed that the global market for Adventure Travel has an actual value of 89 \$ billion and, if adding equipment expenditure, the total value would amount to 142 \$ billion. The sector of adventure tourism has enviably over-

came the recession with a calculated annual growth rate of 17 % (Adventure Travel Trade Association, 2010). Given these growth rates, adventure tourism appears to a big number of developing countries as a possible source of economic development. Moreover, it is believed to be a good strategy for helping the rebuilding process after a political crisis or natural disaster (Adventure Travel Trade Association, 2010).

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Petra Surovcová, Michal Zezula
(Петра Суровцова, Михаил Зезула)
Mendel University, Brno
Университет им. Менделя, Брно,
Чешская Республика

ECOTOURISM ON THE EXAMPLE OF ENVIRONMENTAL ACTIVITIES AT MUNICIPAL LEVEL: HOSTĚTÍN (ЭКОТУРИЗМ НА ПРИМЕРЕ ПРИРОДООХРАННОЙ ДЕЯТЕЛЬНОСТИ НА МУНИЦИПАЛЬНОМ УРОВНЕ: ХОСТЕНИН)

Описывается поселение Хостенин, в котором при поддержке муниципальных органов власти используются альтернативные источники энергии. Данное поселение приобрело известность за счет экологических проектов, участвующих в использовании местных ресурсов, сохранения и использования возобновляемых источников энергии, в частности солнца и биомассы, а также экологически безопасных технологий, поддерживающих устойчивое развитие местности с середины 1990-х годов.

Hostětín is a small municipal village in the eastern part of the Czech Republic, namely in eastern Moravia, few kilometres far from

the Slovakian borders. The village is situated at the foot of the White Carpathians (UNESCO Biosphere Reserve), numbering approxima-

tely 240 inhabitants on an area of 3, 63 square kilometres in total.

The village of Hostětín is well-known for its great number of

ecological projects engaged in the use of local resources, saving and renewable sources of energy, particularly sun and biomass energy, as well as environmentally friendly technologies maintaining its future self-sufficient and sustainable development since the middle of the 1990s.

Its importance for the sustainable development makes it so unique that even his highness Prince Charles included this completely breath-taking place into his agenda on his visit across the Czech Republic.

The village is heated centrally by biomass from its local biomass heating plant with an output of 732 kW, providing more than 80 percent of households. Waste water produced by everyday life is cleaned in the reed-bed sewage treatment plant and electricity is generated with the assistance of two photovoltaic power plants.

Furthermore, the town use energy-saving public lighting which positively contributes to reduce electricity consumption.

In addition, the village owns a passive house which functions as a base of ecological institute called Veronica and also as an educational centre and ecological guest house. Moreover, the city produces its organically labelled unfiltered juices and syrups from the regional fruit species since 2000.

Through the years, Hostětín as a model town of sustainable rural development as well as self-sufficiency gained a couple of prestigious national and international awards for their contribution to environment protection, for instance the Energy Globe (2007), the Czech Solar Award (2009) or Climate Star (2012).

Projects within the village **Reed-bed sewage plant**

The reed-bed sewage treatment plant of this kind was the first one in eastern Moravia, operating since 1996. The basis of this reed-bed sewage plant is a constructed wetland with common wetland plants such as common reed or reed canary grass where water is treated mainly by bacteria living on the roots of plants which decompose the organic pollution and thus clean the water.

This kind of water treatment serves a unique sustainable and environmental friendly way of cleaning water in the respect of nature with considerable landscape functions boosting ecological stability and aesthetic quality of the place. Moreover, it houses various types of plants and animals.

Energy-efficient public lighting

In 2006, Hostětín retrofitted its out-of-date street lighting system using luminaires with flat-glass bottom cover which enables to distribute light much more efficiently along the street and prevent negative impacts of insufficient outdoor lighting; characteristic in poor light distribution, light pollution or intrusive lighting disrupting natural rhythms.

While the intensity of road and pavement illumination increased two or three times, light pollution of surrounding and atmosphere reduced ten times and electric input of the whole system lowered by one third.

Passive house

Since 2006, the first Czech public passive house has stood in Hostětín, serving as the educational centre Veronica. The passive house consumes 7–10 times less energy

for heating than usual buildings that was accomplished by a thick layer of heat insulation without thermal bridges, precise construction, controlled ventilation with heat recuperation and utilization of solar heat thanks to windows with perfect heat and technical parameters. The building incorporates many modern as well as traditional and natural materials and technologies, including e.g. straw isolation, clay plasters, unburnt bricks, rain water, etc. The Centre provides space for environmental education and meetings as well as accommodation.

Biomass heating plant

A central municipal heating plant with an output of 732 kW was installed in 2000. The boiler burns 500–600 tons per year of wood chips from waste wood from nearby woods and sawmills. More than 80 % of homes in Hostětín are connected to the heating plant distribution system. This unique investment was financed by the State Environmental Fund, a Dutch grant within one of the international mechanisms reducing CO₂ emissions, the Czech Energy Agency, by the community budget as well as by the beneficiaries themselves.

The investment in the heating plant has been complemented by thermal insulation of houses which the residents have been installing gradually at their own expense. The heating plant produces approximately 3,500 GJ of heat per heating season and saves 1,500 tons of CO₂ emissions per year. Fuel payments do not leave the regional economy, as they would for coal, gas or electricity, but go to the municipality and local entrepreneurs. An important benefit is clean air, which is much cleaner than in the past.

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Ярослав Мартинек
(*Yaroslav Martinek*)

Mendel University, Brno
Университет им. Менделя, Брно,
Чешская Республика

**ПРОБЛЕМА ЭФФЕКТИВНОГО ИСПОЛЬЗОВАНИЯ МАТЕРИАЛЬНОЙ БАЗЫ УНИВЕРСИТЕТА
ДЛЯ КАЧЕСТВЕННОЙ ПОДГОТОВКИ МЕНЕДЖЕРОВ
(THE PROBLEM OF EFFECTIVE USE OF THE MATERIAL BASE OF THE UNIVERSITY
FOR HIGH-QUALITY TRAINING OF MANAGERS)**

Наличие у вуза собственной материально-практической базы является залогом успеха для качественной подготовки менеджеров. На примере чешского лесного учебного предприятия «Масариков лес» в Кристинах, принадлежащего Университету им. Менделя г. Брно, рассмотрены основные преимущества подобного объединения в практической и теоретической составляющих образования. 90-летний опыт работы чешского лесного предприятия показателен и вполне может быть адаптирован к применению в УГЛТУ и принадлежащей ему лесной базе.

The presence of a University of its own material and practical base sits as the pledge of success for the qualitative training of managers. On the example of the Czech forestry training enterprise «Masarykov forest», owned by the University Mendel, discusses the main advantages of this combination of practical and theoretical components of education. The 90-year experience of the Czech forest enterprise is indicative and may be adapted for use in USFEU and belonging to him forestry.

В XXI в. общество повсеместно начинает воспринимать лес не только как кладовую древесных материалов, но и как «фабрику здоровья», которая способна улучшать экологическую ситуацию в том или ином регионе, которая может влиять на среду обитания человека, на окружающую природу, причем иногда в глобальном масштабе

вплоть до изменения климата. Речь идёт о способности лесных биосистем постоянно влиять на качество жизни людей. Леса не только дают кислород и очищают воздух, но и являются «собирающими», накопителями воды, которые питают реки, озера. Без лесов невозможно представить жизнь на планете Земля.

Что надо делать, чтобы леса приносили людям постоянную пользу, в том числе давали и древесину, сырье для производства?

Это непростые вопросы. Решать их будут выпускники наших вузов, Университета им. Менделя в Брно и Уральского государственного лесотехнического университета в Екатеринбурге (УГЛТУ). Хотелось бы, однако,

подчеркнуть одно важное различие между этими двумя вузами. Оно, в частности, состоит в том, что в то время как наш университет готовит специалистов, которые будут влиять на способ ведения хозяйства только в лесах, расположенных на площади, занимающей $\frac{1}{3}$ нашей маленькой республики, выпускники УГЛТУ будут работать в лесах на огромной территории от Урала до Дальнего Востока. Такое глобальное различие действительно существует. Поэтому считаю, что моё заявление об особой ответственности ваших выпускников за решение глобальных экологических проблем справедливо.

Не давая развёрнутую оценку подготовке будущих менеджеров по управлению лесными комплексами вашей страны, попытаюсь на примере моей страны и нашего университета (MENDELU, Брно) поразмышлять над тем, всегда ли для качественной подготовки будущих специалистов мы учитываем всё передовое, используем все возможности.

Начну немного издалека.

После распада Австро-Венгрии в конце первой мировой войны в 1918 г. образовалась независимая Чехословацкая Республика, а уже в 1919 г. был основан Сельскохозяйственный институт в Брно, ставший предшественником сегодняшнего MENDELU. В те времена в институте было два факультета – сельскохозяйственный и лесохозяйственный, а его основатели – профессора факультета лесного хозяйства, набранные на работу из числа успешных руководителей крупных частных

лесных хозяйств. Эти специалисты с момента создания вуза стремились иметь собственное опытное лесное хозяйство.

Их устремления увенчались успехом. В 1923 г. Сельскохозяйственный институт в Брно получил право вести хозяйственную деятельность в лесах, принадлежавших до этого роду Лихтенштейн. Такая уникальная конкретная поддержка в подготовке будущих специалистов в области лесоводства со стороны государства заложила основу сегодняшнего учебного лесного предприятия «Масариков лес», которое в этом году отмечает свое 90-летие. Мне приятно констатировать, что работа этого предприятия хорошо известна и в вашем университете, несмотря на разделяющее нас расстояние почти 5000 км. Об этом также свидетельствует более чем 10-летнее сотрудничество между вашим университетом и нашим предприятием.

В чём же следует искать корни успеха предприятия? Прежде всего в том, что основатели университета с самого начала считали свой лесхоз неотъемлемой частью материально-технической базы и соответственно учебного процесса университета, предназначенной для качественного обучения. Они рассматривали это предприятие как крупнейшую аудиторию и естественное пространство для ведения собственной научно-исследовательской деятельности.

Обращаясь к прошлому, я могу сказать, что наибольшего расцвета предприятие в процессе обучения студентов достигло в период между двумя мировыми войнами. Именно в это время

профессора университета непосредственно управляли деятельностью предприятия, а его работники лишь выполняли принятые решения. Совершенно понятно, что к широкому кругу подготовительных работ, ведущих к принятию решений, привлекались студенты. Они участвовали главным образом в различных работах по учету и проведению полевых измерений. В результате студенты со своими преподавателями проводили много времени в лесу, в самой прекрасной аудитории нашего университета. У преподавателей имелась возможность часто находиться со студентами в полевых условиях, поскольку в то время студентов было значительно меньше. Преподаватели передавали свои знания и умения студентам непосредственно в реальных производственных условиях.

Результаты своей учебной научно-исследовательской деятельности, осуществлённой главным образом в учебном лесном предприятии, преподаватели публиковали; проводили специализированные конференции, сопровождаемые выходами в лес. Все это привело к тому, что предприятие постепенно стало известным образцом для подражания. Фамилии профессоров того времени Оплетала, Хаши, Коншела, Дыка сегодня можно рассматривать в качестве икон чешского лесного хозяйства, их работами и методами воспитано нынешнее поколение чешских лесоводов.

Я подчеркиваю, что слава профессоров исчислялась не количеством публикаций, а прежде всего конкретными результатами их деятельности, эффективностью управления.

Именно тот факт, что студенты университета и его преподаватели часто посещали лесонасаждения, где проходило обучение, естественным образом привел к тому, что студенты «сканировали» в свою память способ ведения хозяйства. Приобретенный положительный опыт они затем применяли в своей практической деятельности в лесах всей страны, а некоторые из них даже за границей.

Что это действительно так, могу доказать на примере собственной профессиональной деятельности. Я из потомственных лесников; в лесу вырос, часто сопровождал своего отца в рабочих поездках по Западной Чехии. Когда мне исполнилось 18 лет,

поступил на лесохозяйственный факультет в Брно. Мы начали ездить с нашими преподавателями на практики и практические занятия в учебное лесное предприятие в Крштинах. Вот тогда передо мной вдруг предстали совершенно другие леса. Нежный порослевой способ ведения хозяйства в крштинских лесах, акцентирующий рекреационную функцию лесов путем создания рекреационных полей, родников и памятников Лесного Славина, дендрария — всё это запечатлелось в моей памяти на всю жизнь. Причём я уверен, что практика оказала на меня гораздо большее влияние, чем изучение теории, которую нам преподавали на лекциях. Когда же я приступил

к работе в лесу, я, конечно же, в соответствии с предоставленными мне компетенциями, всё «отсканированное» в университетском предприятии стремился реализовать в своей работе.

Это очень существенный факт, который я особо подчеркиваю. В результате долгосрочной кропотливой работы — педагогической и исследовательской — удалось создать «витрину» университета, объект, который вдохновляет, вызывает размышления, побуждает к дискуссии, и, возможно, достоин послужить примером для подражания. Это неотъемлемая часть того, что в среде чешского лесоводства называется Брненской школой лесоводства.

Таблица 1

SWOT-анализ целевых мероприятий УЛП MENDELU

S – СИЛЬНЫЕ СТОРОНЫ	W – НЕДОСТАТКИ
<ul style="list-style-type: none"> – История, традиции и опыт – Преемственность близкого природе лесного хозяйства – Экономическая база взаимодополняющей деятельности, полезная для финансирования АКК – Исследовательская база данных – Производство лесной техники – Количество демонстрационных объектов – Разнообразие природных условий – Эстетическое благоустройство лесов – Многочисленность охраняемых районов – Опытный и честный персонал – Сотрудничество с зарубежными странами – Близость университета 	<ul style="list-style-type: none"> – Отсутствие возможности использовать все ресурсы УЛП в преподавательской и исследовательской деятельности – Незначительное вовлечение сотрудников предприятия в процесс обучения ЛДФ – Отсутствие предпочтения размещения в MENDELU решения исследовательских задач в УЛП Крштины – Дисбаланс демонстрационных объектов в соответствии с отдельными учебными программами – Отсутствие возможности добиваться предоставления дотаций и средств из фондов ЕС в качестве прямого заявителя – Персональные отношения, координация
O – ВОЗМОЖНОСТИ	T – РИСКИ
<ul style="list-style-type: none"> – Расширение практической подготовки, опыта работы, стажировки и научно-исследовательской деятельности, в том числе для иностранных студентов – Активизация международного сотрудничества при взаимодействии с MENDELU – Создание учебных моделей лесохозяйственных (лесные питомники) и лесопромышленных (центр Утехов) объектов – Потенциал объединения человеческих ресурсов, в частности с ЛДФ – Проектные возможности – Сотрудничество в области PR – Расширение интереса к УЛП внутри и за пределами MENDELU – Испытания на практике модели управления активами лесного хозяйства 	<ul style="list-style-type: none"> – Неблагоприятная оценка положения лесника в обществе – Неясная ситуация в отношении результатов влияния программы NATURA 2000 на обучение в полевых условиях – Шанс длительного отсечения от грантов и фондов ЕС – Расширение брненской агломерации и чрезмерная нагрузка со стороны мероприятий досуга – Отсутствие у педагогов интереса к УЛП – Плохая связь между организационными компонентами – Руководящие работники УЛП не имеют отношения к академической среде – Дефицит финансовых ресурсов

Но мне бы не хотелось, чтобы создалось впечатление, что я говорю только о прошлом. Утверждение об учебном лесном предприятии, являющемся «витриной» университета, справедливо и сегодня. И в хорошем, и не очень хорошем смысле. Студенты, по крайней мере те из них, которые учатся в университете с подлинным интересом к специальности, наблюдательны и критичны. Конечно, они «сканируют» облик предприятия, в котором их воспитыва-

ет родной университет. У них достаточно примеров, которые они смогут воплотить в своей практике. К сожалению, большое число студентов в нашем университете и «энциклопедическая» система обучения, применяемая многими преподавателями без учёта накопленного наследия, ограничивают познание положительного и проверенного временем.

Понятно, что нынешнее время совсем другое, чем период между двумя мировыми война-

ми. Открываются новые, ранее скрытые возможности приобретения опыта по всему миру. Это отлично, но хотелось бы предостеречь от спешки и от того, как мы пытаемся всегда и сразу всё успеть. Я предостерегаю от массового подхода и в преподавании в университетах. Я знаю по моему собственному опыту и убедился неоднократно, что хорошие результаты могут быть достигнуты только в результате длительной кропотливой честной работы.

Таблица 2

SWOT-анализ экономической деятельности УЛП MENDELU

	Strenghts – сильные стороны		Weaknesses – недостатки
	Внутренние условия		
	<ol style="list-style-type: none"> 1. Профессиональные, квалифицированные и лояльные работники. 2. Стабильные деловые партнеры, имеющие значительное влияние на рынке. 3. Разнообразный состав запасов сырья древесины. 4. Хорошее состояние и производственный статус леса. 5. Лесная транспортная сеть, постоянно поддерживаемая. 6. Диверсификация производства. 7. Собственный источник сырья для производства. 8. Обширное недвижимое имущество, пригодное для продажи. 9. Историческая преемственность с 1923 г. 10. Участие в международной деятельности. 11. Большое количество международных контактов и престиж 		<ol style="list-style-type: none"> 1. Отсутствие финансовых ресурсов для педагогической, научной и образовательной деятельности в УЛП Крштины. 2. Масштабный морально и технически устаревший жилищный фонд. 3. Незначительное вовлечение работников УЛП в педагогическую деятельность университета. 4. Малое использование образовательного и культурного центра – замка Крштины
	Opportunities возможности	Стратегия SO, макси – макс	Стратегия WO, мини – мини
	Внешние условия	В сотрудничестве с учеными и преподавателями использовать ноу-хау работников и хозяйственную базу УЛП для обучения по бакалаврским программам, организации технологических центров и участия в международных проектах, направленных на ведение лесного хозяйства, лесовосстановление и пропаганду значения лесов для общества и устойчивого развития на Земле	Укреплять систему взаимного сотрудничества путем подключения топ-менеджмента к международному научному сообществу. Теоретически возможно обратное, т. е. поручить представителям академических кругов принять участие в исполнительном управлении предприятием (модель действовала в период Первой Республики), что ввиду существующих высоких требований ко времени и профессиональным требованиям к членам академических кругов считаем менее реальным. Имущество, требующее затрат на ремонт или капиталовложений, которые превышают собственные ресурсы предприятия, продать, и полученные ресурсы использовать для увеличения рыночной стоимости оставшегося недвижимого имущества

Окончание табл. 2

	Threats – риски	Стратегия ST, макси – мини	Стратегия WT, мини – мини
Внешние условия	<ol style="list-style-type: none"> 1. Конкуренция со стороны существующих вузов с учебными предприятиями. 2. Стремление усилить влияние на экономически важные части предприятия. 3. Снижение спроса на товары и услуги в результате экономического застоя в странах Европы. 4. Исключение университетов из структурных фондов по поддержке инвестиций для производства. 5. Медленное правосудие, что приводит к неспособности добиться прав, предусмотренных законом за реальное время. 6. Риск возврата инвестиционных субсидий (примерно 90 млн крон) для инвестирования Замка Крштины (ожидается контроль из ГКУ или проверка из Министерства образования) при несоблюдении назначения, на которое была предоставлена субсидия 	<p>Путём усиления практического обучения студентов приобрести репутацию учреждения, которое «создает» выпускника, подготовленного для экономической и производственной сферы деятельности. Воспользоваться всеми формами равного доступа к структурным фондам. Путём диверсификации производства и разнообразного состава пород в лесонасаждениях противостоять кризису сбыта. Для поддержки продажи продуктов воспользоваться всеми личными контактами. Укреплять добрые отношения и доверие с заказчиками, предоставляя им серьезную информацию</p>	<p>На участках, которые станут нерентабельными и потеряют ключевое значение для осуществления целевого назначения, закрыть производство и законсервировать его. Пуск производства или продажу не возобновлять до восстановления экономики. Недостижимые требования и доступ к фондам принимать, ограничивая область эстетики леса, рекреационные функции леса и снижая расходы на закладку и воспитание леса до уровня, регламентируемого законом. Одновременно реализовать план сокращения персонала</p>

Предлагаю вниманию научного сообщества выполненный мною SWOT-анализ по учебному лесному предприятию Крштины, который прошу рассматривать как приглашение к дискуссии по вопросам совершенствования лесного образования конкретно в части развития материальной базы.

Из информации в табл. 1 следует, что в настоящее время, по мнению автора, возможности активизации практической подготовки будущих специалистов по лесному хозяйству сузились из-за усиления административных рычагов в управлении и ограниченности финансовых ресурсов.

Для преодоления указанных трудностей нужно усилить эко-

номическую сторону деятельности УЛП MENDELU. С целью поиска резервов усиления экономической деятельности предприятия представляю SWOT-анализ работы УЛП MENDELU.

Материалы второго SWOT-анализа (табл. 2) представлены мною, чтобы все специалисты осмысленно изучили проблему повышения качества подготовки специалистов лесного профиля, изложили свою точку зрения на сложившуюся ситуацию об их практической подготовке и совместно выработали эффективные рекомендации.

SWOT-анализ нынешнего состояния нашего УЛП в Крштинах и его роли в осуществлении миссии университета можно раз-

вернуть; его нужно обсуждать; искать подобие с вашим университетом и его учебным лесхозом. Наш SWOT-анализ я привожу для того, чтобы и ваш университет в полной мере использовал свое учебное лесное хозяйство для проведения преподавательской и исследовательской деятельности. Размышления о том, что смогут ваши студенты «отсканировать» во время практик в вашем лесхозе для применения в их последующей жизни, какие положительные примеры они возьмут с собой на место своей будущей работы, являются важной отправной точкой для дискуссии и обмена мнениями по проблеме дальнейших путей развития высшей школы.

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Dániel Andrési, Ferenc Lakatos
(Даниель Андреши, Ференц Лакатош)
University of West-Hungary,
Institute of Silviculture and Forest Protection,
Sopron, Hungary
Западно-Венгерский университет,
Институт лесоводства и защиты леса,
Шопрон, Венгрия

THE METHODOLOGY OF PITFALL TRAPPING
AND THE GROUND BEETLE COMMUNITY OF ZÁNKA
(МЕТОДИКА ОТЛОВОВ ПОЧВЕННЫМИ ЛОВУШКАМИ
ЖУЖЕЛИЦ СООБЩЕСТВА ЗАНКИ)

The pitfall trapping is one of the most popular and well-known trapping method of the ground-dwelling arthropods. This trapping method gives good results in case of the ground-dwelling spiders and ground beetles. During the trapping, the cups are dug to the soil surface and are filled with various kinds of killing- and preservative materials. As killing- and preservative materials different chemical sand mixtures of these are used. The control period of the traps can vary from one day to one month, depending on the trap material. The traps can be placed in line transects, in random order and in networks. The traps are usually placed 5-10 m from each other. The material and the size of the traps can be various. The use of the roof is important. It protects the trap and partly the collected arthropods against the rain and some other unwanted contaminants, and it keeps the birds and the mammals off the trap.

*In 2013 the ground beetle communities of a mixed oak forest in Central Transdanubien were studied. We used 10 pitfall traps filled with 10 % of acetic acid solution. The traps were monitored ones a month, altogether 8 times between April and November. We collected 4357 individuals of 20 carabid species. We analysed the monthly distribution and the frequency of the species. The most common species was the *Carabus convexus convexus*.*

*В 2013 г. были изучены сообщества жуужелиц в смешанном дубовом лесу в Центрально-Задунайском крае. Нами было расставлено 10 почвенных ловушек, наполненных 10%-ной уксусной кислотой. Ловушки проверялись раз в месяц, всего 8 раз с апреля по ноябрь. В результате было собрано 4357 экземпляров 20 видов жуужелиц. Мы проанализировали распределение видов по месяцам и частоту встречаемости видов. Самым распространенным видом оказался *Carabus convexus convexus*.*

Introduction

The pitfall trapping is one of the most popular and well-known trapping method of the ground-dwelling arthropods (Barber, 1931). This trapping method gives good results in case of the ground-dwelling spiders and ground beetles (LÖVEI & SUNDERLAND, 1996). During the trapping, the cups are dug to the soil surface

and are filled with various kinds of killing- and preservative materials (ethylene glycol, propylene glycol, formalin, water, alcohol, saline solution, chloralhydrate, acetic acid) (WOODCOCK, 2005; KÁDÁR & SAMU, 2006). The control period of the traps can vary from one day to one month, depending on the trap material. The traps can be placed in line transects, in random

order and in grid. The traps are usually placed 5-10 m from each other. The material and the size of the traps can be various. The use of the roof is important (Fig. 1). It protects the trap and partly the collected arthropods against the rain and some other unwanted contaminants, and it keeps the birds and the mammals off the trap (WOODCOCK, 2005).

Material and methods

In 2013, the ground beetle assemblages of an artificial gap were researched in a mixed oak stand in Central Transdanubien (Bala-

ton-Uplands, Zánka 1B). We used 10 double cup pitfall traps filled with acetic acid solution (Fig. 2).

In our research we examined four habitats (gap, gap edge, closed

forest, mesic part of the forest). In each habitat two pitfall traps were set up. We analysed the number of species and the number of individuals by dates and habitats.

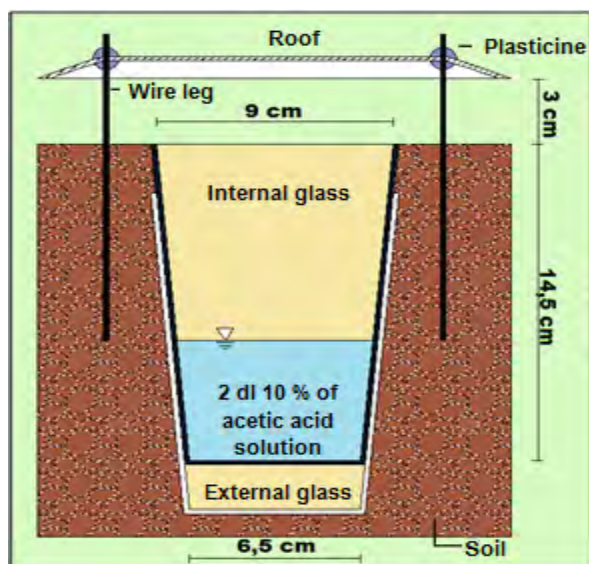


Figure 1. The structure of the pitfall trap



Figure 2. The double cup pitfall trap

Results

We collected altogether 4357 individuals of 20 carabid species. We trapped the highest number of species (16 species) on the 28th of June, while we trapped the highest number of specimens (1422 specimens) on the 31st of July (Fig. 3).

The number of species was the highest in the gap edge and in the mesic part of the forest (16 species each). The number of specimens was the highest in the gap edge (1308 specimens) (Table).

The ground beetle fauna of the investigated locations (gap, gap edge, closed forest, mesic part of

the forest) were compared with various ecological parameters (diversity, the level of consistency, similarity measures and hierarchical cluster analysis, based on Bray-Curtis).

