

RASTEMO Z GOZDOM

70 let Gozdarskega inštituta Slovenije

GROWING WITH FOREST
70 years of the Slovenian Forestry Institute





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Ob 70-letnici Gozdarskega inštituta Slovenije

Pogled na postorjeno v sedmih desetletjih Gozdarskega inštituta Slovenije pokaže na izjemno pot, ki jo je ta prehodil do danes. Ne le na področju raziskav, temveč tudi v vsem, kar opravlja v okviru javne gozdarske in okoljske službe. Skrb za gozdove, ki pokrivajo več kot 60 odstotkov naše domovine, že vrsto desetletij uspešno poteka ravno pod pokroviteljstvom inštituta.

Gozd je treba varovati in skrbeti za njegovo izjemno biotsko pestrost. Čeprav v Sloveniji (še) ne izkoriščamo dovolj gozdnega bogastva, ki ga premoremo, se zavedanje o pomenu le-tega postopoma krepi. Pri tem ima izjemno vlogo Gozdarski inštitut Slovenije. Lepo ste ubesedili sami svojo vlogo, ki jo imate danes, ko predstavljate znanstveni, strokovni in kulturni hram odnosa do narave, dobrin in storitev, ki jih gozd ponuja Sloveniji.

Zavedajoč se pomena gozdnega in lesnega gospodarstva v svetu, se je znanstveno-raziskovalno delo na tem področju pričelo že okoli leta 1730 v Franciji, v naslednjih desetletjih pa se je zelo razmahnilo. V razvitih državah

z naprednim gozdnim gospodarstvom so pričeli ustanavljati inštitute in zavode za raziskovanje gozdov. V Sloveniji zavedanje o pomenu lesnega in gozdnega gospodarstva sega v leto 1945, ko je bila po vojni vihri oblikovana nova država. V letu 1947 korenini današnji Gozdarski inštitut Slovenije. Sprva se je pri delu spopadal s številnimi težavami. »Lažje se je boriti z gozdom, drevesom ali z lesom kakor pa s človekom«, jih je slikovito v Gozdarski vestnik leta 1957 zapisal takratni direktor Inštituta za gozdno in lesno gospodarstvo, inženir Bogdan Žagar.

Če so imeli prva leta na inštitutu med drugim težave z ustreznim kadrom, saj je primanjkovalo tovrstnih strokovnjakov, danes o tem ni več sledu. Kakovostnega kadra ne primanjkuje več. Stroka se je razvila, se mednarodno uveljavila in postavila ob bok tudi tistim s precej daljšo tradicijo.

Kako pomembna je mednarodna vpetost, je že davnega leta 1957 v Gozdarskem vestniku opozoril takratni direktor, ko je pisal o pomenu preučevanja in upoštevanja tujih izsledkov in ugotovitev za razvoj stroke, ter na njihovo upoštevanje pri delu v Sloveniji. Mednarodna vpetost inštituta je danes dejstvo. Vključen je v številne mednarodne projekte, financirane tudi iz 7. okvirnega programa in Obzorja 2020, v lasti ima nekaj patentnih prijav, inštitut je mednarodno uveljavljen in prepoznan.

Seveda izzivov ne manjka. Z novimi podlagami, ki jih na ministrstvu v sodelovanju z deležniki postavljamo v na novo nastajajočem Zakonu o razvojno-raziskovalni dejavnosti, verjamemo, da bomo raziskovalnim inštitutom zagotavljali ustrezno podstat za nadaljnje delo in razvoj.

Vsem, ki so, in še kakorkoli pripomorete k razvoju stroke, se iskreno zahvaljujem in želim uspešno delo tudi v prihodnje.

dr. Maja Makovec Brenčič

At the 70th anniversary of the Slovenian Forestry Institute

A quick glance at everything achieved in the last seven decades of the Slovenian Forestry Institute (SFI) reveals an exceptional path covered by it till this day – not only in the field of research, but in everything implemented by this institution within the framework of a public forestry and environmental service. The forests that cover no less than 60 percent of our homeland have been successfully taken care of for several decades under the very auspices of SFI.

Forests should of course be protected and looked after owing particularly to their exceptional biodiversity. Although not enough forest wealth we possess has been exploited in Slovenia (as yet), the awareness of their significance is growing gradually. An exceptional role here is played by the Slovenian Forestry Institute. You yourselves have nicely articulated the role you are having today, when presenting the scientific, professional and cultural sanctuary of relationship to nature, natural assets and services offered by forests to Slovenia. Aware of the significance of forest and timber economy in the world, the scientific-research work began in this field as early as in 1730 in France, then greatly expanded in the ensuing few decades. In developed countries with progressive forest economy the first forest research institutes began to be founded.

In Slovenia, the awareness as to the significance of forest and timber economy dates back to the year 1945, when a new state was formed after the maelstrom of war. The current SFI took root in 1947. Initially, it was faced with numerous problems. »It is easier to fight a forest, tree or wood than man«, was a very vivid description of the unenviable situation in those years by Bogdan Žagar, BSc, Director of the Institute of Forest and Timber Economy of that time.

If problems with suitable personnel were one of the main issues during the first years at the Institute, given that

suitable experts were badly lacking, no such problems exist today. The forestry profession has developed a great deal, asserted itself at the international level and caught up even with those boasting much longer tradition in this field.

How very important is the Institute's international integration was pointed out way back in 1957 in the journal Gozdarski vestnik by the former Director, when writing about the significance of studying and taking into consideration foreign findings and insights for the development of this profession, including our own in Slovenia. The Institute's international integration is today a pure fact, considering that it participates in numerous international projects (co-financed by the 7th Framework Programme and Obzorja 20120), that has few patent applications in its possession, and is internationally fully established and recognized. Challenges, of course, are not missing. With new bases set up at the Ministry of Education, Science and Sports in cooperation with stakeholders in the newly emerging Act on developmental-research activities, we believe that we shall provide a suitable foundation for further work and development at our research institutes.

To all those who have and still are contributing in any way to the development of this profession, I would like to express my sincerest thanks and wish you much success in your work in the future as well.

Dr Maja Makovec Brenčič



70-letnica Gozdarskega inštituta Slovenije

Gozd je v Sloveniji najbolj prepoznaven element krajine, saj pokriva kar 60 % našega ozemlja. Pomemben je za državo in za njene ljudi. Prispevek gozda k ohranjanju naravnih virov - čiste pitne vode in kakovosti zraka - je neprecenljiv. Gozd zagotavlja življenjski prostor številnim rastlinskim in živalskim vrstam, lastnikom omogoča dohodek in s tem preživetje, gozdarskim strokovnjakom zaposlitev, prav za vse nas pa je lahko prostor zdravega oddiha in sprostitve. Zato je zelo pomembno, da imamo v Sloveniji močno in dobro organizirano gozdarsko znanost in stroko.

Gozdarski inštitut Slovenije je javni raziskovalni zavod nacionalnega pomena s področja temeljnega in aplikativnega raziskovanja gozdov, gozdne krajine, gozdnih ekosistemov, ekologije divjadi in lovstva, rabe dobrin in storitev gozdov. Svoja raziskovalna dognanja dosega z znanstveno odličnostjo in strokovno kompetentnostjo. Zelo je uspešen pri pridobivanju

mednarodnih projektov na področju gozdne ekologije, gozdne fiziologije in genetike, gozdne tehnike in ekonomike, monitoringa gozdne krajine, prirastoslovja in gojenja gozdov ter varstva gozdov. Posamezni raziskovalci pa se na svojih področjih dela uvrščajo med najbolj prepoznavne in uspešne v evropskem in celo svetovnem merilu.

Slovenija ima dolgo in uspešno tradicijo trajnostnega in sonaravnega gospodarjenja z gozdovi. In vendar se gozdarska znanost in stroka spopadata z novimi izzivi, kot so podnebne spremembe in posledično naravne ujme velikega obsega, pojavljanje novih škodljivih organizmov v gozdu ter vse večji pritiski na gozd in gozdni prostor zaradi turizma in rekreacije. Zato Ministrstvo za kmetijstvo, gozdarstvo in prehrano skupaj z Javno agencijo za raziskovalne dejavnosti RS financira raziskovalne projekte, ki ponujajo odgovore in rešitve za aktualne ter najzahtevnejše probleme na področju gozdarstva. Dognanja in rezultate nato v praksi uporabi in udejanja gozdarska stroka. Poleg raziskovalne dejavnosti Gozdarski inštitut Slovenije opravlja tudi javno okoljsko službo in javno gozdarsko službo. Težišče javne okoljske službe je monitoring toplogrednih plinov in s tem podpora mednarodnim zavezam RS na tem področju. Javna gozdarska služba pa temelji na nalogah, določenih v Zakonu o gozdovih, ki se nanašajo na spremljanje stanja razvrednotenja in poškodovanosti gozdov, vodenje poročevalske in prognostično-diagnostične službe za gozdove, usmerjanje gozdnega semenarstva in drevesničarstva, informacijski sistem za gozdove in pripravo normativov za opravljanje del v gozdovih. Slogan Tedna gozdov, v katerem Gozdarski inštitut Slovenije praznuje 70 let, je »Znanje za gozd«. Zato mu ob tem pomembnem jubileju želim še veliko let in desetletij znanstvenih in raziskovalnih uspehov.

mag. Dejan Židan

70th anniversary of the Slovenian Forestry Institute

Forest is the most distinctive landscape element in Slovenia, for it covers no less than 60% of our territory. It is of great significance for both the state and its people. Its contribution to the conservation of natural resources – clean drinking water and clean air – is priceless. Forest provides habitat for numerous plant and animal species, enables income and, in turn, survival to its owners, jobs to forestry experts, and a place of healthy rest and relaxation to us, the people. It's very important, therefore, that we sustain powerful and well organized forestry science and profession in our country.

The Slovenian Forestry Institute is a public research institution of national significance in the spheres of basic and applicative research into forests, forest landscape, forest ecosystems, ecology of game and hunting, use of natural assets and forest services. The Institute has achieved its high results with scientific excellence and professional competency. It is very successful in acquiring international projects from the fields of forest ecology, forest physiology and genetics, forest engineering and economics, forest landscape monitoring, yield, silviculture and forest protection. Furthermore, the Institute employs several researchers that are ranked, in their respective fields, among the most recognizable and successful on the European and even global scale.

Slovenia boasts a long and successful tradition of sustainable and close-to-nature forest management. Still, the forestry science and profession are facing new challenges, such as climate change and consequently large-scale natural disasters, occurrence of new harmful organisms in forests and increasing

pressures on forests owing to tourism and recreation. This is why the Ministry of Agriculture, Forestry and Food is financing, together with the national Public Research Agency, research projects that offer answers and solutions to the current and most complex problems in the field of forestry. The findings and results are then utilised in practice by forestry profession.

Apart from various research activities, the Slovenian Forestry Institute performs public environmental and public forestry services. The public environmental service focuses on greenhouse gas monitoring and thus contributes to the implementation of Slovenia's international commitments in this field. The public forestry service, on the other hand, is based upon the obligations stipulated by forestry laws relating to the monitoring of the forests' state of degradation and damage, implementation of the prognostic-diagnostic service for forests, guidance of forest seed and tree-planting trade, information system for forests and preparation of forest work standards and norms.

The slogan of Forest Week, in which the Slovenian Forestry Institute celebrates its 70th anniversary, is »Knowledge for Forests«. At this important jubilee I therefore wish the Institute many more years and decades of scientific and research success.

Dejan Židan, MSc



Letos je minilo 70 let od ustanovitve Gozdarskega inštituta Slovenije. V Uradnem Listu LR Slovenije iz 26. aprila 1947 so zapisali, da se inštitut ustanovi z namenom, da se postavijo temelji v načrtovanju gozdnega in lesnega gospodarstva, da se izboljšata gozdna in lesna proizvodnja in da se pospešuje tehnični napredek v gozdarstvu in ustanovi.

Od leta 1956 inštitut deluje v stavbi arhitekta Edvarda Ravnikarja in se tako umešča v arhitekturno dediščino 20. stoletja. V obdobju od leta 1947 do 1993 inštitut večkrat zamenja svoje ime, menjajo pa se tudi (so) ustanovitelji: Ministrstvo za kmetijstvo in gozdarstvo, Poslovno združenje gozdnogospodarskih organizacij, Biotehniška fakulteta. Decembra 1993 se inštitut s sklepom Vlade Republike Slovenije preoblikuje v javni zavod Gozdarski inštitut Slovenije. Predstavniki ustanovitelja so Ministrstvo za kmetijstvo in gozdarstvo, Ministrstvo za znanost in tehnologijo ter Ministrstvo za okolje in prostor.

This year marks the 70th anniversary of the establishment of the Slovenian Forestry Institute. The edition of the Official Gazette of the Republic of Slovenia of 26 April 1947 stated that the Institute would be set up in order to lay the foundations for forestry planning, improve forest and wood production, accelerate progress in forestry and develop the Institute.

The Institute's home is the building constructed by Edvard Ravnikar, which makes it a part of the architectural heritage of the 20th century. During the period 1947–1993, the Institute changed its name several times and its (co)founders changed as well: the Ministry of Agriculture and Forestry, the Business Union of Forestry Organisations and the Biotechnical Faculty. In December 1993, the Slovenian government decided to transform the Institute into a public institution called the Slovenian Forestry Institute. The founding body was represented by the Ministry of Agriculture and Forestry,

V današnjem času ni nič več samoumevno. V državi, katere slabi dve tretjini površine prekriva gozd, raziskovalci z velikimi naporji zagotavljamo svoje poslanstvo, ki je v spoznavanju, raziskovanju in razumevanju delovanja gozdov ter izvajanju nalog v podporo razvoja gozdov in gozdarstva v Sloveniji.

Slovenci se od drugih držav razlikujemo predvsem po obdarjenosti z naravnimi viri. To so voda in gozdovi. Bili so nam predani v skrb in zaslužijo si več naše pozornosti. Naša dolžnost in obveza sta, da z njimi vzdržnostno gospodarimo, jih ohranjamo in s tem poskrbimo, da jih predamo v čim boljšem stanju našim zanamcem.

Gozdovi nam omogočajo in nudijo številne ekosistemske storitve. Dajejo les, ščitijo nas pred erozijskimi procesi in plazenju tal, skupaj s tlemi uravnavajo vodni cikel, številni viri pitne vode se nahajajo v gozdnem prostoru. Z izjemnim bogastvom vrst (gliv, rastlin in živali) se Slovenija uvršča v območja z največjo biotsko pestrostjo v Evropi. Izjemna pestrost vrst in ekosistemov je seveda rezultat naravnih danosti, a hkrati tudi načina gospodarjenja z gozdovi v preteklosti in sedanjosti. Poleg biotske pestrosti je za gozdne ekosisteme v Sloveniji značilno tudi to, da so velik ponor ogljikovega dioksida. Bilanca gozdnega ogljika (sekvestracija) na enoto državne površine je celo najvišja v Evropi!

Podnebne spremembe, naravne velikopovršinske motnje, bolezni, napadi insektov, invazivne tujerodne vrste, lastniška struktura, spremembe v družbi, morebitne nove energetske krize, neugodni tokovi lesa so samo nekatere od groženj, ki vplivajo na današnje in bodoče stanje gozdov. V gozdovih potekajo trajni procesi, ki spreminjajo njihovo naravo delovanja, vplivajo na njihovo rast, odpornost, vrstno sestavo, strategijo vrst. Brez vrhunskega znanja in uporabe tega znanja pri reševanju težav v gozdarstvu in gozdovih, se bomo težko spopadali z biološkimi in tehnološko-inženirskimi izzivi 21. stoletja.

the Ministry of Science and Technology and the Ministry of the Environment and Spatial Planning.

Nowadays nothing is taken for granted anymore. In a country where nearly two-thirds of its surface is covered in forests, researchers are struggling to fulfil their mission to explore, research and understand the functioning of forests or to perform tasks supporting forest and forestry development in Slovenia.

One thing that sets Slovenia apart from other countries is its abundance of natural resources, especially water and forests. Their preservation has become our responsibility and therefore deserves more of our attention. It is our duty and commitment to ensure their sustainable management and preservation so that they will be kept in the best possible condition for the future generations.

Forests offer numerous ecosystem services, such as providing wood, protecting us from erosion and earth slides, and also help manage the water cycle. Several drinking water resources can be found in forests. Slovenia is one of the greatest biodiversity hotspots in Europe (fungi, flora and fauna), which obviously correlates to its natural treasures. However, this is also a result of its long-term sustainable and ecosystem-oriented forest management practices. Nevertheless, biodiversity is not the only characteristic of Slovenia's forest ecosystems. They are a major carbon sequestration processes, ranking the highest carbon sink in Europe per unit of state area!

Climate change, large-scale natural disturbances, diseases, insects, invasive alien species, ownership structure, social change, potential energy crises, and adverse wood flow are just a few of the threats currently affecting the current and future condition of

Naloga nas raziskovalcev je, da ob upoštevanju znanja naših predhodnikov ter uporabi novih tehnologij razvijamo stroko in odločilno prispevamo k boljšemu poznavanju in ohranjanju gozda. Kljub nekaterim nespodbudnim trendom v naši družbi smo optimistični, saj se lahko pohvalimo, da je danes Gozdarski inštitut Slovenije moderna znanstveno-raziskovalna organizacija nacionalnega pomena. Skupaj z drugimi sorodnimi raziskovalnimi institucijami v Sloveniji, kot so Biotehniška fakulteta, Slovenska akademija znanosti in umetnosti, njen Znanstveno raziskovalni center in Kmetijski inštitut Slovenije in številnimi drugimi, ter strokovnimi institucijami, kot je Zavod za gozdove Slovenije, vzpostavljamo ključne raziskovalne in strokovne osnove za upravljanje in vzdržnostno gospodarjenje z gozdovi. Poudariti moramo, da današnji čas raziskovalcem, poleg znanstvenega preučevanja in objavljanja, nalaga tudi dolžnost izobraževanja javnosti, prenosa znanja s pomočjo novih medijev in s tem seznanjanja javnosti z raziskovalnimi dosežki in smiselnostjo raziskovalnega dela.

Svoje delo smo morali v zadnjih letih usmeriti tudi v iskanje raziskav in financiranje našega dela v tujini, pri čemer smo se povezali z številnimi uglednimi raziskovalnimi in strokovnimi institucijami v Evropi in svetu. Ključni preobrat na tem področju se je zgodil nekaj let pred vključitvijo Slovenije v Evropsko unijo, tako da danes izvajamo že več kot tretjino raziskav s tujimi partnerji v okviru različnih evropskih in drugih mednarodnih programov in projektov.

Kot inštitut nacionalnega pomena se moramo posebej zahvaliti za podporo ustanoviteljem, v prvi vrsti Ministrstvu za izobraževanje, znanost in šport, Ministrstvu za kmetijstvo, gozdarstvo in prehrano in Javni agenciji za raziskovalno dejavnost Republike Slovenije ter drugim financerjem, Ministrstvu za okolje in prostor in Agenciji Republike Slovenije za okolje. Želimo si, da bi nas Ministrstvo za okolje in prostor, kot eno izmed ustanoviteljskih ministrstev, še tesneje vključilo v svoje programe.

our forests. They are home to long-term processes that change the way they function and affect their growth, resilience, species composition and species strategy. We know for a fact that it will be difficult to cope with the biological, technological and engineering challenges presented by the 21st century without specialised knowledge and the ability to use it to solve forestry issues.