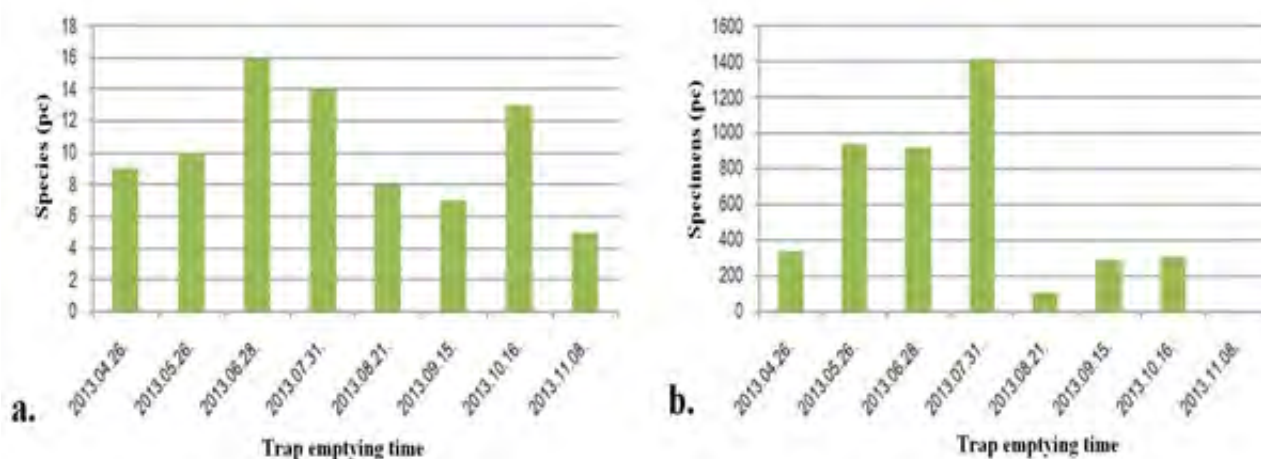


Figure 3. The number of collected ground beetles in each habitats
a. according to the number of species; b. according to the number of individuals

The cumulate number of ground beetle specimens

Species	Mesic part of the forest	Closed forest	Gap edge	N part of the gap	S part of the gap
	S (pc)	S (pc)	S (pc)	S (pc)	S (pc)
<i>Brachinus crepitans</i> (Linnaeus, 1758)	-	-	-	1	-
<i>Calosoma inquisitor</i> (Linnaeus, 1758)	104	43	220	103	76
<i>Calosoma sycophanta</i> (Linnaeus, 1758)	5	1	221	120	160
<i>Carabus convexus convexus</i> (Fabricius, 1775)	283	419	386	202	160
<i>Carabus coriaceus coriaceus</i> (Linnaeus, 1758)	22	18	39	31	37
<i>Carabus germari exasperatus</i> (Duftschmid, 1812)	-	1	1	-	3
<i>Carabus hortensis hortensis</i> (Linnaeus, 1758)	19	20	39	32	28
<i>Carabus intricatus intricatus</i> (Linnaeus, 1761)	2	-	1	-	-
<i>Carabus nemoralis nemoralis</i> (O. F. Müller, 1764)	220	169	203	80	113
<i>Leistus rufomarginatus</i> (Duftschmid, 1812)	4	2	1	-	-
<i>Notiophilus rufipes</i> (Curtis, 1829)	11	10	1	1	1
<i>Pterostichus melas</i> (Creutzer, 1799)	2	-	7	7	4
<i>Abax parallelepipedus</i> (Piller et Mitterpacher, 1783)	116	149	127	70	109
<i>Platyderus rufus</i> (Duftschmid, 1812)	2	-	-	-	-
<i>Calathus fuscipes</i> (Goeze, 1777)	4	1	1	1	1
<i>Amara saphyrea</i> (Dejean, 1828)	-	-	-	-	1
<i>Harpalus atratus</i> (Latreille, 1804)	1	1	6	5	6
<i>Harpalus rufipes</i> (DeGeer, 1774)	7	1	54	37	21
<i>Harpalus tardus</i> (Panzer, 1796)	-	-	1	-	1
<i>Ophonus laticollis</i> (Mannerheim, 1825)	1	-	-	-	-
Summary	803	835	1308	690	721

Summary

The cluster analysis' dendrogram (Fig. 4) shows that the traps of the gaps separated well from the traps of the closed forest, the mesic part of the forest and the gap edge.

More open habitat's species appeared in the gaps. The research presents one year results, the refore we are planning to continue in order to get more accurate results.

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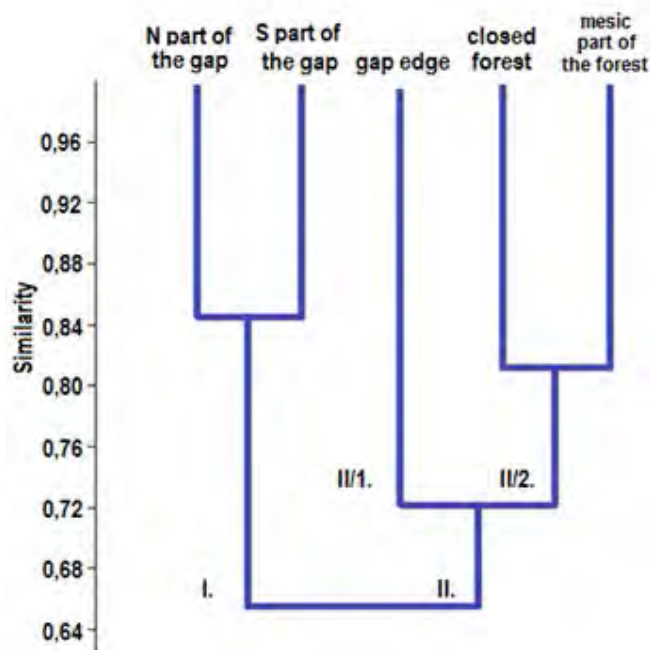


Figure 4. Agglomerative hierarchical cluster analysis dendrogram based on Bray-Curtis similarity

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Réka Andrési, Katalin Tuba
(Река Андреши, Каталин Туба)
University of West-Hungary,
Institute of Silviculture and Forest Protection,
Sopron, Hungary
Западно-Венгерский университет,
Институт лесоводства и защиты леса,
Шопрон, Венгрия

EXAMINATION OF BEETLE COMMUNITY IN TINDER FUNGUS (ИЗУЧЕНИЕ КОНСОРЦИЙ ЖЕСТКОКРЫЛЫХ И ТРУТОВЫХ ГРИБОВ)

Рассматриваются результаты изучения взаимосвязи между трутовыми грибами и популяциями жуков. В западной части Венгрии с апреля по декабрь 2013 г. собрано 94 экземпляра трутовых грибов, которые относятся к 22 видам. Самыми распространенными видами являются трутовик настоящий *Fomes fomentarius* (56 экз.) и окаймленный трутовик *Fomitopsis marginata* (8 экз.). Среди хвойных пород наиболее уязвимым видом оказалась ель обыкновенная *Picea abies*, поврежденная 8 видами трутовых грибов. Обнаружено 35 видов жуков.

Introduction

The dead trees offer a favourable habitat to numerous aliens. Most of them have important role from the viewpoint of the demolition. The viewpoint of the forests the metabolism processes has emphasis meaning. One of these processes is the tree-tinder fungus-beetle food chain.

Our aims were: 1) which ones are the most frequent tinder fungi and beetles living in fungi; 2) what kind of tinder fungus has the rich-

est beetle community; 3) what is the relationship among the tree species-tinder fungus-beetles.

The tinder fungi are the determining member of natural forests associations. They have a special insect's community. In the food chain the saproxylic insects have important role, because they eat dead trees. The tinder fungi appear on the trees and the tinder fungi are colonised by fungus feeders. They create a chain of decomposer.

Material and methods

The most of samples were collected from the west part of Hungary from April until December in 2013. Many samples originate outskirts Sopron and Zalaegerszeg (Fig. 1).

The tinder fungus samples were got down without bark. Every tinder fungus was packed in a paper sack (Fig. 2).

The tinder fungi were collected from different quality trunks (Fig. 3), lying and standing dead



Figure 1. The sample sites of the tinder fungi



Figure 2. Tinder fungus was packed in a paper sack

trees (Fig. 4) and trees without vigorous. Among the samples there were annuals (Fig. 3) and perennials types (Fig. 4), too (Table).

We noticed the sites, the collecting time, tree species, tree quality, name of tree and name of the fungus species and the age of fungi.

The fungus samples were placed under special conditions (20 ± 1 °C; 16 hours lighting and 8 hours darkness). Every 8 weeks the insects were collected from the bags and they were selected by families. The separation of the fungus debris and arthropods was done based on

the difference of specific gravities. The samples were stored under different conditions as in alcohol, in silica gel (for genetic samples), and or in the freezer.



Figure 3. *Laetiporus sulphureus*



Figure 4. *Fomes fomentarius*

The quality of the hosts, the tinder fungus and the number of related insect's species

Genus Species	Dead tree					Tinder fungus						Beetles species		
	Healthy	Standing	Collapsed	Trunk	Root swelling	Healthy	Standing	Collapsed	Trunk	Root swelling	Altogether	Annual	Perennial	Altogether
<i>Celtis spp.</i>	0	0	0	2	0	0	0	0	2	0	2	0	1	1
<i>Quercus spp.</i>	0	1	6	2	0	0	1	3	2	0	6	2	11	13
<i>Quercus cerris</i>	2	2	3	0	0	2	2	1	0	0	5	0	14	14
<i>Fraxinus spp.</i>	0	0	1	0	0	0	0	1	0	0	1	2	0	2
<i>Juglans spp.</i>	0	0	1	0	0	0	0	1	0	0	1	0	0	0
<i>Fagus sylvatica</i>	1	0	28	5	0	1	0	1	3	0	5	3	47	50
<i>Salix spp.</i>	4	0	1	0	0	4	0	1	0	0	5	0	5	5
<i>Carpinus spp.</i>	0	0	1	1	0	0	0	1	1	0	2	0	2	2
<i>Populus spp.</i>	0	1	1	4	0	0	1	1	2	0	4	0	9	9
<i>Prunus spp.</i>	1	0	1	3	0	1	0	1	1	0	3	0	11	11
<i>Picea abies</i>	0	0	6	1	0	0	0	4	1	0	5	4	4	8
<i>Acer spp.</i>	0	0	1	6	0	0	0	1	3	0	4	1	10	11
<i>Aesculus hippocastanum</i>	0	0	0	2	0	0	0	0	2	0	2	0	1	1
<i>Euonymus spp.</i>	0	1	0	0	0	0	1	0	0	0	1	0	1	1
<i>Alnus spp.</i>	0	1	0	0	0	0	1	0	0	0	1	0	2	2
<i>Tilia spp.</i>	0	0	0	0	1	0	0	0	0	1	1	2	0	2
<i>Malus spp.</i>	1	0	0	0	0	1	0	0	0	0	1	0	0	0
Altogether:	9	6	50	26	1	9	6	16	17	1	49	14	118	132

Results

Under this period 94 tinder fungus were collected. The 94 tinder fungus could divide 19 species. The most frequent species was *Fomes fomentarius* (56 samples) (Fig. 5) and *Fomitopsis marginata*



Figure 5. *Fomes fomentarius*

(8 samples) (Table). 13 species were very rare (one presence in the samples). The most fungi were collected from dead trees and trunks. Regarding the coniferous trees the richest community was detected at *Picea abies* with 8 tinder fungi. Among the broadleaves trees *Quercus cerris* and *Q. petraea* had the most diverse fungus community with 3 by 3 species. The least tinder fungi were found in *Fraxinus* spp., in *Juglans* spp., in *Euonymus* spp., in *Alnus* spp., in *Tilia* pp. and in *Malus* spp.

Near 25 beetles species were identified. The most frequent species was *Sulcaxis affinis*. This is a very polyphagous beetle. We could breed it from 11 tinder fungus

species. The other frequent beetles were *Bolitophagus reticulatus* (Fig. 6) and *Dacne bipustulata* (Fig. 7). There are some species which we found only in low number such as *Thymalus limbatus*, *Mycetophagus quadripustulatus* (Fig. 8), *Bembidion varicolor*, *Rhopalodautus perforatus*, *Tritoma bipustulata* (Fig. 9), *Asaphidion flavipes*, *Diaperis boleti*, *Oxyomus sylvestris* and *Bitoma crenata*.

It seems there are not significant relationships between the beetles – site of sample collection and between the beetles – time of sample collection. The age of tinder fungi influence the insect community in a dominant way.



Figure 6. *Bolitophagus reticulatus*



Figure 7. *Dacne bipustulata*



Figure 8. *Mycetophagus quadripustulatus*



Figure 9. *Tritoma bipustulata*

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Dénes Molnár, Norbert Frank
 (Денеш Молнар, Норберт Франк)
University of West Hungary
Institute of Silviculture and Forest Protection,
Sopron, Hungary
 Западно-Венгерский университет,
 Институт лесоводства и защиты леса,
 Шопрон, Венгрия

EXAMINATION OF STAND STRUCTURE IN AN OLD-ESTABLISHED EXPERIMENTAL PLACE (ИССЛЕДОВАНИЕ СТРУКТУРЫ ДРЕВОСТОЯ НА ИСТОРИЧЕСКОЙ ЭКСПЕРИМЕНТАЛЬНОЙ ПЛОЩАДИ)

The continuous forest cover does not mean selection cutting, but the selective cutting helps to provide it the most efficiently. As there were no extended selection forests in Hungary before, the selection cutting system is used to transform the previously even-aged forests treated by cutting system. The process of the transformation is very long and can take even centuries. The conversion in Sopron 182/B forest compartment started in 1937 and it is in its final stages. The diverse structured stand enables us to analyze the process in a real forest which may also help the practice. Our data processing is in the initial stage, after the correction of the positions we will have more options for geodesic software.

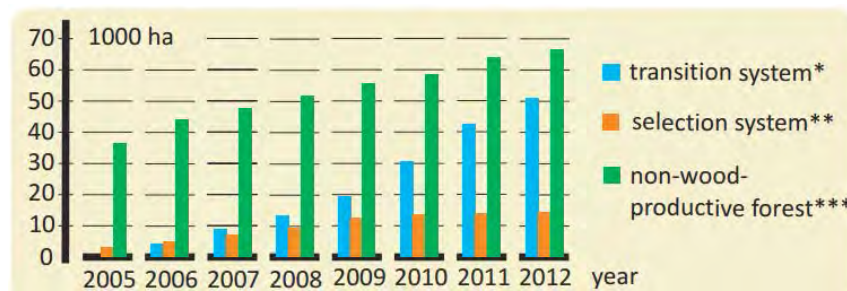
Защитные леса не подразумевают выборочных рубок, но выборочные рубки помогают поддерживать их наиболее эффективно. Так как раньше в Венгрии не было больших площадей регулируемых лесов, система выборочных рубок используется для перевода в эту категорию ранее одновозрастных лесов. Процесс трансформации очень длительный и может занять века. Трансформация лесного участка Sopron 182/B началась в 1937 г. и теперь находится на финальных стадиях. Разнообразно структурированный древостой позволяет нам анализировать процесс в реальном лесу, что может помочь на практике. Обработка данных пока на начальном этапе, и после корректировки позиций появится больше возможностей для применения ГИС-технологий.

Introduction

Nowadays close to nature forest management and continuous cover forestry has become more and more widespread in Hungary. The law XXXVIII. 2009 (forest law) defines three silvicultural systems (non-wood productive, selection and transition systems) which all ensure continuous forest cover. The law enacts the increase of the territory of these systems. While the non-wood productive forests does not have notable economical function, the selective cutting and the transition forests have to provide yield, social and protective functions as well. Hungarian forests are characteristic all even-aged stands, the conversion to selection forest has

to be strictly controlled if the management objective is to create diverse and stable stands. The main question is how to make the conversion which has not enough

scientific and practical background yet. Without previous domestical experiences circa 60.000 hectares of forests were forced into selection or transition systems (Fig. 1).



* The goal is to reach the selection system.

** Individual trees or groups are harvested periodically and frequently.

*** The aim is to let natural processes to take their course. Fellings are possible only for scientific, protection or regeneration purposes.

Source: National Forestry Database, data of 1st Jan. 2013

Figure 1. The change of territory of silvicultural systems ensuring continuous forest cover in Hungary

This paper is about the examination of stand structure of Sopron 182/B forest, which is an old-established experimental place (Fig. 2). The trial was started by Gyula Roth in 1937 since the stand is managed in his own conversion system. Gyula Roth is famous name in Hungarian forestry history. He was a professor at the University of Sopron (nowadays the University of West Hungary) for many years, and the president of IUFRO (International Union of Forest Research Organizations) in 1932. He led many researches and was especially interested in selection forests. The 19,4 hectare Sopron 182/B forest compartment was originally just a part of a more than 70 hectare research area managed in Roth Gyula's conversion system. Due to historical reasons (it was the part of the border area) only one compartment remained, which was managed in the same system during the past nearly 80 years. The stand structure of the spruce, sessile oak, hornbeam mixed submontane beech forest has been changed a lot since the trial was started.

Methods

Our main goal was to make a detailed database of the forest stand and a map with all of the crown projections and stem positions. We mapped every single tree has breast height diameter over 15 cm. The following data was collected: coordinates, tree species, height, height of living and dead crown, breast height diameter, stem quality, disease and other notes. Many of the trees has painted numbers on the bark. Those are from a previous data collecting, so we decided to note the numbers to be able later to compare some part of the two databases. For mapping and data collecting we used Field-Map system and a Vertex IV ultrasound technology clinometer. Since the Field-Map system does not have desirable accuracy for larger area mapping were measured our reference points with Sokkia Powerset 3000. Microsoft Excel and Digi-Terra Map software were used for data processing.

Results

After more than a half year of fieldwork we registered 3435 trees

and started to analyse the collected data. First we compared the stand structure to Prodan's theoretical selection forest model as a benchmark (Fig. 3). Prodan divided the categories by breast height diameter and decided how many trees belong to them. The results show that the stand structure is close enough to the theoretical model and the transformation is turning into its last stages.

The main tree species are beech (*Fagus sylvatica*), sessile oak (*Quercus petraea*), spruce (*Picea abies*) and hornbeam (*Carpinus betulus*). If we look at different diameter categories we can see that some of the tree species (e.g. sessile oak) are just in the larger ones (Fig. 4). That means that number of sessile oak is decreasing in the process. We can draw as a conclusion that the used silviculture system does not subserve the regeneration of light-demanding tree species, beech was the only one spreading in the last decades.

We examined how the volume changed during the long period. We signed trees for the next cutting being careful about the whole conversion process and the forest health condition. Sadly diseases as beech bark disease and *Heterobasidion annosum* encumber the research. Nearly 60 % of beeches is suffering from beech bark disease.

The heterogeneity in structure, the more canopy layers gives more space for the crowns. The beech can adapt well to this situation and its crown can fill the gaps even in old erages. Those big crowned trees have mostly worst stem quality, and short branch free trunk. It seems that the stem quality in an

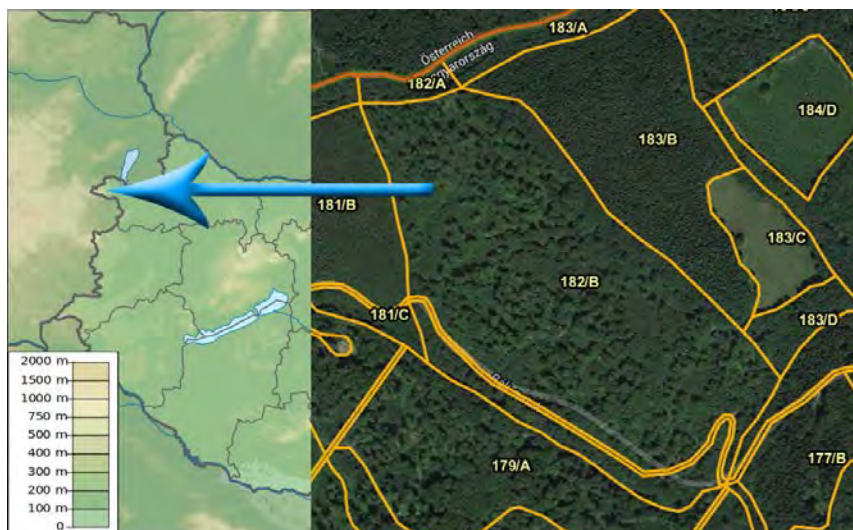


Figure 2. The Sopron 182/B forest compartment

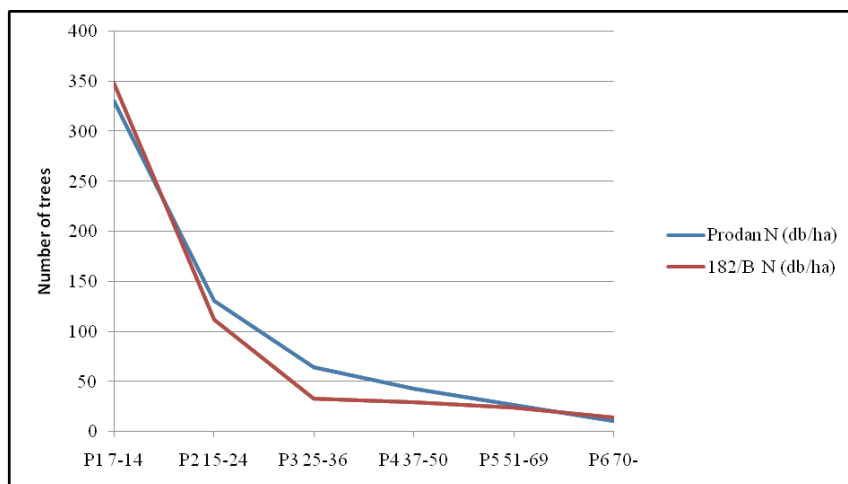


Figure 3. Stand structure compared to Prodan's theoretical selection forest model

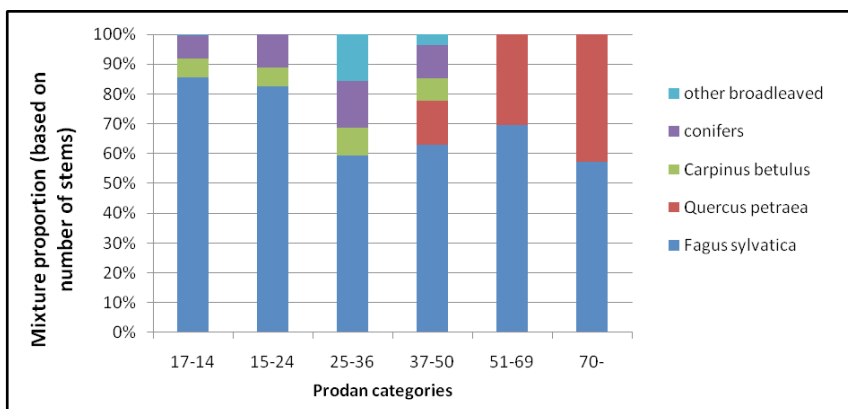


Figure 4. Mixture proportion (based on number of stems) of Prodan-diameter classes in the study area

even-aged forest is better than in a selection forest.

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Ferenc Facskó
(Ференц Фачко)
University of West Hungary,
Faculty of Forestry
Sopron, Hungary
Западно-Венгерский университет,
Факультет лесного хозяйства
Шопрон, Венгрия

OVERVIEW OF INFORMATICS DEVELOPMENT OF FORESTRY SECTOR IN HUNGARY (РАЗВИТИЕ ИНФОРМАЦИОННОЙ СИСТЕМЫ ЛЕСНОГО ХОЗЯЙСТВА В ВЕНГРИИ)

In the last decades, significant IT investments have been made in the Hungarian state forest sector. Investing in IT infrastructure has been a “necessity”, because company management requires timely information, and maintaining digital connections is also a crucial factor in business. Information technology support for planning, management and recording of professional work became commonplace only later. On the one hand, this can be explained by the fact that the subject of management usually does not require fast actions or actions on a daily basis. On the other hand, administration of different phases of forest work became effective only when geographic information systems (GIS) emerged and compatible professional applications were developed. The author has examined the steps of adoption of IT tools, IT solutions and their effects.

В последние десятилетия были сделаны значительные инвестиции в ИТ в венгерском государственном лесном секторе. Инвестиции в ИТ-инфраструктуру были необходимы, так как экономическое управление компаний требует своевременного получения срочной информации, использования цифровых соединений, а также является важным фактором в бизнесе. Информационно-техническая поддержка для планирования, управления и записи профессиональной деятельности стала обычным явлением чуть позже. С одной стороны, это можно объяснить тем фактом, что субъект управления обычно не требует быстрого действия или действия на ежедневной основе. С другой стороны, руководство различными фазами работы стало эффективным только тогда, когда появились геоинформационные системы (ГИС) и были разработаны совместимые профессиональные приложения. Автором рассмотрены шаги введения ИТ-инструментов, ИТ-решений и их последствия.

Definition of the topic, aims, hypotheses

The paper deals with electronic data processing solutions and information systems in the state forestry sector and emphasizes two aspects: the development to the present stage and the analysis in how far these systems fulfill the needs of the sector.

The investigations were not extended to the whole forestry sector, only companies managing state owned forests were dealt with. The hypotheses of the investigation were as follows:

The relation of the forestry sector to information is different from that of the other sectors

The introduction of informatics into the forestry sector was a necessary step.

The infocommunication developments improved the security of the management

The infocommunication developments improved the efficiency of the operation

Material and methods

The work is a case study. The step of “field and laboratory data

collection” was in this case a data collection using questionnaires and the completion of several personal interviews. The work has a broad time interval; the data collection was done three times, in 2001, in 2005 and in 2013. Among the questions of the questionnaire sent out in 2001 there were questions about the early stages of the “modern computer era” in the forestry sector. These were completed by the doctoral theses of Béla LETT (1986), József ÓDOR (1996) and the graduation thesis by Gyula HALASY (1997).

In the first part of this paper is an overview of the more than 50 year history is given based on special literature and other documents. Using his professional contacts the author of the publication could get hold of materials which were not publicly available, because they were in archives or in the drawers of some colleagues, and these pieces of information could make the publicly available publications more precise.

The questionnaires sent out in 2001 and 2006 contained only one series of questions, which were directed to the employees responsible for the information systems at the forest managers. The last survey was done using two questionnaires. One questionnaire was also directed to the person responsible for the information system and with the other the attitude of the users of the information system was surveyed. Another method of data collection was personal interviews. These were conducted under both formal and informal conditions. From these conversations either personal notes or recorded sound material were available. The author could collect a lot of information as a member of the informatics committee of the Association for The Forests on The Great Plain and the section of informatics in the Association of Hungarian Foresters.

The author applied for authorization of data collection at the forest companies addressing the general directors. Unfortunately not all answers were positive. Some of the leaders considered that the answers to the question are in the area of business secret and did not allow the data collection, or did not even answer the request.

Out of the questionnaires sent out to the twenty-two forest companies in 2001 eleven, in 2005 ten and in 2013 sixteen were returned. From the user questionnaires 283 were returned.

Results and discussion

Role of the information within the forestry sector

Before investigating the informatization of the sector we have to make clear what is the relation between information, information systems and forest sector.

A continuous data collection and analysis is needed so that a system can reach its optimal target state, in order to have relevant information about the system. In the knowledge of these information and the limiting factors decisions have to be made about measures which would lead the system nearer to the desired state.

The author has prepared a model of the use of data characterizing and describing forests (Fig. 1). Actors in

the model use data about forests in different locations, resolutions and with different accuracy. The most important among forestry data is the Database of Forests, which dates back for the longest period of time (nearly half century) and the structure of which is unchanged for the most important characteristics, and its data is also electronically available. The model also demonstrates that in making decisions other factors and limitation play also an important role. The most important is the legal environment, which effects the different actors with different intensity.

The author also investigated the information relation between the actors (Fig. 2). The connections represented by arrows are regulated in their form and intensity, while the brownish "background" colour means unregulated, "diffuse" informations. The strongest and the most intensive among the relations is the relation between manager and authority and the manager and the owner.

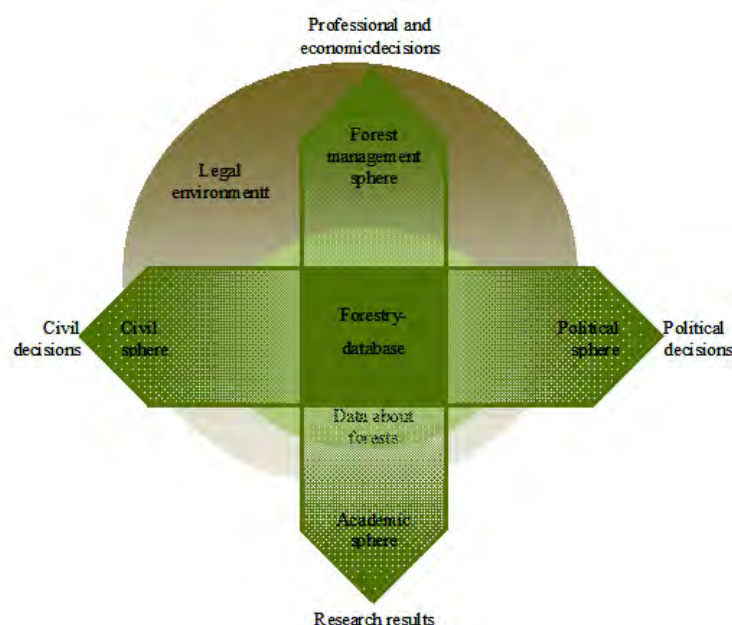


Figure 1. Model of use of forestry data

In the course of the investigations the economic approach was the most relevant among the many different definitions of information. According to this the information represents a part of the product, there is a supplementary connection between the raw material and energy used to manufacture the product and the information. As the energy, material and labor input decreases in the same amount the used information increases. Having this in mind the forest sector can be put in the lower left corner of the information intensity matrix introduced by PORTER and MILLAR (Fig. 3).