In this respect, the role of researchers is to apply the knowledge gained by our predecessors and to use new technology to encourage the industry to take a crucial step forward towards understanding and preserving our forests. Despite a number of worrying trends in society, our optimism remains high because the Slovenian Forestry Institute is a modern scientific research organisation of national importance. The Institute works hand in hand with other related research institutions in Slovenia, such as the Biotechnical Faculty, the Slovenian Academy of Sciences and Arts and its Research Centre, the Agricultural Institute of Slovenia, and other professional institutions, such as the Slovenia Forest Service, in order to lay solid scientific and professional foundations for sustainable forest management. It is important to note that the role of researchers today is not only to study phenomena and publish their findings, but also to educate the public, ensure that knowledge is disseminated through the media, and to bring the public up to be speed with their scientific achievements and the general purpose of the research undertaken.

In recent years, we have been focusing on searching research opportunities and financing options abroad. As a result, we established links with numerous renowned research professional institutions from Europe and elsewhere. However, Slovenia's accession to the European Union was a crucial step forward, which means that now over one-third of our research efforts are carried in cooperation with foreign partners within European and international programmes and projects.

Nekdanji in sedanji raziskovalci Gozdarskega inštituta Slovenije smo ponosni na 70 let prehojene poti. Ponosni smo na raziskovalne dosežke, na mlade sodelavce, mlade raziskovalce s svežo energijo in idejami, na svoje znanje, na laboratorije in raziskovalno opremo tako v zgradbi inštituta kot na trajnih raziskovalnih objektih na terenu. Ponosni smo na svojo založbo Silva Slovenica, na Repozitorij SciVie, ki služi shranjevanju spletnih gradiv, na Gozdarsko knjižnico, ki si jo delimo z Biotehniško fakulteto in Zavodom za gozdove, ter nenazadnje na našo letošnjo pridobitev – prilagoditev prostorov inštituta gibalno oviranim osebam.

dr. Primož Simončič
direktor Gozdarskega inštituta Slovenije

As an Institute of special national importance, we would like to take this opportunity to thank the founders, especially the Ministry of Education, Science and Sport, the Ministry of Agriculture, Forestry and Food, the Slovenian Research Agency, and other funders, the Ministry of the Environment and Spatial Planning, and the Slovenian Environment Agency. We hope that the Ministry of the Environment and Spatial Planning will continue to strive to integrate the Institute into its programmes.

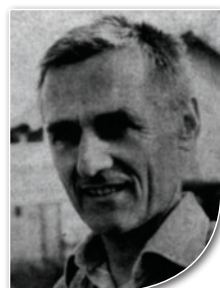
The former and current researchers of the Slovenian Forestry Institute are proud that it is celebrating its 70th anniversary; not only that, we are also delighted about all the achievements made, our younger fellow professionals, junior researchers providing a new momentum and fresh ideas, our knowledge, laboratories, the equipment at the premises and the permanent monitoring sites in the field. We are proud of our Silva Slovenica publishing centre, the repository SciVie, which stores online resources, the Forestry Library we share with the Biotechnical Faculty and the Slovenia Forest Service, and of course our most recent acquisition – the improved premises of the Institute to cater to the needs of people with physical disabilities.

Dr Primož Simončič,
Director of the Slovenian Forestry Institute

Direktorji GIS



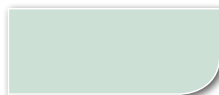
Franjo Sevnik
1947 - 1949



Milan Ciglar
1966 - 1971



Milan Hočevar
1994 - 1999



Jože Jošt
1950



Milan Kuder
1971 - 1981



Niko Torelli
1999 - 2008



Milan Brinar
1950 - 1954



Marko Kmecl
1981 - 1994



Mirko Medved
2008 - 2012



Bogdan Žagar
1954 - 1966



Gozdarski inštitut Slovenije

Gozdarski inštitut Slovenije je javni raziskovalni zavod nacionalnega pomena s področja temeljnega in aplikativnega raziskovanja gozdov, gozdne krajine, gozdnega ekosistema, ekologije divjadi, lovstva, gospodarjenja z gozdovi, rabe dobrin in storitev gozdov. Znanstvena spoznanja na omenjenih področjih raziskovanja omogočajo raziskovanje gozdne biodiverzitete, njenih vlog in njenega upravljanja v povezavi s spremenljivimi klimatskimi pogoji.

Inštitut v okviru raziskovalnega programa in komplementarnih raziskav izvaja tudi javni službi v interesu države, gozdarsko in okoljsko javno službo. Inštitut z namenom poglobljanja znanj ter zavedanja o pomenu gozda v okolju in ravnanju z njim prenaša znanstvena spoznanja v vse pore trajnostnega razvoja družbe. Lahko rečemo, da je inštitut znanstveni, strokovni in kulturni hram odnosa do narave, dobrin in storitev, ki jih gozd daje Sloveniji.

Vizija

Gozdarski inštitut Slovenije je javni raziskovalni inštitut nacionalnega pomena, ki svoja raziskovalna spoznanja dosega z znanstveno odličnostjo in strokovno kompetentnostjo. Z raziskovanjem gozdne biodiverzitete in njenega upravljanja v povezavi s klimatskimi spremembami predstavlja inštitut pomemben del poglobljanja znanj in zavedanja o pomenu gozda v okolju in ravnanju z njim. S svojim delom inštitut utrjuje svoj status v družbi in ostaja osrednja, doma in v tujini prepoznavna zakladnica znanja, inovativnosti in ustvarjalnih idej v raziskavah gozda, gozdnih ekosistemov, ekologije divjadi, lovstva, gospodarjenja z gozdovi, rabe dobrin in storitev gozdov.

The Slovenian Forestry Institute

The Slovenian Forestry Institute is a public research institute of national importance, which conducts basic and applied research on forests and forest landscapes, forest ecosystems, wildlife ecology, hunting, forest management, and other uses of the resources and services forests provide. The scientific knowledge from these fields helps further the research on forest biodiversity and its management in relation to climate change.

As part of its research programme and related studies, the Institute also provides forestry and environmental services in the public interest.

Another of the Institute's functions is to provide scientific knowledge on all aspects of sustainable development, with the purpose of increasing knowledge and awareness of the importance of forests within the environment and the importance of forest management. In short, the Institute is a scientific, professional, and cultural storehouse for Slovenia's relationship with its forests and the resources and services they provide.

Vision

The Slovenian Forestry Institute is a public research institute of national importance, which bases its research on scientific excellence and professional competence. The research it conducts on forest biodiversity and its management in relation to climate change gives the Institute a key role in increasing knowledge and awareness of the importance of our forests and the way we interact with them. The Institute's work reinforces its position in society. Highly regarded both at home and abroad, it is Slovenia's principal treasury of knowledge, innovation, and creative ideas in researching forests, forest ecosystems, wildlife ecology, hunting, forest management, and the use of resources and services that forests provide.

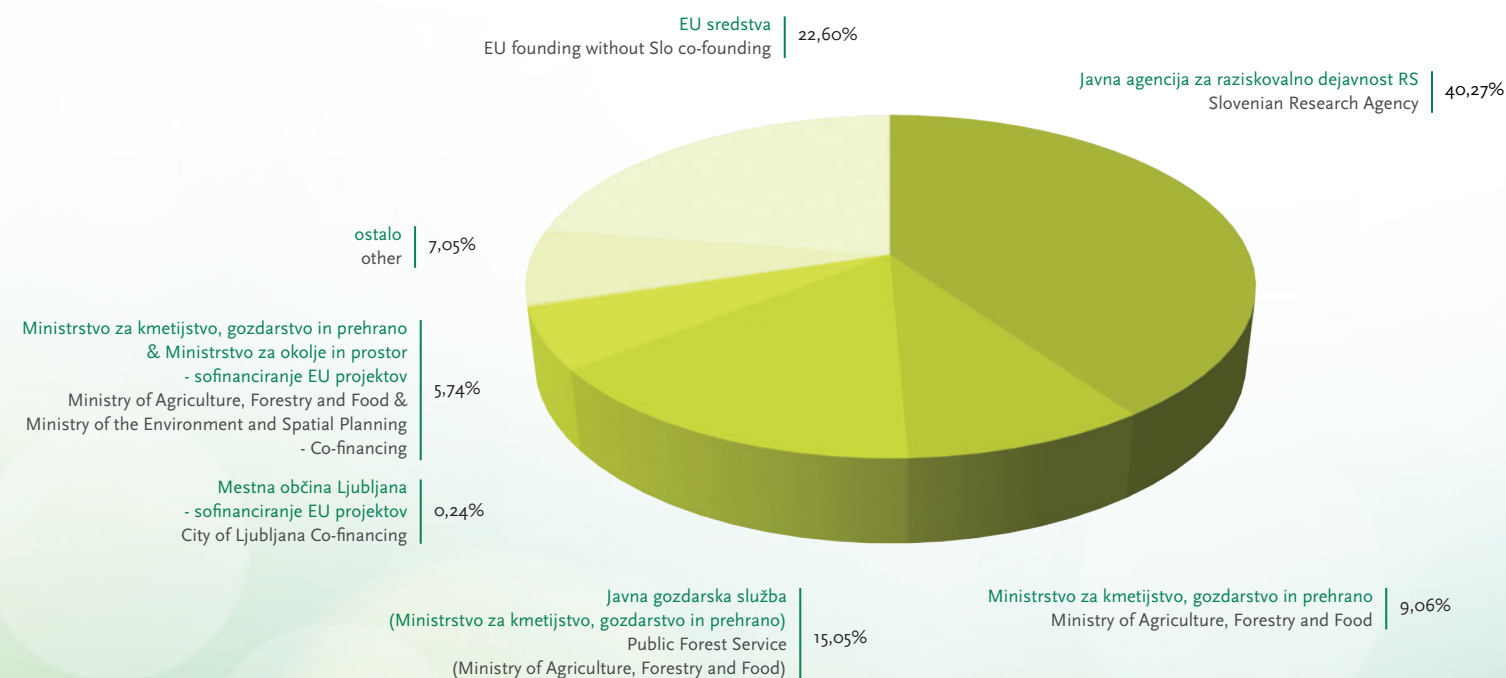
Poslanstvo

Inštitut se bo še naprej razvijal kot znanstveni, strokovni in kulturni hram odnosa do narave, dobrin in storitev, ki jih gozd daje Sloveniji. Inštitut v okviru raziskovalnega programa in komplementarnih raziskav izvaja javna pooblastila zapisana v Zakonu o gozdovih ter javno gozdarsko in okoljsko službo.

Mission

The Institute will continue to develop as a scientific, professional, and cultural storehouse for Slovenia's relationship with its forests and the resources and services they provide. As part of its research programme and related studies, the Institute acts with public authority granted under the Forest Act and provides forest and environmental public services.

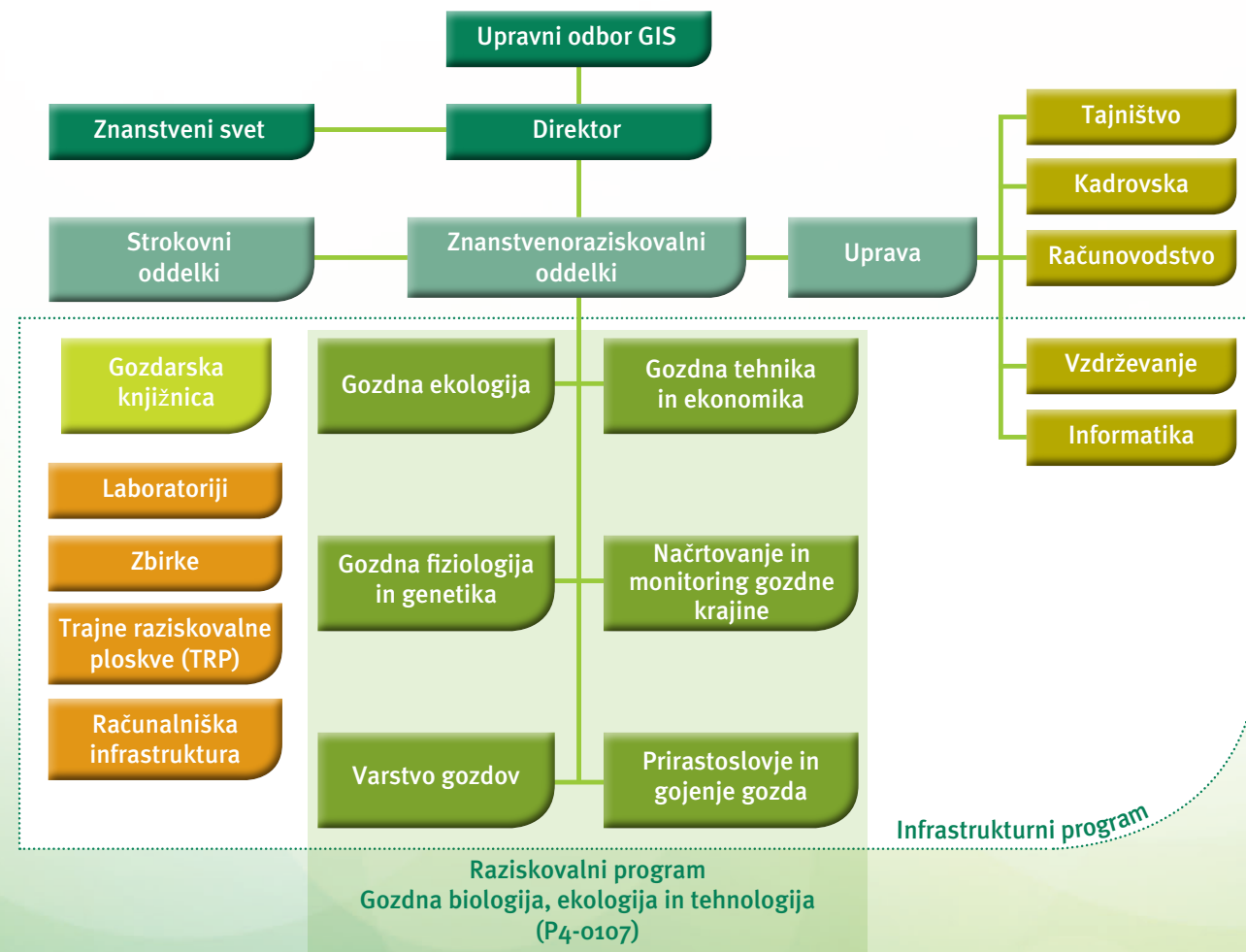
Financiranje Gozdarskega inštituta Slovenije 2017 Slovenian Forestry Institute - financial resources 2017



ORGANIGRAM GOZDARSKEGA INŠTITUTA SLOVENIJE

Legenda

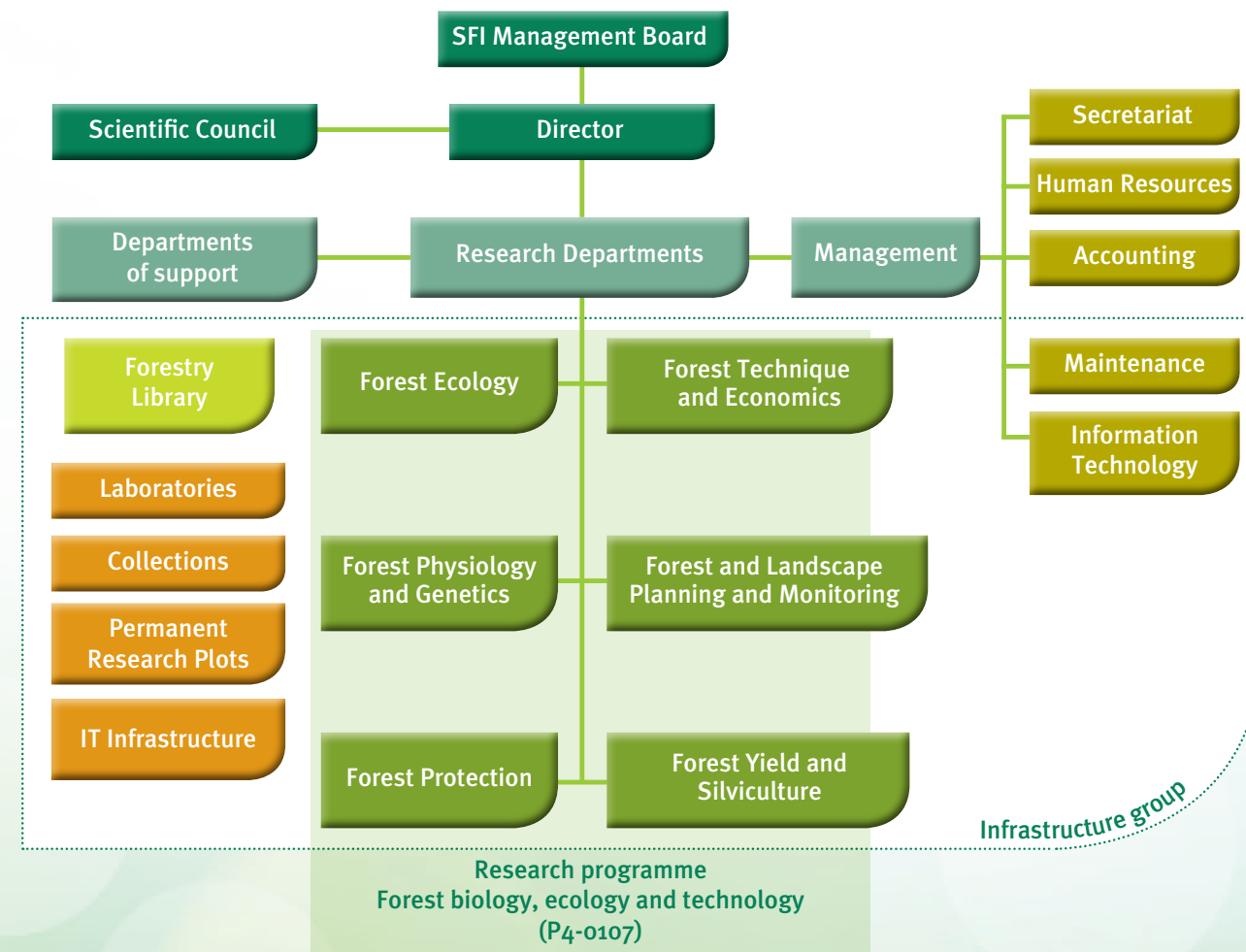
- • Organi inštituta
- • Organizacijske enote
- • Uprava
- • Strokovni oddelek
- • Oddelki
- • Infrastrukturne enote



SLOVENIAN FORESTRY INSTITUTE – ORGANIGRAM

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- • Institute's bodies
- • Organisational Units
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- • Professional Department
- • Departments
- • Infrastructural Units





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DEPARTMENT OF FOREST ECOLOGY

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01

ODDELEK ZA
GOZDNO EKOLOGIJO
GOZDNO EKOLOGIJO

DEPARTMENT OF
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FOREST ECOLOGY

ODDELEK ZA GOZDNO EKOLOGIJO

V nalogah sodelavcev z Oddelka za gozdno ekologijo se prepletajo različna področja, saj ima gozd kot pomemben gradnik krajine raznolike vplive na človekov vsakdanjik, in obratno. Bistvenega pomena je mednarodno sodelovanje, brez katerega si velikih in finančno zahtevnih projektov ne moremo predstavljati. Prav rezultati slednjih so bodisi temeljna znanost bodisi strokovne podlage gozdnogospodarskemu, gozdnogojitvenemu, lovsko-gospodarskemu in prostorskemu načrtovanju ter drugim politikam na ravni Slovenije ali Evropske unije.