In the forest sector the actual technological processes are short in comparison to the natural processes, and are inserted in consecutive interval into the flow of spontaneous processes. So neither the “product” nor the “process” of the forestry sector needs a large amount of information or fast information processing.

Analyzing the sector from the standpoint of information systems it can also be placed into the lower left corner of the strategic grid model of CASH, McFARLAN and McKENNEY (Fig. 4).

This position means the supporting role of the information system. The placement comes at one hand from the low information intensity and at the other hand from the fact, that the companies produce their end product under differ “production circumstances” so they are not each other’s concurrent in the classical sense of the word.

Development from the beginning until now

Before dealing with the history of the development of the infor-

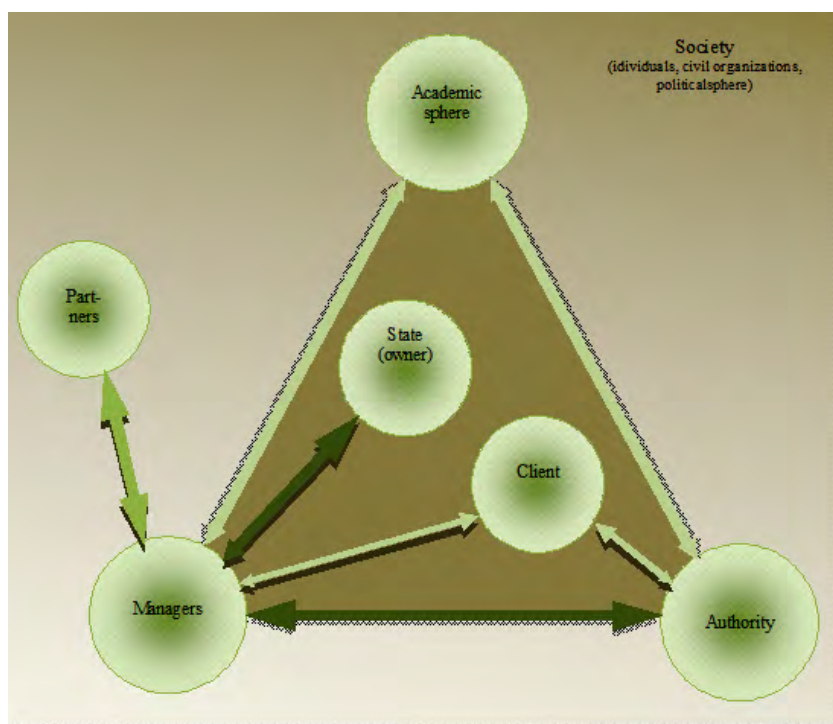


Figure 2. Information relations between actors in the sector and society



Figure 3. Matrix of information intensity



Figure 4. Strategic grid

mation systems it is necessary to review the history and changes of the structure of the state forests. The forestry law of 1879 (law XXXI) gave the basis to form the organizational structure of the state forests. They established royal forest inspectorates and management planning offices. The change in circumstances after the peace treaty in Trianon the organization which was working well had to be simplified. All the organizations had been terminated and unified forest directorates were created.

After nationalizing the bigger part of the forests the Hungarian State Forest Companies were formed which were subdivided into 22 forest directorates. This organization, called MÁLLERD was terminated in 1949 and a Forest Center was organized with 15 national enterprises and 78 forest companies. 12 forest management offices were created for preparing forest management plans. Forest inspection was assigned to 29 state forest inspectorates within the framework of the forest management planning offices. As of 1st of August 1950 78 state forest companies were established within 16 forest management unions. By 1957 the number of the companies was reduced to 32, in 1973 to 21, and these companies had different status. Companies within the EFAG group were profit oriented, and those in the EVAG group (mainly dealing with wildlife management) were budgetary institutions. Forest management planning and controlling tasks were separated again, and the State Forest Management Planning Service was established.

The state forestry organizations were supervised by the Ministry of Agriculture from the beginning,

and then the supervision of three forest companies was transferred to the Ministry of Defense. The actual department for the supervision within the Ministry also changed. After the political change in 1989 the companies became private share companies and supervision was transferred to the State Holding, and starting in 2010 to the Hungarian Bank of Development.

The automation of the accounting started with accounting machines before the appearance of computers. In the forestry literature computers were first mentioned in August 1963. At the same time development work was in progress with the leadership of László KIRÁLY at the department of Forest Management Planning of the State Forest Directorate to modernize forest management planning work with the electronic data processing of the management inventory data. The development was a success, in 1965 one-four forest estates were processed by the means of electronic data processing. In the forest management manual of 1971 this means was made compulsory.

The results of the research and development work started at the Department of Forest Management Planning and then continued at the Technical Office of Forest Management Planning Directorates were summarized in a thesis submitted for the degree of candidate of sciences by László KIRÁLY in 1978. During studying this work the author discovered that professor KIRÁLY uses the word "informatika" (informatics), though this was not common at that time. The Corpus of the History of Hungarian Language dates the first appearance of this word to 1987. This discovery refines Hungarian language histo-

ry and puts the date 9 years earlier, and primacy has also to be given to forest terminology.

The author considers a meeting held in November 1972 in Kecske-mét of vital importance concerning the introduction of computers into the sector. The minutes of the meeting could not be located, but the important topics can be reconstructed using the reports of the people attending the meeting. Though the main authorities did not support the recommendations the developments were done according to the recommendations of the meeting.

A consequence of the changes in the history of the sector was an increasing independence of the companies. At the time of the strong central leadership the devices of the data processing were expensive and their use did not seem to be inevitable. There was no central concept or direction for these kinds of developments. When suddenly the affordable devices appeared the companies were quite independent, so there was no question about introducing a unified system. It is the author's opinion that the continuous change, transformation is the reason that no unified computer system was introduced into the forestry sector.

The author does not see any evidence for the need of the introduction of a unified information system at the same time. The compulsory use of a unified accounting system is sufficient for the owner to judge the performance of the companies.

In the process of preparing forest management plans with computers it became evident, that good quality and stable work can only be accomplished using own equipment. The Technical Office of

Forest Management Planning Directorates (ÁEMI) created its own computing center in the summer of 1976. There was an intention to use the equipment for other task in the sector as well.

Also in 1976 an association named FAINFORG (Common Enterprise for Information Technology and Organization in the Forest Sector) was established. Most of the forest companies were members of the association, and the association was directed by a board of directors consisting of the chief financial officers of the forest companies. Evaluating the operation of FAINFORG the author states that it contributed considerably to the development of the sector in terms of reorganizing the processes within the companies but with the appearance of personal computers the specialists and the business model of FAINFORG could not satisfy the needs of the companies and this led to becoming insignificant and finally to termination.

The education of electronic data processing started at the Faculty of Forestry of the University of Forestry and Wood Sciences in 1970 as an optional subject, and was made compulsory in the curriculum introduced in 1975. The group of subjects started to further develop with the arrival of professor KIRÁLY to the Faculty and became praxis-oriented. At its best the offered material consisted of three semesters with the addition of six other subjects in special educational directions. The education of GIS systems was also initiated by the department of professor KIRÁLY. The quality of the education is indicated by the fact that many of the persons responsible for informatics at forest compa-

nies are forest engineers graduated from the Faculty of Forestry.

Regarding education the education of operation research has to be mentioned. Operation research gives methods for optimizing practical problems, but the effective solution of the problems is impossible without computers. Because of this the two subjects became closely related even at early stages.

With the appearance of personal computers (PCs) the use of computers became more frequent at the companies. First – similar to other sectors – accounting was computerized. Parallel to this colleagues with knowledge of programming languages prepared small programs to support their work.

The first professional program was STEGA, introduced in 1988. The importance of the program is that it demonstrated how informatics can efficiently be used in management and inspection. It was a complex forestry information system based on PC which was used by both forest managers and forest authorities. It was the first program to accomplish electronic data exchange between authorities and forest companies.

The next step was the appearance of the Digiterra Forestry Information System in 2003. An important development was in the program that data were handled on GIS basis and were integrated from several external sources like the database of forests, the database of the state land registry and the forestry maps. This program package supported the operative tasks of forest management and control. It also supported work processes in the field by integrating the possibility of use of mobile devices.

The development of computer techniques and technologies enabled the establishment of a Forestry Database for the whole country. The on-line database form supporting GIS was completed in 2004. The web-based forestry map for the whole country opened the forestry database to the public.

At present forest managers have only indirect access to the system, in the development it is planned that they also will have direct access. In my opinion it would be useful to connect the database with other official databases to improve its accuracy and reliability.

A general statement can be made about developments in the sector that at the beginning independent solutions were developed, which had no connection or only limited connections to other systems. This was the period of the so-called island systems, the applications were working separately and there was no automatic exchange of data between them.

By the beginning of the 1990s it became evident to the leaders of the companies that homogenizing the companies information systems consisting of heterogeneous solutions would improve efficiency and reduce costs. An important development of recent times was the introduction of the common unified information system for the forest companies. The project started in 2008 with the announcement of the State Treasury managing the companies at that time but due to the resistance of the companies and technical problems the project was stopped in the summer of 2009. In 2010 the forestry portfolio was transferred to the Hungarian Bank for Development. The bank was investigating the situation of the

info-communication at the companies and restarted the stuck development project. According to the new concept the Unified Forestry Management System consists of four modules: accounting system, loan and human resources system, enterprise resources management system and forestry system. The first two systems were introduced on the 1st of January 2013; the other two systems are being tested.

In the last decade several forest companies tried to introduce mobile devices, but this happened only at three companies, the majority only accomplished tests. Hindrances in introducing mobile devices are the limited offer in types, their high price and their life cycle equals to the development time of a system.

Based on the above in the everyday praxis of the companies data can be recorded and transmitted both on paper and on electronic devices depending on the location

of the origin of the data. The on-line presence on the field was not forced by the practice because the data originating from the field are not necessary to meet operative decisions. This is in accordance with the statement that only those service levels have to be developed to be supported by informatics which are needed to maintain the normal business activities. Because of the supporting nature of informatics in the sector data acquisition in the field and on-line data connection is not absolutely necessary.

The history of the introduction of informatics to the forestry sector is summarized on Fig. 5. The milestones marked are:

1. First successful electronic data processing in the sector
2. Starting informatics education at the Faculty of Forestry
3. All alphanumeric data of the Hungarian forests is available in digital form

4. Start of use of “modern” informatics tools at the forest managers

5. Digital data exchange between authority and forest managers (STEGA)

6. Electronic processing of surveying results (Digiterra Map)

7. Digitizing forestry maps

8. Professional system based on GIS (Digiterra EIR)

9. On-line support of the work of authorities (ESZIR)

10. Introduction of a unified system at forest companies

Analysis of the present situation

The hardware supply has considerably changed as compared to the situation in 1990. Today we reached a level where all colleagues who are working in office have a computer on their desks. The supply with computers is 98 %. The missing part is the district foresters, who don't have to work with computer every day,

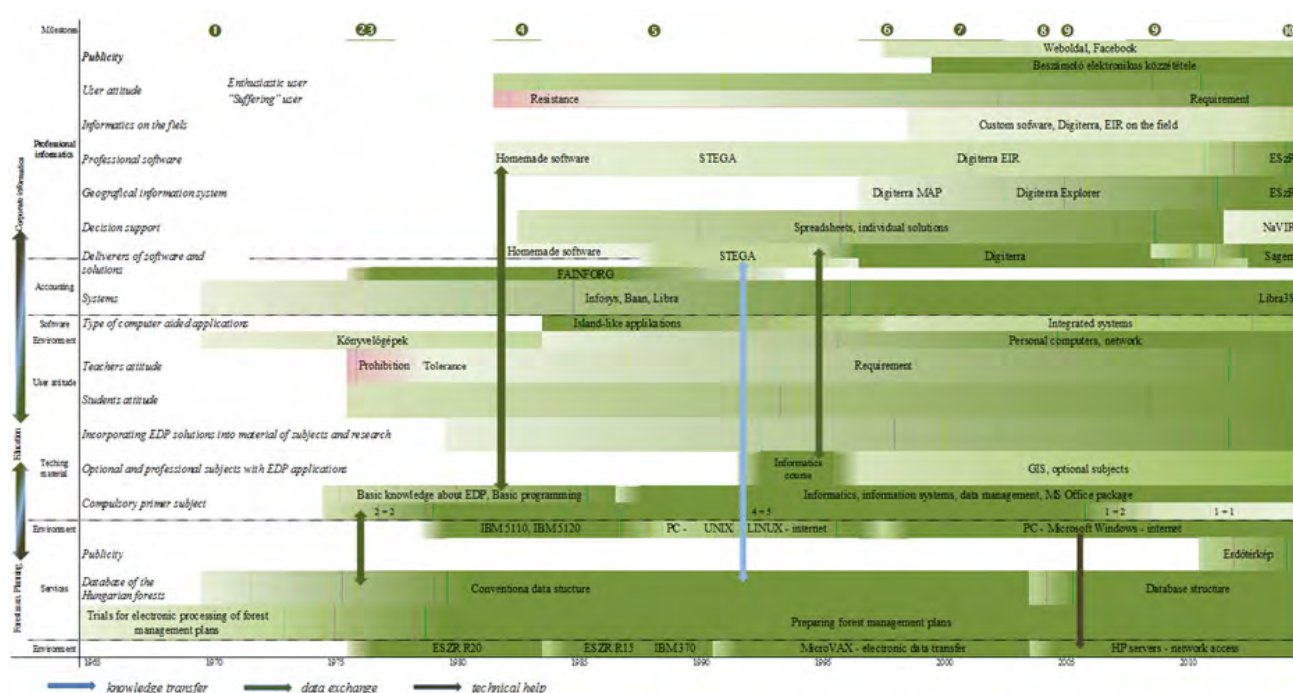


Figure 5. The history of IT development of forestry sector

so several of them share one computer. The survey showed that the management and the administrative staff have to use the computer, without computer they cannot accomplish their work. Only 5 % of the district foresters indicated that they use computer every day.

The departments dealing with informatics were subordinated without exception to the chief financial officer of the companies, and this situation remained until today. At the beginning these departments handled all informatics needs of the company. The increase of the number of tasks and/or the requirement of special knowledge forced the companies to buy special services from external companies, but they kept the “sensitive” applications in house. Some of the companies however completely dismantled its informatics groups and buys all the informatics services. Looking at the average in the sector two-third of the activities

is solved by own departments and one-third is outsourced. The typical outsourced services are web and mail server services and maintenance.

In the past decade the support for different activities steadily increased with different intensity (Fig. 6). It is not surprising, that the rate of change is the smallest in the case of accounting. This was the area where there were professional solutions available before the general computerization.

The relatively low level of office automation might be surprising, that despite the use of MS Office programs the average of the support of office procedures is just above sixty percent. One has to know, that the term office automation has been extended. Today under office automation we understand not only the preparation of documents and presentations with computers and using E-Mail, but also the handling of documents: re-

ceipt, filing, archiving, monitoring and retrieving of documents.

The support of the professional activities also increased after the millennium thanks to the development work of Digiterra.

The operation efficiency of an organization is determined by the quality of the decisions. The quality of the definitions depends on the availability of information needed to make that decision. One of the most important tasks of the information systems is to provide leaders with information necessary to make their decisions. The survey in 2005 showed that the leaders asked for the necessary information in form of summarized data in Excel tables. According to the last survey at more than 80 percent of the companies there is a regular production of reports in a pre-defined form, and in the same proportion do leaders request ad hoc reports. Compared to decision support the methods

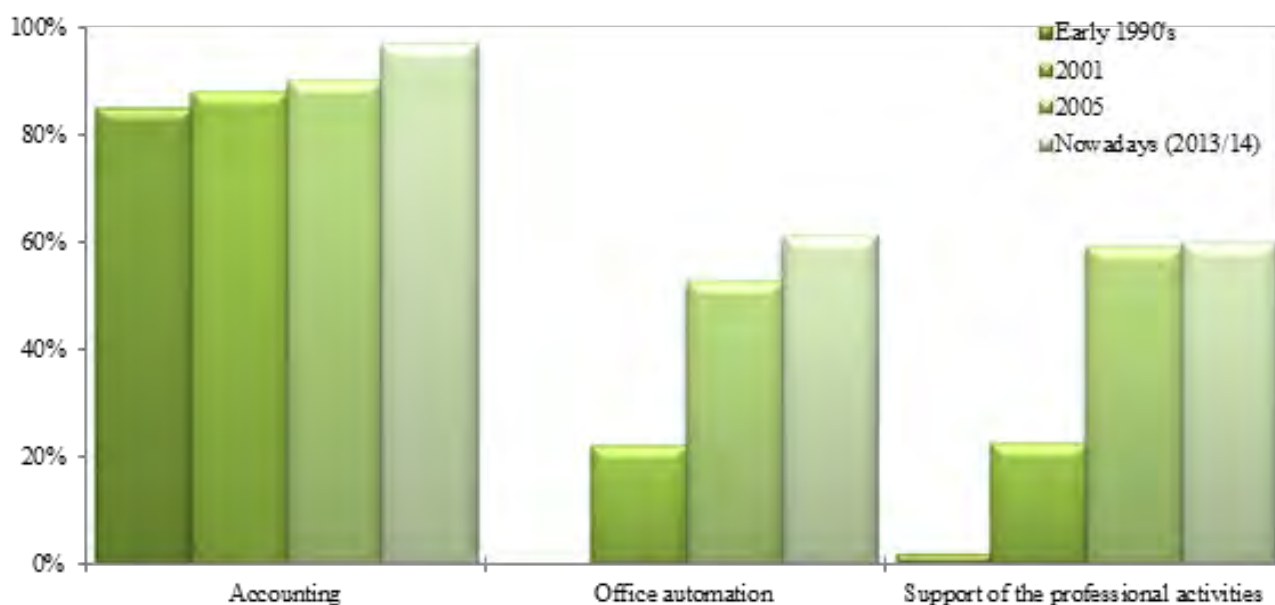


Figure 6. Changes in computer support of the main activity area

used in the preparation for decisions the proportion of the “usual” methods” shows a less favorable proportion. In the authors opinion the low information content of the products and the low information intensity of the production process do not require the use of more sophisticated decision preparation methods.

In a “computer-ecosystem” (hardware + software + user) the weakest links is the user, who is at the top of the system. The reliable and ergonomic tools and the programs with appropriate services are in vein their inappropriate use will deliver faulty data and will lead to incorrect decisions. That’s why it is important to investigate the attitude of the colleagues using the tools of informatics.

A strong coincidence can be shown between frequency of computer use and judgment of the importance of the applications. In four out of the five categories people use computers every day, and these four categories are who have a positive relation to computer use. Five percent of the district foresters state that there are hindered by computers in their work and 85% responded that they can do they work with or without computer in the same way.

Behind the neutral or negative attitude one could suspect without any further investigation their lack of practice of computer use. On the contrary the survey showed, that the majority of these people – though not everybody – has at least one computer at home.

The “quality” and the self-confidence of the computer use of employees is largely determined by their informatics education and their digital literacy. District fo-

resters have the greatest lag in this respect. This is the group who received the least education in these terms. In the responses they reported only one training category, and a quarter of them did not receive any education. Nearly hundred percent of employees in the other four categories reported several training categories and there was none of them who would not have received training in some form. It is also remarkable that there were people who financed their courses by themselves. Within this group lots of people keep their knowledge up to date by teaching themselves. Only three percent of the whole employee numbers did not receive any informatics training. This is a big improvement compared to the data in 2001 when this ratio was 45.9 %.

The lack of special equipment suitable for field use from the tools of district forester was identified as a problem by the author. Field informatics tools at leaders are usually not GIS tools supporting work organization and inventory but tools for surveying measurements. In the past 8 years these GPS systems became standard tools for foresters. Forest companies today buy the more accurate GPS/GNSS equipment because of the requirements of the EU subsidies.

Analyzing satisfaction with the tools available it can be stated that all user groups are more satisfied with the hardware than with the applications running on them. On the whole sample and using the analogy of the five degree marks hardware received a better, than four mark, software received a mark considerably worse than four. Among the groups all groups except for district foresters gave a

mark four to hardware. The judgment by the leaders working in plants is a bit weaker; this can be due to the fact, that they should have used computers in the fields more frequently. A nearly opposite tendency is in the judgment of the available software. Employees working in management and leadership gave a worse mark than district foresters. Those working in administration judged both hardware and software to be good. This might be due to the fact, that they don’t have to use “special” equipment, and the work what they are doing was computerized first and therefore the programs in use are well tested.

It was also analyzed if the applications available are necessary, or if they are still some processes which were worth automating. It became evident from the responses that employees supervising professional have a great demand toward professional programs, though there are some programs which they consider unnecessary. The need is especially explicit at the level of decision-makers. The need for changes is less with employees working in administration. This could be predicted in advance, because the programs they use are the most mature ones.

The author has also investigated what employees use computers for outside of the strictly professional work at their workplace and at home. Among the categories the most important is the use of web (getting information) and communication, transferring data in an electronic way, though the proportion of this was different among the different levels of control. Less emphasis is on the access of internal information sources (intranet)

and on transferring files from server to server.

When analyzing computer use at home it has to be stated that the role of computers as electronic data storage devices has increased even in private life, sixty to ninety percent uses its devices for storing their personal data. The big number of devices for recording data in digital form in a household also contributes to this high proportion.

The high proportion of work at home (reading work E-Mails and answering them, using intranet, entering and processing data) was especially emphasized by the author. This proportion is above sixty percent in the management but is around thirty percent at the administrative workers and district foresters. This fact is not useful according to research in occupational health. The stress level of the employee is increasing and is not able to relax from the problems what leads to health problems.

In the form of an open question the respondents indicated the appearance of which application made their work easier. Many

pointed to the word processing and spreadsheet capabilities of office packages. They also stated that the office packages enabled faster work, more professional look and the reduction of number of errors. Work is made faster with these packages in a way that similar documents have to be produced only once, and later their content has only to be updated.

The respondents described the fast access to the documents due to electronic storage as a major advantage in work. Employees with higher education in informatics also indicated, that the storage of data in relational databases gives the possibility to create unplanned, ad-hoc queries in the standard SQL language.

The appearance of GIS, and within this the field GIS is also considered to be a qualitative step. GIS applications give the possibility to create thematic maps in a fast and error-free way.

Summarizing the statements outlined above it can be stated that the spreading of informatics in the forestry sector follows the

model described by HÜSING and SELHOFFER (Fig. 7). The spreading of informatics means shows an S-shaped curve, which shows different shapes depending on the groups if the group is developed or not developed. The forestry sector has reached the saturation stage of the curve denoted by 3.

In the process of late adaptation some of the groups are lagging behind, which is then expressed in the form of social and territorial inequalities. In Fig. 7 the "Total population" (---) means the whole sample, "Disadvantaged group" (---) means the group of district foresters.

District foresters live and work on the periphery in areas which are poorly supplied with informatics resources. For the effective use of informatics "digital literacy" is needed, thus the ability of using these equipment. The investigations showed that this is missing in the category of district foresters. Between the groups we can differentiate those, who are able to use the possibilities, those who use the possibilities, probably with less

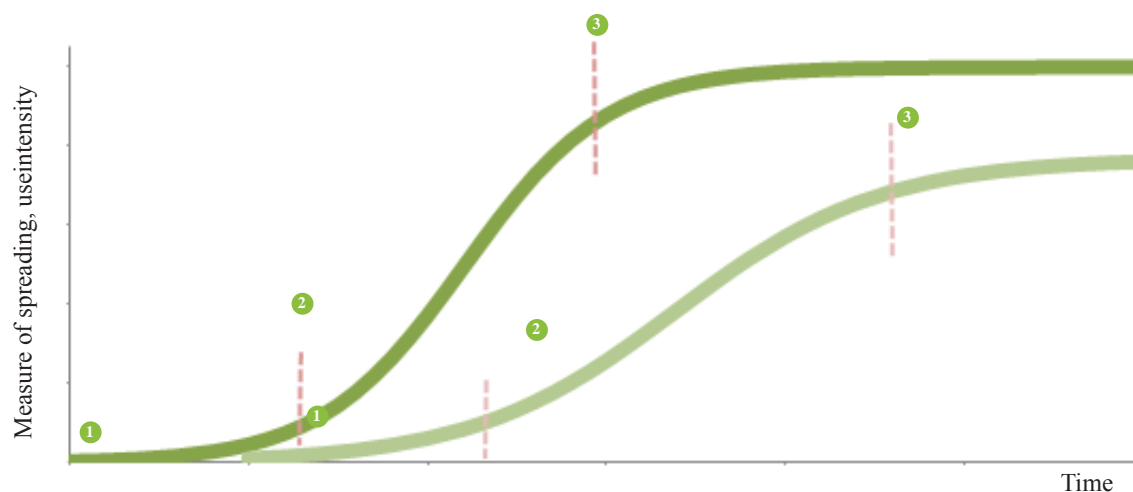


Figure 7. Spreading IT equipment within a population

efficiency – or due to some obligation – and those, who don't use the technology at all. A big part of the district forester category comes into the second group.

The acquisition of IT equipment is investment. It is very important also in the case of IT investments what kinds of values are generated by the investment for the company, and how the profile of the company changes on the short and long run. With such expectations investments into information technology had also to be evaluated in the aspect of business, and the individual investments had to be supported with calculation of return.

It has been known for a long time that the cost of informatics investments can be estimated relatively well, the profit of these cannot be estimated, or can only be estimated with big uncertainty. Direct profit can be proven only in few cases of informatics investments, and in many cases the informatics services add up with the activities of other departments, so the profit coming from informatics shows up only indirectly.

Because forestry is not an information-intensive sector, thus it does not need up-to-date data in all areas the informatization did not change the basic management conditions, but became inevitable for people working in the sector. We can state, that without the introduction of informatics the operation of the companies according to the existing laws (the amount and complexity of data to be reported, the short time period available for reporting) would be impossible.

The number of administrative employees was reduced due to the

introduction of informatics systems, but the amount of work, the number and complexity increased. If we compare the data delivery obligations before and after computerization we can say that they increased both in quantity (a lot more type) and quality (more details). This task is solved by the companies with fewer employees, so the productivity increased (according to its definition).

Information technology became a mass product with its products and applications, so it cannot provide a competitive advantage on the long run, because its available to all competitors, it can be purchased and in short time copied. Because strategic competitive advantage can only be given by rare resources information technology has to be handled among the basic infrastructure. This is supported by the fact, that none of the companies reported that they did some preliminary or follow-up analysis concerning the returns of the informatics investments.

A strong tendency of standardization can be observed in information technology which is related not only to products (computers, software, systems) but also to best practices in sectors which are then built in into standard IT solutions. Using information technology as a part of the standard infrastructure is nowadays rather a basic requirement for survival than a potential competitive advantage.

The author has determined the one time and close to the data source data entry as the direction of development. This means in technological terms a greater integration of the parts and the use of informatics in the field.

Summary

In forestry changes took place like in other sector of the economy: the different manual registries and information systems were replaced by computer solutions. The first such changes were introduced in forest management planning. As of today all forestry data of the country is stored in an online database.

The informatics education is present in the forestry higher education since 1975, and provides qualified specialist for both the authorities and for forest managers.

The information technology solutions introduced at the forest companies did not produce a demonstrable improvement in productivity. This statement is in accordance with the generally accepted opinion that informatization has different effect in different sectors and improves productivity where the product or service can be digitized. There is no such product or service in the forest sector, so this was not the reason for informatization.

If we compare data delivery obligations before and after informatization we can state that this increased both in quantity (more types) and quality (detailed reports). This task is solved with less people by the companies, so productivity "per definition" increased, at a better quality level. Quality work, faster and more accurate information delivery and the reduction of operation risks mean an indirect profit for the companies. Another detectable effect of the system that costs can be allocated more precisely and as consequence savings occur. In economy cost reductions can also considered as a factor of profit.

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Viktória Nemes, Miklós Molnár
 (Виктория Немеш, Миклош Молнар)
 University of West-Hungary,
 Institute of Silviculture and Forest Protection
 Sopron, Hungary
 Западно-Венгерский университет,
 Институт лесоводства и защиты леса,
 Шопрон, Венгрия

CONTROL EXPERIMENT AGAINST AN INVASIVE WEED, THE BLACK CHERRY (PRUNUS SEROTINA)

(КОНТРОЛЬНЫЙ ЭКСПЕРИМЕНТ ПРОТИВ ИНВАЗИВНОГО ВИДА ЧЕРЕМУХА ПОЗДНЯЯ (PRUNUS SEROTINA))

Приводятся экспериментальные данные искоренения инвазивного вида *Prunus serotina*. На 20 опытных участках были использованы 8 видов гербицидов и их соединений. Обработка *Prunus serotina* проводилась путем полива, нанесения и опрыскивания гербицидами. Эксперимент показал более эффективное применение нанесения.

Introduction

Europe is characterized by its biological diversity. The non-native plants are aggressively spreading more and more and that means threat to the continent.

The importation of foreign plants can be conscious (introduced) or unconscious (not introduced). Many non-native plants tolerance to broad, fast ontogenesis, plenty of harvest and efficient seed dispersal, and it has vegetative reproductive capacity. These features greatly facilitate the successful colonization in new environments and massive proliferations. Allelochemicals released by the alien

plants are further great benefits to newcomer species of native vegetation conquest. One of the most dangerous invasive woody plant species in the Hungarian forestry is *Prunus serotina*.

Introduction of the *Prunus serotina*

The official scientific name is *Prunus serotina* EHRH. Within the Rosaceae family it belongs to the genus *Prunus*, classified within the Subgenus *Padus*. Four variety can be separated, var. *serotina*, var. *eximia*, var. *rufula*, and var. *virens*.

Comes from the eastern part of North America. Economically sig-

nificant within the territory where distributed.

The first appearance date from Hungary is 1897. Initially planted as an ornamental tree, but also experimented with economic exploitation of the forest in the first half of the 20th century. The *Robinia pseudoacacia* also from America, is one of Hungary's most important economic tree species. Large, unmixed populations are growing in the sandy lowland areas. The *Prunus serotina* was planted in to the unmixed *Robinia pseudoacacia* with the aim to create a second level of the canopy. In terms of the Economic growth they had high hopes, but the Hungarian agricultural areas

showed negative figures due to size and shape characteristics are not fulfilled. In the 1970s onward spread explosively and settled in areas where it was not planted (Fig. 1). Spread is still in progress, and the *Robinia pseudoacacia* is for the forest regeneration one of the most dangerous weeds.

Birds like its fruit, they are very significantly involved in their dissemination. One problem is that the natural stands of trees and shrubs forming regrowth the fast growing *Prunus serotina* seedlings suppressed. Foliage, shoots containing highly toxic cyanogen glycoside, so neither wild nor insects are not eating it. Species behave aggressively, soon to bear fruit, cut out the tribes around the shoots quickly appear and grow vigorously.

The *Prunus serotina* reduction from a highly infected area is a difficult task. The mechanical control can only be effective if the seedlings or saplings of several years pulled out by the roots and destroyed. Older trees, cutting down trees in itself does not work. The strong sprout more regular training intervention is required.

The use of pesticides in sprout formation is preventable, but also the shoots may emerge successfully be suppressed.

Materials and methods

I compared the results of examinations against plant weed control. Attempts have been made seed spread core tree trunks (injection and lubrication) and into sprouting in forest restoration treatment (spraying).

The area I investigated was the forestry and wood Ltd. of Nagykunság, at a closer part to Üllő, in between 18E and 18H forest installments. The main characteristics of two adjacent are similar to each other:

- The forest is located in the steppe climate, hydrology excess water impact, independent genetic type of soil humic sand, topsoil thickness of medium depth, physical kind of sandy soil, topography and slope of the area is flat.

The trunk treatment was in 18E of forest installment. The Tree Holdings: 90% locust *Robinia pseudoacacia* in 10% Populus

x euramericana cv „I-58/57”. The age of the population is 12 years.

The treatments were made on 27. 05. 2012. and on 08. 06. 2102. In the trunk of *Prunus serotina* lubrication individuals, each has been treated with 30 cm stem length. Depending on the diameter of the trunk for each plant protection product is 0.2-0.4 litre was applied to the surface. During injection, not all individuals were treated. Specimens with a diameter of less than 5 cm remained untreated. In all plants treated with 3 holes were prepared, a 45° slope, the helically disposed strain, the diameter at breast height. These holes injected with 1-1 ml of herbicides, veterinary public extinguisher. The potential leaching, spillage, evaporation in order to inhibit the drug can not enter the environment after the introduction of the chemical silicone adhesive sealant holes were closed.

The scion of the treatments was made in 18H forest installments. The populus mixed *Robinia pseudoacacia* tree was produced before last autumn. The examination was performed during the

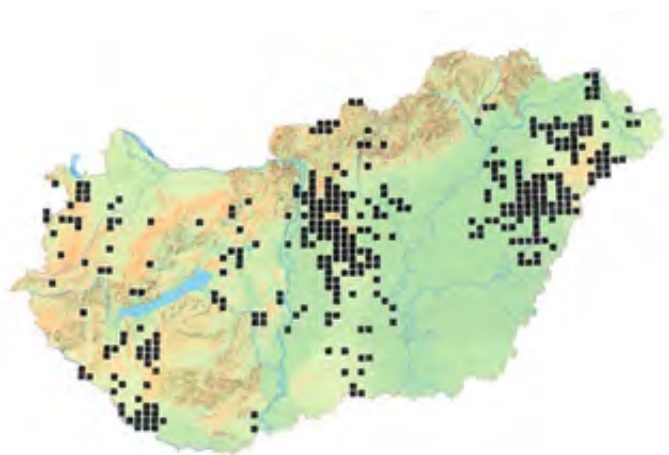


Figure 1. The *Prunus serotina* distribution territory and occurrence

forest restoration. The area, were treated with hydraulic knapsack sprayers *Prunus serotina* freshly sprouted shoots. Treatment date: 20. 05. 2012.

The two portions of total forest area, 26 samples of eight different herbicide or herbicide combination used for the injection, lubrication and spraying of *Prunus serotina*.

The effectiveness were evaluated visually. Successfully been considered those treatments in which

the treated plants withered, and were not shoots developed. Examined during the evaluation of the effects of treatments on *Robinia pseudoacacia* flocks.

Achievements

Evaluation of lubrication and injection experiments

The core areas of the sample treated with lubrication, diesel Garlan 1: 3 mixture of BFA P code-named combination of the

chemical. Areas treated with the combination could successfully defend against the *Prunus serotina* (Tab. 1 and Tab. 2).

After the experiments carried out by injection of *Prunus serotina*, observed powerful destruction and minimal germination. The Banvel-Silwet-water and Banvel-Medallon-Silwet combinations of the effect is so powerful that the nearby *Robinia pseudoacacia* symptoms can cause decay (Fig. 2).

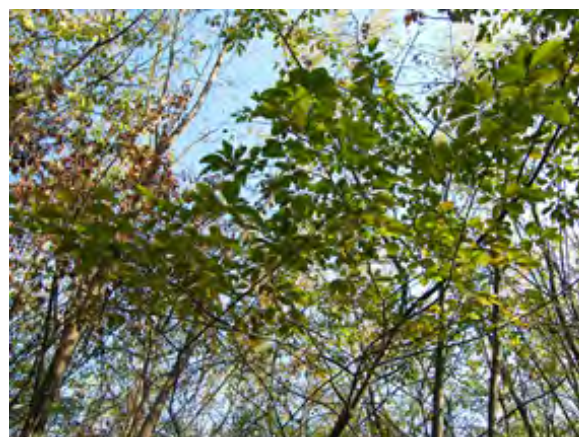


Figure 2. One efficient and one non efficient results in the trunk treatments

Table 1

Results of lubricational experiments

No.	Treatment	Active substance	Rate	Treated amounts of plants	Phytotoxicity	Affects on <i>Prunus serotina</i>
1	Garlon 4E : fuel oil	480 g/l triklopir	1 : 3	59	-	Effective
2	Garlon Duplo : fuel oil	84 g/l triklopir + 29 g/l fluroxipir-metilheptil-ester	1 : 1	37	-	Not effective
3	BFA G	glyphosate + additive + adhesive	0,2-0,4 l	17	-	Not effective
4	BFA A	glyphosate + additive + adhesive	0,2-0,4 l	52	-	Not effective
5	BFA P	glyphosate + additive + adhesive	0,2-0,4 l	8	-	Effective

Table 2

Results of injectional experiments

No.	Treatment	Active substance	Rate	Treated amounts of plants	Phytotoxicity	Affects on <i>Prunus serotina</i>
1	Medallon Premium Mezzo water	360 g/l glyphosate 20 % metsulphuron-methyl	75 ml 5 g 15 ml	51	-	Effective
2	BFA G	glyphosate + additive + adhesive	0,2-0,4 l	48	-	Effective
3	Garlon 4E : fuel oil	480 g/l triklopir	1 : 3	55	-	Effective
4	BFA A	glyphosate + additive + adhesive	0,2-0,4 l	75	-	Effective
5	BFA P	glyphosate + additive + adhesive	0,2-0,4 l	11	-	Effective
6	Barvel 480 S water Silwet L-77	480 g/l dicamba + 84 % polyalkilenoxid + 16 % polypropilen isomer	50 ml 50 ml 1 ml	10	+	Effective
7	Barvel 480S Medallon Premium Silwet L-77	480 g/l dicamba + 360 g/l glyphosate + 84 % polyalkilenoxid + 16 % polypropilen isomer	50 ml 50 ml 1 ml	19	+	Effective

Evaluation of spraying methods

The majority of the different doses tested treatments effectively destroyed the intensively developing stump shoots. The Medallon-Agrol is an effective combination of technology without adding Galigan and Mezzo. Minimum of

5 % and 5 % of the dose formulations of experiments have achieved good results in the suppression of sprouts and shoots successfully prevented the further formation (Tab. 3, Fig. 3).

The *Prunus serotina* infected *Robinia pseudoacacia* populations protection should be made

through combined methods. Prior to the final cut to older flocks slaughter strain treatment is suggested. The 5 cm at breast height specimens for thinner body lubrication, the thicker trees should be treated by injection. This shall be done during the growing season. Upon a successful defense after



Figure 3. One efficient and one non efficient results in the scion of the treatments

Table 3

Results of spraying experiments

No.	Treatment	Active substance	Rate	Treated amounts of plants	Phytotoxicity	Affects on <i>Prunus serotina</i>
1	Medallon Premium	360 g/l glyphosate	20%	11	-	Effective
	Agrol Plus	90 % oil (paraffin)	20%			
2	Medallon Premium	360 g/l glyphosate	10%	18	-	Effective
	Agrol Plus	90 % oil (paraffin)	10%			
3	Medallon Premium	360 g/l glyphosate	5%	11	-	Effective
	Agrol Plus	90 % oil (paraffin)	5%			
4	Medallon Premium	360 g/l glyphosate	20%	19	-	Effective
	Agrol Plus	90 % oil (paraffin)	20%			
	Mezzo	20 % metsulphuron-methyl	100 g/ha			
5	Medallon Premium	360 g/l glyphosate	10%	8	-	Effective
	Agrol Plus	90 % oil (paraffin)	10%			
	Mezzo	20 % metsulphuron-methyl	100 g/ha			
6	Medallon Premium	360 g/l glyphosate	5%	13	-	Effective
	Agrol Plus	90 % oil (paraffin)	5%			
	Mezzo	20 % metsulphuron-methyl	100 g/ha			
7	Medallon Premium	360 g/l glyphosate	20%	21	+	Effective
	Agrol Plus	90 % oil (paraffin)	20%			
	Geligan 240 EC	240 g/l oxyfluorfen	3%			
8	Medallon Premium	360 g/l glyphosate	10%	13	+	Effective
	Agrol Plus	90 % oil (paraffin)	10%			
	Geligan 240 EC	240 g/l oxyfluorfen	3%			
9	Medallon Premium	360 g/l glyphosate	5%	8	-	Effective
	Agrol Plus	90 % oil (paraffin)	5%			
	Geligan 240 EC	240 g/l oxyfluorfen	3%			
10	Medallon Premium	360 g/l glyphosate	20%	11	-	Effective
	Agrol Plus	90 % oil (paraffin)	20%			
	Mezzo	20 % metsulphuron-methyl	100 g/ha			
	Geligan 240 EC	240 g/l oxyfluorfen	3%			
11	Medallon Premium	360 g/l glyphosate	10%	10	-	Effective
	Agrol Plus	90 % oil (paraffin)	10%			
	Mezzo	20 % metsulphuron-methyl	100 g/ha			
	Geligan 240 EC	240 g/l oxyfluorfen	3%			
12	Medallon Premium	360 g/l glyphosate	5%	19	-	Effective
	Agrol Plus	90 % oil (paraffin)	5%			
	Mezzo	20 % metsulphuron-methyl	100 g/ha			
	Geligan 240 EC	240 g/l oxyfluorfen	3%			
13	Tomigan 250 EC	360 g/l fluoxipir-methyl	3%	27	-	Not effective
14	Taltos 450 WG	355 g/kg potassium aminopyralide + 150 g/kg florasulam	50 g/ha	37	-	Effective

the final cut there wont any sprout formation.

The treatment of individuals recovering from vigorous treatment may be left out and the thinner sprouts stock down after the formation of granulation production-intensive produce. It is

recommended to use knapsack sprayers against the proposed treatment shoots. The treatment should be carried out at spring time, as have not yet been very strong leaves, but sufficient leaf surface for capturing the pesticide shoots.

Efficient products are presented in the Results section, only recommended, which the *Robinia pseudoacacia* phytotoxic symptoms do not provoke. To be continued experiments is suggested and concoction tested at lower doses as well.

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Benedek Parczen
(Бенедек Парцен)
University of West Hungary,
Faculty of Forestry
Sopron, Hungary
Западно-Венгерский университет,
Факультет лесного хозяйства
Шопрон, Венгрия

CREATING NATURAL FORESTS IN FLOODPLAINS (СОЗДАНИЕ ЕСТЕСТВЕННЫХ ЛЕСОВ В ПОЙМАХ)

Рассматриваются результаты исследования 15 лесных участков на пойменных территориях. На трех из них произрастает *Populus nigra*, *Populus alba*, на пяти – *Fraxinus angustifolia* spp. *danubialis* и *Populus alba* и на семи – *Populus alba*. Приведены данные, какой из типов леса является наиболее устойчивым к внедрению инвазивных видов деревьев и кустарников.

The forests in floodplains have a big problem, that in these areas turn up lot invasive tree and shrub species. In our research we wanted to know, that when we want to create forests, what are made up of native tree species, then on these areas what composition of tree species is logic to plant, that we can prevent the invasive species to take too many area. We made our mensurations on the regions of the Körös-Maros National Park, which located on the South-Transisza. We measured 15 forest details, three made from *Populus nigra* with *Populus alba*, five made from *Fraxinus angustifolia* spp. *danubialis* with *Populus alba* and seven are made only from *Populus alba*. In the mixed forests are the different species in different ratio. The ratio of the *Fraxinus angustifolia* spp. *danubialis* is between 20 and 85 % (20, 70, 80, 80, 85 %) and the ratio of the *Populus nigra* is between 20 and 80 % (20, 30, 80 %). The youngest forest is 11 years old, the oldest is 24 years old and the average field is 3,5 ha.

We thought that in the forests with *Fraxinus angustifolia* spp. *danubialis* contain less invasive species, because the *Fraxinus angustifolia* spp. *danubialis* has an allopathic action and the canopy closer of this species close higher than the other's.

This was so, we found in these forests the invasive tree species (*Acer negundo*, *Fraxinus pennsylvanica*) and the invasive shrub species (*Amorpha fruticosa*, *Vitis riparia*) in the slightest degree. When we enlarge the area covered by *Fraxinus angustifolia* spp. *danubialis* in the forest then the regrowth of the invasive species number will

fall, but the area covered by invasive shrub species doesn't depend on the area covered by *F. angustifolia* spp. *danubialis*, we experienced, that one of the *F. angustifolia* spp. *danubialis* forest there are 15 % invasive shrub species (except in one part of the forest, where a thin out had been made, so the shrubs get more light, that's why there are 70 % *A. fruticosa*).

In the forests with *P. nigra*, except one part, the black poplars decay, so here the areas covered by invasive species are high. In that one part of the forest, where the black poplars do not decay, the area covered by invasive tree

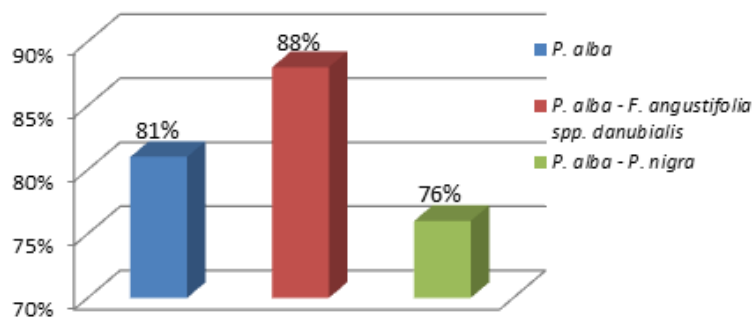


Figure 1. Canopy closer in different forests

species are low, however from one part of the forest we can't deduce.

In the forests with *P. alba* the covered areas by invasive species almost twice higher (14,28%) as in the forest with *F. angustifolia* spp. *danubialis* (8%), and are the covered areas by invasive shrubs almost twice and a half higher (*P. alba* – 61%; *P. alba*-*F. angustifolia* spp. *danubialis* – 26%).

We examined in these forests the density of the native shrub species (*Rubus caesius*, *Viburnum opulus*, *Cornus sanguinea*) too. The dispersion of the data is similar to the invasive species. In the clear *P. alba* forest are the most native shrub species (40 %), in the forest with *P. alba* and *P. nigra* is the density 18 % and in the less native shrubs are in the *P. alba*-*F. angustifolia* spp. *danubialis* forests (4 %). We found *Viburnum opulus* only twice and *Cornus sanguinea* only once, so we can say that these data are based on the density of the *Rubus caesius*.

The next viewpoint by the examine of the data is that we see the density of the individual species in the different forests. We experienced that the biggest differences are by the *A. fruticosa* and by the *R. caesius*. The density of *A. fruticosa* is in *P. alba* forests 61 %, if there are *P. nigra* in the forest too, then this data is 43 %. In *P. alba*-*F. angustifolia* spp. *danubialis* forests is the density of *A. fruticosa* 25 %.

The density of *R. caesius* is similar to *A. fruticosa* just it is in average lower. In *P. alba* forests is the density 39 %, in *P. alba*-*P. nigra* forests 18 % and if there is *F. angustifolia* spp. *danubialis* with *P. alba* in the forest then only 4 %.

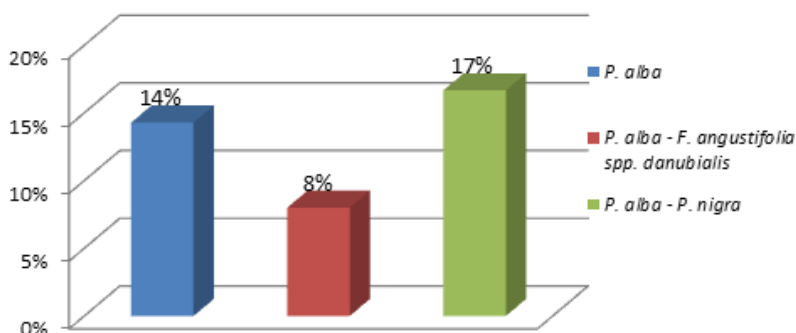


Figure 2. Density of the invasive regrowth in different forests

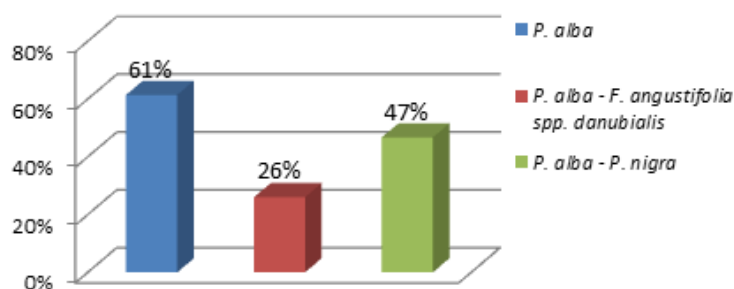


Figure 3. Density of the invasive shrubs in different forests

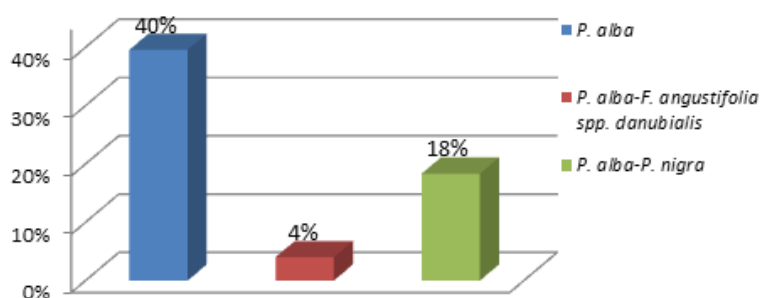


Figure 4. Density of the native shrubs in different forests

By *F. pennsylvanica* are the differences in the data not great but we can good follow it (*P. alba* – 10%, *P. alba-P. nigra* – 7%, *P. alba-F. angustifolia* spp. *danubialis* – 6%).

We examined the density of *A. negundo* and we experienced that it's in the *P. alba-P. nigra* forests is the highest (10%), in the *P. alba* forest is 4% and in the *P. alba-F. angustifolia* spp. *danubialis* forests only 2%.

We found even *V. riparia* and regrowth of *P. alba*, but we saw that it not depends on the type of the forest.

The density of the multiannual viable regrowth is a very important data because the oodles regrowth are useless if they die in one or two years. So we examine this factor too. We get the result that in the *P. alba* forests and in the forest with *P. alba* and *P. nigra* the density of the multiannual viable regrowth is the same, in both 2%. We didn't find multiannual viable regrowth in the *P. alba-F. angustifolia* spp. *danubialis* forests so we can say, that these forests drive back the regrowth of the invasive trees (and the native too).

Based on these data, we can say that from the examined forests, the *Populus alba* - *Fraxinus angustifolia* spp. *danubialis* forests prevent most of all the invasive plant species on the floodplains. Against the regrowth of the invasive tree species is good if we enlarge the ratio of the *F. angustifolia* spp. *danubialis*, but the density of the invasive shrub species not depend on this ratio.

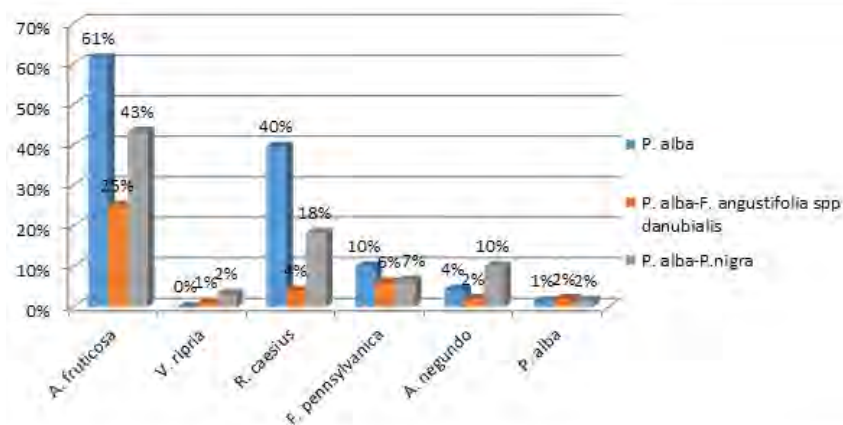


Figure 5. The severally density of the shrubs and the regrowth in the different forests

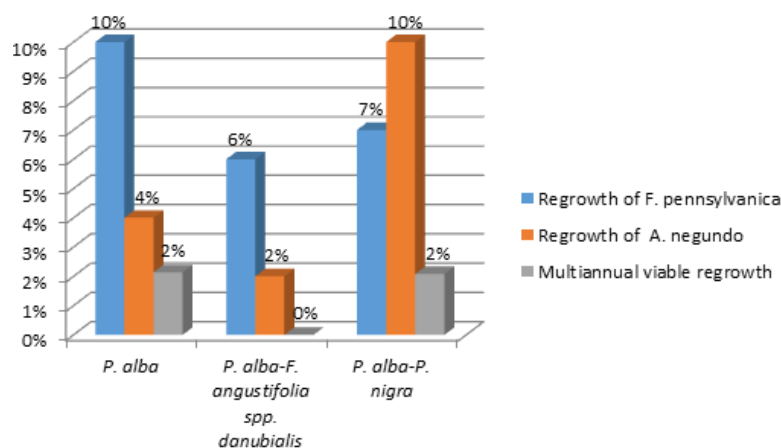


Figure 6. The density of the *F. pennsylvanica*, the *A. negundo* and the multiannual viable regrowth in different forests



Figure 7. A *P. alba* forest



Figure 8. *P. alba-F. pennsylvanica* forest

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András Takács

(Андраш Такач)

University of West Hungary – Faculty of Forestry

Sopron, Hungary

Западно-Венгерский университет,

Факультет лесного хозяйства

Шопрон, Венгрия

THE FIRST RESULTS OF THE EXPERIMENTAL AREA OF TÜNDÉRHEGY (ПЕРВЫЕ РЕЗУЛЬТАТЫ С ЭКСПЕРИМЕНТАЛЬНОЙ ПЛОЩАДИ ТЮНДЕРХЕГИ)

Приведены данные детального описания участка леса в Тюндерхеги. Изучена динамика структуры древостоя: изменения соотношения пород, плотности, сомкнутости крон, потери первоначальных показателей. Было изучено 1380 видов с помощью различных показателей, предоставленных GPS.

Introdoaction

The Pilisi Parkerdő Zrt.'s Forestry department of Budapest is planning to establish a forestry reserve in the Mountains of Buda in the near future. That is how it came the survey of the assigned study area nearby Tünderhegy in the summer of 2012. The measured datas of the plot provide the description of the current state. The further results of the surveys, that will be done specified from time to time, can be compared against the recently measured conditions. These comparisons can give a momentous help during the research of the processes occurring in time in the forest, in other words during the research of the forest dynamics.

On another research area, we can also make comparison among the surveys about the temporal changes in tree-stand structure. From the surveys, done every five years, we can get information of the tree-stand structure changes such as mixture ratio, density, the change of closure of canopy layer or ingrowth and loss of prime numbers.

Description of the area

The complete selected plot can be found in downtown part of Budapest, in the XII district. It's infrastructure is well-established and easily approachable.

The stand is very unique and it is protected by nature protection and the Natura 2000 network. The cutting is limited, the last one was in 2011 and was not forceful. The



Figure 1. The geographical position of the experimental area

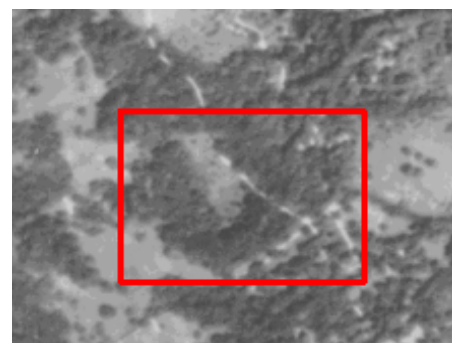


Figure 2. Air photo from 1941 and satellite from 2012

most part of the forest was afores-
ted in the past seventy years, whi-
ch you can see well in the pictures.
The plant community shows ravin-
es character, it is extremely rich
in species, you can find a lot of re-
served herbaceous plants. We have
to mention the huge 194 years old
beech, 155 years old sessile oak
and the 107 years old common ash
trees that is also described in the
forest planning.