FITOCENOLOGIJA IN EKOLOGIJA RASTLIN

Fitocenologijo so začeli razvijati takoj po ustanovitvi Inštituta. Sprva so uporabljali standardno srednjeevropsko metodo za preučevanje vegetacije (Braun-Blanquet), vzporedno s tem so razvijali t.i., inštitutsko metodo', pri kateri se bolj upoštevajo mikro-rastiščne razmere gozda. Kasneje so nekdanji sodelavci Biroja za gozdarsko načrtovanje, ki se je leta 1981 priključil inštitutu, v aplikativnih raziskavah vrednotili gozdni prostor in vegetacijo za praktične namene. V zadnjih desetletjih se je področje razvijalo v povezavi z gozdarsko operativno, zato je večji poudarek na preučevanju odzivov vegetacije na gospodarjenje z gozdom. Z uporabo sodobnih statističnih orodij in modeliranja se vrednotijo različni vidiki gozdne vegetacije, vključno s pričakovanimi odzivi na podnebne spremembe.

DEPARTMENT OF FOREST ECOLOGY

Due to forest variability impacts on human everyday life, the team of Department of Forest Ecology is faced with multitasking. The international cooperation is essential for winning major and financially complex research projects. Their results are crucial for science and serve as a basis for forest management as well as policy at the Slovenian and European Union level.

PHYTOSOCIOLOGY AND PLANT ECOLOGY

Phytosociology began to develop soon after the Institute was established. Initially, the Standard Central European method (Braun-Blanquet) was used for the study of forest vegetation. In parallel, the so-called »Institute method« was developing, by which forest micro-site conditions are taken into consideration. Later on, former experts of the Forest Planning Bureau, which in 1981 joined the Institute, evaluated forest land and vegetation through applied research with practical aims. In recent decades, phytosociology has been developed in cooperation with the forestry practice, when responses of vegetation to forest management were in the focus of these studies. Using modern statistical tools and modelling, various aspects of forest vegetation, including the expected responses to climate change, have been evaluated.

BIODIVERZITETA IN PREUČEVANJE OBMOČIJ ZAVAROVANE NARAVE

Že v 80. letih dvajsetega stoletja so v pragozdnih ostankih analizirali rastlinsko vrstno pestrost. Kasneje so preučevali rastlinsko raznovrstnost gozdnih rezervatov, barjanskih gozdov, različnih gospodarskih gozdov, še posebej hrastovih. Študije pestrosti mahov, praprotnic in semenk so bile napravljene v gozdovih, ki so bili leta 2004 izbrani za dolgoročno spremljanja stanja. V sodelovanju z drugimi inštitucijami so bili opisani gozdni habitatni tipi (Natura 2000), ki so posebej pomembni z vidika ohranjanja biotske raznovrstnosti gozdov. V zadnjem času se preučujejo negativni vplivi invazivnih tujerodnih rastlin na gozd.

GOZDNA HIDROLOGIJA IN FENOLOGIJA

Gozdna hidrologija obravnava medsebojno odvisnost gozdov in podnebja. Spremljamo količino in kakovost sestojnih padavin v različnih gozdnih tipih in ekoloških regijah ter s hidrološkimi modeli izračunavamo vodno bilanco gozdov ter sušni stres. Poseben poudarek je na raziskavah vplivov gozdnogojitvenih ukrepov in premene smrekovih monokultur na količino in kakovost padavin ter vodotokov v porečju Oplotnice ter padavinah v urbanih in poplavnih gozdovih reke Save. Fenološke raziskave vključujejo spremljanje fenološkega razvoja dreves v različnih gozdnih tipih in ekoloških regijah, kar je pomembno za ugotavljanje povezav med vremenskimi spremenljivkami in odzivi dreves.

BIODIVERSITY AND STUDY OF NATURAL PROTECTED AREAS

Back in the 1980s, plant species diversity was analysed in primeval forests. In the ensuing period, plant diversity of forest reserves, bog woodlands and different managed forests, especially oak forests, were studied. Studies of diversity of mosses, ferns and vascular plant species were carried out in the forests selected for a long-term monitoring in 2004. In collaboration with other institutions, forest habitat types (Natura 2000), which are particularly important for the conservation of forest biodiversity, were described. Recently, negative impacts of the invasive alien plants on forests have been studied.

FOREST HYDROLOGY AND PHENOLOGY

Forest hydrology deals with interactions among forest ecosystems and climate. We are monitoring quantity and quality of net precipitation in different forest types and eco-regions. With the help of hydrological models we are estimating water balance and drought stress in forests. Special emphasis is given to the research, related to the effects of silvicultural measures and transformation of spruce monocultures into more natural mixed stands on the quality and quantity of net precipitation and streams in the Oplotnica catchment and precipitation in urban and floodplain forests of the river Sava. Phenological studies include monitoring the phenological development of trees in different forest types and eco-regions, which helps us to assess the links between weather variables and the response of trees.

KROŽENJE SNOVI IN MODELIRANJE PROCESOV V GOZDNIH EKOSISTEMIH

S preučevanjem kroženja snovi v gozdnih ekosistemih smo se intenzivneje začeli ukvarjati po letu 1985 v okviru Konvencije o daljinskem transportu onesnaženega zraka. Po letu 1994 smo uvedli program »Intenzivno spremljanje stanja gozdnih ekosistemov«. Z novimi znanji, boljšo opremo in metodološko izpopolnjenimi meritvami smo po letu 2000 začeli z računalniškim modeliranjem. Za gozdne ekosisteme smo razvili modele vodne bilance, kroženja hranil, ogljika in procesov dihanja tal. Še posebej zahtevne raziskave potekajo v bližini Kraškega roba. Njihov namen je ovrednotiti kroženje ogljika v različnih sukcesijskih stadijih gozda glede na podnebne spremembe, rastišče, gospodarjenje in požare.

PREUČEVANJE TAL

Raziskave tal so bile načrtovane že ob ustanovitvi Gozdarskega inštituta Slovenije leta 1947. Pedološki laboratorij je začel delovati leta 1956, v šestdesetih letih razvoja pa se je razvil v edini gozdarski laboratorij v Sloveniji, v katerem potekajo analize tal, rastlinskega materiala, vod idr. Raziskave tal in procesov v njih so pomembne za razumevanje gozdnih rastišč, našega ravnanja z gozdom in delovanja gozdnih ekosistemov. Rezultati analiz nam omogočajo podrobnejši vpogled v gozdna tla, ki opravljajo številne ekološke funkcije; dajejo oporo rastlinam, omogočajo njihovo preskrbo z vodo in hranili, so življenjski prostor organizmom, vežejo ogljik, so ponor in emitent toplogrednih plinov ter delujejo kot naravni filter vode.

MATTER CYCLE AND PROCESS MODELING IN FOREST ECOSYSTEMS

Examination of matter cycles in forest ecosystems intensively started after 1985 within the framework of the Convention on the remote transport of air pollution. In 1994, we introduced a new program entitled »Intensive monitoring of forest ecosystems.« After 2000, we opted for more sophisticated equipment and methodological measurements and together with the newly acquired knowledge embarked on computer modelling. For forest ecosystems measurements, we developed models for the water balance, nutrient cycling, carbon and soil respiration processes. Especially demanding research studies are conducted in the Karst area (SW Slovenia), their purpose being to evaluate the carbon cycle in different stages of forest succession in relation to climate change, habitat, forest management and fire impacts.

PEDOLOGY

Forest soil research was planned as early as in 1947, when the Slovenian Forestry Institute was established. In 1956, the Forest Ecology Laboratory was established and developed during its sixty years into the only forestry laboratory in Slovenia, in which analyses of soil, plant material, water, etc. are conducted. Studies of forest soil and the ongoing processes in soil are important for the understanding of forest sites, our management of forests and forest ecosystem functioning. The results of analyses allow us a more detailed insight into the forest soils, which provide for several ecological functions: support to plants, supply of water and nutrients to plants, serve as habitat for various organisms, act as carbon sink and emitter of greenhouse gases, as well as a natural water filter.



URBANO GOZDARSTVO

Trend preseljevanja ljudi v mesta je v strmem vzponu, zato je skrb za urbani gozd, tj. drevje in gozd v mestih ter njihovi neposredni okolici, izjemnega pomena. Urbani gozd daje mestu identiteto, omogoča prostor za rekreacijo, vpliva na blažnje skrajnih vremenskih pojavov, varuje vire pitne vode ter s svojo kuliso privablja turiste in dviguje vrednost bivalnemu okolju. Področje je med osnovnimi dejavnostmi inštituta, delo pa sloni predvsem na mednarodnih projektih. Eno prvih posvetovanj s tega področja smo imeli že leta 1993, nazadnje pa smo leta 2016 kot glavni organizator gostili letno konferenco Evropskega foruma za urbano gozdarstvo in dosegli svetovno odmevnost.

EKOLOGIJA IN VARSTVO GOZDNE FAVNE, UPRAVLJANJE POPULACIJ DIVJADI

Že v preteklosti je imel GIS pomembno vlogo na področju raziskav gozdne favne, zlasti velikih zveri, koconogih kur, parkljaste divjadi in njenih interakcij z rastlinsko komponento gozdnih ekosistemov. Trenutno smo usmerjeni k raziskovanju prostoživečih parkljarjev, pridobivanju novih podatkov o bioloških značilnostih vrst, zmanjševanju konfliktnih situacij med ljudmi in parkljarji in izboljšanju upravljanja s populacijami. Z raziskavami drugih vrst divjadi sledimo izzivom, ki jih pred nas postavlja spreminjajoče se okolje. Aktivni smo v mednarodnih skupinah s tega področja, prepoznavnost pa krepimo prek organizacije in udeležbe na mednarodnih znanstvenih dogodkih.

URBAN FORESTRY

Migration to urban areas is constantly increasing. This puts the care for urban forests – that is trees, groups of trees and forest in and around towns and cities – high on a priority list. Urban forests give cities their identity, space for recreation, mitigate weather extremes, protect fresh water resources, attract tourists and improve the overall value of the living environment. Urban forestry research is one of the basic activities at the Institute which, however, rely mainly on international projects. One of the first events held in the field of urban forestry at the Institute dates back to 1993, while in 2016 we hosted the 19th European Forum on Urban Forestry with extensive international outreach.

WILDLIFE ECOLOGY AND CONSERVATION, WILDLIFE AND GAME MANAGEMENT

In the past, SFI played an important role in wildlife research, focusing especially on large carnivores, tetraonids, ungulates and their interaction with forest vegetation. Our recent research has been mainly focused on studies of wild ungulates and collection of new data on biological characteristics of species, prevention of human-wildlife conflicts and development of more efficient and adaptive wildlife management. With several studies on other game species, we follow the challenges, induced by the upcoming environmental changes. SFI is a member of international wildlife-research groups, and is also active in organization and participation at international scientific events.



SPREMLJANJE GOZDOV IN VPLIVOV NA GOZDNE EKOSISTEME

Stanje gozdov spremljamo v skladu s Konvencijo Združenih narodov o daljinskem transportu onesnaženega zraka prek meja. Meritve potekajo na dveh nivojih. Prvi obsega 45 ploskev in obravnava gozd na nivoju drevesa, drugi pa 10 ploskev, na katerih opravljamo mednarodno usklajene aktivnosti: kemizem tal in talne raztopine, hranila v drevesnih listih in depozicija onesnažil ter popisi stanja krošenj, talne (pritalne) vegetacije, fenološka opazovanja, rast drevja, meteorološke meritve in spremljanje ozona.

PRENOS ZNANJ

Sodelovanje z mednarodnimi organizacijami in mrežami omogoča prenos inovativnih raziskovalnih metodologij in spoznanj v slovenski prostor, hkrati pa odpira možnosti za sodelovanje v vseevropskih raziskavah. Poleg znanstvenih in strokovnih publikacij se aktivno udeležujemo pri prenosu znanj splošni javnosti ter razvoju idej in novih znanj za podporo vzgojno izobraževalnega procesa v naravnih okoljih, ki poteka s pristopi gozdne pedagogike v Gozdu eksperimentov. Svoja znanja delimo z drugimi uporabniki gozdnega prostora: združenja lastnikov gozdov, vzgojno-izobraževalne ustanove, nevladne organizacije, različne javnosti idr.



MONITORING OF FORESTS AND IMPACTS ON FOREST ECOSYSTEMS

The Slovenian Forestry Institute implements forest monitoring according to the Convention on Long-range Transboundary Air Pollution (CLRTAP) of the United Nations Economic Commission for Europe (UNECE). Forest monitoring runs at two levels. Level I consists of 45 plots laid on a systematic grid and monitors forest condition on tree-level. Level II consists of 10 plots, where monitoring is more intensive: chemistry of soil and soil solution, nutrients in leaves and needles, deposition of pollutants, crown condition and ground vegetation assessments, phenological observations, tree growth, meteorology, and ozone measurements.

KNOWLEDGE TRANSFER

Cooperation with international organizations and networks is important for introducing innovative research methodologies and insights in Slovenia. Furthermore, it opens up possibilities for cooperation in the pan-European research. In addition to scientific and professional publications we are actively involved in transfer of knowledge to the public as well as in development of new ideas and knowledge to support the educational process in natural environments, using forest pedagogics in our »Forest of Experiments« educational centre. We share our knowledge with all the stakeholders: forest owners' associations, educational institutions, non-governmental organizations, public, etc.

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02

ODDELEK ZA
GOZDNO FIZIOLOGIJO IN GENETIKO
GOZDNO FIZIOLOGIJO IN GENETIKO
DEPARTMENT OF
FOREST PHYSIOLOGY AND GENETICS
FOREST PHYSIOLOGY AND GENETICS

O oddelku

Na **Oddelku za gozdno fiziologijo in genetiko (FIGE)** združujemo raziskovanje in uporabo fiziologije ter funkcionalne, vrstne in genetske pestrosti gozdnih drevesnih vrst in njihovih simbiotov v podporo vzdržnemu gospodarjenju z gozdnimi ekosistemi. Multidisciplinarna znanja so pogoj za uspešno obnovo gozdov, ohranjanje prilagoditvenega potenciala gozdnih drevesnih vrst, in s tem ohranjanja gozdnih genskih virov in biotske pestrosti v spreminjajočih se razmerah v okolju.

Javni pooblastili vključujeta vodenje postopkov odobritve gozdnih semenskih objektov (SO) z vodenjem Registra SO in certificiranje izvora gozdnega reprodukcijskega materiala. V okviru oddelka deluje več laboratorijev s **sodobno raziskovalno opremo in najsodobnejšimi analitskimi metodami**: molekularno-genetske analize in bioinformatika, kar vključuje tudi sekvenciranje novih generacij, klasične in specializirane mikroskopske tehnike, tudi laserska mikrodisekcija, možnosti eksperimentalnega dela *in vitro* in *in vivo* vse od izoliranih koreninskih sistemov do kompleksnih združb. Vodimo, vzdržujemo ali dopolnjujemo več **zbirk**, med njimi Slovensko gozdno gensko banko, molekularne baze podatkov in referenčni material ter zbirko živih koreninskih simbiotov gozdnega drevja.

Usmerjeni smo v nenehen razvoj znanstvene odličnosti in standardiziranih metodologij ob hkratnem tesnem sodelovanju s slovensko in mednarodno gozdarsko in naravovarstveno prakso.

About department

Department of Forest Physiology and Genetics combines physiology and functional, species and genetic diversity of forest tree species and their symbionts to support sustainable forest ecosystem management. Multidisciplinary knowledge is a prerequisite for successful regeneration of forests, conservation of the adaptation potential of forest tree species, and conservation of forest genetic resources and biodiversity in the changing environmental conditions.

We hold public authorisation for approving forest basic material (seed objects) and keeping the National list of approved basic material, and for certification of forest reproductive material. The Department boasts several laboratories with **modern research equipment and the capacity to perform state-of-the-art analytical methods**: molecular analysis and bioinformatics, including next-generation sequencing, classic and specialized microscopy techniques, such as laser microdissection and possibilities for *in vitro* and *in vivo* experiments on isolated roots or complex systems. We manage, maintain or supplement **collections**, including the Slovenian Forest Gene Bank, molecular databases and reference material, and a collection of live root symbionts of forest trees.

We focus on continuous development of scientific excellence and standardized methodologies and support close cooperation with the Slovenian and international forestry and nature conservation practices.

Ohranjanje gozdnih genskih virov

Ohranjeni gozdni genski viri so temelj odpornosti in prilagajanja drevesnih vrst na biotski in abiotski stres ter spremembe v okolju. V okviru javne gozdarske službe, projektov in raziskovalnega programa izvajamo molekularne in klasične raziskave gozdnih genskih virov, vodimo izbor in evidenco gozdnih semenskih objektov in genskih rezervatov ter s Slovenskim programom ohranjanja gozdnih genskih virov SIFORGEN (www.siforgen.si) aktivno sodelujemo v mednarodnih programih EUFORGEN (Evropski program za gozdne genske vire, www.euforgen.org) in EUFGIS (Evropska informacijska baza o gozdnih genskih rezervatih, www.eufgis.org) ter ekspertno sodelujemo v Delovni skupini Evropske komisije za gozdni reprodukcijski material (GRM). V objektih, namenjenih gozdnemu genetskemu monitoringu, spremljamo genetsko pestrost v času, za kar smo pridobili tudi izvedbeni projekt LIFE (LIFEGENMON, www.lifegenmon.si).

V Laboratoriju za gozdno semenarstvo raziskujemo pridobivanje, shranjevanje, dodelavo in kalitev semena, izvajamo analize kakovosti semena, ter v okviru javne gozdarske službe svetujemo in usmerjamo načrtovalce, upravljalce in lastnike gozdov. V Laboratoriju za gozdno genetiko s pomočjo molekularnih metod ocenimo stopnjo genetske pestrosti populacij dreves, gozdnega reprodukcijskega materiala in preverimo njegov izvor, tj. provenienco.

Provenienčni poskusi najbolj neposredno in otipljivo pokažejo genetsko diferenciacijo. So dolgotrajni in omogočajo statistično ovrednotenje rezultatov. Na GIS vodimo mednarodni provenienčni poskus bukve v bližini Novega mesta.

Conservation of forest genetic resources

Diverse forest genetic resources underpin both resilience and adaptability of forest tree species to biotic and abiotic stresses and to the changing environment. Our projects, the research programme and public forest services entail the performance of molecular and classic studies of forest genetic resources as well as the approval and registering of basic material and forest gene reserves. In addition, we lead the Slovenian programme for the conservation of forest genetic resources (SIFORGEN, www.siforgen.si) within which we actively participate in international programmes EUFORGEN (European Forest Genetic Resources Programme, www.euforgen.org) and EUFGIS (European Information System on Forest Genetic Resources, www.eufgis.org). We provide expert knowledge for the European Commission Working Group on forest reproduction material (FRM) legislation. Our forest genetic monitoring sites enable the monitoring of genetic diversity in time, for which we obtained an implementation LIFE project (LIFEGENMON, www.lifegenmon.si).

Our Forest Seeds Laboratory is tasked with studying the production, storage, processing and germination of seed, conducting seed quality analyses, and providing guidelines and counselling within the public forest service to forest planners, managers and owners. As for the Laboratory for Forest Genetics, it deals with estimating genetic diversity of tree populations, forest reproductive material (FRM) and checking its origin, i.e. provenance.