Sadly these days a local forester
has to face many problems due the
close capital and the well estab-
lished infrastructure. The biggest
problems are the illegal bumps
and settlements of homeless peop-
le. The newest problem is downhill
cycling which is widespreading
in the hills of Buda increasing the
erosion and debase the area.

Material and method

During the field measurement
I surveyed all of the boles with the
help of the Field-Map program.
This is a software which can com-
municate between data collect-
ing-measuring equipments and the
computer. The main point of the
system is mapping, it can mana-
ge many mapping and measuring
tasks virtually. The recorded datas
can be stored in the own reference
point network.



Figure 3. The Fiel-Map system

I measured every piece of tree
ont he plot. I measured breast di-
ameter and height on every tree
which had breast height diameter
over 7 cm. The used equimentment
was Vertex IV. I also mapped the
logs of dead trees.

I examined 1380 wood speci-
ments, based on different perspe-
ctives, provided with GPS coor-
dinates. After the survey I could

complete detailed forest stand
structure.

Results

I have analysed the vertical and
horizontal structure of the forest
stand. Tree species proportion was
also examined.

Species proportion was also
examined in the different diam-
eter and height classes (Fig. 6 and 7).

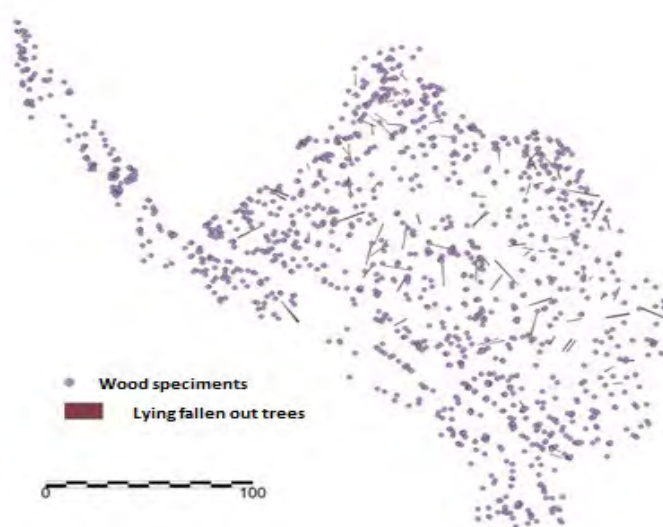


Figure 4. Live and death wood specimen

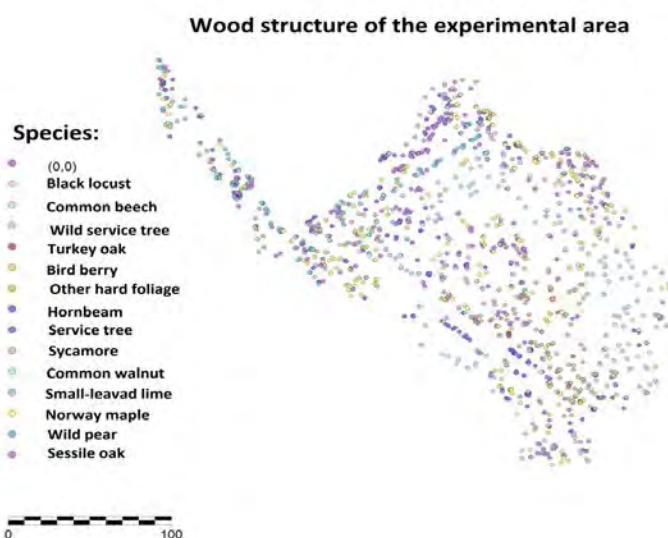


Figure 5. Tree species proportion on the plot

Summary

The history and the plants community of the forests deserves appreciation and attention. The previous woodcutting and the leeway of this activity significantly influenced the image of the fo-

rest. There are still very old beech trees and sessile oak trees in the forest but their renewal is complicated in the new competitive circumstances, without the human interference these trees will be suppressed. However, in the

meantime, a new, rich in species and closed plant-community evolved and spreaded slowly by itself. The observation of these two process could help to understand the unbidden forest dynamics in the long term.

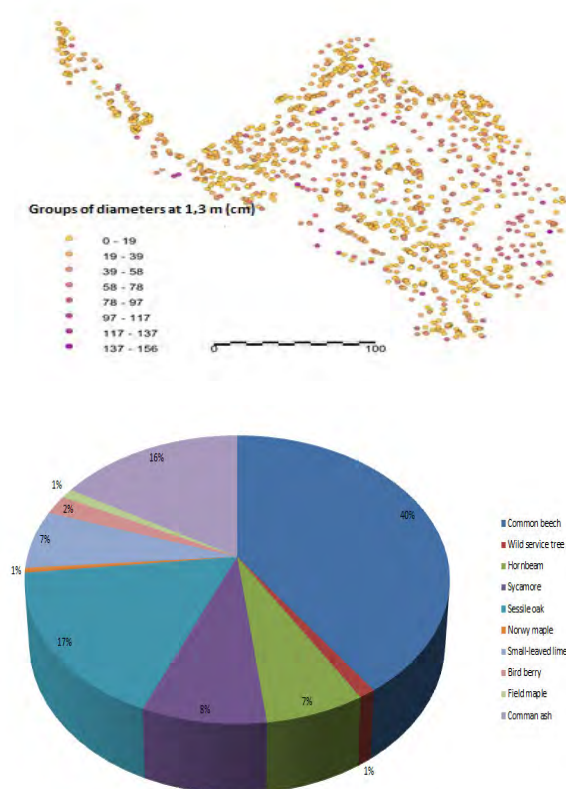


Figure 6. Groups of diameters at 1,3 m and species ratio over 50 cm diameter

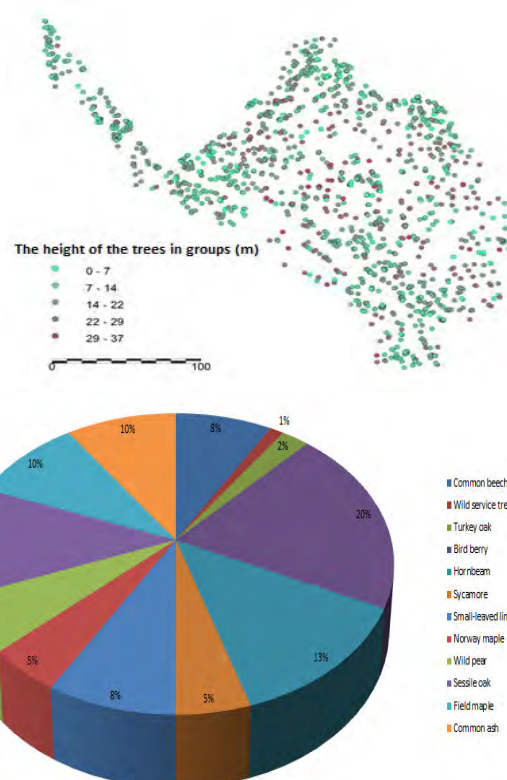


Figure 7. The height of the trees in groups and species ratio at deadwoods

УДК 630.232

Bernadett Tóth, Gábor Kovács, Bálint Heil
(Бернадет Тот, Габор Ковач, Балинт Хейль)
University of West Hungary
Faculty of Forestry
Sopron, Hungary
Западно-Венгерский университет,
Факультет лесного хозяйства
Шопрон, Венгрия

CHANGING FOREST STAND STRUCTURE MANAGEMENT IN THE PÁPA FOREST DISTRICT OF BAKONYERDŐ FORESTRY CORPORATION
(МОДИФИКАЦИЯ СОСТАВА ЛЕСООБРАЗУЮЩИХ ПОРОД ЗАО BAKONYERDŐ В ЛЕСНИЧЕСТВЕ PÁPA)

Были исследованы медленно растущие леса из робинии псевдоакации на площади 250 га в лесничестве Pápa ЗАО Bakonyerdő на трех пробных площадях (Egyházaskesző, Kemeneshőgyész, Magyargencs). Леса на выбранных ПП достигнут возраста рубки в течение следующего 10-летнего периода лесной таксации. Задачей работы было выяснение взаимосвязи между параметрами древостоя и индексами выхода древесины.

Introduction

We investigated weak growth black locust forests with an area of appr. 250 ha, in the Pápa Forest District of Bakonyerdő Ltd. stands around three territories (Egyházaskesző, Kemeneshőgyész, Magyargencs). Stands chosen will reach their felling age within the next 10-years-forest inventory period. Our goal was to evaluate the relationship between forest site parameters and yield index.

Material and methods

Forest inventory was based on geometric circle-sampling unit procedure. Timber volume (yield) was calculated with the bivariate function of Király. For site survey in each forest management unit a soil pit (51 pits) was opened for detailed description. From each of the four characteristic site-types soil samples were taken for laboratory measurements from 1 pit each, respectively.

Results

Although size and stand age of the individual forest plots varied, the low productivity of the sites and the low yields of the stands were common for the whole area investigated. Three-quarters of the stands had a root sprout origin with protection forest management goal. About 80 % of the stands were classified with the lowest yield class Nr. 6., and the rest of them reached only the second



Figure 1. Magyargencs 24C forestdetail
(forest management unit)



Figure 2. Egyházaskesző 19D forestdetail
(forest management unit)

lowest yield class Nr. 5. Single trees are characterized with low height and diameter at breast height, average yield reached only 70 m³ per hectare.

Main soil type was the Cseri-soil (skeletal Regosol), other three soil types (gleyic Fluvisol skeletal;

arenic Luvisol skeletal; arenic Luvisol) could be found with lesser extent. The skeletal Regosols are characterized with shallow rooting depth, high skeleton content and a strongly acidic soil pH (pH(H₂O) 4,5-5,6; pH(KCl) 3,4-4,3). The pH values of the gleyic Fluvisol were

higher (pH(H₂O) 7,6-7,8; pH(KCl) 7,0-7,4). Roots penetrate the upper soil only to a depth of 50 cm, limited by a cemented gravel layer. Water and air management of the soil is bad, water supply from groundwater is not given. During high precipitation periods upper.

Results

(Explanation: EK: Egyházaskesző, MG: Magyargencs, KH: Kemeneshőgyész, the three territories)

Number of soilpits	Forest detail (forest management unit)	Height (m)	Diameter-atbreastheight (cm)	Crosssection of treetrunk (m ² /ha)	Timber-volume (m ³ /ha)
1.	EK 19D	5,4	6,9	4,8	33,0
2.	EK 19A	13,2	14,3	11,8	94,1
3.	MG 31B	6,4	5,2	3,5	27,2
4.	MG 31A	7,1	6,4	6,3	40,8
5.	MG 30B	9,5	8,8	7,8	53,9
6.	MG 29F	12,7	13,9	12,1	94,2
7.	MG 30A	12,7	12,2	12,9	100,2
8.	MG 29D	12,4	11,8	12,1	93,6
9.	MG 36A	9,5	10,1	10,2	71,3
10.	MG 36B	8,3	8,4	8,7	58,2
11.	MG 28B	9,7	8,6	6,1	42,7
12.	MG 21A	12,7	11,8	12,0	93,7
13.	MG 28A	7,0	7,0	8,4	40,0
14.	MG 23B	11,1	10,0	6,8	50,4
15.	MG 27A	11,0	11,0	14,5	99,0
16.	MG 24C	8,1	8,2	7,4	49,6
17.	MG 27B	13,5	11,8	13,2	106,8
18.	MG 26C	9,9	13,3	12,5	86,5
19.	MG 18A	7,8	9,1	7,3	48,4
20.	MG 18C	7,3	9,8	6,5	42,5
21.	MG 24D	7,0	7,0	8,6	42,0
22.	MG 25B	6,2	8,0	6,5	43,0
23.	MG 8A	7,6	6,8	7,9	52,0
24.	MG 7E	11,4	10,7	12,5	92,7
25.	MG 7C	7,0	8,0	7,8	37,0
26.	MG 7I	3,0	2,0	0,0	7,0
27.	MG 6G	12,0	16,0	14,4	105,0
28.	MG 2D	9,0	9,0	13,1	75,0
29.	MG 2C	4,4	6,7	5,3	39,4
30.	MG 2B	6,0	6,0	7,5	34,0
31.	MG 2A	10,0	11,0	8,4	51,0
32.	MG 5B	6,0	6,0	7,7	34,0

End table

Number of soilpits	Forest detail (forest management unit)	Height (m)	Diameter-atbreastheight (cm)	Crosssection of tree trunk (m ² /ha)	Timber-volume (m ³ /ha)
33.	MG 1B	6,0	7,0	5,6	20,0
34.	MG 3B	9,0	11,0	12,6	73,0
35.	MG 7D	9,2	14,4	20,0	135,3
36.	MG 5D	6,0	5,0	5,3	24,0
37., 38.	MG 10B	12,7	11,5	12,5	98,3
39.	MG 15A	13,0	19,0	11,0	86,0
40.	MG 11C	18,3	15,9	16,0	155,3
41.	MG 14C	10,1	9,9	16,7	117,7
42., 43.	MG 11D	11,3	10,6	10,6	78,5
44.	MG 14B	11,7	11,8	13,6	101,3
45.	MG 13D	11,1	10,1	8,4	61,6
46.	KH 3C	6,6	6,9	9,8	64,2
47.	KH 4C	7,2	7,0	4,6	30,3
48.	KH 3B	8,1	8,6	10,4	69,2
49.	KH 4B	7,3	7,5	4,5	29,4
50.	KH 3A	7,9	7,9	7,6	50,4
51.	KH 4A	10,5	9,3	7,4	53,0



Figure 3. Egyházaskesző 19D forestdetail (forest management unit)



Figure 4. Kemeneshőgyész 3A forestdetail (forest management unit)

Summary

Our results showed, that – with one exception – all the sites have a low productivity 5th and 6th level yield class. Weak black locust stand growth can be explained probably by the unfavourable site properties for this tree spe-

cies. Most typical soil type was the “rusty-red cseri soil” (Haplic ARENOSOL Dystric, Skeletic, Arenic), with a compacted layer with more than 40 percent (by volume) of gravels within 100 cm from the soil surface, resulting in poor water balance. From the

acidified topsoil most nutrient are leached, nutrient supply capacity is low.

Among the site parameters and the yield class a systematical relationship was found. Greatest impact on the yield had the reduced rooting depth, correlations

are weak with humus content and estimated water holding capacity. Traditional forest site survey methods are not sufficient for accurate quantification of timber

yield. Estimations can be refined with a more precise measurement of gravel content, direct measurement of water holding capacity (pF-value) as well as by the

detailed evaluation of climatic data.

Based on the results, it is prudent to attempt the conversion of black locust stands to mixed deciduous stands.



Figure 5. Magyargencs 31B forestdetail (forest management unit)



Figure 6. Magyargencs 5D forestdetail (forest management unit)

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Melinda Váradi, Katalin Tuba
(Мелинда Варади, Каталин Туба)
University of West Hungary
Institute of Silviculture and Forest Protection
Sopron, Hungary
Западно-Венгерский университет,
Институт лесоводства и защиты леса,
Шопрон, Венгрия

THE FECUNDITY OF THE POPLAR LEAF BEETLE (*CHRYSOMELA POPULI* L. 1758) OVERWINTERING GENERATION UNDER LABORATORY CONDITIONS (ПЛОДОВИТОСТЬ ПЕРЕЗИМОВАВШЕГО ПОКОЛЕНИЯ ТОПОЛЕВОГО ЛИСТОЕДА (*CHRYSOMELA POPULI* L.) В ЛАБОРАТОРНЫХ УСЛОВИЯХ)

Тополевый листоед (*Chrysomela populi* L. 1758) – один из наиболее опасных вредителей в тополевых питомниках и в различных видах плантаций тополей по всей Европе. В работе была исследована плодовитость перезимовавшего поколения в лабораторных условиях. Перезимовавшие имаго были собраны в марте 2014 г. перед наступлением сезона спаривания. Парочки содержались при температуре 20 °C и фотопериоде 16:8 и выкармливались листьями гибридного тополя *Populus x euramericana* cv. Раппониа. В процессе исследования подсчитывалось количество яиц от каждой самки и их вес до и после яйцекладки. Представлены данные о количестве яиц и размере каждой яйцекладки, времени между яйцекладками и плодовитости имаго.

Abstract - The poplar leaf beetle (*Chrysomela populi* L. 1758) is one of the most important defoliator pest in the poplar nurseries and in the different type of poplar plantations all over Europe. In our trial the fecundity of the overwintering generation was investigated under laboratory conditions. The hibernated adults were collected in March 2014 before beginning of the breeding season. The pairs were kept in 20 °C under 16:8 photoperiod and they were fed with *Populus x euramericana* cv. Pannonia.

During the investigation we observed and counted the number of eggs by each female and measured the weight of them before and after the oviposition. The results represent the egg number and the size of each egg masses, the elapsed time among the ovipositions and the reproduction ability of the imagoes.

Keywords – *Chrysomela populi*, herbivore, overwintering generation, reproduction ability, oviposition, egg mass.

Introduction

The poplar leaf beetle (*Chrysomela populi* L. 1758) (Fig. 1) is one of the most important

defoliator pest in the short rotation coppice forests all over in Europe. It belongs to the family of *Chrysomelidae* with over 30 thousand species. Many of the Chrysomelids are responsible widespread for serious agricultural and forest damages. These pests are every time phytophagous species, the larvae and the imagoes both are feeding by the leaves of their host plant (Lopatin & Nesterova, 2005). In Middle Europe about 50 *Chrysomela* species causes losses by their feeding on the shoots of trees belonging to the family of *Salicaceae* (Urban, 1997).

Ch. populi causes serious problems in the nurseries as well as in the young forestations and plantations, too. Poplars and willows are the most common trees in short rotation coppice (SRC) in Hungary. The use of these fast growing species for bioenergy has attracted the attention, mainly in the European countries in the last decades. In these cases the most important duty of the forestry management is to ensure and also to optimize the mean annual growth.

The intensive plantations usually are monoclonal and due to that they are vulnerable by insects therefore successful forest mana-

gement cannot carry out in these fields without plant protection. That is why it is so important to get to know more about this pest's copulation and fecundity.

Material and methods

In our trial the fecundity of the overwintering generation was investigated under laboratory conditions. Laboratory studies were carried out from the end of March 2014. The samples were collected before the beginning of the breeding season. We made pairs from the samples randomly and the imagoes were placed in plastic cages. The chrysomelids were fed on shoots of *Populus x euramericana* cv. Pannonia. Petioles of the leaves were put in a holed Eppendorf tube covered by parafilm. The pairs were kept under 20 °C, 16:8 photoperiod. Through the daily monitoring, the date of the copulation and the number of eggs were recorded by 10 pairs.

Results

The results represent the egg number of each egg masses and the elapsed time among the ovipositions (Fig. 2.).

Considering our results one pair from the wintering generation is able to reproduce 2-5 times (in average 3,6 times) under their lifespan. An average egg mass consisted of 59 eggs under examined conditions. Comparing this results with data from other literatures we can say that this value match to them. According to Tillesse et al. (2007) one egg mass consists of 15-65 egg and they are settled usually in groups. In our research the eggs numbers were alternating the scale 1-64 by one clutch.



Figure 1. Feeding imagoes from the overwintering generation (left) and fresh egg mass (right)

Sometimes we observed extreme high egg numbers, but in these cases the females laid not in a single egg mass, she composed 2-4 separated groups. Urban et al. (2006) described that under laboratory conditions the clutches are divided into 2 or more part, that is why the number of eggs in clutches is lower than in nature. By them the size of the egg masses varied from 1 to 68.

Conclusions

Correlate with the climate change many of the species are reacting for the changing environmental conditions, also they are increasing their resistance through their reproductive strategy. That is why it is important to know, that a certain pest how behaves under different conditions.

In this paper we published our results only about one tempera-

ture but in our trial we are going to carry on further investigation under other temperatures (25 and 30 °C) to get to know more about the fecundity of this serious forest pest. With the help of the results we try to serve useful help for the forest management to optimize the plant protection in these vulnerable monocultural poplar forest.

Acknowledgments

This study was carried out in the program of the ТАМОР-4.2.2.B-11/1/KONV.

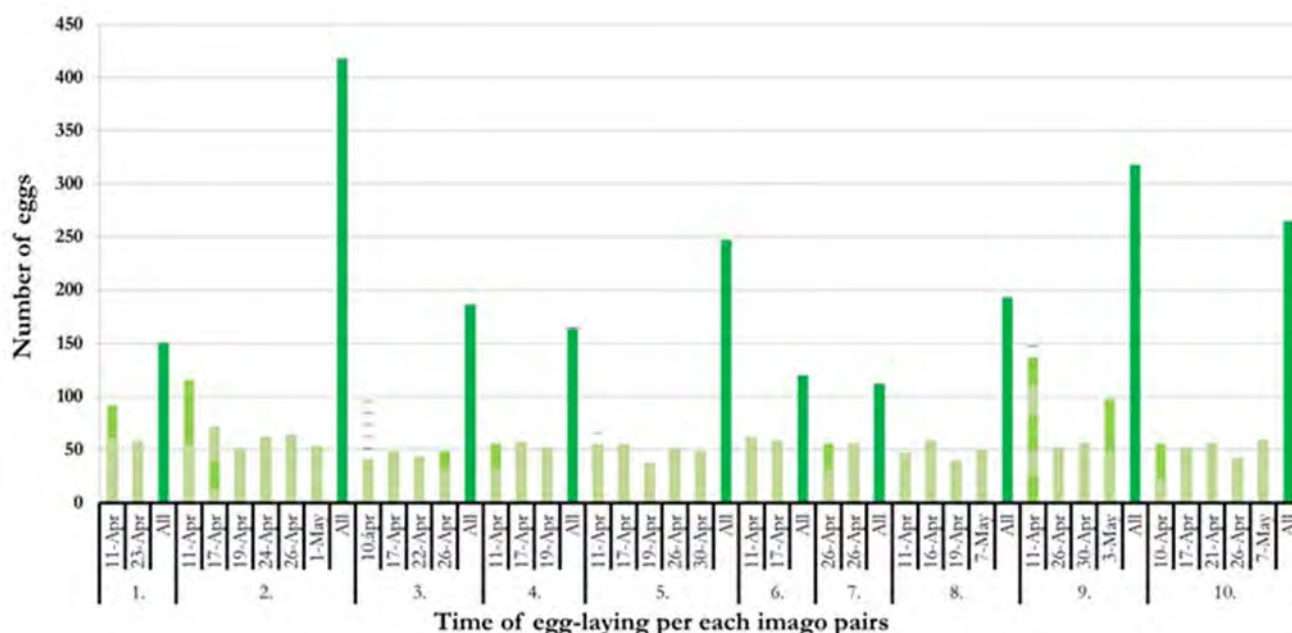


Figure 2. The reproduction rate of the overwintering generation under 20 °C

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Н.А. Луганский, В.Н. Луганский, Н.В. Луганский
(N.A. Luganskiy, V.N. Luganskiy, N.V. Luganskiy)

Уральский государственный лесотехнический университет, Екатеринбург
(Ural State Forest Engineering University, Yekaterinburg)

**СОСТОЯНИЕ ПРЕДВАРИТЕЛЬНОГО ВОЗОБНОВЛЕНИЯ
В КЕДРОВНИКАХ САЛЫМСКОГО ЛЕСНИЧЕСТВА (ХМАО-ЮГРА)
(THE CONDITION OF PRELIMINARY REFORESTATION IN THE CEDAR FORESTS
OF THE SALYM FORESTRY (KHANTY-MANSI AUTONOMOUS DISTRICT))**

Наши исследования посвящены вопросам предварительного возобновления в потенциальных кедровниках Салымского лесничества типов леса зеленомошно-ягодниковый и багульниково-брусничный. Изучены состояние подроста, его встречаемость, а также возрастная и высотная структуры. Проведена оценка успешности естественного возобновления под пологом древостоев с различными лесоводственно-таксационными показателями.

We have studied some questions related to the preliminary reforestation development laws in potential cedar forests of the Salym forestry. The study was conducted in green moss-berry and ledum-cranberry types of cedar forests. Condition of preliminary reforestation, its occurrence, structure of heights and ages have been reviewed in this article. Evaluation of preliminary reforestation success is represented too.

По комплексному районированию Тюменской области территория ТУ Салымское лесничество относится к подзоне среднетаежных лесов Обь-Иртышской лесорастительной провинции Среднеобского лесохозяйственного района (Смолонгов, Вегерин, 1980). По схеме лесорастительного районирования Западной Сибири лесничество входит во вторую лесорастительную зону средней тайги,

в подзону кедрово-сосновых заболоченных лесов.

Исследования возобновления проводились в Куть-Яхском участковом лесничестве на ВПП, заложенных в насаждениях кедрово-зеленомошно-ягодникового и бруснично-багульниково-брусничного типов леса.

Лесоводственно-таксационная характеристика древостоев ВПП (по данным лесоустройства) рассмотрена в табл. 1.

Из представленных данных видно, что древостои произрастают по 4 бонитету, имеют полноту от 0,5 до 0,7. Они отличаются составом, доля кедра сильно колеблется от 3 до 7 единиц. В составе также представлены ель, пихта, берёза. Возраст спелых древостоев отличается незначительно – 210–220 лет. Запас варьирует от 240 до 310 м³/га.

Анализ естественного возобновления проводился методом

Таблица 1

Таксационная характеристика временных пробных площадей

Номер ВПП	Состав древостоя	Средняя высота, м	Средний диаметр, см	Возраст, лет	Класс возраста	Бонитет	Полнота	Тип леса	Запас на 1 га, м ³
1	4К2Е2П2Б	22	24	220	6	4	0,7	змяг	250
2	3К2Е1П2Б2Ос	20	28	220	6	4	0,5	змяг	240
3	4К2Е4Б	21	30	220	6	4	0,5	бгб	240
4	3К2Е1П2Б2Ос	22	30	220	6	4	0,5	змяг	280
5	3К2С1Е2Б2Ос	21	28	220	6	4	0,5	змяг	260
6	7К2Е1Б	22	30	210	6	4	0,6	змяг	310
7	5К2Е3Б	22	32	210	6	4	0,6	змяг	310

учетных площадок (Побединский, 1966), которые закладывались по трансектам в шахматном порядке в количестве 20–25 шт. размером 2х2 м.

Жизнеспособность (благонадежность) подроста варьирует и достигает наименьших значений на ВПП 1, где составляет 65,5% от общего количества, нежизнеспособного 8,7, а сомнительного 25,8%. Данные показатели отмечаются под пологом древостоев с полнотой 0,7 и выше. В этом случае относительная полнота может выступать лимитирующим фактором в росте и развитии подроста предварительной генерации. Наибольшее количе-

ство жизнеспособного подроста (6,5 тыс.шт./га, или 81,3% от общего) наблюдается на ВПП 4. Высокие показатели жизнеспособности выявлены на ВПП 2, где количество жизнеспособного подроста более 5,6 тыс.шт./га, или 78,8%. Аналогичная ситуация наблюдается на ВПП 3, где жизнеспособного подроста 5,1 тыс.шт./га, или 78,7% от общего количества. На ВПП 5 жизнеспособный подрост составляет 5,0 тыс.шт./га, или 75,4% от общего его количества. Относительная полнота на ВПП 2–5 – 0,5–0,6.

В табл. 2 рассмотрена общая характеристика подроста на ВПП.

Из представленных данных видно, что общее количество жизнеспособного подроста на ВПП составляет от 3,8 (ВПП 6) до 6,5 (ВПП 4) тыс.шт./га. На долю хвойных приходится 70–100, а кедра – 30–50 %. Наиболее крупный подрост кедра располагается на ВПП 1 (1,04 м), а также ВПП 7 и 6 (0,99 м) при среднем возрасте 10 лет.

Таким образом, полнота материнского древостоя 0,5 и ниже наиболее комфортна для формирования хвойного подроста предварительной генерации. Доля участия хвойных пород в составе древостоев в 5–6, а кедра в 3 ед. является достаточным в обеспе-

Таблица 2

Общая характеристика жизнеспособного подроста на ВПП

Номер ВПП	Состав	Общее количество, шт./га	Встречаемость, %	Средние по главной породе		
				Порода	Средний возраст, лет	Средняя высота, м
1	3К 5Е 2П Итого	1440 2400 1440 5280	64	Кедр	10	1,04
2	4К 4Е 2П Итого	2240 2240 1120 5600	69	Кедр	12	0,96
3	3К 4Е 3Б Итого	1530 2040 1530 5100	66	Кедр	10	0,81
4	4К 3Е 3П Итого	2600 1950 1950 6500	71	Кедр	10	0,90
5	5К 3Е 2П Итого	2500 1500 1000 5000	65	Кедр	10	0,85
6	4К 6Е Итого	1520 2280 3800	58	Кедр	10	0,92
7	3К 5Е 2П Итого	1290 2150 860 4300	63	Кедр	10	0,99

чении естественного возобновления под их пологом. Для оценки успешности естественного возобновления проводился подробный анализ его количественных и качественных показателей (Правила лесовосстановления, 2007).