Genetic differentiation is most readily seen in **provenance trials**, which are long-term trials that enable statistical interpretation of the results. SFI is in charge of the international beech provenance trial located in the vicinity of Novo mesto.

Slovenska gozdna genska banka (SGGB)

V slovenskih gozdovih s preišljenim mnogonamenskim gospodarjenjem ohranjamo evolucijski potencial in zato lahko ohranjene gozdove uvrščamo v Slovensko gozdno gensko banko (SGGB). Posebni del SGGB so gozdovi *in situ*, v katerih gospodarimo v podporo izbrani drevesni vrsti ali skupini vrst z namenom ohranjanja genetske pestrosti – gozdni genski rezervati in pridobivanje gozdnega reprodukcijskega materiala – semenski objekti. Enote SGGB *ex situ* so testni in provenienčni nasadi, semenske plantaže, živi arhivi, semenska banka in knjižnica dednine.

Slovenian Forest Gene Bank (SFGB)

The evolutionary potential of Slovenian forests has been maintained through sustainable multipurpose forest management. Our well-preserved forests can therefore be considered as an integral part of the Slovenian Forest Gene Bank (SFGB). A special part of SFGB are *in situ* gene reserve forests, where management is directed in support of selected tree species or groups of species to maintain genetic diversity in gene reserves and approved forest seed objects (SO) for the production of forest reproduction material. The *ex situ* units are provenance trials, seed orchards, living archives, a seed bank, and a DNA library.



V Sloveniji je trenutno 40 gozdnih genskih rezervatov za 24 drevesnih vrst.
There are currently 40 forest gene reserves for 24 species in Slovenia.



Provenienčni poskus bukve na Kamenskem hribu pri Novem mestu (ZGS KE Straža) po zgodnjem snegu oktobra 2012. Na sliki je provenienca Perche, ki v Franciji raste na nadmorski višini 205 m. Zgodnji sneg je polomil 87 % osebkov te provenience pri starosti 16 let. Zraven je provenienca, ki je sneg ni poškodoval.
European beech Provenance trial on Kamenski hrib near Novo mesto (ZGS KE Straža) after early snow in October 2012. Figure presents Perche provenance, which grows in France at elevation 205 m. Early snow broke 87 % of specimens of this provenance at the age of 16 years. Next to it is the provenance which was not damaged by the snow.



Živi arhivi in testni nasadi hitrorastočih drevesnih vrst vključujejo nacionalni živi arhiv topolovih klonov v inštitutski drevesnici Zadobrova pri Ljubljani, ki obsega 40 selekcioniranih, visoko produktivnih in biološko stabilnih topolovih klonov, ter živi arhiv avtohtonega črnega topola iz različnih rastišč.

Living archives and test plantations of fast-growing tree species include a national living archive of poplar clones at the Institute's Zadobrova nursery in Ljubljana, which contains 40 selected, highly productive and biologically stable poplar clones, and a living archive of indigenous black poplars from different sites.

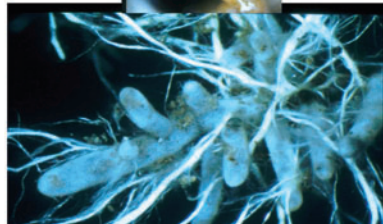
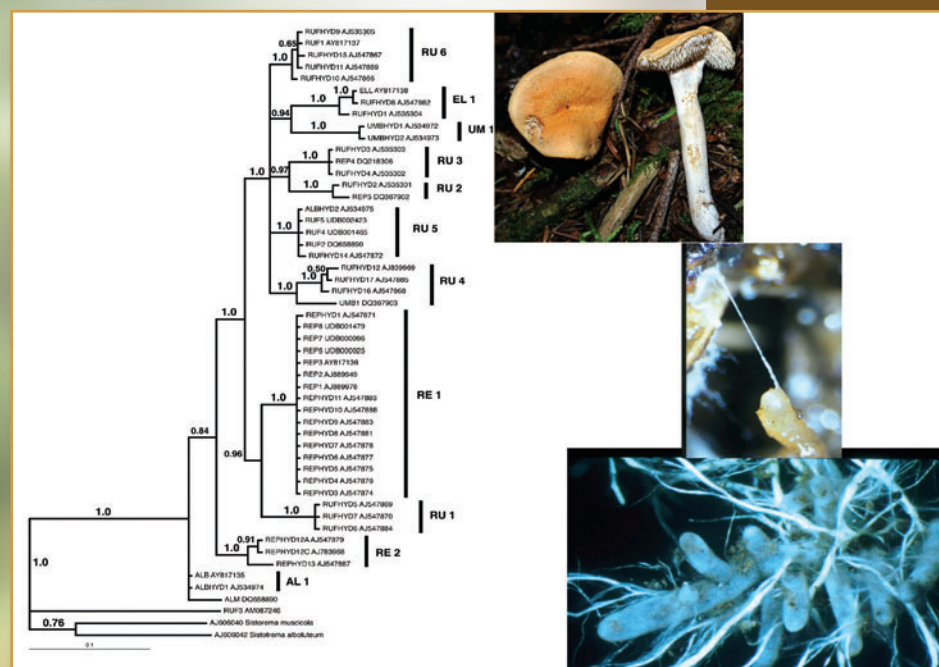
Klon avtohtonega črnega topola selekcije GIS lahko dosega zavidljive prirastke že po prvih dveh letih rasti v nasadu.
Indigenous black poplar clone from SFI selection can achieve prominent increment after just two years of growth.

Mikoriza in mikorizosfera

Mikoriza je sožitje med korenino rastline in glivo, ki deluje kot organ za sprejem in prenos vode in hranil med viri in porabniki: micelij mikoriznih gliv je glavna povezovalna mreža v predelu gozdnih tal pod neposrednim vplivom mikoriznih korenin in micelija mikoriznih gliv, tj. mikorizosferi. Raziskave pestrosti in pomena mikorize, predvsem ektomikorize, so stalnica raziskav Oddelka za gozdno fiziologijo in genetiko od leta 1984 naprej. V opisih ektomikorize smo v raziskavah med prvimi na svetu združili anatomske in molekularne metode identifikacije, kar je vodilo tudi do osnovanja prvega laboratorija za molekularno biologijo in genetiko na področju gozdarstva v Sloveniji. V okviru raziskav vrstne in funkcionalne pestrosti tipov ektomikorize smo razvili metodo mikobioindikacije stresa, mikorizoremediacije sterilnih in kontaminiranih površin, ter identificirali veliko število podzemnih gliv iz rodu *Tuber* (gomoljki – tartufovi) na Balkanu, pomembnih tudi v prehrani.

Mycorrhiza and mycorrhizosphere

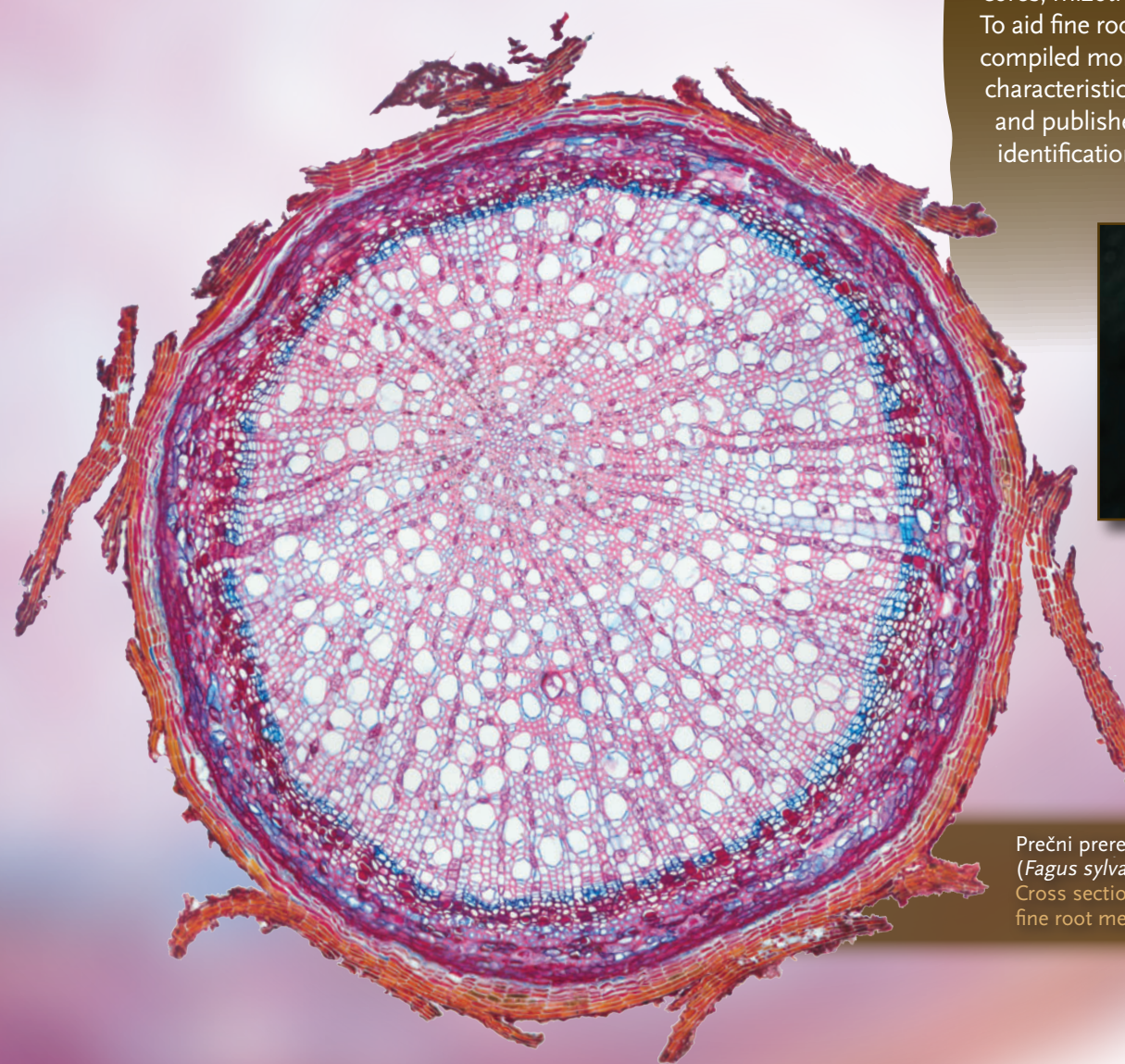
Mycorrhiza is a permanent symbiotic organ of plant roots and fungi for the uptake and transfer of water and nutrients between sources and sinks. As a result, common mycelial networks largely affect processes in the volume of forest soils, which are under direct influence of mycorrhizal roots and mycelium of mycorrhizal fungi, i.e. the mycorrhizosphere. Studies on the diversity and roles of mycorrhizae, especially ectomycorrhizae, have been a constant in the research of the Department of Forest Physiology and Genetics since 1984. We were among the first in the world to combine anatomical and molecular identification methods of mycorrhiza, which also led to the establishment of the first laboratory for molecular biology and genetics in forestry in Slovenia. Our studies of species and functional diversity of types of ectomycorrhiza lead to the development of methods of mycobioindication of stress, mycoremediation of sterile and contaminated land, and the identification of numerous below-ground fungi of the genus *Tuber* (truffles), which is also highly sought-after in gastronomy.



Filogenija in predstavitev ektomikorize glive *Hydnum rufescens* na smreki (*Picea abies* (L.) H. Karst)
Phylogeny and characterisation of the ectomycorrhizal fungus *Hydnum rufescens* on Norway spruce (*Picea abies* (L.) H. Karst)

Z raziskavami obrata micelija mikoriznih gliv in obrata drobnih korenin prispevamo k razumevanju dinamike ogljika v gozdnih ekosistemih in vplivih težke mehanizacije na delovanje biokomponente gozdnih tal. Za meritve obrata, dolgoživosti, produkcije drobnih korenin in micelija uporabljamo metode zaporednega vzorčenja, vrstne mrežice, rizotrone in minirizotrone. Za identifikacijo drobnih korenin do vrste smo zbrali morfološke in anatomske lastnosti za 12 drevesnih vrst in rezultate izdali v obliki določevalnega priročnika.

By studying mycelium and fine root turnover, we contribute to the understanding of carbon dynamics in forest ecosystems and the impact of heavy machinery on the biocomponents of forest soil. The measurements of turnover, longevity, production of fine roots and mycelium are based on sequential coring method, ingrowth soil cores, rhizotrons and minirhizotrons. To aid fine root species identification, we compiled morphological and anatomical characteristics of 12 species of forest trees and published them in the form of an identification key.



Dihotomni tip ektomikorize na črnem boru (*Pinus nigra* Arnold)
Dichotomous type of ectomycorrhizae on Austrian pine (*Pinus nigra* Arnold)

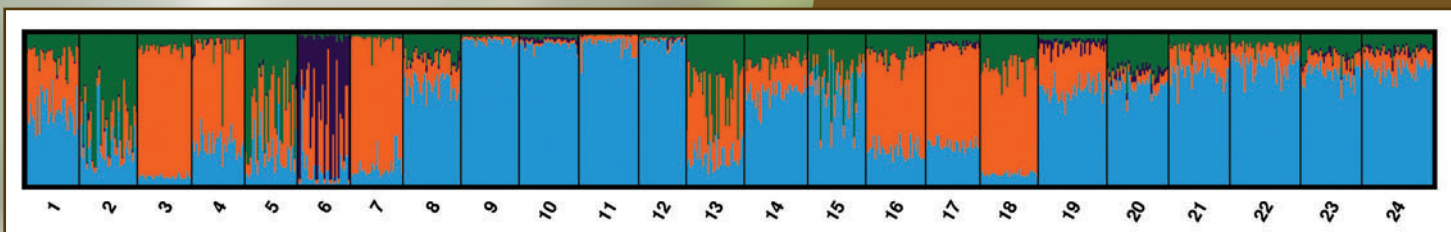
Prečni prerez drobne korenine bukve (*Fagus sylvatica* L.) s premerom 1 mm.
Cross section of beech (*Fagus sylvatica* L.) fine root measuring 1 mm in diameter.

Genetska struktura, filogenija in filogeografija

Poznavanje genetske strukture gozdnih sestojev in posameznih dreves je pomembno pri izbiri semenskih in plus dreves, identifikaciji izvora populacij dreves in partij semena ter sadik kot tudi pri morebitni identifikaciji nezakonito posekanih dreves. S filogenijo predstavimo evolucijske odnose oz. evolucijsko zgodovino skupin(e) organizmov glede na proučevane znake. Filogeografija omogoča ugotavljanje geografske strukturiranosti genetskega signala in posledično identifikacije področij posebnega pomena za ohranjanje biotske raznovrstnosti in definicijo »evolucijsko pomembnih enot«. Slednje zahtevajo posebne ohranitvene ukrepe zaradi svojega edinstvenega filogenetskega položaja in geografske lokacije, kar smo doslej uporabili v sklopu ohranjanja gozdnih genskih virov, mikoriznih gliv, pa tudi pri raziskavi divjega petelina na Balkanu. Za analizo združb gliv in bakterij v odmrlem in vgradnem lesu uporabljamo sekvenciranje naslednje generacije (NGS).

Genetic structure, phylogeny and phylogeography

Knowledge of the genetic structure of forest stands and individual trees is important for the selection of seed objects and plus trees, the identification of the origin of tree populations, seed lots and seedlings, as well as the identification of illegally felled trees. Phylogeny allows us to present the evolutionary relationships or the evolutionary history of groups of organisms in relation to the studied traits. Phylogeography adds a geographic component to genetic signals, thus enabling the identification of conservation areas of special importance as well as the definition of »evolutionarily significant units«. These require special conservation measures due to their unique phylogenetic position and geographic location. We use studies of genetic structure, phylogeny and phylogeography for making decisions on conservation of forest genetic resources, mycorrhizal fungi and capercaillie (*Tetrao urogallus*) in the Balkans. We also utilise next-generation sequencing (NGS) for the analysis of communities of fungi and bacteria in dead wood and construction timber.



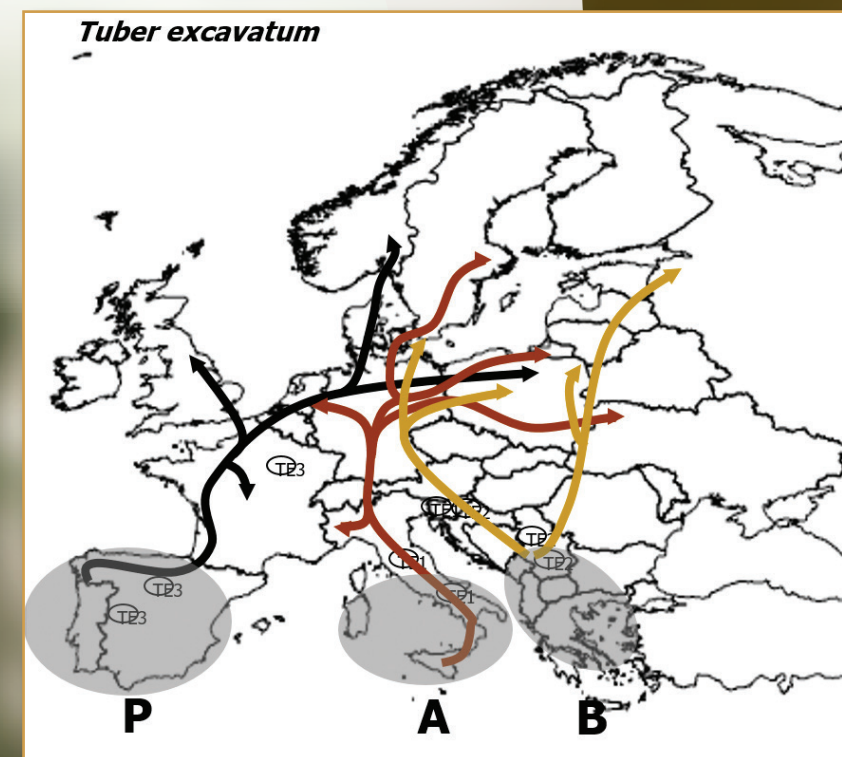
Genetska struktura 24 populacij bukve iz Evrope, pridobljena z jedrnimi mikrosateliti, kaže na obstoj različnih genetskih bazenov. Genetic structure of 24 European beech populations across Europe based on the use of nuclear microsatellites suggests the existence of different gene pools

Znanstvena, okoljska in gozdarska politika, strategije, zakonodaja

Aktivno sodelujemo v ekspertnih telesih resornih ministrstev in v evropskih programih: oblikovali smo strokovne osnove in vodili komisije za pripravo zakonodaje s področja gozdnega reprodukcijskega materiala, pregleda stanja biotske raznovrstnosti gozdnih tal, mikorize in gozdnih genskih virov ter njihove vključitve v Strategijo ohranjanja biotske pestrosti v Sloveniji. V okviru teles Javne agencije za raziskovalno dejavnost prispevamo k razvoju ocenjevanja znanstvenoraziskovalne dejavnosti v Sloveniji, saj smo sooblikovali več dokumentov v sklopu Science Europe in sodelovali v ekspertnih skupinah za ocenjevanje učinkov okvirnih programov Evropske komisije na področju znanosti, genskih virov v kmetijstvu in gozdarstvu in predpisov s področja gozdnega reprodukcijskega materiala.

Science, environment and forestry policy, strategies, legislation

We actively participate in expert bodies of ministries and European programmes, such as the committee dealing with legislation on forest reproductive material, monitor the condition of forest soil biodiversity, mycorrhizal and forest genetic resources and their integration into the National Biodiversity Conservation Strategy. We participate in expert bodies of the Slovenian Research Agency and have co-created several documents in the context of Science Europe. Moreover, we participated in expert groups to assess the impact of several framework programmes of the European Commission in the fields of science, genetic resources in agriculture and forestry, and regulations regarding forest reproductive material.



Filogeografija vrste *Tuber excavatum* in poledenodobne migracije različnih haplotipov vrste s haplotipi hrastov - njihovih drevesnih ektomikoriznih partnerjev. Phylogeography and post-glacial comigration of *Tuber excavatum* along the migration paths of their ectomycorrhizal hosts - oaks.



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03

ODDELEK ZA
VARSTVO GOZDOV
ΛΒΚΣΛΛΟ ΓΟΖΔΟΛ

DEPARTMENT OF
FOREST PROTECTION
ΕΟΚΕΣΛ ΠΡΟΤΕΚΤΙΟΝ

Kaj delamo

Zdravje rastlin in s tem tudi gozdov je javna dobrina. Raziskovanje in spoznavanje potencialno škodljivih organizmov je zato ključnega pomena in obveza posamezne države. Oddelek za varstvo gozdov na Gozdarskem inštitutu Slovenije skupaj s svojim laboratorijem predstavlja raziskovalno infrastrukturo slovenskega gozdarstva, ki omogoča temeljne in aplikativne raziskave, povezane z zdravjem gozda.

Poudarek našega delovanja je na identifikaciji, preučevanju, spremljanju in napovedovanju gozdu škodljivih organizmov in abiotičnih poškodb. Smo del Javne gozdarske službe in imamo javno pooblastilo Ministrstva za kmetijstvo, gozdarstvo in prehrano za determinacijo gozdu škodljivih karantenskih organizmov in za opravljanje drugih strokovnih nalog s področja zdravstvenega varstva rastlin.

Posebno pomembna dejavnost oddelka je sodelovanje z Zavodom za gozdove Slovenije pri opravljanju javne gozdarske službe in prenosu znanja strokovni in širši javnosti.

Najnovejši raziskovalni dosežki

V Laboratoriju za varstvo gozdov na Gozdarskem inštitutu Slovenije tradicionalno uspešno uporabljamo morfološke tehnike diagnostike in preučevanja tako gliv kot tudi žuželk. Od leta 2010 pa je laboratorij opremljen z molekularnim modulom in samostojno opravlja molekularne analize vseh organizmov, ki pomenijo potencialno grožnjo slovenskim gozdovom.

S področja zdravja gozda smo v zadnjih desetih letih objavili 109 znanstvenih člankov, od tega 50 v revijah s SCI, celotna bibliografija oddelka pa obsega 812 prispevkov. Poročali smo o prvih pojavih številnih tujerodnih organizmov v Sloveniji ali celo v Evropi, a tu naštevamo le nekatere:

What we do

Plant health, which also includes forest health, is a public good. A thorough study of organisms potentially harmful to plants is therefore of the utmost importance and an obligation of each country. The Department of Forest Protection of the Slovenian Forestry Institute, including its Laboratory of Forest Protection, represents the main forestry infrastructure in Slovenia, which enables basic and applied forest health research.

The main focus of our work is identification, monitoring and study of organisms and abiotic agents harmful to Slovenian forests, prognosis of their occurrence and development, and providing guidelines for their management. We are a part of the Forest Public Service, and the Laboratory of Forest Protection has been appointed by the Ministry of Agriculture, Forestry and Food as a diagnostic laboratory for the determination of quarantine organisms harmful to forests, and various tasks regarding plant health.

Very important part of our work is collaboration with the Slovenian Forest Service in fulfilling different tasks of the Forestry Public Service, as well as in knowledge transfer both to professional audience and general public.

Latest research achievements

The Laboratory of Forest Protection of the Slovenian Forestry Institute is characterised as a diagnostic and research laboratory. We excel at morphological identification of forest insects and fungi, and since 2010, when the laboratory was upgraded with a module for molecular analyses, also at molecular diagnostics of organisms that are potentially harmful to forests.

In the past ten years, we have produced 109 scientific papers, 50 of which have been published in SCI journals. The complete bibliography of the Department of Forest Protection includes 812 articles. We have reported first findings of alien species in Slovenia and in Europe, among which are:

- javorov rak – *Eutypella parasitica* nov tujerodni organizem v Evropi,
- vdor jesenovega ožiga – *Hymenoscyphus fraxineus*,
- masleničina zavrtalka – *Ophiomyia kwansonis* prvič najdena v Evropi,
- karantenska bolezen rjavenje borovih iglic *Lecanosticta acicola*,
- razjasnitev kompleksa kriptičnih vrst iz rodu *Dothistroma* v Sloveniji, ki povzročajo rdečo obarvanost borovih iglic,
- prva najdba glive *Rhizoctonia butinii* na okrasnih smrekah,
- pojav pooglenitve hrastov – *Biscogniauxia mediterranea*,
- razjasnitev vloge glive *Botryosphaeria dothidea* v obsežnem sušenju črnega gabra po sušnem stresu,
- najdba brestove grizlice – *Aproceros leucopoda* v Sloveniji,
- prva najdba hrastove čipkarke – *Corythucha arcuata* v Sloveniji.

Raziskovali smo v zadnjih letih hitro napredujočo bolezen jesenov, predvsem smo se osredotočili na občutljivost glive *Hymenoscyphus fraxineus* na višje temperature ter kemična sredstva. Spremljali smo okuženost jesenovih semenskih sestojev ter poročali o diferencialni občutljivosti klonov poljskega jesena. Naši rezultati so močno odmevali po svetu ter so osnova za iskanje ukrepov proti jesenovemu ožigu.

Številni strokovni prispevki Oddelka za varstvo gozdov obravnavajo modeliranje pojava boleznin in škodljivcev v odvisnosti od različnih ekoloških razmer, kar je temelj za prognoze izbruhov ali namnožitvev škodljivih organizmov. V sklopu tega smo razvili model za kratkoročno napoved debeline žleda in pojava žledoloma v Sloveniji, model, ki na dnevni ravni samodejno izračunava oceno požarne ogroženosti gozdov, fenološki model za osmerozobega smrekovega lubadarja (*Ips typographus*) RITY-1 na območju Slovenije in modele za kratkoročne in dolgoročne napovedi številčnosti populacije smrekovega lubadarja.

- Eutypella canker of maple, caused by the fungus *Eutypella parasitica* – first record in Europe,
- Ash dieback, caused by the fungus *Hymenoscyphus fraxineus* – report on its invasion to Slovenia,
- insect *Ophiomyia kwansonis*, Daylily Leafminer – first record in Europe,
- Needle blight of pine, caused by the fungi *Lecanosticta acicola* – first record in Slovenia,
- fungus *Rhizoctonia butinii* – first record on ornamental spruce trees,
- Cork charcoal disease, caused by the fungus *Biscogniauxia mediterranea* – first record in Slovenia,
- insect *Aproceros leucopoda*, zigzag elm sawfly – first record in Slovenia,
- insect *Corythucha arcuata*, oak lace bug – first record in Slovenia
- elucidation of the complex of the cryptic fungus species of the genus *Dothistroma*, which cause *Dothistroma* needle-blight, in Slovenia,
- elucidation of the role of the fungus *Botryosphaeria dothidea* in the European hop hornbeam dieback after drought stress.

In the past few years, much research has been carried out on ash dieback, focusing on the susceptibility of the fungus *Hymenoscyphus fraxineus* to high temperatures and chemicals. We have also been monitoring the level of infection by *Hymenoscyphus fraxineus* in ash seed stands, and reported on the differential susceptibility of clones of narrow-leaved ash to this pathogen. Our results are well renowned worldwide, and represent a stepping stone in ash dieback management.

The Department of Forest Protection has produced numerous articles on modelling the occurrence and development of plant pests, diseases and abiotic agents, such as fire and sleet, with regard to various ecological conditions. Our knowledge in this field provides a firm basis for the prognosis of outbreaks of pests and diseases harmful to forests, as well as of the occurrence of natural disasters. We have developed models for short-term and long-term prognoses of outbreaks of spruce bark beetles in Slovenia, the model for a short-term prognosis of the occurrence of sleet in Slovenia, the model which enables an hourly prognosis of fire hazard in Slovenian forests, and a phenological model for the eight-toothed spruce bark beetle, *Ips typographus*, RITY-1, for Slovenia.

Oddelek za varstvo gozdov izdaja tudi dve elektronski reviji, Napovedi o zdravju gozdov od leta 2007 in Novice iz varstva gozdov od leta 2008. V upravljanju oddelka so: nacionalna zbirka gliv (Mikoteka Gozdarskega inštituta Slovenije), podatkovna zbirka gliv Slovenije (*Boletus informaticus*), Zbirka živih kultur Oddelka za varstvo gozdov (ZLVG) in Entomološka zbirka.

Kot zanimivost – v letu 2016 smo opravili več kot 300 zdravstvenih pregledov rastlin na terenu ter pregledali več kot 200 vzorcev s sumom na prisotnost karantenskih škodljivih organizmov.

Aktualne raziskave in smernice

Področje varstva gozdov je nenehno pred novimi izzivi – razvoj novih diagnostičnih in raziskovalnih orodij je čedalje hitrejši, še hitrejši pa so vnosi tujerodnih organizmov in pojavi novih bolezni, ki lahko resno vplivajo na zdravje in kakovost gozdov in s tem tudi na kakovost našega življenja.

V prihodnje bodo najpomembnejše aktivnosti Oddelka za varstvo gozdov obsegale razvoj novih diagnostičnih metod, modeliranje pojava bolezni in škodljivcev gozdnega drevja, raziskave biodiverzitete, genetike, populacijske dinamike in razširjenosti škodljivih organizmov, preučevanje najustrežnejših metod kontrole škodljivih organizmov, ocene tveganj za tujerodne škodljive organizme in preučevanje pojavov organizmov, ki se k nam širijo zaradi klimatskih sprememb.

The Department of Forest Protection publishes two electronic journals, specifically the Prognosis in Forest Health (Napovedi o zdravju gozdov) since 2007 and the News From Forest Protection (Novice iz varstva gozdov) since 2008, and manages several collections: the national collection of fungi (Mikoteka Gozdarskega inštituta Slovenije), a database for fungi and insects of Slovenia (*Boletus informaticus*), the living cultures collection of the Department of Forest Protection (ZLVG) and an entomological collection.

And to illustrate the extent of our work, we carried out more than 300 plant health surveys in 2016 regarding quarantine pests and diseases harmful to forests in the field, and analysed more than 200 samples in the laboratory.

Current research and future prospects

Forest health is constantly facing new challenges. It is not only the development of new diagnostic and research tools that is very rapid but also the intensity of introductions of new pests and diseases which pose a significant threat to forest health and consequently human well-being.

In the future, the Department of Forest Protection will continue to develop new diagnostic methods and protocols, to model the occurrence of forest pests, diseases and abiotic agents, as well as to carry out research into biodiversity, genetics, population dynamics and distribution of pests and diseases harmful to forests. We will also study management methods for common forest pests and diseases as well as alien organisms that have the potential to spread into our area due to climate change. Furthermore, we will conduct pest risk analyses for invasive alien species.

Viviparna tujerodna krivonoga jelova uš (*Cinara curvipes*) se bo morda namnožila na navadni jelki. Viviparous alien aphid *Cinara curvipes* might become highly troublesome for silver fir.

1 mm

V povezavi z Upravo za varno hrano, veterinarstvo in varstvo rastlin bomo še naprej opravljali naloge zdravstvenih pregledov za karantenske in druge škodljive organizme na območju celotne Slovenije.

Okrepili bomo sodelovanje z Zavodom za gozdove Slovenije in razvijali informacijski sistem za varstvo gozdov, vključno s spletnim portalom www.zdravgozd.si, ki je trenutno osrednji informacijski sistem za varstvo gozdov v Sloveniji.

Razvili in vzpostavili bomo osrednji informacijski sistem za invazivne tujerodne vrste v Sloveniji www.invazivke.si, ki bo veljal kot osnova za zgodnje odkrivanje in hitro odzivanje na invazivne tujerodne vrste. Posebno pozornost in več aktivnosti bomo namenili vsem karantenskim in invazivnim tujerodnim organizmom.

Stalno in intenzivno sodelovanje s tujimi inštitucijami za varstvo gozdov ter redno izobraževanje vseh sodelavcev Oddelka za varstvo gozdov pa bo še naprej osnova za našo kakovost.

Together with the Administration of the Republic of Slovenia for Food Safety, Veterinary and Plant Protection, we will continue to implement our regular plant health surveys regarding quarantine organisms harmful to forests in Slovenia.

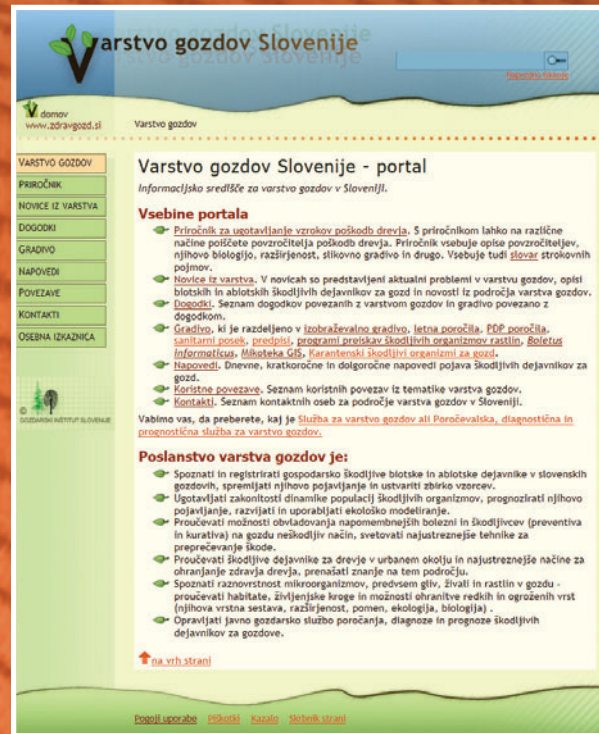
In addition, we aim to strengthen our collaboration with the Slovenia Forest Service and further develop the forest protection information system, including www.zdravgozd.si, which represents the main information system for forest protection in Slovenia.

In the near future we are going to develop a centralised information system also for invasive alien species in Slovenia, www.invazivke.si, which will serve as a basis for early detection of and rapid response to invasive alien species that pose a major threat to Slovenian forests.



Člani oddelka / Department members:

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Vstopna stran portala o varstvu gozdov Slovenije/
Home page of the Slovenian forest protection portal
(www.zdravgozd.si)



Glive, povezane z odmiranjem črnega gabra v Sloveniji /
Fungi, connected to dieback of European hop hornbeam in Slovenia



04

ODDELEK ZA
GOZDNO TEHNIKO IN EKONOMIKO
GOZDNO TEHNIKO IN EKONOMIKO
DEPARTMENT OF
FOREST TECHNIQUE AND ECONOMICS
FOREST TECHNIQUE AND ECONOMICS

Poslanstvo: Raziskujemo in uveljavljamo inovativne pristope trajnostnega pridobivanja in rabe obnovljivih gozdnih virov.

Vizija: Z raziskovalno razvojnim delom na področju proizvodnih, poslovnih in družbenih procesov pri pridobivanju in rabi lesa ter humanizaciji dela želimo prispevati h konkurenčnosti in prepoznavnosti slovenskega gospodarstva ter pospeševati trajnostno rabo obnovljivega lesa kot surovine in energenta.

Razvoj v zadnjih 20 letih:

Leta 1995 je vodja oddelka prof. Boštjan Košir zapisal: »Oddelek spremlja sodobno gozdno tehniko in razvoj učinkovitih tehnologij, ki so primerne za rabo v gozdu v naših geografskih razmerah. Odgovoren je tudi za načrtovanje optimalne mreže gozdnih prometnic, za vzdrževanje katastra le-teh in za njihovo projektiranje. Velik poudarek je tudi na ekonomski in tehnološki obravnavi zasebnega sektorja, saj je kar 83 % slovenskih gozdov v zasebni lasti. Med pomembnejšimi aktivnostmi je treba omeniti še izdelavo sodobnih tehnoloških kart, vrednotenje in normiranje delovnih faz v tehnoloških procesih, ekonomsko vrednotenje funkcij gozda kot tudi preučevanje poškodb na gozdnem drevju in tleh zaradi spravila lesa.« Takrat je bilo na oddelku 5 raziskovalcev in en tehnični sodelavec.

Our mission: To study and implement innovative approaches to sustainable mobilization and use of renewable forest resources.

Vision: Our vision is to contribute, through research and development activities in the field of manufacturing, business and social processes in the production and use of wood and humanisation of work, to the competitiveness and recognition of the Slovenian economy and to promote sustainable use of wood as a renewable raw material and fuel.

Development through the last 20 years:

It was 1995 when Prof Boštjan Košir wrote: »The department follows the development of modern forest techniques and efficient technologies appropriate for our geographical conditions. It is also responsible for planning an optimal forest-road network, for updating the forest-road cadastre and for carrying out projects. Quite some emphasis is given to economic and technological research of the private sector, as more than 83% of Slovenian forests belong to private owners. Other important activities are: creation of modern technological maps, evaluation and standards-setting for particular phases of technological processes, economical evaluation of forest functions, monitoring of tree and soil damages caused by felling, skidding, etc.« There were 5 researchers and one technician working at the department in that particular period.

Dr. Mirko Medved je leta 2005 dejal: »Spodbujali in omogočali bomo rast kompetentnosti zaposlenih, razvijali timsko in inovativno znanstveno-raziskovalno delo ter vzpostavljali in negovali poslovne odnose z domačimi in tujimi partnerji. S kakovostjo raziskav bomo uresničevali pričakovanja naročnikov, razvijali področja gozdarske ekonomike in politike ter kulture in zgodovine rabe gozdov. Neposredni uporabniki naših rezultatov so strokovnjaki javne gozdarske službe, gozdarske gospodarske družbe, nosilci odločanja na lokalnem, regionalnem in državnem nivoju, posredno pa prek 300.000 gozdnih posestnikov in različne laične javnosti.« Leta 2005 je bilo na oddelku 6 raziskovalcev in en tehnični sodelavec.

Ob začetku leta 2015 smo zapisali: »Čas, v katerem živimo, zahteva od nas veliko prilagodljivosti. Na eni strani se k nam obračajo ministrstva z vprašanji in željo po hitrih in natančnih odgovorih, na drugi strani smo ujeti v pravila delovanja javnega sektorja, kjer se sredstva za raziskovalno dejavnost krčijo, na tretji strani smo udeleženci v tekmi za EU-sredstva, ki nam trenutno omogočajo širjenje oddelka in razvoj, na četrti strani pa se spopadamo z neugodnimi razmerami v lesnopredelovalnih industrijah ter majhnim interesom gozdarskih podjetij.« Danes nas je na oddelku 10 raziskovalcev in en tehnični sodelavec.

Dr Mirko Medved said in 2005: »We are encouraging and enabling growing competence of employees, developing teamwork and innovative scientific research as well as creating and cultivating business relations with domestic and foreign partners. Trough quality of the research work clients' expectations will be met. Areas of forest economics, policy and the culture of forest use will be developed and promoted. Direct users of our results are experts in the public forestry service, forestry companies, decision-makers at local, regional and national levels, different stakeholders along wood supply chains and indirectly over 250,000 forest owners and general public«. There were 6 researchers and one technician working at the department in 2005.