На данных ВПП возобновление имеет состав с преобладанием кедра до 4 ед., с участием ели до 5 ед., пихты до 2 единиц.

Встречаемость подроста на ВПП 1–5 и 7 составляет от 63 до 71 %, что позволяет оценить возобновление для свежих типов леса как успешное, а размещение подроста как равномерное. Чётких зависимостей количественных и качественных характеристик подроста от лесоводственно-таксационных показателей древостоев, в том числе от их состава, не выявлено. Оптимальная относительная полнота материнского полога, предположительно, составляет 0,6. В типе леса багульниково-брусничном наблюдается возрастание доли участия берёзы в составе подроста. В целом предварительное возобновление оценивается как недостаточное. Данный факт объясняется большей конкурентоспособностью мягколиственных пород по отношению к живому напочвенному покрову на более трофных почвах. При этом возобновление хвойными оценивается как удовлетворительное по кедру (более 1 тыс. шт./га), но недостаточное по ели и пихте (менее 2 тыс. шт./га).

В табл. 3 рассмотрена высотная структура хвойного подроста.

Из представленных данных видно, что на ВПП 2 и 5 предва-

рительное возобновление протекает успешно по кедру (более 1,5 тыс. шт./га в пересчёте на крупный), а на ВПП 1, 2, 4 – по ели и пихте (более 2,5 тыс. шт./га). Доля участия в формировании возобновления мелкого подроста варьирует от 19,6 (ВПП 3) до 31,4 и 31,6 % (ВПП 7 и 6). Меньше его накапливается в типе леса багульниково-брусничном, где конкуренция с живым напочвенным покровом велика. В кедровниках зеленомошно-ягодниковых участие мелкого подроста больше при полноте 0,6, что свидетельствует о благоприятных условиях для него под пологом среднеполнотных древостоев. Наибольшее количество подроста ели и пихты отмечено при полноте 0,7 и выше, а кедра 0,6 и ниже, что определяется биологическими особенностями пород.

В результате наших исследований сделаны следующие выводы.

1. Лесорастительные условия района обуславливают возможность формирования ценных насаждений с участием кедра 3 ед. и более средней производительности.

2. В большинстве случаев предварительное возобновление под пологом потенциальных кедровников обоих типов леса идёт успешно или удовлетворительно кедром, а в целом хвойными успешно. Состояние и доля участия кедра в нём являются достаточными для обеспечения непрерывности лесообразовательного процесса.

3. Полнота материнского древостоя 0,5 и ниже наиболее комфортна для формирования хвойного подроста предварительной генерации. Доля участия хвой-

ных в составе древостоев 5–6, а кедра 3 ед. и более обеспечивают устойчивое возобновление хвойными.

4. В кедровниках зеленомошно-ягодниковых участие мелкого подроста больше всего насчитывается при полноте 0,6, что свидетельствует о благоприятных условиях для него под пологом среднеполнотных древостоев. Наибольшее количество подроста ели и пихты отмечено при полноте 0,7 и выше, а кедра 0,6 и ниже, что определяется биологическими особенностями данных пород.

5. Встречаемость подроста на ВПП 1–5 и 7 варьирует от 63 до 71 %, что позволяет оценить возобновление как успешное, а размещение подроста как равномерное. Чётких взаимосвязей характеристик подроста от лесоводственно-таксационных показателей древостоев не выявлено.

6. В типе леса багульниково-брусничном наблюдается возрастание доли берёзы в составе подроста, что объясняется большей конкурентоспособностью мягколиственных пород в сравнении с хвойными по отношению к живому напочвенному покрову на более трофных почвах. При этом возобновление хвойными оценивается как удовлетворительное по кедру (более 1 тыс. шт./га), но недостаточное по ели и пихте (менее 2 тыс. шт./га).

7. С учётом общей оценки успешности возобновления кедром на ВПП 1, 3, 4, 6, 7 сохранение подроста и минерализация почвы площадками являются достаточными и эффективными мерами содействия.

Таблица 3

Распределение хвойного подроста по высотным группам, тыс. шт. на га

Номер ВПП	Порода	Количество подроста по высотным группам, м				В пере- счете на круп- ный	Оценка возобновления
		до 0,5	0,51-1,0	1,1-1,5	>1,6		
1	Кедр	0,30	0,32	0,31	0,51	1,16	Удовл. по кедру Успешн. по ели и пихте
	Ель	0,70	1,00		0,70	1,85	
	Пихта	0,20	0,40	0,40	0,44	1,10	
Итого		1,20	1,72	0,71	2,05	4,11	
2	Кедр	0,60	0,40	0,42	0,82	1,78	Успешн. по кедру Успешн. по ели и пихте
	Ель	0,70	0,81		0,73	2,08	
	Пихта	0,40	0,31		0,51	0,96	
Итого		1,7	1,52	0,42	2,06	4,81	
3	Кедр	0,30	0,20	0,44	0,60	1,26	Удовлет. по кедру Недост. по ели и пихте
	Ель	0,70	0,40	0,24	0,70	1,45	
Итого		1,00	0,66	0,68	1,30	2,89	
4	Кедр	0,45	0,55	0,80	0,80	1,23	Удовлет. по кедру Успешн. по ели и пихте
	Ель	0,70	1,05		0,85	2,04	
	Пихта	0,60	0,72		0,63	1,51	
Итого		1,55	2,32	0,80	2,28	5,28	
5	Кедр	0,65	0,65	0,40	0,80	1,96	Успешн. по кедру Недост. по ели и пихте
	Ель	0,40	0,60		0,50	1,18	
	Пихта	0,40	0,30		0,30	0,74	
Итого		1,45	1,55	0,40	1,60	3,9	
6	Кедр	0,40	0,41	0,21	0,50	1,20	Удовл. по кедру Недост. по ели
	Ель	0,80	0,82		0,76	1,82	
Итого		1,20	1,23	0,21	1,26	3,01	
7	Кедр	0,25	0,30	0,45	0,29	1,02	Удовл. по кедру Удовл. по ели и пихте
	Ель	0,90		0,82	0,43	1,54	
	Пихта	0,20	0,32		0,34	0,70	
Итого		1,35	0,62	1,27	1,06	3,25	

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D.S. Maleeva, I.V. Shevelina

(Д.С. Малеева, И.В. Шевелина)

Ural State Forest Engineering University, Yekaterinburg

(Уральский государственный лесотехнический университет, Екатеринбург)

ESTIMATION OF THE SANITARY STATE OF THE PINE TREES BY ELECTROPHYSICAL METHOD IN URBAN PLANTINGS OF YEKATERINBURG

(ОЦЕНКА САНИТАРНОГО СОСТОЯНИЯ СОСНОВЫХ ДЕРЕВЬЕВ ЭЛЕКТРОФИЗИЧЕСКИМ МЕТОДОМ В ГОРОДСКИХ НАСАЖДЕНИЯХ ЕКАТЕРИНБУРГА)

The scale estimation of sanitary state categories by using Electrophysical Method for pine Trees Urban Plantings of Yekaterinburg are presented in the article.

Представлена шкала оценки категорий санитарного состояния для деревьев сосны обыкновенной на основе электрофизического метода в насаждениях Екатеринбурга.

Introduction

At present the sanitary state of trees is generally assessed visually. The parameters to consider are crown condition, foliage (needle-foliage) condition, the degree of insect and phyto-infestation, physical damage, etc. Identifying these parameters is based on subjective perception rather than qualitative parameters.

It has been stated in specialist literature that one needs to develop more objective methods of tree health assessment. Among other things it has been suggested to assess the sanitary state by thermal and electrophysical parameters (Kashiro, 1970, Matorkin A.A, 2009, et al).

We believe that the electrophysical method is especially noteworthy. It is based on measuring electrical impedance of plant stem cambial zone. This parameter is mostly contingent on water content of tree organs. This method provides rather objective assessment of plants without damaging their tissues or breaking their ontogenically determined interaction.

Aim of the study

The research aims at developing a scale to determine tree sanitary

state categories using electrophysical parameters which increase assessment accuracy and objectivity during the inventory of urban green space elements.

Materials and methods

The field research was conducted in natural pine stands located in various parts of Yekaterinburg (pocket parks, parks and woodland parks). The average age of pine forest ranges between 120 and 140 years. During Stage 1 sample trees of various sanitary states were selected in the stands under study. Their sanitary state categories were determined visually using a corresponding scale. There were the following categories: healthy trees (category 1), weakened trees (category 2), highly weakened trees (category 3), drying out trees (category 4), dead standing trees (category 5). To achieve the objective 107 sample trees were selected. Their sanitary state category distribution is shown on Table 1.

During stage 2 each sample tree was measured at four different frequencies (1kHz, 10kHz, 100Hz, 120Hz) to determine electrical impedance (R, ohm), an electrophysical parameter of the cambial zone, using the RLC Aktacom-3123

measuring device with a custom-made test probe at a height of 1.3 m above the butt at four cardinal directions. Before that, small 2 by 2-square-centimeter sample areas had been prepared. The test probe was stuck in about 13 mm deep. The distance between test probe contact points was 1 cm.

Discussion

While processing the experimental data we solved the following methodological problems:

1) Which cardinal direction is most suitable for measuring?

We analyzed data obtained by the RLC Aktacom-3123 measuring device at every frequency at four cardinal directions and found out that there is no correlation between cardinal directions and the parameters measured. Hence we may conclude that one can take measurements at any direction, but it ought to be the same with every tree at a given site.

2) Another methodological problem to solve was at which height and which frequency we are to take measurements.

For this we used the E7-25 impedance measurement device with a range between 25 hertz to 1000 kilohertz. The device works

Table 1

Sample trees distribution on various objects by grade of sanitary state

№	Location of objects of study	Number of user trees by grade of sanitary status				Total
		1	2	3	4	
1	Square (Mashinostroiteley street)	-	1	11	3	15
2	Kalinovskii WoodLand Park	3	13	1	2	19
3	Square (Iasnia street)	-	7	-	3	10
4	Shyvakhishskii WoodLand Park	20	22	4	-	46
5	natural pine stand (district of Sortirovka)	-	1	12	1	14
6	natural pine stand district of Akademicheskii	-	1	2	-	3
	Total	23	45	30	9	107

in the automatic mode with a computer. Slide 10 shows this computer-supported operation. After the test probe contact points had been inserted in the bast all we had to do was run custom software so that the measuring device could read and record electrical impedance R and capacity C at recommended frequencies. Using the data obtained, hodographs were plotted in special program. The hodograph data and the data file analysis prove that the optimal measurement frequency is 10 kilohertz. We came to the conclusion that a frequency of 10 kilohertz is to be used for further research.

3) The next stage was to develop scale to determine tree sanitary state categories.

Using the STATISTICA 10 software the main statistical parameters were calculated: mean, standard deviation, variation coefficient, precision for electrophysiological parameter R for all sanitary state categories (Tab. 2).

Analyzing the Tab. 2 we can conclude that there is a correlation between and sanitary state category, wood moisture content and electrical impedance R. The worse the tree sanitary state is, the higher

the electrical impedance. That is why a preliminary sanitary state category assessment scale was developed using the electrophysical parameter R. The scale is shown on Tab. 3. Using the scale we can assume that the value of electrical impedance for category 1 trees is up to 7 kOhm, that for category 2 trees is between 7 and 11 kOhm, and that for category 3 trees is

between 11 and 20 kOhm. Category 4 is assigned to trees with values over 20 kOhm.

Resume

The recommendations and the scale make it possible to determine with more accuracy sanitary state categories for pine trees. Further research can be conducted for other local species as well.

Table 2

Basic Statistics for Electrical Impedance

Sanitary state category	Basic Statistics for R, Ohm				
	mean value	standard deviation	min. value	max. value	precision of the experiment, %
1	6912	164	5600	8200	2.4
2	8756	267	7525	11500	3.0
3	11302	640	9275	15475	5.7
4	370499	9326	23575	3334490	2.5

Table 3

Preliminary sanitary state category assessment scale for pine trees by electrical impedance

Sanitary state category	Electrical impedance (R, Ohm)
1	less than 7000
2	7000-11000
3	11000-20000
4	over 20000

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С.Л. Менищikov
(S.L. Menshikov)

Ботанический сад УРО РАН, Екатеринбург
(Botanical garden, Ural branch of RAS, Yekaterinburg)

**УСТОЙЧИВОСТЬ ЛЕСНЫХ НАСАЖДЕНИЙ К АЭРОТЕХНОГЕННОМУ ЗАГРЯЗНЕНИЮ
В ЗАВИСИМОСТИ ОТ СТРУКТУРЫ, ВОЗРАСТА, СОСТАВА ДРЕВОСТОЕВ
И УСЛОВИЙ МЕСТОПРОИЗРАСТАНИЯ
(RESISTANCE OF FOREST PLANTATIONS TO AIR POLLUTION DEPENDING
ON THE STRUCTURE, AGE AND SPECIES COMPOSITION
OF FOREST STANDS AND SITE CONDITIONS)**

Установлено, что устойчивость лесных насаждений к аэротехногенному загрязнению зависит от структуры, возраста, состава древостоев и условий местопроизрастания. Полученные данные свидетельствуют о значительном ухудшении состояния лесов под воздействием аэротехногенного загрязнения в неблагоприятные по климатическим условиям периоды. Устойчивость лесов к выбросам в это время снижается. В такие периоды, как правило, проявляется эффект так называемого «накопленного воздействия» в условиях хронического аэротехногенного загрязнения.

It was found that the stability of forest stands to air technogenic pollution depends on the structure, age and composition of stands and site condition. The obtained data confirm that in adverse climatic conditions significant deterioration of forests occurs under the influence of air technogenic pollution. Stands resistance to emissions is reduced during such periods. During such periods the effect of the so-called "accumulated impact" in conditions of chronic air technogenic pollution is found as a rule.

Исследования в районах крупных промузлов на Урале показывают, что под влиянием аэротехногенных выбросов развитие лесных насаждений сопровождается снижением их общего биологического разнообразия, продуктивности, а также упрощением структуры, изменением круговорота химических элементов. Наблюдается торможение как продукционных, так и деструктивных процессов.

В зоне сильного поражения СУМЗа, например, насаждения находятся в V (последней) стадии дистрессии.

Условия местопроизрастания. На местностях с сильно выраженным рельефом, особенно в бореальных лесах, состояние кроны деревьев в значительной степени зависит от влияния ветров, поэтому предлагают при закладке ППП выделять четыре топографические положения:

- 1) вершина (верхняя часть холма, плато с уклоном менее 20°);
- 2) склон (уклон более 20°);
- 3) терраса или плоский склон (уклон менее 20°);
- 4) равнина, долина и т.п. (Лесиньски, Армолайтис, 1992).

Исследования состояния елово-лиственничных лесов и редколесий в зоне действия Норильского горно-металлургического комбината (НГМК) показали, что устойчивость древостоев зависит

и от их местоположения. Состояние древостоев, расположенных на склонах, закрытых от ветров со стороны Норильска, лучше. В качестве примера можно привести древостой на постоянной пробной площади (ППП) Ю-14, расположенный на склоне, открытом для северо-восточных ветров, где средняя категория жизненного состояния лиственницы (по шестибальной шкале) в 1990 г. – 5,1, а на ППП Ю-22, УП-2 и 3, расположенных на подветренных склонах – 4,2, 3,5, 3,9 соответственно (Менщиков, Ившин, 2006). В этом же районе, в долине р. Кета-Ирбо (в 5 км от ППП Ю-14), хорошо защищенной от северо-восточных ветров (со стороны Норильска) горным хребтом, можно встретить древостой без визуальных признаков повреждения.

Повышение температуры воздуха, так же как и относительной влажности воздуха, приводит к понижению устойчивости растений (Rist, Davis, 1979). В темноте растения очень устойчивы к SO_2 , но с увеличением освещенности становятся более чувствительными (Mukammal, 1976). При оптимальном содержании питательных веществ в почве повышается устойчивость растений к действию загрязнителей или, по крайней мере, улучшается их восстановление и состояние после экспозиции. Иначе говоря, устойчивость лесных насаждений к аэротехногенному воздействию в значительной степени зависит от условий местопроизрастания и от возраста древостоев. Например, в зоне действия НГМК состояние лесов, расположенных на водоразделе (ППП Ю-38), значительно хуже (сухих

и усыхающих деревьев – 98,4 %), чем расположенных в долинах озера Кета (ППП Ю-14 и Ю-22: сухих и усыхающих деревьев 54,5–76,0 %) и реки Туколана (ППП Ю-1 – 66,7 %), хотя аэротехногенная нагрузка здесь больше (активность SO_2 в 1989 г. – 0,73, а в 1990 г. – 1,47 мг/дм³ в сутки). Количество деревьев лиственницы 4–6 категорий жизненного состояния в древостоях на ППП с более худшими лесорастительными условиями (мелкие малоплодородные почвы верхних склонов) за 5-летний срок наблюдений с 1986 г. увеличилось почти на 20, ели – 6–22, березы – до 22 %. Значительно лучше состояние древостоев на ППП Ю-2 и ППП Ю-4 (на достаточно плодородных почвах в долине оз. Малое Хантайское) – количество деревьев лиственницы 4–6 категорий увеличилось лишь на 4, ели – на 17 %.

Возраст. Устойчивость деревьев к аэротехногенному воздействию зависит и от их возраста. Исследования на ППП в районе Норильска показали, что при одинаковой аэротехногенной нагрузке в более молодых лиственных древостоях (115 лет, ППП Ю-24) сухих и усыхающих деревьев 54,5 %, а в 235-летних древостоях (ППП Ю-14) – 76,0 % (расстояние между данными ППП – 500 м). Средняя категория состояния одновозрастного древостоя на ППП Ю-24 – 3,7, а разновозрастного с преобладанием перестойных деревьев на Ю-14 – 5,1, хотя отпад на Ю-24 и Ю-14 в 1987–1990 гг. был примерно одинаковым – 8,8 и 9,9 %. В древостоях с преобладанием перестойных деревьев в зонах с одинаковой аэротехногенной

нагрузкой отпад деревьев начинается раньше и протекает более интенсивно, чем в средневозрастных.

Для ели показательна в данном аспекте ППП Ю-1, где у ели хорошо выражены два яруса. В I ярусе (средний возраст ели 220 лет) сухих и усыхающих деревьев 29,6 %, в то время как во II ярусе (средний возраст 70 лет) все деревья только 1–3 категорий жизненного состояния.

Неблагоприятные климатические условия. Наблюдениями установлено, что неблагоприятные климатические условия вегетационного сезона прошлого года способствуют увеличению отпада в древостоях. Так, после холодного лета 1989 г. на следующий год был зафиксирован максимальный отпад лиственницы за все годы наблюдений на десяти ППП и УП из 13 (где проводилось повторное обследование в 1990 г.). На двух ППП отпад оказался равен отпаду за 1989 г. и лишь на ППП Ю-22 оказался значительно меньше, чем в предыдущем году. На 4 из 9 повторно обследованных ППП с участием ели в составе отмечен максимальный отпад за все годы наблюдений (на трех ППП отпад не был зафиксирован за весь период наблюдений). Максимальным за весь период наблюдений был отпад березы на ППП Ю-1 и Ю-22, где фиксировалось ее состояние.

Доказательством воздействия неблагоприятных климатических условий сезона на состояние лесных насаждений в условиях аэротехногенного загрязнения служит ухудшение состояния основных древостоев (наблюдалось повышение дехромации хвои

сосны до 30–40 %) на ППП в регионе Среднего Урала в 1993 г. после обильного снегопада в конце мая (Менщиков и др., 1997). Этот факт подтверждают данные по динамике состояния древостоев на ППП в Рефтинско-Асбестовском районе. Через

два года ситуация на ППП опять стабилизировалась, и динамика жизненного состояния древостоев вернулась к прежнему уровню.

Таким образом, приведенные данные свидетельствуют о значительном ухудшении состояния лесов под воздействием

аэротехногенного загрязнения в неблагоприятные по климатическим условиям периоды. Устойчивость лесов к выбросам в это время снижается. В такие периоды, как правило, проявляется эффект так называемого «накопленного воздействия».

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E.S. Mikhailov
(Е.С. Михайлов)

Ural State Forest Engineering University, Yekaterinburg
(Уральский государственный лесотехнический университет, Екатеринбург)

GREENING OF LOWER SURFACES OF URBAN CONSTRUCTIONS (ОЗЕЛЕНЕНИЕ НИЖНИХ ПОВЕРХНОСТЕЙ ГОРОДСКИХ СООРУЖЕНИЙ)

Cities are three-dimensional systems. Nowadays, we use mainly illuminated by the sun vertical surfaces for landscaping. Large effective area for landscaping is not applied. Inverted landscaping can change that situation. Appropriateness of inverted technique is well supported by calculations of potential areas of landscaping on not vertical or shaded sites.

Города являются трехмерными системами. В настоящее время для озеленения используются преимущественно освещаемые солнцем горизонтальные поверхности. Большие площади, пригодные для озеленения, не используются. Это поверхности, обращенные вниз, к земле. Перевернутое (инвертированное) озеленение способно изменить ситуацию. Целесообразность применения этого метода озеленения подтверждается расчетами доступной площади.

Introduction

Urban construction of any type provide a lot of utility area for many purposes. The area of the cities is limited. If there is a need

to add an element, it can be done in different ways. It is possible to cut down other objects or to remove some of them. Therefore, if we reduce, for example, the area of

lawns for carriageway expansion, efficiency of transport system will increase, but the ecological condition on the transformed site can be worsen considerably. Other option

is using new levels, up or down. Skyscrapers, multi-level parking, tunnels, bridges have large area, which is inconvenient for using on floors lower surfaces.

Inverted plants' benefits

There is an opportunity to use multi-level objects for providing the city with gardening. Thus, plants can be placed on a reverse side of occupied sites, which is under them. Use of this reception is limited, but the advantage of it can be considerable.

It is known, that the plant reaches in the direction of light source. Thus, roots develop in an opposite direction. Plants have to be close to surface edge of multilevel construction to receive a diffused light.

Some advantages of this landscaping method are:

- Good appearance of plant band along the floor or wall edge;
- An opportunity to place a lot of plants on sites where is no free

space for standard landscaping approach;

- Inverted plants and vertical gardens are quite simple way of environment ecological improvement;

- Plant protection from human impact by reducing physical contact with plants and tree trunk sites

Complexity of the application of technology

Inverted plants, as usual ones, require water and nutrients. There is a risk of drying or lack of nutrients while planting technology is not tested in different conditions. Anyway, it takes load calculations for provide construction safety.

Other requirement refers to light intensity. Shade-enduring plants well develop at illumination 500-800 lux. It is possible to observe such indicators at distance about 2 meters from an aperture. Using of illumination allow to use all suitable area (fig. 1).

Unfortunately, lighting is not a single problem of inverted landscaping. It takes water to plants growing. It is not difficult to create a special irrigation system for plants from the technical point of view. That is so expensive. Rainwater in cities may contain too many pollutants when it washes dust from buildings and pavements. Theoretically, there are at least two possible ways of water providing: using tap water or creating watersheds that do not collect water from pavements.

Calculations

In a pair of round-drives of a five-floor parking with an open top floor can be located about 1810 square meters of green plantings in case the external radius of round drives will be equal 25 meters (Irmscher, 2013).

Available area can increased, without resorting to artificial lighting if to use light coverings and



Fig. 1. Useful area of multi-level parking.

reflecting light. The reflection coefficient of asphalt is about 0.07, and light-gray concrete is 0.6 (Karlen, 2007). The useful area thus will increase. Use of illumination will allow using all area of a parking. Total area will depend on the sizes of the main unit of a construction. So, when using ceilings on four floors and drives on three floors, the parking on 700 places will contain nearly 9500 square meters of plants. Such quantity can suffice for gardening of a small street or a square.

Conclusions

The technology of considered gardening type creation is similar to cultivation on vertical surfaces. Distinctions are only in system of support of plants. Patrick Blanc

created a set of vertical compositions (fig. 2) with polyamide felt, which has a number of merits (Blanc, 2008).

Proceeding from the aforesaid, it is possible to draw the following conclusions:

- large area is available to the inverted plants;
- multilevel constructions are capable to contain more greening, than streets at the same area in a horizontal projection;
- there are the available technologies which are necessary for creation of inverted systems of gardening.

As practice shows, interior and garden plants, grow well in the turned condition. Therefore, further work on this subject should be direct on selection of the plants

suitable for street gardening in different climatic and ecological conditions.

There are many unoccupied and appropriate constructions for greening in cities. Inverted systems have a great potential. That technology can be also used in horticulture because of considerable space saving. Other advantage is no need to use light reflectors, which loose part of energy that can be noticeably for large growing volume.

It is necessary to develop a support system for large plants and to conduct experiments before wide application of the technique.

Using walls and floors for growing is the great way to improve the environment (Korson-Knowels, 2012), and it is logically to expand to new spaces.



Fig. 2. Vertical garden by Patrick Blanc.

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*R. Mullagalieva, N. Lugansky, V. Lugansky
Р. Муллагалиева, Н. Луганский, В. Луганский
Ural State Forest Engineering University, Yekaterinburg
(Уральский государственный лесотехнический университет, Екатеринбург)*

THE COMPOSITION AND PROPERTIES OF THE OB FLOODPLAIN (СОСТАВ И СВОЙСТА ПОЧВ ПОЙМЫ Р. ОБЬ)

Particle-size distribution and mineralogical composition of soils were studied for each mineral soil horizon of each soil pit (the total number of samples is 13).

The mineralogical composition of soils near Nizhnevartovsk is represented mostly by primary minerals of the silica group including quartz, chalcedony, opal. Their content is 80–90%. Secondary clay mineral content is insignificant (1–5%). Soils formed on smooth relief minerally differ from those of floodplains.

Soils near Nizhnevartovsk compare favourably with background characteristics of zonal podzol soils, including pH_{KCl} reactions, hydrolytic soil acidity, total exchangeable cations, soil saturation, phosphorus and potassium content. This is due to the alleviation processes, such as silt particle accumulation in parent rock.

Agrochemically, gley podzol soils are between representative podzol soils and soddy gley soils, where soddy gley soils have the highest trophic factor.

Изучение гранулометрического и минералогического состава почв производилось для каждого минерального почвенного горизонта каждого почвенного шурфа (общее количество образцов 13).

Минералогический состав почв Нижневартковского района представлен в основном первичными минералами группы кремнеземов, в том числе кварцем, халцедоном, опалом. Они составляют до 80–90%. Вторичные глинистые минералы представлены незначительно (1–5%). Почвы, сформированные на ровных поверхностях, в минеральном отношении отличаются от пойменных почв.

Показатели почвы Нижневартковского района отличаются от фоновых показателей для зональных подзолистых почв, в том числе реакциями pH_{KCl} , гидролитической кислотностью, суммой обменных катионов, степенью насыщенности почв и обеспеченностью фосфором и калием в лучшую сторону. Данный факт обусловлен аллювиальными процессами, в том числе накоплением илистых частиц в материнских породах.

В целом глеево-подзолистые почвы по своим агрохимическим показателям занимают промежуточное положение между типичными подзолистыми и глеево-дерновыми. Наиболее высокотрофными из них являются глеево-дерновые.

Particle-size distribution and mineralogical composition of soils were studied for each mineral soil horizon of each soil pit (the total number of samples is 13).

The Rutkovsky's method was used to analyze particle-size distribution of the soil samples from key sites. The method is based on the swelling capacity of clay particles of soils and grounds when put in water. The clay particle content of the analyzed samples can be calculated using the following empirical formula:

$$x = 22.7K, \quad (1)$$

where x is clay particle content;
 K is increased soil volume per 1 cm³ compared to the original soil volume.

After the volume has been calculated the bottom sediment is put into a porcelain dish and dried using an asbestos-covered electric heater. Then the 0.5–0.05 mm fraction material is examined using a binocular microscope (or magnifier). Then the fraction material of less than 0.05 mm is

examined and the mineralogical composition of these fractions is determined.

Clay fraction content (particle size is less than 0.005 mm) is calculated using the following formula:

$$K_v = (V_1 - V_0)/V_0, \quad (2)$$

where K_v is increased volume per 1 cm³;

V_0 is the original volume of the analyzed material;

V_1 is the swell volume after 24 hours.

The content of the silt fraction (0.05–0.005 mm) is determined by subtracting the amount of clay and sand particles from 100 percent [1].

Key site 1 is located on the terrace above the flood-plain near Dolgoye Lake, Sibirskiye Uvaly Nature Park. Tab. 1 shows the results of particle-size distribution analysis.

The main soil skeleton-forming particles are those between 0.5 and 0.05 mm in size. They can be identified as fine sand. Since the amount of very fine particles less than 0.05 mm in size is low, except for the B₁ horizon, one can assume that the soil is formed by primary minerals: 54% quartz, 18% chalcedony, 14% opal, 9% iron-titanium oxide.

Secondary minerals – 5% kaolinite – are formed in the upper illuvial horizon (B₁), which is proved by the presence of fine clay particles.

Key site 2 is located on the left bank of the Ob river, near Bylino settlement. Its particle-size distribution is shown in Tab. 2.

The particle-size of this soil is mostly 0.5–0.05 mm. There are almost no silt particles less than 0.005 mm in size in the soil, which means that secondary minerals form in very small quantity (1%). It proves that in terms of mineralogical composition the soil contains mostly primary minerals: 50% translucent silica, 30% milk quartz, 10% opal, 5% chalcedony, 4% mica. Secondary mineral – kaolinite (1%) – was found only in humus and illuvial horizons, which can be explained by the fact that floodplain surface is formed by the river. During high flood the

river deposits sand and the amount of secondary minerals formed between floodings is insignificant.

Key site 3 is located on the left bank of the Ob river opposite Nizhnevartovsk. The crest-broken character of the floodplain contributes to the podzol-forming process. Tab. 3 shows particle-size distribution of the soil from the site.

In terms of particle-size the floodplain gley-podzol sandy loam

soil on alluvial sand contains mostly fine sand. Its mineralogical composition is represented by 62% translucent silica, 12% opal, 10% kaolinite, 9% iron-titanium oxide, and 7% chalcedony.

Thus the mineralogical composition of soils near Nizhnevartovsk is represented mostly by primary minerals of the silica group including quartz, chalcedony, opal. Their content is 80–90%. Secondary clay

Table 1

Particle-size distribution of representative podzolic soil on lacustrine-alluvial sand

Horizon	Depth, cm	Fraction distribution, %			
		>0.5	0.5-0.05	0.05-0.005	<0.005
A ₂	10-32	-	85.0	13.2	1.8
B ₁	32-61	-	50.1	45.6	4.5
B ₂	61-85	-	70.1	18.7	11.4
BC	85-105	-	80.0	15.5	4.5
C	105	-	70.0	30.0	1.8

Table 2

Particle-size distribution of alluvial soddy gley light loamy soil on alluvial sand

Horizon	Depth, cm	Fraction distribution, %			
		>0.5	0.5-0.05	0.05-0.005	<0.005
A _{lg}	10-32	-	75.4	44.6	-
B _g	32-74	-	80.0	20.0	-
G	74-91	-	60.4	39.6	-
C	91	-	90.1	9.9	-

Table 3

Particle-size distribution of floodplain gley-podzol sandy loam soil on alluvial sand

Horizon	Depth, cm	Fraction distribution, mm			
		>0.5	0.5-0.05	0.05-0.005	<0.005
A ₂	10-55	-	70.1	26.3	3.6
B _g	55-80	-	40.2	55.5	4.3
BC	80-117	-	79.8	20.2	-
C	117-150	-	90.3	9.7	-

mineral content is insignificant (1–5 %). Soils formed on smooth relief minerally differ from those of floodplains.

Kaoline accumulation [2] indicates that the soils analyzed are poor. And their particle-size distribution points to their good aeration, water infiltration and drainage, that create favourable growing

conditions for average productivity pine forest.

Table 4 shows comparative agrochemical characteristics of soils. Soils near Nizhnevartovsk compare favourably with background characteristics of zonal podzol soils, including pH_{KCl} reactions, hydrolytic soil acidity, total exchangeable cations, soil

saturation, phosphorus and potassium content. This is due to the alleviation processes, such as silt particle accumulation in parent rock.

Agrochemically, gley podzol soils are between representative podzol soils and soddy gley soils, where soddy gley soils have the highest trophic factor.

Table 4

Agrochemical properties of soils

Horizon index	Depth, cm	pH _{KCl}	Hydrolytic soil acidity (H), mg-eq · 100 g ⁻¹	Total exchange-able cations (S), mg · 100 g ⁻¹	Soil base saturation (V), %	Content	
						Phosphorus (P ₂ O ₅), mg · 100 g ⁻¹	Potassium (K ₂ O), mg · 100 g ⁻¹
Representative podzolic alluvial sandy loamy soil, modal podzol (cross section 1)							
A ₂	10-32	4.2	2.04	2.9	58.7	2.75	5.2
B ₁	32-61	4.4	2.27	3.8	62.6	3.25	5.9
B ₂	61-85	4.8	2.11	2.17	50.7	2.75	4.8
BC	85-105	5.2	1.97	5.0	71.7	2.0	2.9
Soddy gley alluvial light loamy soil, medium-deep (cross section 2)							
A _{1g}	10-32	4.4	3.18	6.82	68.2	5.75	10.8
B _g	32-74	4.8	2.87	6.08	72.7	6.85	7.7
G	74-91	4.4	2.12	6.05	74.1	5.75	7.7
Gley podzol alluvial sandy loamy soil, deep (cross section 3)							
A ₀ A ₁	5-10	4.0	7.04	4.2	51.4	6.25	8.8
A ₂	10-55	3.9	3.5	4.5	56.2	6.25	4.4
B _g	55-80	3.4	4.3	4.8	52.7	5.5	9.2
BC	80-117	5.0	1.88	7.0	58.2	3.75	4.4

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А.В. Березина

(A.V. Berezina)

Уральский государственный лесотехнический университет, Екатеринбург

(Ural State Forest Engineering University, Yekaterinburg)

К ПРОБЛЕМЕ СОЗДАНИЯ ЭТНОПРИРОДНОГО ПАРКА «САБАРСКИЙ УВАЛ» (THE PROBLEM OF MAKING ETHNO NATURAL PARK "SABARSKY UVAL")

Данная статья посвящена проблеме развития, становления, прогресса и сохранения этнических культур и их природной среды, возможности создания природного парка.

This article is devoted to the problem for the development, establishment, progress and survival of ethnic cultures and their natural environment, the possibility of creating a natural park.

Сегодня, как никогда, представляется актуальным вернуться к разговору о создании на месте бывшего ландшафтного памятника природы ООПТ областного значения. Тем более, что история этого уникального объекта и недавние события ставят перед нами классический вопрос: «быть или не быть»?

Еще с 1990 по 2000 гг. комплексной экспедицией ЦЭПЛ РАН совместно с биологическим факультетом МГУ проводились исследования в лесных массивах Артинского лесхоза и Нижнесергинского леспромхоза. Уникальная сохранность этих лесов, богатая флора и фауна, включающая виды, занесенные в Красную книгу Российской Федерации и Свердловской области, привели к заключению о необходимости создания на данной территории ООПТ (в 1993 г. было составлено краткое обоснование выбора территории ООПТ и ее зонирования). Все эти исследования не только не потеряли свой смысл, но и стали еще более актуальными.

Подавляющее большинство лесов за всю многовековую историю их эксплуатации подвергалось столь глубоким

трансформациям, что не может существовать в естественном равновесии и не позволяет получить объективные данные о структуре и принципах достижения динамичного равновесия в ненарушенных лесах. Только на основе всестороннего изучения лесов, аналогичных Сабарскому массиву, возможна разработка действенных принципов сохранения биоразнообразия естественных лесов, ведения рационального лесного хозяйства и восстановления нарушенных лесных экосистем. Последнее положение подтверждается всеми предыдущими исследованиями в других массивах подобной сохранности.

Однако исследование единичных массивов не дает представления обо всех возможных вариантах разнообразия структуры лесов и поддержания их естественного равновесия, поэтому исключение из эксплуатации массивов, сохранностью подобных Сабарскому массиву, крайне важно.

Сам участок, несомненно, отвечает критериям территории, заслуживающей создания ООПТ областного значения. Однако существующая на данный момент

охрана лесного массива недостаточна ни по площади охватываемой территории, ни по статусу. На эту ситуацию накладывается интенсивная эксплуатация лесных ресурсов Среднего Урала и высокая востребованность древесины и других продуктов леса, поэтому представляется весьма сомнительным возможность сохранения лесов без включения их в зону ООПТ.

Собранные данные об истории, состоянии, перспективах развития и возможности восстановления подавляющего большинства широколиственных лесов на данной территории весьма существенны. Известно, что антропогенная трансформация широколиственных лесов и вообще всей растительности этой зоны значительно выше, чем можно было предполагать. Сегодня способность к самовосстановлению лесов в первозданном виде почти на всей территории Урала исчерпана. На Урале сохранилось не более 2% лесов, не пройденных рубками, причем большая часть этих лесов сосредоточена в неудобьях, высокогорьях у верхней границы леса.

Предлагаемый к созданию ООПТ участок елово-пихтовых

и смешанных лесов не был затронут активной хозяйственной деятельностью как в XVIII–XIX вв., так и в последующие годы. Эти леса были впервые подробно описаны экспедициями АН СССР под руководством академика С.С. Шварца и профессора Б.П. Колесникова в 1950-х годах, когда начались работы по заповеданию данной территории, что привело к созданию памятника природы «Сабарский заповедный участок темнохвойно-широколиственных лесов». Территория расположена в Артинском и Нижнесергинском районах Свердловской области. Площадь территорий, предлагаемых для включения в зону покая, – 87,5 км².

Площадь территорий, предлагаемых для включения в зону ограниченного туризма, составляет 104,5 км² по Артинскому району и 16,5 км² по Нижнесергинскому району. Зона свободного туризма – 4 км² (река Уфа, вдоль русла реки, вдоль дороги Пристань – Комарово).

Схема предполагаемой части ООПТ «Сабарский» с раскраской зон по категориям приведена на рисунке.

Внешние границы:

Северная: от северо-западного квартального столба кв. 14 на восток по северным квартальным просекам кв. 14, 15, 16, 17, 18, 19, 20, 21 до северо-восточного квартального столба 21 Артинского лесничества, далее на восток к северо-восточному столбу 48 Уфимского лесничества Нижнесергинского муниципального района.

Восточная: от северо-восточного квартального столба кв. 48 Уфимского лесничества Ниж-

несергинского муниципального района по восточным квартальным просекам 48, 50, 61, 70, 75, 82, 88, 94, 101 Уфимского лесничества Нижнесергинского муниципального района до юго-восточного квартального столба кв. 119 Уфимского лесничества Нижнесергинского муниципального района.

Южная: от юго-восточного квартального столба кв. 119 на запад и юго-запад по границам кв. 119 Уфимского лесничества Нижнесергинского муниципального района и 1–8 Поташинского лесничества Артинского лесхоза, 148–149 Артинского лесничества Артинского лесхоза до юго-западного квартального столба кв. 148 Артинского лесничества Артинского лесхоза.

Западная: от юго-западного квартального столба кв. 148 на север по просекам кв. 148, 138, 124, 108, 92, 69, 53, 39, 26, 14 до северо-западного квартального столба 14 Артинского лесничества.

Всего 212,5 км².

Территория расположена в западных предгорьях Среднего Урала, в среднем течении р. Уфы, по обоим ее берегам. Сюда входят полностью или частично бассейны нескольких мелких притоков р. Уфы 1-го и 2-го порядка (реки Серебровка, М.Югуш, Латыш, М.Кургашка, Еманзелга) и водораздельные территории. Предельные абсолютные высоты достигают 485 м. Рельеф местности – высокие увалистые равнины, сильно изрезанные долинами рек и оврагами. Существенную роль здесь также играют карстовые явления. Преобладают бурые лесные почвы легкого и среднего механического состава, отлича-

ющиеся высоким содержанием гумуса и элементов минерального питания, причем достаточно велико разнообразие почвенных разностей по составу минеральных элементов.

Территория покрыта лесом и включает несколько сенокосных полей. В первом ярусе леса преобладают ель и пихта, участвует липа. Во втором ярусе присутствуют липа, ильм, черемуха, рябина, незначительную роль играет клен остролистный. В составе травяно-кустарничкового яруса присутствуют виды разных экологических групп: таежное мелкотравье, дубравное широколистное и эфемероиды, высокотравье. Значительную роль играет примесь европейских флористических элементов. Есть также участки сероольшаников в поймах рек, вторичных мелколиственных (осиновых и березовых) лесов на местах вырубок и сенокосов, а также нарушенные участки первичных хвойно-широколиственных лесов, находящиеся на разных стадиях процессов восстановления. Разнообразие вариантов количественного участия разных древесных видов и разных экологических групп видов травяного яруса достаточно велико.

Здесь имеется разнообразие видов млекопитающих и птиц. Из редких видов животных обитает сокол балабан, из насекомых – бабочка Аполлон, из типичных – медведь, кабан, бобр, лось, ястреб-тетеревятник, тетерев, желна, малый пестрый дятел и др. Из редких видов растений произрастают короставник татарский, башмачки крупноцветковый и крапчатый, пион Марьин корень, лилия саранка,

Условные обозначения:

- Сосна
- Кедр
- Пихта
- Лиственница
- Береза
- Липа
- Осина
- Лесные культуры
- Водные объекты
- Болото

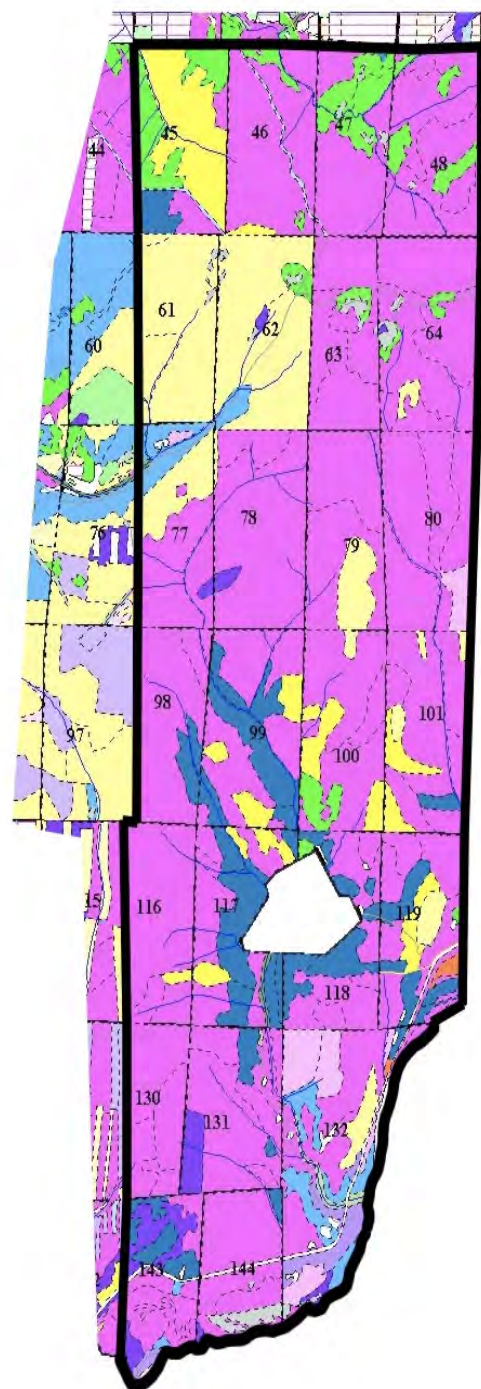


Схема
 «Зоны покоя» ландшафтного заказника
 «Сабарский»
 (Артинское лесничество Артинского лесхоза
 кв. 45–48, 61–64, 77–80, 98–101, 116–119, 130–132, 143–144)

подлесник европейский, лишайник лобария легочная.

Ценность объекта

Этот участок хвойно-широколиственных лесов, довольно слабо затронутый хозяйственной деятельностью в значительном объеме, представляет собой уникальный эталон климаксовых хвойно-широколиственных лесов Западного Предуралья. В массиве преобладают абсолютно разновозрастные насаждения, характеризующиеся полнотностью возрастных спектров всех видов деревьев и кустарников, что представляет собой исключительное явление для Европейской России и Урала. Высока степень мозаичности древесного яруса, создаваемой различными естественными факторами (рельеф, световая мозаика, влияние фитопатогенов). Высока и мозаичность травяного покрова со своеобразным сочетанием видов различных экологических групп. Наблюдается естественная динамика элементов сообществ, отсутствуют воздушная эрозия и признаки антропогенного смыва почв.

Начатые исследования, касающиеся состава, структуры и динамики эталонных хвойно-широколиственных лесов, исключительно перспективны. Накопленный к настоящему моменту фактический материал включает данные по составу и структуре преобладающих растительных группировок, характеру сопутствующих почв, участию фитопатогенов в формировании структуры древостоев. На постоянных пробных площадях эти исследования проведены в едином комплексе, по всем этим направлениям

начаты исследования во всем массиве с целью изучения естественного разнообразия структуры сообществ и их естественной динамики. Этот материал дополняется сведениями о составе, структуре и путях восстановления нарушенных сообществ прилегающих территорий. Уже ясно, что начатые исследования, продолженные на соответствующем уровне, внесут значительный вклад в познание структуры растительных сообществ и возможностей их рационального использования, а значимость этого вклада выходит далеко за рамки данного региона. Территория уже стала научной базой для проведения фундаментальных исследований в области биологии и морфологии растений и флорогенетики.

Использование территории в научных целях в полной мере возможно лишь при создании прочных гарантий сохранения целостности природного объекта, каким является данный лесной массив. Такие гарантии могут быть обеспечены только организацией заповедника с соответствующими возможностями охраны, проведения многолетних исследований и контролируемого минимально необходимого хозяйственного использования территории. Неоспоримым аргументом в пользу особого заповедного режима использования лесов территории является их роль в поддержании ландшафтно-гидрологического равновесия во всем регионе Уфимского плато.

Хорошо было бы этот участок объединить в один комплекс с другими ООПТ Артинского района.

Это:

1. Березовская дубрава – крайняя восточная граница ареала дуба черешчатого в России – Поташкинское лесничество, кв. 3, 4, 5, 6, 7, 10 вблизи д. Березовка. Зона покоя – 4 км², зона ограниченного туризма – 4 км², зона свободного туризма – 4 км². Итого 12 км².

2. Поташкинская дубрава – крайняя восточная граница ареала дуба черешчатого в России – Поташкинское лесничество, кв. 14 вблизи д. Поташка. Зона покоя – 4 км², зона ограниченного туризма – 4 км², зона свободного туризма – 1 км². Итого 9 км².

3. Участок елово-пихтовых древостоев – в окрестностях села Азигулово в пойме реки Уфы. Артинское лесничество кв. 1, участок произрастания пихты с сизой хвоей. Зона покоя – 2 км², зона ограниченного туризма – 1,5 км², зона свободного туризма – 1,5 км². Итого 5 км².

4. Горные ковыльные степи – вблизи деревень Верхний и Нижний Бардым. Участки произрастания лиственницы сибирской. Бардымская пещера. Зона покоя – 1,5 км², зона ограниченного туризма – 2 км². Итого 3,5 км².

5. Горные ковыльные степи – в окрестностях села Новый Златоуст. Зона покоя – 0,4 км², зона свободного туризма – 0,4 км². Итого 0,8 км².

6. Гора Кашкабаш – в 2 км от села Курки, Артинское лесничество кв. 102 – 103. Зона ограниченного туризма – 6 км², зона свободного туризма – 1 км². Итого 7 км².

7. Участок культурной посадки женьшеня. На территории д. Комарово. 0,2 км².

На проектируемой территории предполагается ввести зонную систему.

1. Зона покоя – невосстанавливаемая территория памятников природы, которым угрожает опасность ликвидации. Зона запрещенного доступа для туристских и хозяйственных целей. Работа научно-исследовательских групп.

2. Зона ограниченного туризма – служит охранной полосой для памятников природы. Частично восстанавливаемая. Предназначена для научно-познавательного туризма и экскурсий с сопровождением инструктора. Оборудуется указателями, экологическими тропами, аншлагами, путеводителями, маршрутными листами.

3. Зона свободной рекреации. Относительно самовосстанавливаемая природная система. Предназначена для свободного доступа граждан с целью отдыха. В данную зону входят поймы рек и речек, площади вдоль магистральных дорог, базовые стоянки и площади около них.

Итак, всего под ООПТ «Сабарский» предполагается отвести 250 км². Из них зона покоя составит 99,6 км², зона ограниченного туризма – 138,5 км², зона свободного доступа – 11,9 км².

Рекреационные ресурсы

Важной особенностью для развития туризма является геополитическое положение предполагаемого памятника природы «Сабар» в Артинском районе, большую площадь которого занимают леса и природные комплексы различных уровней. Артинский район граничит с Ниж-

несергинским районом, что даёт возможность продолжить туристическую программу, которая начинается в Н. Серьгах («Оленьи ручьи»). Также в Нижнесергинском районе находится санаторий «Зелёный мыс», отдыхающие которого могут принять участие в туристско-экскурсионной программе по Артинскому району.

Район природного памятника «Сабар» может являться объектом геологического тура, включающего Кунгурскую пещеру, Артинский ярус, карстовые провалы вдоль реки Серьга, гору Волчиха, границу Европа-Азия и др.

Наличие реки Уфы на границе предполагаемого памятника природы «Сабар» даёт возможность организации сплавов вдоль самых крупных и красивейших памятников природы (Разбойничья гора, г. Кашкабаш, Артинский ярус, заповедные места широколиственных лесов).

Гора Кашкабаш (Романов увал) – это геологический, ландшафтный, ботанический памятник природы, одно из немногих мест на планете, не измененных в результате деятельности человека или лесных пожаров. Гора находится на правом берегу реки Уфа, в 4 км от села Пристань. Общая площадь памятника – 617 га. Из общей площади 617 га покрыто лесом 598 га, сенокосами – 15,9 га, под дорогами – 3,0 га, под водой 0,3 га. Гора Кашкабаш невысокая – 600 м над уровнем моря, сложена песчано-глинистыми известняковыми толщами нижнего палеозоя.

В Артинском районе было бы целесообразно предложить конные маршруты.

Артинский район – территория, сохранившая спустя столетия не только природные комплексы, но и памятники сельскохозяйственной деятельности. Например, на территории района имеется единственная в Свердловской области культурная посадка женьшеня в д. Комарово.

Для развития сельскохозяйственного туризма свои услуги предлагают пасечные хозяйства, расположенные у границ ландшафтного памятника природы в 7 км от д. Комарово.

Соотношение благоприятных природных, климатических, исторических и культурных ресурсов позволяет реализовать экологические турпроекты даже при малой доле развитой инфраструктуры.

Развивая туризм в новых регионах, тем более таких богатых природными ресурсами, как Артинский район, необходимо помнить, что туризм является экологически эффективной отраслью хозяйства и при правильной его организации играет ведущую роль в деле экологического образования и просвещения населения, является наиболее действенным инструментом формирования у людей глобального экологического мировоззрения, что так важно на сегодняшний день для Свердловской области. Кроме того, туризм, как ни одна другая отрасль, заинтересован в регулировании антропогенных воздействий на природные комплексы.

Сегодня все геоморфологические, ботанические и геологические памятники природы находятся в ведении районных структур лесной и сельскохозяйственной управы. Вышеперечис-

ленные объекты доступны для умеренного посещения.

К преимуществам Артинского района относится то, что туризм может удачно (не требуя больших затрат на производство туристского продукта) сочетаться с другими видами природопользования: сельским хозяйством, рыболовством. Развитие туризма содействует сохранению природных комплексов, организации национальных парков.

Кроме того, организация на данной территории памятника природы «Сабар» будет обеспечивать взаимодействие и дальнейшее развитие различных видов туризма в Артинском районе:

1) этнографического туризма. Артинский район уникален и в этом плане. На его территории проживают марийцы, сохранившие исконную культуру, поклоняющиеся лесным духам и идолам. Энтузиасты уже сейчас собирают этнографический материал для музея, расположенного в Доме культуры;

2) исторического туризма. В п. Арти до сих пор действует единственный в мире завод по производству кос методомковки. На территории завода сохранились корпуса, построенные еще во времена Демидовых;

3) научно-познавательного туризма. В п. Арти находится маг-

нитометеорологическая обсерватория – первое на Урале научное учреждение (сегодня филиал Института геофизики УрО РАН), значение исследований которой общепризнано во всем мире.

Итак, исходя из вышеприведенных данных можно сделать вывод, что создание ООПТ на данной территории своевременно и актуально.

Уже сейчас прошло несколько экспедиций, состоящих из представителей дальнего зарубежья, которые посетили Артинский завод, марийские и татарские поселения, уникальные памятники природы.

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E.A. Frolova, A.G. Magasumova, S.V. Zalesov
(*Е.А. Фролова, А.Г. Магасумова, С.В. Залесов*)

Ural State Forest Engineering University, Yekaterinburg

(*Уральский государственный лесотехнический университет, Екатеринбург*)

APPLICATIONS OF UNCONVENTIONAL FERTILIZERS ON FOREST SCOTTS PINE NURSERIES IN THE URALS

(ОПЫТ ПРИМЕНЕНИЯ НЕТРАДИЦИОННЫХ УДОБРЕНИЙ ПРИ ВЫРАЩИВАНИИ СЕЯНЦЕВ СОСНЫ ОБЫКНОВЕННОЙ (PINUS SYLVESTRIS L.) НА УРАЛЕ)

The article presents information on the possibility of using non-traditional fertilizers, which are prepared on the basis of production wastes. Currently, they are accessible, affordable and at the same time highly effective means of increasing the fertility of forest soils. The changes in the parameters of planting material when making these mixtures.

Представлена информация о возможности использования нетрадиционных удобрений, которые приготовлены на основе отходов производств. В настоящее время они являются доступными, недорогими и высокоэффективными средствами повышения плодородия лесных почв. Проанализированы изменения параметров посадочного материала при внесении данных смесей.

About 600–800 seedlings and saplings for planting are grown in forest nurseries of Russia annually. It is the main method of regeneration. Most of the nurseries are located in the zone of low soil

fertility and used for a long time. This has a negative impact on the quantity and quality of planting material (Rodin et al., 1989).

The use of conventional mineral and organic fertilizers in forestry is

limited due to their high cost. As a cheap and at the same time highly effective means of increasing of forest soil fertility can be applied fertilizers, based on various waste products (Romanov et al., 1983).

Some types of waste, such as sewage sludge, have a high content of soluble organic compounds and elements, which influence the growth and development of plants.

The purpose of this study is to investigate applications of 6 types of unconventional fertilizers on forest Scots pine (*Pinus sylvestris* L.).

Some unconventional fertilizer mixtures were applied such as a mixture of peat and an active sludge; surplus active sludge treated with lime milk; surplus active sludge after mechanical dewatering; ashes of "Solikamskumprom" enterprise; the mixture of sewage sludge and excess active sludge; a mixture of sewage sludge, active sludge and ash of "Solikamskumprom" enterprise. These mixtures were provided by Perm National Research Polytechnic University.

The investigations were in two forest nurseries: the Ural train-

ing experimental forestry USFEU (UUOL) and the State Institution "Sukholozhsky forestry" (Metodicheskie ..., 1964; Sokolov, 1967; Szczerba, 1967; Peresypkin et al, 1989). Fertilizers were applied between rows on sample plots (1x1 m) (1 m²). At the same time parts of sample plots were fixed where fertilizers were not used.

Each mixture was applied at doses of 500 and 1000 kg per ha to annual and biennial Scots pine seedlings.