At the beginning of 2015 we wrote: »The time in which we are now requires a lot of flexibility from us. On the one hand, the Ministries are turning to us with issues and a desire for quick and accurate responses, while on the other hand we are caught up in the rules of public sector operation, where research funds are shrinking; on the third part, we are participants in the race for EU funds, which currently enable the expansion and development of our department; on the fourth part, we are faced with unfavourable conditions in wood processing industry and low interest of forestry enterprises.« Nowadays, the departments comprises 10 researchers and 1 technical assistant.

Predstojnica oddelka: Nike Krajnc

Člani oddelka: Mitja Piškur, Jaka Klun, Tina Jemec, Matevž Triplat, mag. Marjan Dolenšek, Peter Prislan, Špela Ščap, Darja Kocjan, Jernej Jevšenak, Iztok Sinjur

Danes sledimo potem, načrtanim v preteklosti, in suvereno pokrivamo naslednja **strokovna področja**: zasebni lastniki gozdov, varnost pri delu v gozdovih, študij dela in normativi, raba lesa v energetske namene, tokovi lesa, primarna predelava lesa, tehnologije pridobivanja lesa, kalkulacije stroškov, ekonomika gozdarstva, gozdno lesne proizvodne verige (proces), logistika v gozdarstvu, vrednotenje zalog in sprememb zalog lesa in ogljika v gozdovih in lesnih izdelkih, socialno-ekonomski vidiki gospodarjenja z gozdovi, posledice gozdarskih tehnologij na gozdne ekosisteme, kakovost lesnih goriv, trg lesa in storitev ter gozdarske politike.

Department Head: Nike Krajnc

Department members: Mitja Piškur, Jaka Klun, Tina Jemec, Matevž Triplat, Marjan Dolenšek, Peter Prislan, Špela Ščap, Darja Kocjan, Jernej Jevšenak, Iztok Sinjur

Today we follow the paths outlined in the past and we confidently cover the following areas of expertise: private forest owners, safety at work in the forests, studies of work and norms, use of wood for energy purposes, wood flows, primary wood processing, wood production technologies, cost calculations, forestry economics, forest wood production chains (processes), forestry logistics, carbon sequestration in forests and harvested wood products, socio-economic aspects of forest management, effects of forestry technologies on forest ecosystems, quality of wood fuels, forestry service markets, forest products markets and forestry policy.



Večina naših **referenc** je strokovna (strokovni in poljudni članki ter strokovne monografije sestavljajo več kot 60 % referenc), kar potrjuje našo usmeritev v strokovno delo in je odsev sodelovanja z gospodarstvom, sodelovanja v mednarodnih aplikativnih projektih ter podpore resornim ministrstvom. Ponosni smo na zbirko strokovne literature, ki je nastala v okviru različnih domačih in predvsem tujih projektov in je namenjena vsem, ki jih zanima učinkovito pridobivanje, predelava in raba lesa. Večina literature je dostopna na redno posodobljeni spletni strani oddelka v okviru strani **www.gozdis.si**.

Most of our **references** are professional (with professional articles, popular articles and expert monographs representing more than 60% of all our references), which confirms our focus in professional work and is the reflection of cooperation with industry, participation in international applied projects and support to sectoral ministries. We are proud of our professional literature, which was created within the framework of different domestic and mainly international projects and is dedicated to those who are interested in efficient exploitation, processing and use of wood. Most of the literature is available on the regularly updated website of our department, which is part of the Institute's home website **www.gozdis.si**.



Prepoznavnost uspešno izboljšujemo tudi z aktivno stranjo na Facebooku (www.facebook.com/gisgte). Aktivna in obnovljena je tudi stran spletne aplikacije za izračun stroškov strojev vzdolž proizvodnih verig – WoodChainManager (wcm.gozdis.si). Spletni portal WoodChainManager (WCM) razvijamo za različne deležnike vzdolž gozdno-lesnih verig. Spletni-informacijski portal ponuja več kot le kalkulacijo stroškov vzdolž proizvodnih verig. Uporabniku omogoča oblikovanje in vizualizacijo njemu lastnih proizvodnih verig. Portal ima poleg omenjenega izračuna stroškov strojev tudi modul za določanje normativov gozdarskih del, pričeli pa smo z razvojem novega modula, namenjenega določanju stroškov dela. Prenovljeni portal WCM ponuja tudi pregled nad cenami gozdno-lesnih sortimentov, cenami lesnih goriv in tokovi lesa ter podaja druge aktualne podatke. Portal postaja vedno bolj interaktiven, saj lahko uporabniki sami preverijo gospodarnost svojih tehnologij pridobivanja lesa.

V zadnjih 15 letih smo vodili ali sodelovali kot partnerji v 11 ciljnih raziskovalnih projektih, 26 projektih, financiranih v okviru različnih programih Evropske unije in drugih mednarodnih inštitucij (H2o2o, 7OP EU, 5 OPEU – INTERREG, Intelligent Energy Europe, WoodWisdom, Erasmus +, FAO ...), in v več kot 20 naročilih različnih deležnikov (ministrstva, občine, podjetja, drugi deležniki).



The department's recognisability is being successfully enhanced also by our active page on the Facebook (www.facebook.com/gisgte). Active and renovated is also the web application for calculating the costs of machinery along the production chain – WoodChainManager (wcm.gozdis.si). The web portal WoodChainManager (WCM) has been developed for different stakeholders along forest-wood chains. In addition, the web portal has a module for determining the norms of forestry work; furthermore, we also embarked on the development of a new module for determining labour costs. Refurbished WCM portal offers also an overview of the prices of forest-wood assortments, an overview of the prices of wood fuels, an overview of timber flows in Slovenia and provides other current information. The WCM portal is becoming more and more interactive, as users themselves can verify the economy of their wood production technology.

In the last 15 years, we have led or participated as partners in 11 target research projects, in 26 projects financed under the various programs of the European Union and other international institutions (H2o2o, FP7 EU, 5 OPEU, INTERREG, Intelligent Energy Europe, WoodWisdom, Erasmus +, FAO ...) and in more than 20 orders placed by various stakeholders (ministries, municipalities, enterprises, other stakeholders).

LABORATORIJ ZA LESNO BIOMASO

V laboratoriju za lesno biomaso opravljamo, skladno z evropskimi oz. mednarodnimi standardi, analize fizikalno-mehanskih lastnosti lesnih goriv. Letno opravimo več sto analiz kakovosti pelet, sekancev in tudi drv. Analize opravljamo tako za posameznike kot tudi za večje proizvajalce ali porabnike lesnih goriv.

Leta 2015 smo uspešno registrirali tržno znamko S4Q (System for Quality). Tržna znamka S4Q je del sheme oz. sistema zagotavljanja in kontrole kakovosti lesnih pelet, katere glavni namen je povečati kakovost pelet ter posledično povečati zaupanje potrošnikov v slovenske proizvajalce tega energenta. Danes je znamka prepoznavna tako med potrošniki kot tudi proizvajalci pelet. V okviru znamke S4Q bomo razvijali in uveljavljali tudi sistem zagotavljanja in kontrole kakovosti sekancev in kasneje tudi drugih lesnih goriv. Več o sami znamki, proizvajalcih, cenah in drugih aktualnih podatkih je dostopnega na www.s4q.si.

Pogled naprej

Naš razvoj v naslednjih 20 letih bo v največji meri odvisen od projektov, ki jih bomo pridobili, in od naše sposobnosti prilagajanja nastalim razmeram. Imamo vizijo in željo postati in obstati prepoznavni v domači in tuji strokovni in laični javnosti, uveljaviti laboratorij za lesno biomaso in tržno znamko, nadalje razviti orodje za oceno stroškov vzdolž proizvodnih verig (WCM), razviti in v življenje spraviti sistem ocenjevanja kakovosti izvajalcev del v gozdovih, povezovati deležnike vzdolž gozdno-lesnih verig, kakovostno opravljati naloge Javne gozdarske službe, aktivno sodelovati pri oblikovanju gozdarske politike ter osvajati nova aktualna področja, kot so logistika in optimizacija procesov.

Dosegljivi smo na:

gte@gozdis.si, www.facebook.com/gisgte

WOOD BIOMASS LABORATORY

In our wood biomass laboratory analyses of the physico-mechanical properties of wood fuels are carried out in accordance with European or international standards. Annually we perform more than a hundred of wood fuel quality analyses – pellets, chips and firewood. Analyses are conducted both for individuals as well as major producers or consumers of wood fuels.

In 2015, we successfully registered the trademark S4Q (System for Quality). The trademark S4Q is part of the scheme or system for providing for and controlling wood pellets quality. Its main purpose is to increase the quality of pellets and consequently boost consumer confidence in the Slovenian producer of this energy source. Today the trademark is recognised both by consumers and pellet producers. Within the S4Q trademark we will develop and implement a system for providing for and controlling wood chips quality and, eventually, for other wood fuels as well. More about the trademark, producers, prices and other topical data is available on web page www.s4q.si.

LOOKING AHEAD

Our development for the next 20 years will mostly depend on the acquired projects and our capability to adapt to current circumstances. We have the vision and desire to become and stay recognisable in local and foreign expert and general public, to have a good standing for our wood biomass laboratory and our trademark, to continue developing a tool for cost assessment of production chains (WCM), to develop and to start a wood contractor quality grading system, to connect stakeholders of forest wood chains, to perform assignments of public forestry service with quality, to actively participate in designing forestry policy and to master new relevant fields like logistics and process optimization.

You can reach us at:

gte@gozdis.si, www.facebook.com/gisgte.





05

ODDELEK ZA
NAČRTOVANJE IN MONITORING GOZDOV IN KRAJINE
INSTRUMENTALNE IN MONITORING GOZDOV IN KRAJINE

DEPARTMENT OF
FOREST AND LANDSCAPE PLANNING AND MONITORING
FOREST AND LANDSCAPE PLANNING AND MONITORING

Poslanstvo Oddelka za načrtovanje in monitoring gozdov in krajine (NMGK) je temeljno in aplikativno raziskovanje ter implementacija znanj, potrebnih za trajnostni razvoj gozdov in gozdnate krajine. Vizija oddelka je postati prepoznavna skupina v Sloveniji in srednji Evropi na področju gozdarskega načrtovanja in ekosistemskega upravljanja z dobrinami in storitvami gozdnih ekosistemov, monitoringa gozdnate krajine in sestojev ter prostorske informatike.

Oddelek NMGK je nastal pred dobrimi desetimi leti z združitvijo Oddelka za gozdarsko in krajinsko načrtovanje ter Centra za gozdne inventure in prostorske informacijske sisteme. Danes je oddelek NMGK tretji največji oddelek na inštitutu: zaposluje 11 sodelavcev (eden je zaposlen 10%). V oddelku je 7 raziskovalcev/lk z doktoratom, 1 z magisterijem, 1 informatik ter 2 strokovna sodelavca.

Oddelek pokriva naslednja področja:

- Razvoj sistemov gozdnogospodarskega načrtovanja
- Pridobivanje temeljnih ekoloških spoznanj o vplivih gospodarjenja z gozdovi na gozdove
- Pridobivanje temeljnih ekoloških spoznanj o dinamiki ogljika in razvoj metod za izračun bilance ogljika v krajini
- Razvoj konceptov ohranjanja in varstva gozdnate krajine, gozdnih habitatnih tipov in sestojev
- Ekonomsko vrednotenje dobrin in storitev gozdnih ekosistemov
- Razvoj vzorčnih krajinskih inventur (gozdni in negozdni prostor)
- Spremljanje zdravstvenega stanja gozdov z inventurami in razvoj intenzivnega monitoringa zdravstvenega stanja gozdov

The mission of the Department of Forest and Landscape Planning and Monitoring (DFLPM) is basic and applied research and implementation of knowledge, required for sustainable forest and landscape management. The vision of the department is to become a recognizable group in the field of forest planning, forest ecosystem (along with goods and services) stewardship, forest landscape and stand monitoring, and spatial informatics in Slovenia and central Europe.

DFLPM was founded about ten years ago by merging the Department for Forest and Landscape Planning and Centre for Forest Inventories and Spatial Information Systems. With 11 associates, it is the third largest at the institute. It hosts 7 researchers with doctorates, 1 with master's degree, 1 informatics engineer, and 2 technicians.

DFLPM covers the following fields:

- Development of forest management planning;
- Acquiring basic ecological knowledge on impacts of forest management on forests;
- Acquiring basic ecological knowledge of carbon dynamics and development of methods for calculating carbon balance in landscape;
- Development of concepts for conservation and protection of forest landscape, forest habitat types and stands;
- Economic valuation of forest ecosystem goods and services;
- Development of landscape inventories (forest and non-forestlands);
- Monitoring of forest health by means of forest inventories and development of intensive monitoring of forest ecosystems;

- Razvoj biometričnih metod za ocenjevanje strukturnih kazalcev dreves in gozdnih sestojev
- Razvijanje in pojasnjevanje vloge novo razvitih kazalcev za spremljanje gozdnate krajine in sestojev
- Razvoj aplikacij daljinskega zaznavanja (sateliti, avionski posnetki, posebna snemanja) za podporo krajinski inventuri (raba tal, zaraščanje) in spremljanju razvoja krajine v času
- Razvoj koncepta izdelave in obnavljanja kart gozdnih sestojev
- Razvoj LIDAR-aplikacij
- Razvoj aplikacij multikriterialnega vrednotenja za ocenjevanje stanja v okolju, v gozdnih sestojih

Oddelek je vpet v domači (BF/gozd., NIB, Biol. inšt. ZRC SAZU, ERICo Velenje, ZGS) in mednarodni raziskovalni prostor. Je član evropskega omrežja za nacionalne gozdne inventure (ENFIN), je nacionalna kontaktna točka ICP Forests, projektno pa sodeluje z gozdarskimi fakultetami in inštituti v Evropi in ZDA. Operativna pomoč Ministrstvom za kmetijstvo, gozdarstvo in prehrano ter za okolje in prostor poteka prek javne (gozdarske in okoljske) službe. V okviru le-te oddelek že od samega začetka razvija koncept velikoprostorskega in intenzivnega monitoringa gozdov in poroča ICP Forests, 12 let sistemsko preverja kakovost gozdnogospodarskih (GG) načrtov GG-enot, območij in gozdnogojitvenih načrtov, razvija koncepte GG-načrtovanja in pripravlja ocene emisij toplogrednih plinov za sektor Raba tal, spremembe rabe tal in gozdarstvo (LULUCF) in vsebinske dopolnitve nacionalnega poročila (NIR).

- Development of biometric methods and assessment of structural indicators of trees and forest stands;
- Development and justification of newly developed indicators for monitoring forest landscapes and stands;
- Development of remote sensing applications (satellites, aerial photography, special recordings) to support landscape inventorying (land use, overgrowing) and monitoring changes over time;
- Development of the concept for creation and updating forest stand maps;
- Development of LIDAR applications;
- Development of multi criteria assessment applications for assessing environment condition in forest stands.

DFLPM collaborates with domestic (BF/forestry, NIB, Biol. institute ZRC SAZU, ERICo Velenje, ZGS) and foreign scientific institutions. It is a member of the European national forest inventory network (ENFIN), it hosts a national focal point of the ICP Forests and cooperates with forest faculties and research stations across Europe and U.S.A. Executive assistance to the Ministry of Agriculture, Forestry and Food and to the Ministry of the Environment and Spatial Planning is performed through the public forest and environmental service. Within it, the department develops methods for large-scale and intensive forest monitoring, reports to the ICP Forests and provides a systematic control of forest management (FM) plans of FM units, regions and silvicultural plans. Additionally, it prepares estimations of greenhouse gasses emissions for the Land Use, Land Use Changes and Forestry (LULUCF) sector. It also assists in the completion of national reports (NIR) with scientific contributions.

PREDSTAVITEV PODROČIJ DELA

GOZDNOGOSPODARSKO NAČRTOVANJE

Načrtovanje obsega razvoj načrtovalskih konceptov, tipov načrtov ter izvajanje in izpopolnjevanje kontrole kakovosti vseh vrst gozdnogospodarskih načrtov. Razvoj konceptov je vezan predvsem na določitev relacij med različnimi tipi načrtov (velika krajina, krajina, ekosistem) in tako na njihovo določitev v hierarhiji, ki je optimalna z vidika zagotavljanja podatkov in informacij za različne potrebe in za različne deležnike (oblast - gozdna politika; lastnik - gospodarjenje, drugi - drugi interesi). Razvoj tipov načrtov obsega določanje njihovih optimalnih vsebin. Poleg prenove vsebin GG-načrtov GG-območij in enot poteka tudi razvoj novega tipa upravljaljskega načrta za gozdna območja Natura 2000. Z vidika kontrole kakovosti v zadnjem času največ truda posvečamo razvoju metode za objektivno analizo vpetosti gozdnogojitvenih načrtov v GG-načrte GG-enot.

SPREMLJANJE DINAMIKE OGLJIKA

Najnovejše področje oddelka je področje spremljanja dinamike ogljika in razvijanja metod za izračun bilance ogljika v gozdovih in ostali krajini. V okviru javne okoljske službe Agenciji RS za okolje pripravljamo ocene emisij in ponorov toplogrednih plinov v sektorju Raba tal, sprememba rabe tal in gozdarstvo (LULUCF). Nadgrajujemo tudi vsebino Nacionalnega poročila o evidencah izpustov toplogrednih plinov, za kar imamo javno pooblastilo. V okviru javne gozdarske službe pripravljamo strokovne podlage za obračunavanje emisij, nudimo pomoč MKGP pri pripravi poročil in predpisov, predvsem zaradi uresničevanja sklepov in odločb evropske zakonodaje na področju LULUCF. Stremimo k uporabi novih pristopov in orodij za pripravo projekcij toplogrednih plinov v omenjenem sektorju.

PRESENTATION OF WORKING AREAS

FOREST MANAGEMENT PLANNING

This working area comprises the development of forest planning systems, different types of natural resource plans, as well as performance and improvement of the quality control for all forest management plans. A special concern is given to the development of management plans for the Natura 2000 forest areas.