In the State Institution "Sukholozhsky forestry" forest nursery the fertilizers were applied by root method with preliminary and subsequent soil scarification. It was on July 10, 2013 at temperature 23–24 °C in cloudy weather. At the Ural training experimental forestry the fertilizers were used on July 11, 2013 at temperature 25–26 °C in sunny weather. Each sample plot is located at a distance of 50 cm

to 2 m from each other. Also a map for the plots was made.

After the end of the growing season 30 seedlings in each sample plots were dug. In the laboratory the basic parameters were identified: the height of the seedling, the diameter of the neck of the root, the root length, the number of yellow and green needles (Novoseltseva, Smirnov, 1983).

The measurements were processed by methods of variation statistics. Table presents data of all criteria.

Notes: "+" – a positive impact on one or the other option of seedlings and is higher than in the control plot; "-" – lower than in the control plot.

Table shows the effectiveness of the use of certain mixtures.

At the forest nursery UUOL USFEU, when we applied a mixture of sewage sludge and active sludge (at 1,000 kg/ha) for biennial

Effect of unconventional types and doses of fertilizers on the state of Scots pine seedlings

Type of fertilizer	Dose kg per ha	Average Diameter	The average height	The average length of the root system	The average length of the needles	Part of yellow needles
1	2	3	4	5	6	7
Forest nursery UUOL USFEU						
Biennial seedlings						
1. A mixture of peat and active sludge	500 1000	- -	- -	- +	+ -	+ +
2. Excessively activated sludge treated with lime milk	500 1000	- -	- -	- +	+ +	+ +
3. Excess activated sludge after mechanical dewatering	500 1000	- -	- -	- +	+ -	+ +
4. Ash of «Solikamskumprom» enterprise	500 1000	+ -	- -	+ -	+ -	+ +
5. The mixture of sewage sludge and active sludge	500 1000	- +	- +	+ -	+ -	+ +
6. The mixture of sewage sludge, activated sludge and ash of «Solikamskumprom» enterprise	500 1000	+ -	- -	+ +	+ -	- +

End table

1	2	3	4	5	6	7
Annual seedlings						
1. A mixture of peat and active sludge	500 1000	+	+	+	-	-
2. Excessively activated sludge treated with lime milk	500 1000	+	+	-	+	-
3. Excess active sludge after mechanical dewatering	500 1000	+	+	-	+	-
4. Ash of «Solikamskbumprom» enterprise	500 1000	+	+	-	-	-
5. The mixture of sewage sludge and active sludge	500 1000	+	+	-	-	+
6. The mixture of sewage sludge, activated sludge and ash of «Solikamskbumprom» enterprise	500 1000	+	+	-	+	+
Forest nursery of State Institution «Sukholozhsky forestry»						
Biennial seedlings						
1. A mixture of peat and active sludge	500 1000	-	+	-	-	-
2. Excessively activated sludge treated with lime milk	500 1000	-	-	-	-	-
3. Excess active sludge after mechanical dewatering	500 1000	-	-	-	-	-
4. Ash of «Solikamskbumprom» enterprise	500 1000	-	+	-	-	-
5. The mixture of sewage sludge and active sludge	500 1000	-	-	+	+	-
6. The mixture of sewage sludge, active sludge and ash of «Solikamskbumprom» enterprise	500 1000	+	+	+	-	-
Annual seedlings						
1. A mixture of peat and active sludge	500 1000	-	+	-	+	+
2. Excessively active sludge treated with lime milk	500 1000	-	+	-	+	+
3. Excess activated sludge after mechanical dewatering	500 1000	-	+	-	+	+
4. Ash of «Solikamskbumprom» enterprise	500 1000	+	+	-	+	+
5. The mixture of sewage sludge and active sludge	500 1000	+	+	-	+	-
6. The mixture of sewage sludge, active sludge and ash of «Solikamskbumprom» enterprise	500 1000	+	+	-	-	-

seedlings, there is a positive effect on the height of the aerial part. Adding other types and doses of unconventional fertilizers at biennial Scots pine seedlings cultivation resulted in a statistically

significant decrease in the indices of average height compared to the control.

In the State Institution “Sukholozhsky forest” forest nursery only a mixture of sewage sludge

and active sludge (at 1,000 kg per ha) and the mixture of sewage sludge, active sludge and ash of “Solikamskbumprom” (in at 500 kg per ha) influenced on the average diameter of biennial seedlings

positively. At the annual seedlings at both doses had a positive impact of Ash "Solikamskbumprom" enterprise, a mixture of sewage sludge and activae sludge and the mixture of sewage sludge, active sludge and ash of "Solikamskbumprom" enterprise. In other cases, the average diameter of considerably lower than in the control sample plot.

All mixtures had a positive effect on the average diameter of annual seedlings in nursery UUOL USFEU, except a mixture of active sludge after mechanical dewatering (at 1,000 kg per ha). The mixture of ash "Solikamskbumprom" enterprise (at a dose of 500 kg per ha), a mixture of sewage sludge and active sludge (at 1,000 kg per ha) and the mixture of sewage sludge, activ sludge and ash of "Solikamskbumprom" enterprise (at a dose of 500 kg / ha). have

positive results on biennial seedlings. Other substances had no significant effect.

It should be noted that the average length of the root system in the nursery the State Institution "Sukholozhsky forestry" of annual seedlings none mixture had a positive impact, all the indicators are below control. But all mixtures affected the average length of the needles positively

When we applied the unconventional fertilizers in nursery UUOL USFEU, there is an increasing of part of yellow needles of biennial seedlings, we can observe a decreasing for all variants of the experiment.

In the "Sukholozhsky forest" nursery, on biennial seedlings part of yellow needles is smaller in all test areas, except for the site when applying mixture of sewage sludge, activate sludge and ash of

"Solikamskbumprom" enterprise (at 1,000 kg per ha).

Conclusions

1. Unconventional fertilizers can be effectively used for growing Scots pine seedlings.

2. The effectiveness of unconventional fertilizers applying in the State Institution "Sukholozhsky forestry" nursery was higher than that in the nursery UUOL USFEU.

3. The differences in the effect of fertilizers on the unconventional indicators of Scots pine annual and biennial seedlings of cultivation cause the need for further research in order to select the best types and doses of fertilizers.

4. To determine the optimal types and doses of unconventional fertilizers it is necessary to study soil provision by nutrients.

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D.V. Metelev, E.S. Serebriakov, I.V. Shevelina
(Д.В. Метелев, Е.С. Серебряков, И.В. Шевелина)
Ural State Forest Engineering University, Yekaterinburg
(Уральский государственный лесотехнический университет, Екатеринбург)

STRUCTURE OF THE FOREST FUND OF FOREST GREEN ZONE IN YEKATERINBURG (СТРУКТУРА ЛЕСНОГО ФОНДА ЗЕЛЕННОЙ ЗОНЫ ЕКАТЕРИНБУРГА)

*State forestry fund land (dissolved in 2013 due to the territorial expansion of the city of Yekaterinburg municipal unit) with a total area of 28113.5 ha. The results of evaluation the current state of the forestry fund are presented in the article. The forest land is evaluated as follows: the area is highly forested – 99 percent; the area is dominated by natural forest stand with close canopy forest plantation ratio being 656 ha or 2.5 percent; non-forested area is 1.5 per cent, open canopy forest plantation ratio is 0.2 percent; forest regeneration reserve is not large, it is 167 ha. Non-forested land is 12 percent of total forest land. The main forest forming species are Scots Pine (*Pinus sylvestris* L.) and silver birch (*Betula pendula* Roth.) – 74 and 24 % of total forest area respectively. The dominant forest stand belongs to productivity class 1 and productivity class 2, which suggests their high productivity. At present average productivity class is 2.5, which means that Yekaterinburg forest stand is relatively very productive. Forest stand density distribution shows that forest stand in municipal green space is of medium density with an average density of 0.77.*

*Земли государственного лесного фонда муниципального образования г. Екатеринбург составляют 28113,5 га. В статье представлены результаты оценки текущего состояния лесного фонда. Лесные участки характеризуются высоким процентом лесопокрытой площади – 99; преобладают насаждения естественного происхождения, удельный вес сомкнувшихся лесных культур составляет 656 га, или 2,5 %; не покрытые лесом площади занимают 1,5 %, несомкнувшиеся лесные культуры – 0,2 %, фонд лесовосстановления невелик, составляет 167 га. Нелесные земли занимают 12 % от общей площади земель лесного фонда зеленой зоны. Основными лесобразующими видами являются сосна обыкновенная (*Pinus sylvestris* L.) и береза повислая (*Betula pendula* Roth.), доля участия соответственно 74 и 24 % от общей площади зеленой зоны. Преобладают насаждения первого и второго класса бонитета, что говорит об их высокой производительности. На момент анализа средний класс бонитета составляет 2,3 – это дает основание отнести насаждения зеленой зоны МО г. Екатеринбург в целом к насаждениям относительно высокой производительности.*

Introduction

Urban forest is a very important environmental part of a big city. At present Yekaterinburg is one Russia's biggest cities with a population of more than 1.4 million people, and the number is still growing. The City of Yekaterinburg municipal unit includes 29 settlements. The total area of the city of Yekaterinburg municipal unit is 114.7 thousand hectares where Yekaterinburg occupies an area of 49.1 thousand hectares, which is 43 percent of the municipal unit total area.

All forest land within the city of Yekaterinburg is divided into:

1. Woodland parks (property of Sverdlovsk region) 15 parks with a total area of 12337.7 ha which is 28 percent of Yekaterinburg forest land
2. Urban forest (property of the Russian Federation) with a total area of 12337.7 ha which is 8 percent of Yekaterinburg forest land
3. State forestry fund land (dissolved in 2013 due to the territorial expansion of the city of Yekaterinburg municipal unit) (property of Sverdlovsk region) with a total area

of 28113.5 ha which is 64 percent of Yekaterinburg forest land (Fig. 1).

Since there is no up-to-date forest management data on the municipal unit's forest land the project aim – evaluate the current state of the forestry fund (its composition, age class, productivity class, forest type, etc.).

Materials and methods

To achieve this objective have analyzed forest survey data, forest management regulations of forest districts within Yekaterinburg municipal unit.

Discussion

Forest land distribution in terms of land use categories is shown on Fig. 2. The forest land is evaluated as follows:

- the area is highly forested – 99 percent;
- the area is dominated by natural forest stand with close canopy forest plantation ratio being 656 ha or 2.5 percent;
- non-forested area is 1.5 percent, open canopy forest plantation ratio is 0.2 percent;
- forest regeneration reserve is not large, it is 167 ha, non-forested land is 12 percent of total forest land;
- non-forested land mostly includes a net of rides, developed forest roads and paths – 950 ha (28 percent): landscape openings are 762 ha or 22.5 percent.

The species composition of Yekaterinburg forest stand is rather diverse. More than 10 species grow in regional forest. Coniferous species include pine, spruce, larch, fir and Siberian stone pine. Soft-wooded broadleaved species include birch, aspen, European black alder (*Alnus glutinosa*), speckled alder (*Alnus incana*), willow and poplar. The main forest forming species are Scots Pine (*Pinus sylvestris*) and silver birch (*Betula pendula*) – 74 and 24 % of total forest area respectively. The rest of the species are about 2 percent. Analyze forest land area distribution in general in terms of age group and silvicultural system show on Fig. 3.

Coniferous and soft-wooded broadleaved systems are dominated by middle-aged forest stand, which is 57 and 40 percent of total forest area respectively. The percentage of young and mature forest stand is not significant.

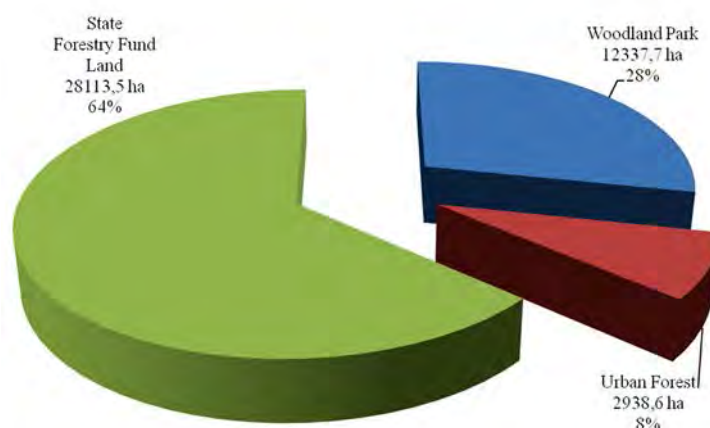


Figure 1. Forest Land structure in the city of Yekaterinburg

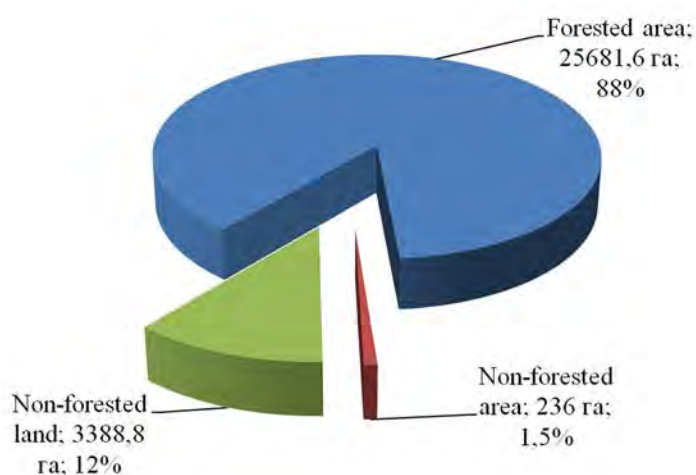


Figure 2. Forest land distribution in terms of land use categories, ha

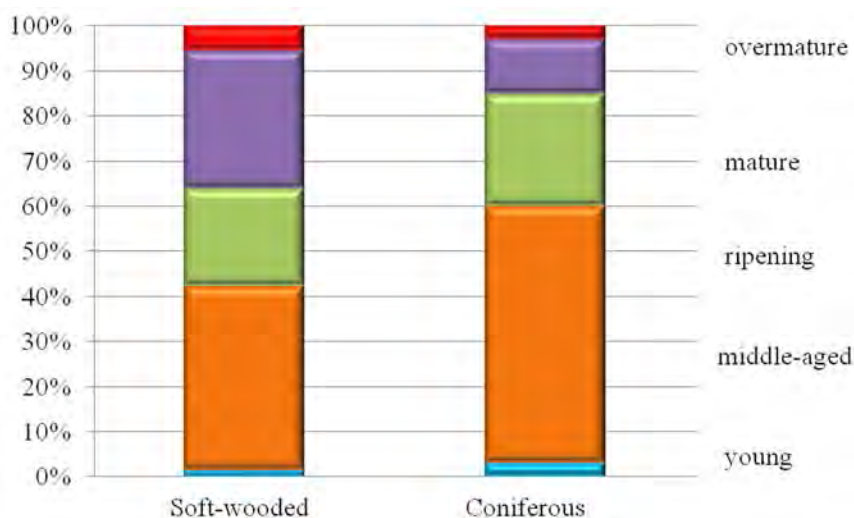


Figure 3. Forest land area distribution of age group and silvicultural system, %

The dominant forest stand belongs to productivity class 1 and productivity class 2, which suggests their high productivity. At present average productivity class is 2.5, which means that Yekaterinburg forest stand is relatively very productive.

Forest stand density distribution shows that forest stand in municipal green space is of medium density with an average density of 0.77.

Incomplete forest stand occupies a small area of 267 ha or

1 percent. Medium density forest stand is predominant in all forest districts. Its area is 15389 ha or 60 percent of forested green space. High density forest stand area is 10081 ha or 39 percent.

Having analyzed mean valuation factors of the dominant species may conclude that at present the average age of pine stand is 110 years; the mean productivity class is 2.2, which suggests highly productive stand; the dominant forest type is berry pine forest; mean density is 0.73, which sug-

gests it is of medium density and is quite productive; mean increment is 3,3 cubic metres per ha.

Birch stand has high and medium mean valuation factors, such as a productivity class of 2.5, a density of 0.75, mature and overmature forest stand covering 244 cubic metres per ha, forested land stand covering 226 cubic metres per ha, a mean increment of 3.1 cubic metres per ha. The average age is quite old – 73 years. The dominant forest type is berry pine forest, birch forest being secondary forest growth.

Resume

This is the first attempt to study the structure of forest land of Yekaterinburg green space in such a way. The data obtained may be used:

to study further the municipal forest using development dynamics monitoring;

The data obtained is the basis for studying forest oxygen productivity and carbon sequestration;

Yekaterinburg municipal administration could use this data when creating or improving the urban development master plan to minimize the damage to natural forest land during the design and construction phases of projects of various applications.

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M. I. Shevlyakova, S.N. Luganskaia
(М.И. Шевлякова, С.Н. Луганская)

Ural State Forest Engineering University, Yekaterinburg
(Уральский государственный лесотехнический университет, Екатеринбург)

THE RATIONALE FOR CHOOSING RESTORATION METHODS FOR MONREPOS PARK NATURAL MUSEUM RESERVE (VYBORG, LENINGRAD REGION) (ОБОСНОВАНИЕ НАПРАВЛЕНИЯ РЕСТАВРАЦИИ ТЕРРИТОРИИ ПРИРОДНОГО МУЗЕЯ- ЗАПОВЕДНИКА «ПАРКА МОНРЕПО» Г. ВЫБОРГ ЛЕНИНГРАДСКОЙ ОБЛАСТИ)

The retrospection method (analogous to Humphry Repton's in late 18th – early 19th centuries) makes it possible to assess the degree of transformation of a historical site over the period of its existence. The results establish a rationale for choosing restoration methods for landmark landscapes.

Метод ретроспекции (аналог работ Х. Рептона, кон. XVIII – нач. XIX вв.) позволяет оценить степень преобразования исторического объекта в течение долгих лет его существования. Результаты работы дают обоснованность методов реставрации памятников садово-паркового искусства.

At present landmark landscape preservation is of great importance. It includes preservation of cultural

heritage, promoting cultural landmarks and using them for research, cultural and educational purposes.

Monrepos, the only rocky landscape park in Russia, is situated on Tverdysh island (the Vyborg Bay,

Leningrad region). It has changed a great deal since it was founded (1788): its artistic appearance has changed, the original ideas and images have become lost to perception, the main architectural features have disappeared, and the surviving features are in poor condition [1, 2].

To form a rationale for its restoration a survey of the area was conducted and the degree of deviation from the original landscape appearance was identified.

The approach is based on the work of Humphry Repton, the English landscape designer of the late 18th – early 19th centuries.

The main point of this approach is the following: modern day photos are superimposed onto the historical images, and differences show changes in landscape. Superimposition of historical and modern day images is called landscape retrospection in this paper.

According to this approach the historically correct elements of

Monrepos Park were photographed from the same angle as their historical images. Ten of these elements were supported by detailed information found in archive documents. Pictures 1 to 3 show some of the elements.

This method shows the degree of transformation of a given historical site. The main transformations are shown in Table.

The survey resulted in the following conclusions: The retrospection method makes it possible



Picture 1. Baroness Octavia Nicolay *Monrepos mansion house in 1830, 1830 г.*



Picture 2. The mansion house, photo from the same angle 2014 г.



Picture 3. The retrospection element of south-east (front entrance) façade of the mansion house

The scope of restoration work

Name of landscape element	Degree of transformation, %			Restoration method
	trees and shrubs	relief	structures	
The mansion house	100	90	80	Full restoration
Narcissus Spring water	80	80	60	Full restoration
Broglia brothers' Obelisk	100	-	20	Reconstruction; restoration
The falling stone	80	100	-	Reconstruction
Marienturm pavillion	60	100	100	Full restoration
Linden gondola	100	100	-	Full restoration
Paulstein pond	80	40	100	Full restoration
Neptune's Temple	5	-	100	Partial restoration
Vainemainen's sculpture	10	-	20	Partial restoration
Ludwigsburg Chapel	-	-	70	Conservation

to assess the degree of transformation of the architectural elements. According to the results of the study one can choose a suitable restoration method (partial, full restoration or reconstruction).

Archive documents are not enough for the full restoration of the element. Letters and contemporaries' descriptions may prove useful but they do not create exact visual images.

Therefore it is the combination of archive documents and field survey (landscape retrospection) that creates an effective visual representation to restore the original architectural and plant landscape.

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Yu.E. Mikhailov, E.V. Lobes

(Ю.Е. Михайлов, Е.В. Лобес)

Ural State Forest Engineering University, Yekaterinburg

(Уральский государственный лесотехнический университет, Екатеринбург)

**ASSESSMENT OF FEEDING NICHE AND PHENOTYPIC VARIATION
IN THE URALS POPULATIONS OF LEAF BEETLE *CHRYSOMELA LAPPONICA*
(ИЗУЧЕНИЕ ПИЩЕВОЙ НИШИ И ФЕНОТИПИЧЕСКОЙ ИЗМЕНЧИВОСТИ
В УРАЛЬСКИХ ПОПУЛЯЦИЯХ ЛАПЛАНДСКОГО ЛИСТОЕДА)**

*The objective was to study feeding preferences of the populations of Lapland leaf beetle *Chrysomela lapponica* in connection to the peculiarities of their habitats. In the urban forests of Yekaterinburg we found colonies with low density, monomorphic in colouration and feeding only on one willow species – *Salix caprea*. In contrast, all the samples from the Konzhakovsky Kamen' mountains were abundant and variable in colouration. 5 willow species were indicated as host plants for the mountain population of Lapland leaf beetle with woolly willow (*Salix lanata*) as preferable host.*

*Целью работы было изучение пищевых предпочтений в популяциях лапландского листоеда (*Chrysomela lapponica*) в связи с особенностями их местообитаний. В лесопарках Екатеринбурга нами обнаружены колонии с низкой численностью, мономорфные по окраске и питающиеся только на одном виде ивы – иве козьей. Напротив, все выборки с горного массива Конжаковский Камень были многочисленными и изменчивыми по окраске. В качестве кормовых растений для горной популяции лапландского листоеда были отмечены 5 видов ив, среди которых ива мохнатая (*Salix lanata*) – наиболее предпочтительное кормовое растение.*

Introduction

The subject of our research includes the Urals populations of the Lapland leaf beetle (*Chrysomela lapponica*), which is widespread in Eurasia but has arctic-alpine distribution pattern. This means that its distribution area is separated in two parts, one lays north of the Arctic circle (Northern group of populations) and the rest (Southern group of populations) are scattered southwards in the mountains on the elevations from 450 m to 2000 m above sea level (Mikhailov, 2001; Machkour-M'Rabet et al., 2008).

The populations from the Urals can be attributed to the Southern group, but this group is quite heterogeneous. Small isolated populations in the city limits of Yekaterinburg (Urban forest named after Foresters of Russia and

Uktus urban forest) as well as very abundant populations in the North Ural Mountains were both found by us in Sverdlovsk region.

Lapland leaf beetle in the last 20 years is an object of special interest of the foreign researchers, in Germany, Belgium, Finland (Zvereva et al., 2010), while in Russia, where the major part of its distribution is situated, this species has not been studied as bioindicator yet. This explains the relevance of our research.

The leaves of willows have high content of glucosides that make them unedible for leaf-eating animals. At the same time larvae of Lapland leaf beetle that feed on willow sequester salicyl glucosides (SGs), which are modified in their defensive glands to bioactive compounds. These secretions serve

for defense against generalist enemies. However, some populations of *C. lapponica* have shifted to SG-poor hosts, and their secretions do not contain salicyl-aldehyde (Zvereva et al., 2010).

Therefore the host plants of Lapland leaf beetle influence the composition of chemical defense of their larvae, which helps them to overcome predatory attacks. The objective of our work was to study feeding preferences of the populations of Lapland leaf beetle in connection to the peculiarities of their habitats.

Materials and methods

The material was collected in June and July of 2012 and 2013 in the urban forests of Yekaterinburg and in July of 2013 in Konzhakovsky Kamen' massif.

We used the methods of evaluating of feeding niche breadth of *C. lapponica* offered E. Zvereva (Zvereva et al., 1995), who also gave us some advice how to use them in exact conditions. To evaluate the pattern of host-plant use, we recorded species and size of all willow bushes within the areas of 50 m² size and counted specimens of *Ch. lapponica* (larvae, pupae and beetles) on each bush. Surveys were conducted when most of the larvae reached the last instar. Willow bushes were ranked to one of five groups according to their approximate number of annual shoots. The mass of foliage was estimated by collecting 20 annual shoots from several bushes of each species. The leaves were dried at 80°C for 12 hours and then weighed.

Preference experiments to find out the food preference of beetles were conducted with leaf disks of four willow species, arranged on moistened filter paper in a Petri dish. Beetles were allowed to feed for 24 hours and the proportion of the consumed area was recorded.

The niche breadth (NB) was calculated from the obtained data using the following equation (Zvereva et al., 1995):

$$NB = \sum \sqrt{p_j} \alpha_j,$$

where p_j is the proportion of specimens of exact leaf beetle species collected on the willow species j , or the proportion of the biomass consumed in preference experiments; and α_j is the proportion of dry mass of the species j in the total resource available, which is either the field abundance of the species or their equal abundances for preference trials.

Results

In the urban forests of Yekaterinburg we found colonies with low density and unusual colouration (only entirely blue beetles). In addition to this they feed only on one willow species – *Salix caprea*. This is the only willow species under forest canopy. Several others can be found on the open places and near lakes, but the leaf beetles never feed on them. In contrast to them all the samples from the Konzhakovsky Kamen' mountains are abundant and variable in colouration (Fig. 1).

As a host plant *Salix caprea* has very low content of salicyl glucosides (SGs), that is why urban populations of the Lapland leaf beetle have low efficiency of defensive secretion and low larval growth rate (Zvereva et al., 2010). Preference tests in the lab showed that among four willow species (*Salix caprea*, *S. cinerea*, *S. triandra* and *S. myrsinifolia*) beetles chose SG-poor species and avoided SG-rich ones.

In the mountains of North Urals 8 study areas were established in

different altitudes (from 1100 to 1250 m), biotopes and slope exposures. We found out 5 willow species to be host plants for the Lapland leaf beetles. From 3 most abundant willow species the beetles prefer woolly willow (*Salix lanata*). In the mountains woolly willow (*Salix lanata*) is the optimum host plant of this species, while *Salix cinerea* and *S. uralicola* are suboptimal. Among the stone debris large proportion of beetles occur on *Salix cinerea*, and on the alpine plateau – on the *S. uralicola* (Fig. 2).

On the study plots the niche segregation with competitor species was found. This was another arctic-alpine leaf beetle *Gonioctena arctica*. This species was the most abundant in the lower part of vertical distribution of Lapland leaf beetle ($h = 1100\text{--}1150$ m) and the niche breadth of *Ch. lapponica* was 0,90–0,96, while niche breadth of *G. arctica* – 0,85–0,97. On the alpine plateau, where only Lapland leaf beetle occurs its niche breadth is maximal (0,98–1,0).



Figure 1. Newly emerged beetles of *Chrysomela lapponica* on *Salix lanata* in the mountains of North Urals

It is known from the investigations in Finland (Zvereva et al., 1995), that the niche breadth (NB) of the Lapland leaf beetle usually goes narrower with the higher pollution. This is due to lower survival of larvae on suboptimal host plants. In the mountains of North Urals we found three suboptimal species of host plants that are useful for the purposes of bioindication.

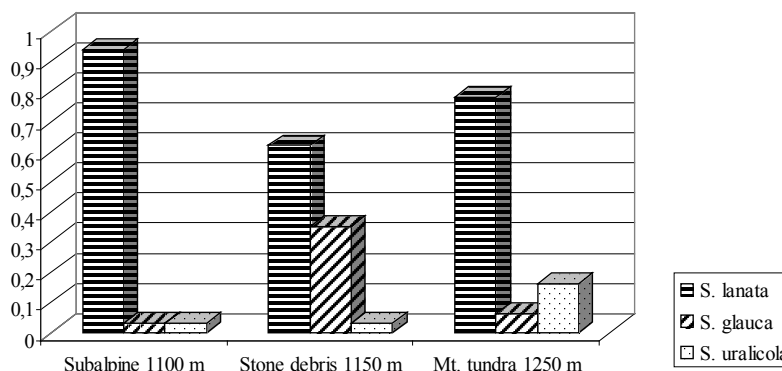


Figure 2. Preference of host plants in the mountain population of North Urals of *Chrysomela lapponica* (proportion of collected specimens on different host plants).

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