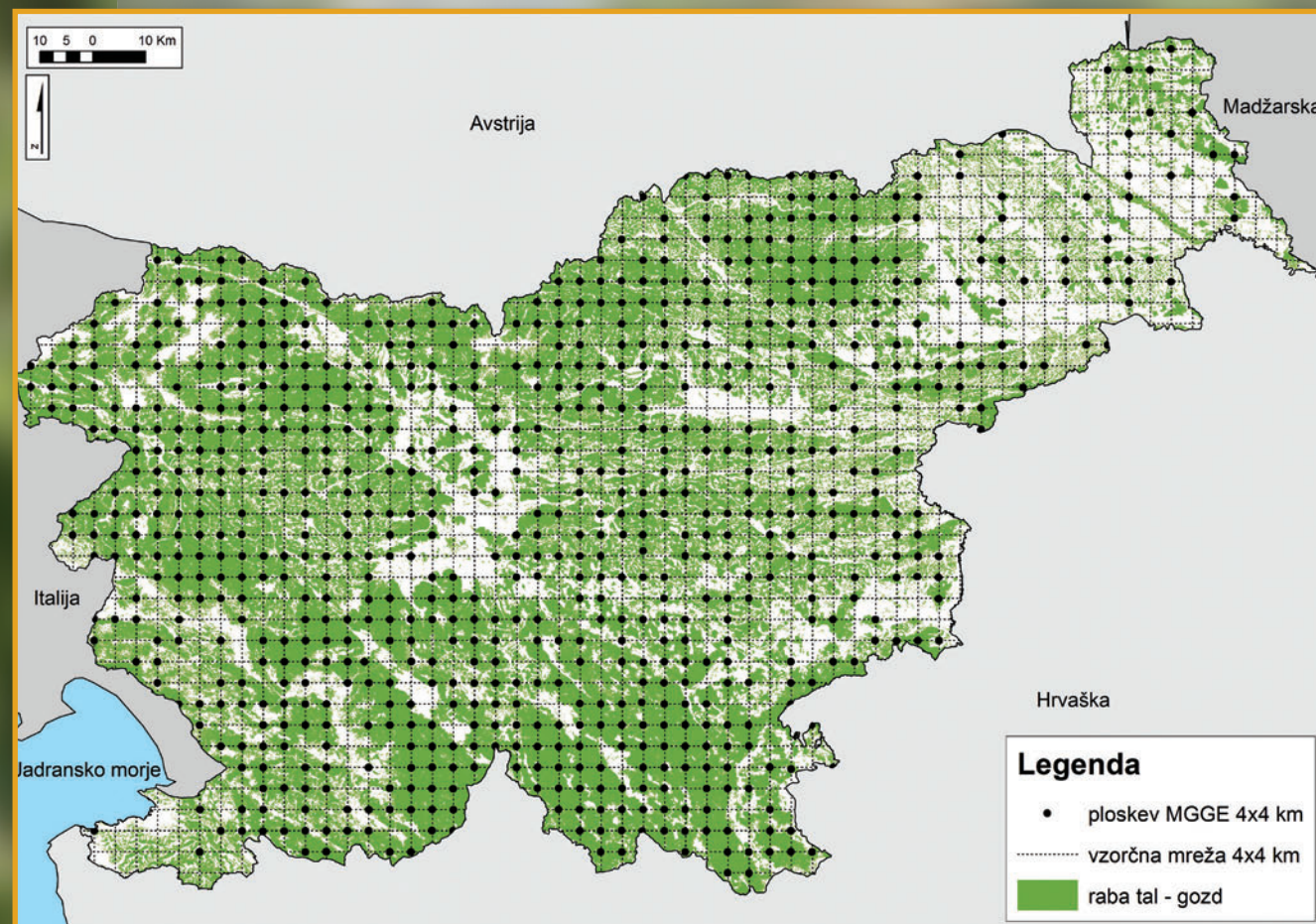
MONITORING OF CARBON DYNAMICS

The latest field of the department's activities is the field of carbon dynamics monitoring and developing methods for calculation of carbon balance in forests and other landscape. Within the framework of the public environment service we prepare evaluations of greenhouse gas emissions and sinks in the Land Use, Land-Use Change and Forestry (LULUCF) sector for the Slovenian Environment Agency. We also upgrade the contents of the National Inventory Report (NIR), for which we have public authorization. Within the framework of public forestry service, we prepare professional bases for calculating the emissions, we provide assistance to MAFF at preparation of reports and regulations, primarily in order to meet the European legislative resolutions and decisions in LULUCF field. We strive for the implementation of new approaches and tools for preparing greenhouse gas projections in the above-mentioned sector.



MONITORING GOZDOV IN KRAJINE

Predhodnik oddelka NMGK je z razvijanjem gozdne inventure začel leta 1994. Tako je bila prva gozdna inventura v Sloveniji izdelana leta 1995, do leta 2000 pa je bila razvita sodobna integrirana inventura, poimenovana Monitoring gozdov in gozdnih ekosistemov (MGGE). Sočasno so se razvijale tudi metode preučevanja vplivov na okolje. Spremljanje stanja gozdov v okviru MGGE se je ponovilo trikrat, v letih 2000, 2007 in 2012. Na proces razvoja MGGE so imeli pomemben vpliv številna mednarodna priporočila, procesi in projekti, posledično je današnji sistem metodološko harmoniziran in mednarodno primerljiv. Želja oddelka NMGK je razviti sistem krajinske inventure s ciljem nadgraditi obstoječi sistem z dodatnimi kazalniki, povečati število vzorčnih ploskev, zagotoviti kontinuiteto izvajanja terenskih meritev ter vzpostaviti protokole za snemanje kazalnikov na terenu in za obračun podatkov.



Sistematična mreža stalnih vzorčnih ploskev MGGE na mreži 4 x 4 km; stanje leta 2012
Systematic network of permanent sampling plots MFFE on the 4 x 4 km grid; state in 2012



MONITORING OF FORESTS AND LANDSCAPE

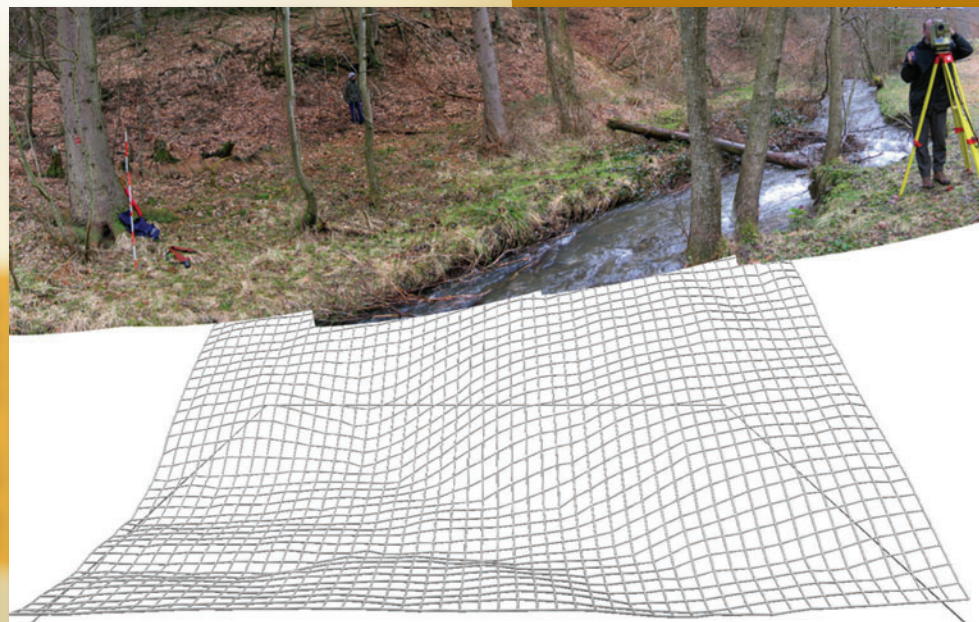
The forerunner of FLPM department began developing forest inventory in 1994. The first forest inventory in Slovenia had been thus performed in 1995 and contemporary integrated inventory, called Forest and Forest Ecosystem Condition Survey (FECS), was established by 2000. Methods of studying impacts on the environment were developed simultaneously. To date, monitoring of forest condition within FECS framework (Figure 1) has been repeated three times, i.e. in 2000, 2007, and 2012. The process of FECS development has been significantly affected by numerous international recommendations, processes, and projects, and, consequently, the present system is methodologically harmonized and internationally comparable. In the future the FLPM department would like to develop a system of landscape inventory, its goal being to upgrade the present system with additional indicators, to increase the number of field sampling plots, ensure continuous performing field measurements, establish protocols for recording indicators in the field, and for calculation of forestry statistics.

DALJINSKO ZAZNAVANJE IN PROSTORSKO MODELIRANJE

S pomočjo aerofoto in satelitskih posnetkov izdelujemo karte rabe tal, gozdnih sestojev in analiziramo spreminjanje rabe tal v krajini. S satelitskimi podatki visoke časovne ločljivosti pa spremljamo primarno produkcijo gozdov in sušni stres. Razvijamo metode za zgodnje zaznavanje podlubnikov s podatki avtonomnih letalnikov. Zanima nas uporaba podatkov daljinskega zaznavanja in drugih prostorskih podatkov za spremljanje, modeliranje in napovedovanje stanja in procesov v gozdu. Lasersko skeniranje iz zraka v kombinaciji z IR orto-fotografijami iz zraka uporabljamo za 3-D opazovanje gozdnih dreves, sestojev in za ocenjevanje njihovih lastnosti (sestojne višine in sklep, razvojne faze, stopnje zaraščanja, fragmentacijo gozda, gozdni rob), sledimo antropogenim in naravnim spremembam gozda in preučujemo vplive nanje. Z različnimi metodami modeliranja napovedujemo učinke klimatskih sprememb na krčenje arealov posameznih drevesnih vrst in tipov gozdov ter napovedujemo porazdelitev habitatov ogroženih vrst ptic in žuželk v Sloveniji.

REMOTE SENSING AND SPATIAL MODELLING

Using aerophoto and satellite imagery we make land use maps, forest stand maps, and analyze land use change in the landscape. We monitor primary forest production and draught stress with the use of satellite data of high temporal resolution. We develop methods for early detection of bark beetle attack using the data from drones. We are interested in the use of remote sensing data and other spatial data for monitoring, modelling, and predicting forest condition and processes. Airborne laser scanning in combination with the aerial IR orthophoto is used for 3-D monitoring of forest trees, forest stands, and for the estimation of their features (stand height and canopy closure, development phase, degree of spontaneous afforestation, forest fragmentation, forest edge), we monitor anthropogenic and natural changes of the forest and study their impacts. Using diverse modelling methods we predict the impacts of climate change on the area reduction of individual tree species and forest types and predict the distribution of habitats of the endangered bird and insect species in Slovenia.



Izračun reliefa golih tal pod gozdnim pokrovom z lastnim algoritmom iz lidarskih podatkov

Lidar-based calculation of bare ground relief under forest cover using our own algorithm



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Člani oddelka: Andrej Kobler, Andreja Ferreira, Mitja Skudnik, Boštjan Mali, Anže Japelj, Špela Planinšek, Jure Žlogar, Saša Vochl, Andrej Grah



06

ODDELEK ZA
PRIRASTOSLOVJE IN GOJENJE GOZDA
ODDELAK ZA
PRIRASTOSLOVJE IN GOJENJE GOZDA

DEPARTMENT OF
FOREST YIELD AND SILVICULTURE
ODDELAK ZA
PRIRASTOSLOVJE IN GOJENJE GOZDA

O oddelku

Oddelek za prirastoslovje in gojenje gozda je najmlajši oddelek na GIS. Nastal je po manjši interni reorganizaciji oddelkov na GIS leta 2005. Ob nastanku so bili v njem zaposleni samo trije raziskovalci: Tom Levanič (dendrokronologija, prirastoslovje), Matjaž Čater (gojenje gozdov in ekofiziologija) in Andrej Kobler (daljinsko zaznavanje in modeliranje; odšel v drug oddelek). V tistem času je imel oddelek tudi strokovnega sodelavca Petra Ogrinca (modeliranje; odšel 2008) in tehniškega sodelavca Roberta Krajnca. Leta 2006 sta se oddelku pridružili raziskovalki Jožica Gričar (lesna biologija) in Daniela Stojanova (strojno učenje in modeliranje; odšla 2009). Na podlagi strategije razvoja oddelka smo leta 2007 dobili mlado raziskovalko Polono Hafner in tehniško sodelavko Špelo Jagodic, leta 2009 mladega raziskovalca Simona Poljanška, leta 2013, zaradi širitve raziskovalnega dela na stabilne izotope, pa še Sašo Zavadlav. Zadnje kadrovske okrepitve smo dobili leta 2014, ko se je oddelku pridružila mlada raziskovalka Martina Lavrič.

Od skromnih začetkov raziskovalnega in strokovnega dela v oddelku, kjer razen merilne mizice Lintab, računalnika in ročne tračne brusilke druge opreme nismo imeli, smo postopno prišli do treh, moderno opremljenih laboratorijev z vso potrebno opremo za najzahtevnejše raziskave rasti dreves in zgradbe drevesnih tkiv – laboratorija za dendrokronologijo, lesno anatomijo in stabilne izotope. Na voljo imamo moderno terensko opremo za odvzem mikro in makro izvrtkov lesa iz dreves, za merjenje dihanja in fotosinteze, pretoka soka po deblu, debelinskega priraščanja z ročnimi in elektronskimi dendrometri...

About Department

Department of Forest Yield and Silviculture is the youngest at the Slovenian Forestry Institute, which was established after the internal reorganization of departments in 2005. At the beginning, only three researchers worked at the department - T. Levanič (dendrochronology, yield), M. Čater (silviculture and ecophysiology) and A. Kobler (remote sensing and modelling), who is no longer employed here. At that time, the department also had a professional associate P. Ogrinc (modelling; left in 2008) and technical associate R. Krajnc. In 2006, we were joined by J. Gričar (wood biology) and D. Stojanova (machine learning and modelling; left in 2009), in 2009 by young researcher P. Hafner and technical associate Š. Jagodic, in 2009 by young researcher S. Poljanšek, and in 2013 by S. Zavadlav (stable isotopes). The last one to join us was young researcher M. Lavrič (2014).

From the modest beginnings concerning our research and professional work, when equipped only with Lintab measuring table, computer and small sanding machine, we gradually developed four modern laboratories with specialized equipment required for the most advanced research in the field of dendrochronology, tree growth and tree growing tissues - laboratory for dendrochronology, forest ecophysiology, wood anatomy and stable isotopes. Our field equipment is modern, such as sets for micro/macro tree tissue sampling, infra-red gas analyser for the respiration and gas exchange measurements, instruments for determination of light intensity and quality, sap flow sets, manual and electronic dendrometers, etc. ...

Kot najnovejši razvojni dosežek oddelka naj omenimo vzpostavitev laboratorija za stabilne izotope leta 2013. V okviru predelave prostorov GIS v pritličju, levo, v laboratorijske prostore in s kasnejšo pridobitvijo velikega evropskega infrastrukturnega projekta EUFORINNO (dr. Kraigher, FIGE) smo v PIGGu pridobili in opremili prostor ter nekoliko kasneje kupili še masni spektrometer za stabilne izotope in s tem zaključili investicijo v moderen laboratorij za stabilne izotope. V letu 2016 smo v okviru paketa opreme 16 (ARRS) dopolnili raziskovalno opremo laboratorijev za lesno anatomijo in dendrokronologijo.

Rast in funkcioniranje drevesa na mikro in makro nivoju ter njuna odvisnost od okoljskih, klimatskih in človeških dejavnikov v prostoru in času je v središču raziskovalnega delovanja oddelka. Z leti smo glavnemu cilju raziskav dodajali še nove, ki so bili predvsem usmerjeni v pokrivanje področij, vezanih na les, priraščanje lesa in funkcioniranje dreves ter v diverzifikacijo raziskovalnega in strokovnega delovanja oddelka (npr. ekspertize s področja forenzične dendrokronologije, datiranje starih hiš in predmetov, lesno anatomске determinacije, izdelava lesno-anatomskih preparatov za trg, storitev merjenja širin branik za trg, analize stabilnih izotopov za trg ...).

The most recent achievement in 2013 is the establishment of laboratory for the stable isotopes, equipped by the mass spectrometer during adaptation of the ground floor and with the help of EUFORINNO, European infrastructural project led by Prof Dr Hojka Kraigher.

The main focus of our research within the department is growth and functioning of trees on micro and macro levels, their spatio-temporal dependence on environmental and human impacts. Other research fields are targeting increment, forensic dendrochronology, dating of wooden objects, wood-anatomically determination and services/analysis on request.

SILVICULTURE AND ECOPHYSIOLOGY

Silviculture as the predominant field of forestry includes studies of the principal processes as well as comparisons of different management approaches and their effects on different tree species in the changing environmental conditions. Forest ecophysiology supplements the field of silviculture; research aims are targeting predominant site factors and their influence on the natural regeneration (lowland oak forests, silver fir and beech forests), study of the key environmental processes (light, water supply, assimilation...) that are assessed with direct measurements in various forest types and compared also with responses obtained in forest reserves. Studies of marginal forest ecosystems, success and response ability of the regeneration after wide-scale disturbances, future perspective and competitive strength of predominant tree species and response on geographical gradients are also targeted topics of our research.

GOJENJE IN EKOFIZIOLOGIJA

Gojenje kot osrednje področje gozdarstva vključuje tako študije osnovnih procesov kot tudi vplive različnih zvrsti gospodarjenja na odzive drevesnih vrst v spreminjajočih se okoljskih razmerah. Področje gozdne ekofiziologije dopolnjuje področje gojenja gozdov. Delo in raziskave so osredotočeni na poznavanje ključnih rastiščnih dejavnikov naravne obnove (npr. nižinska hrastovja, jelova bukovja), poznavanje delovanja ključnih procesov okoljskih dejavnikov (svetlobe, preskrbe z vodo, asimilacije...), ki jih z neposrednimi meritvami v preučevanih gozdnih ekosistemih lahko primerjamo v procesih pomlajevanja ali kot posledico različnih gojitvenih ukrepov v preteklosti na odraslih sestojih. Preučujemo odziv robnih ekosistemov, uspešnost in odzivnost naravnega pomlajevanja po velikopovršinskih ujmah (npr. žled 2014) ter perspektivo in konkurenčno sposobnost drevesnih vrst (npr. smreke, jelke in bukve) v spreminjajočih se okoljskih razmerah na geografskih gradientih in v pragozdnih rezervatih.

DENDROKRONOLOGIJA IN REKONSTRUKCIJA KLIME

Klimatske spremembe spadajo med dejavnike, ki v zadnjem času ključno vplivajo na rast, produktivnost, fiziološke procese, preživetje in mortaliteto dreves / sestojev. Kompleksnost procesa spreminjanja klime ter odziva rastlin in ekosistemov na spreminjajoče se klimatske in okoljske razmere je tako velika, da terja celostne in dolgotrajne raziskave odzivov in posledic. Od leta 2000 smo s pomočjo dendrokronoloških metod raziskali celo vrsto rastišč in drevesnih vrst od nižinskih dobovih gozdov do macesnovih sestojev na zgornji alpski in borovih sestojev na zgornji dinarski

meji do jelovo-bukovih sestojev v optimumu. Razvili smo dolge kronologije širin branik različnih drevesnih vrst in zbrali ključne informacije o odzivih dreves in dejavnikih, ki pomembno vplivajo na rast in odziv preučevanih dreves na območju JZ Balkana. V okviru raziskav rasti nas zanima tudi dinamika višinske rasti, zato smo v sodelovanju z dr. Jalkanenom s finskega inštituta METLA (sedaj LUKE) uspešno uvedli metodo sledenja iglic (NTM – needle trace method), s katero lahko rekonstruiramo dejavnike, ki vplivajo na višinsko priraščanje iglavcev, in s tem sklepamo na dolgotrajne in kratkotrajne spremembe okolja, v katerem drevesa rastejo (npr. onesnaževanje, gozdni požari, ipd.). Metodo smo uspešno uporabili na borovih rastiščih v Sloveniji ter v Bosni in Hercegovini.

DENDROKRONOLOGIJA IN REKONSTRUKCIJA KLIME

Climate change affects growth, productivity, physiological processes, survival and mortality of trees and forest stands; monitoring changes and their effects on trees is complex and requires long term studies of responses and adaptations. Since 2000, many sites and various species have been studied (lowland floodplain forests, upper timberline larch forests and pine forests, silver fir and beech forests...), developing long chronologies of tree rings from the SW Balkan region. Dynamics of height growth is studied in cooperation with Dr Jalkanen (METLA, now LUKE, Finland) where needle trace method has been successfully developed and tested on pine stands (Slovenia, Bosnia and Herzegovina). It helps us determine and reconstruct the most significant factors affecting the height growth and also short term disturbances (pollution, forest fires...).



LESNA ANATOMIJA

Lesno-anatomske raziskave so že potrdile potencial za ocenjevanje odziva dreves na okoljske razmere, saj morfološke značilnosti lesnih celic opredeljujejo njihovo mehansko in prevodno vlogo v drevesu in s tem neposredno vplivajo na njegovo dolgoročno preživetje. Z vidika uporabne vrednosti lesa pa značilnosti lesnih celic določajo lastnosti in kakovost lesa. Po drugi strani pa so zveze med okoljem in floemom še dokaj neraziskane, čemur se v zadnjih letih intenzivno posvečamo. študije sezonske dinamike nastanka lesa in floema zahtevajo večletna zbiranja podatkov v kratkih časovnih intervalih med rastno sezono. Da bi pridobili podatke o odzivu različnih drevesnih vrst na okoljske razmere na globalni ravni, raziskovalci iz različnih laboratorijev po svetu intenzivno sodelujemo, izmenjujemo znanje in združujemo podatke v skupno bazo (npr. Gričar in sod. 2015, Rossi in sod. 2016). Tako bo v prihodnje mogoče izdelati modele dinamike nastanka lesa, s katerimi bomo lahko ocenili gozdno produkcijo in lastnosti lesa v različnih klimatskih scenarijih. Poleg tega je poznavanje nastanka in strukture lesa in floema ključno za oceno prilagodljivosti različnih drevesnih vrst v spremenjenih klimatskih razmerah, kar bo vplivalo na zgradbo in biodiverzitetu gozdov v prihodnosti.

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WOOD ANATOMY

Wood-anatomical studies have already proved the potential for assessing tree response to the environmental conditions, as morphological characteristics of woody cells determine their mechanical and conductive role in the tree, and thus directly influence long-term survival of trees. In terms of wood use, characteristics of woody cells define properties and wood quality. In contrast, the link between the environmental factors and phloem part is still relatively unexplored, and has been one of the main interests of our research group in recent years. Intra-annual studies of wood and phloem formation and the phloem require data collection over several years. To obtain information on the global response of different species to environmental changes, researchers from various laboratories exchange knowledge and compile the data into a common database (e.g. Gričar et al. 2015, Rossi et al., 2016). This approach will allow us to create models of the seasonal dynamics of wood formation in order to assess forest productivity and wood properties of trees from different environments. In addition, knowledge on the formation and structure of wood and phloem is critical to evaluate the adaptability of different tree species to changing environmental conditions, which will undoubtedly affect the structure and biodiversity of forests in the future.



Raziskovalni program Gozdna biologija, ekologija in tehnologija (P4-0107)

Slovenski gozdovi se uvrščajo v »biodiverzitetno vroči pas Evrope«. Zato dajejo raziskovalcem s področja gozdarstva informacije in trdne temelje za uvrščanje panoge med soustvarjalce mednarodnih strategij ohranjanja in rabe kompleksnih funkcij gozdov, biodiverzitete in obnovljivih virov, vezanih na gozd.

Raziskovalni program (RP) Gozdna biologija, ekologija in tehnologija (GBET) je začel leta 1999 kot nadaljevanje dotlej največjega nacionalnega projekta na inštitutu »Rizosfera«. Prvotna dva raziskovalna programa Gozdarskega inštituta Slovenije in Gozdno načrtovanje in prostor sta se v naslednjem obdobju združila v enotni program GBET, ki združuje raziskave vseh področij v gozdarstvu v okviru šestih delovnih skupin – oddelkov GIS. Zastavljen je modularno, kar omogoča fleksibilno letno načrtovanje in delo, uresničujeta ga dve raziskovalni organizaciji: nosilna organizacija je Gozdarski inštitut Slovenije, sodeluje Univerza v Novi Gorici (UNG).

RP GBET vodi raziskave v podporo trajnostnemu sonaravnemu gospodarjenju z gozdom in gozdno krajino. Glavni cilj programa je blažitev in prilagajanje učinkom klimatskih sprememb na rast in razvoj gozdov na njihovih sedanjih območjih uspevanja. Posebni poudarki v tekočem obdobju so usmerjeni v bio-gospodarstvo, temelječe na znanju, ohranjanje gozdnih ekosistemov, njihovih funkcij in ekosistemskih storitev, v trajnostno rabo naravnih virov, ohranjanje biotske pestrosti na vseh nivojih, ter razvoj inovacij v gozdarstvu. Modularna struktura spodbuja specializacijo na šestih glavnih področjih raziskovanja in hkrati omogoča učinkovito

Research programme Forest biology, ecology and technology (P4-0107)

Slovenian forests are placed in the »biodiversity hot belt of Europe«. This is why they provide forestry researchers with information and solid foundations for ranking this sector among the co-creators of international strategies for the preservation and use of complex functions of forests, biodiversity and renewable resources pertaining to forests.

The Research programme (RP) Forest Biology, Ecology and Technology (FBET) came to life in 1999 as a continuation of the till then biggest national project at the Institute entitled »Rhizosphere«. The initial two research programmes of the Slovenian Forestry Institute and Forest Planning and Space merged in the ensuing period into a single programme FBET, which unites research from all forestry sectors within the framework of six working groups – departments of the Slovenian Forestry Institute (SFI). It was conceived modularly, which enables flexible yearly planning and work. It is implemented by two research organizations, the principal being SFI, the participant the University of Nova Gorica (UNG).

The RP FBET covers research in support of sustainable close-to-nature forest and forest landscape management. The RP's main objective is mitigation and adaptation to the effects of climate change on the growth and development of forests as well as conservation of their current areas of proliferation. Special emphasis in the current period is laid on knowledge-based bio-economy, conservation of forest ecosystems, their functions and ecosystem services, sustainable use of natural resources as well as conservation of biodiversity and development of

sodelovanje med skupinami v številnih študijah, v katerih je interdisciplinarnost prednost; sodelovanje z Univerzo v Novi Gorici prispeva k uporabi dopolnilnih metodoloških pristopov in navezuje program na širšo problematiko varstva okolja; sodelovanje uglednih tujih znanstvenikov na posameznih področjih pa dodatno stimulira publiciranje in razvoj človeških in infrastrukturnih kapacitet za uspešnejše prispevanje k svetovni zakladnici znanj v gozdarstvu. Pomen, odmevnost in perspektivnost GBET dokazuje tudi sodelovanje v velikem številu evropskih projektov.

V preteklem obdobju nam je že uspelo povečati in ustrezno dopolniti metodološke pristope z novo raziskovalno opremo in zaposlitvijo visoko usposobljenih strokovnjakov v okviru projekta 7OP EU EUFORINNO. Prepotrebna dopolnitev programa pa omogoča dodaten razvoj in aplikacijo inovativnih idej v njihovi zgodnji fazi razvoja, tako inovacije pri razvoju merilnih naprav, pri razvoju rabe tal, razvoju in uporabi kompleksnih multidisciplinarnih raziskovalnih metod, za katere je oprema že na voljo na GIS, kot sodelovanje večjega števila uveljavljenih tujih raziskovalcev.

Področja raziskovalnega dela šestih delovnih skupin (DS) so podrobneje opisane v okviru posameznih znanstveno-raziskovalnih oddelkov GIS:

- DS1: Gozdna ekologija
- DS2: Gozdna fiziologija in genetika
- DS3: Varstvo gozdov
- DS4: Gozdna tehnika in ekonomika
- DS5: Načrtovanje in monitoring gozdov in krajine
- DS6: Rast, gojenje in dendrokronologija

innovations in forestry. The modular structure promotes specialization in the six major research areas and at the same time enables effective collaboration among groups in numerous studies in which interdisciplinarity is certainly an advantage; the cooperation with UNG contributes to the use of supplementary methodological approaches and relates the programme with wider issues of environmental protection, whereas the participation of prominent foreign scientists in separate fields additionally stimulates publishing and development of human and infrastructural capacities for a more successful contribution to the global treasury of knowledge in forestry. The FBET's significance is further proved by our participation in a great number of European projects.

In the previous period we managed to increase and suitably supplement methodological approaches with new research equipment and by employing highly qualified experts within the framework of 7OP EU EUFORINNO project. The completion of the programme, on the other hand, enables additional development and application of innovative ideas in their early phase of development, innovations in development of measuring devices, in development of land-use, development and use of complex multidisciplinary research methods for which equipment is already available at SFI, and collaboration by a larger number of recognized foreign experts.

The areas of research work of six working groups (WG) are described in greater detail within the framework of the Institute's separate departments of scientific research:

- DS1: Forest Ecology
- DS2: Forest Physiology and Genetics
- DS3: Forest Protection
- DS4: Forest Engineering and Economics
- DS5: Planning and Monitoring of Forests and Landscape
- DS6: Growth, Silviculture, Dendrochronology

Raziskovalni program, ki je bil odobren za obdobje 2015 - 2019 v višini 4,35 FTE letno, uresničujeta Gozdarski inštitut Slovenije (4,15 FTE) in Univerza v Novi Gorici (0,2 FTE). Kakovost RP dokazuje število publikacij v zadnjih 5 letih (458 publikacij od skupno 3.291 zapisov v COBISS), od teh 208 v najvišje uvrščenih 5 % revij (A'', A') v področju (<http://izumbib.izum.si/bibliografije/V20170414124258-V-000.html>), z 11.176 C110 citati); aktivnosti RP so prispevale k številnim COST akcijam in spodbudile sodelovanje ali vodenje številnih evropskih raziskovalnih in izvedbenih projektov.

Slovenija ima eno najdaljših tradicij trajnostnega in sonaravnega gospodarjenja z gozdovi v Evropi. Če želimo nadaljevati s to tradicijo, moramo poznati odziv gozdnega drevja in gozdov na ekstremne razmere v okolju, da bi lahko ustrezno načrtovali gospodarjenje z gozdovi, upoštevali spremembe v sestavi drevesnih vrst, ustreznost provenienc oz. izvora gozdnega reprodukcijskega materiala, njihovo kakovost in genetsko pestrost za prihodnje generacije gozdnega drevja. Raziskovalni program prispeva bistvene informacije za prihodnje gospodarjenje z gozdovi za zmanjševanje posledic spremenjenih temperaturnih in padavinskih ekstremov, s ciljem, da bi preprečili, da bi gozdovi postali vir namesto ponor ogljika. Raziskave GBET so širšega družbenega pomena in prispevajo k socio-ekonomskim in kulturnim vrednotam gozdov. V zadnjih letih pa smo sodelavci GBET bistveno prispevali tudi k posodobitvi raziskovalne infrastrukture GIS, založniškega centra Silva Slovenica, prostemu dostopu do publikacij in »sive literature« iz zgodovine delovanja GIS z organizacijo repozitorija SciVie, ki se v letu 2017 združuje z Digitalnim repozitorijem raziskovalnih organizacij Slovenije (DIRROS), ter k znanstveni politiki na področju biotehniških ved in širše, znanosti o okolju in življenju, doma in po svetu.

The research programme, which was approved for the 2015–2019 period at 4.35 FTE annually, is implemented by SFI (4.15 FTE) and UNG (0.2 FTE). The quality of RP has been proved by the number of publications in the last five years (458 publications of a total of 3,291 records in COBISS), 208 of which in the highest ranked 5% of journals (A'', A') in the sphere (<http://izumbib.izum.si/bibliografije/V20170414124258-V-000.html>), z 11.176 C110 citati); the RP's activities contributed to numerous COST actions and promoted participation in numerous European research and implementation projects.

Slovenia boasts one of the longest traditions of sustainable and close-to-nature forest management in Europe. If we wish to preserve this tradition, however, we need to know the reaction of forest trees and forests to the extreme conditions in the environment to be able to make suitable forest management plans, to consider the changes in tree species structure, the adequacy of provenances or origin of forest reproduction material for the future generations of forest trees. The research programme contributes key information for future forest management for the mitigation of effects of the changed temperature and precipitation extremes in order to prevent forests becoming carbon source instead of carbon sink. The FBET research is of a wider social significance and contributes to the forests' socio-economic and cultural values. In the last few years, however, we, the FBET collaborators, significantly contributed to a thorough updating of SFI's research infrastructure, Silva Slovenica Publishing Centre, free access to publications and »grey literature« from the history of SFI functioning with organization of SciVie repository, which is in 2017 merging with the Digital Repository of Research Organizations of Slovenia (DIRROS), and to science policy in the sphere of biotechnical sciences and wider, science of the environment and life at home and abroad.



Infrastrukturna skupina Gozdarskega inštituta Slovenije

Infrastruktorni program Gozdarskega inštituta Slovenije, katerega naslov se glasi Infrastrukturna skupina Gozdarskega inštituta Slovenije (ISGIS), se uresničuje v sklopu sheme infrastrukturnih programov, ki jih financira Javna agencija za raziskovalno dejavnost Republike Slovenije (ARRS) in katerih namen je podpora infrastrukturni dejavnosti raziskovalnih organizacij. ISGIS je začela delovati v programskem obdobju 2009–2014 pod vodstvom dr. Roberta Robeka.

Vsebinsko so aktivnosti ISGIS razdeljene na šest delovnih sklopov: DS1 – Laboratoriji, DS2 – Zbirke, DS3 – Trajne raziskovalne ploskve, DS4 – Računalniška infrastruktura, DS5 – Založništvo, DS6 – Druga infrastruktura in vodenje programa.

Prednostna naloga ISGIS je podpora dejavnosti laboratorijev GIS in v njih nameščene raziskovalne opreme ter računalniške infrastrukture. ISGIS zagotavlja materialno podporo in organizacijo rednih vzdrževanj raziskovalne opreme in strežnikov, kalibracij, validacij, nabave osebnih varovalnih sredstev za laboratorijsko osebje, zbiranja in odvoza laboratorijskih odpadkov, sofinanciranje licenc raziskovalne programske opreme. Sodelujemo pri pripravi strategije vpeljevanja mednarodnih laboratorijskih standardov in akreditacij, podpiramo opravljanje krožnih testov, sodelujemo pri pripravi standardnih operativnih protokolov in cenikov za raziskovalno opremo GIS ter zagotavljamo del sredstev za delo vzdrževalca računalniške infrastrukture GIS.

ISGIS je bila vseskozi aktivno udeležena pri dveh ključnih dogodkih, ki sta v zadnjih letih bistveno prispevala k dvigu sodobnosti in zmogljivosti raziskovalne infrastrukture GIS: (1) prenova levega krila pritličja v laboratorijske prostore, opremljene z ustreznim laboratorijskim pohištvo, in selitev laboratorijev GIS v nove prostore (2010-2012); (2) priprava javnih naročil,

Infrastructure group of the Slovenian Forestry Institute

Infrastructure programme of the Slovenian Forestry Institute, entitled Infrastructure Group of the Slovenian Forestry Institute (ISGIS), is part of the national infrastructure programme scheme funded by the Slovenian Research Agency (ARRS). ISGIS became operational in 2009 under the leadership of Dr Robert Robek.

ISGIS activities are divided into six work packages, specifically: DS1 – Laboratories, DS2 – Material and data collections, DS3 – Permanent research sites, DS4 – IT infrastructure, DS5 – Publishing, DS6 – General infrastructure and programme management.

The focal point of ISGIS activities is the support of infrastructure related to laboratories, including research equipment and IT infrastructure. In this capacity ISGIS provides financial and organisational support for preventive maintenance and repairs of research equipment and servers, calibrations, validations and ring tests, personal protective equipment for laboratory personnel, collection and disposal of laboratory waste materials. ISGIS has been involved in promoting the implementation of international laboratory standards (e.g. ISO 17025), good laboratory practices and accreditation, preparation of standard operational procedures and price lists for analytical services offered by SFI. ISGIS also provides part of the funding for the IT infrastructure expert and research software licences.

ISGIS was actively involved in and contributed significantly to the two key events that increased the capability and state-of-the-art of SFI research infrastructure: (1) renovation and adaptation of the left ground floor wing of SFI into laboratories outfitted with appropriate laboratory furniture, and relocation of different SFI laboratories to the new facilities (2010-2012); (2) preparation of public tenders for and acquisition of new state-of-the-art research equipment,

nabava in namestitev najsodobnejše raziskovalne opreme ter priprava in implementacija standardnih operativnih postopkov za njeno uporabo, kar je bilo opravljeno v okviru projekta EUFORINNO (2012-2016) ter ARRS Paketa 16 (2015-2017).

ISGIS ima osrednjo vlogo tudi pri pripravi planov prednostnih investicijsko vzdrževalnih del v stavbi GIS in drugih nepremičninah, s katerimi upravlja GIS, ter pri pripravi prijav na nacionalne programe sofinanciranja energetske sanacije in investicijsko vzdrževalnih del.

installation thereof, preparation and implementation of standard operational protocols for the new equipment purchased within the EU funded project EUFORINNO (2012-2016) and ARRS funded Paket 16 (2015-2017).

ISGIS is also involved in the preparation of priority plans for activities regarding general infrastructure investments and maintenance, including preparation of applications for national infrastructure investments and maintenance works co-funding programmes.



Založba *Silva Slovenica* Gozdarskega inštituta Slovenije

Silva Slovenica je založba Gozdarskega inštituta Slovenije (GIS), ustanovljena hkrati z Inštitutom leta 1949. V okviru založbe so bile izdane mnoge publikacije na znanstveni in strokovni ravni. Najvidnejši med njimi sta knjižna zbirka *Studia Forestalia Slovenica* in znanstvena revija *Acta Silvae et Ligni*.

V zadnjih nekaj letih je založba po zaslugi financiranja projekta EUFORINNO in prizadevanj profesionalnega urednika dosegla občuten razvoj in močno pospešila svoje dejavnosti. Tako se je v veliki meri povečalo število del, ki jih je izdala *Silva Slovenica*. Prek mnogih kakovostnih publikacij je založba dvignila kakovost založniškega procesa in produkcije na strokovno mednarodno raven. GIS je postal član mednarodne organizacije CrossRef, ki omogoča založnikom pri vzpostavljanju URL-povezav njihovih e-vsebin z zagotavljanjem številke DOI.

Studia Forestalia Slovenica je znanstvena in strokovna knjižna zbirka, ki jo izdaja Založba *Silva Slovenica* v sodelovanju z Oddelkom za gozdarstvo in obnovljive vire in Oddelkom za lesarstvo in tehnologijo Biotehnišne fakultete Univerze v Ljubljani. Zbirka izhaja že od leta 1949 in odtlej je bilo v njej objavljenih že čez 150 bibliografskih enot. Eden izmed ciljev projekta EUFORINNO je bil razvoj zbirke do mednarodne znanstvene ravni. Nedavne znanstvene publikacije so zagotovo dober korak v tej smeri.

Silva Slovenica Publishing Centre of the Slovenian Forestry Institute

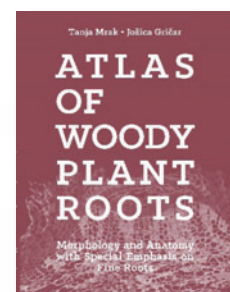
Silva Slovenica is the publishing centre of the Slovenian Forestry Institute (SFI), established in parallel with the establishment of the Institute in 1949. Through the centre, numerous publications at the scientific or professional level have been published. The most prominent are the monograph series *Studia Forestalia Slovenica* and the scholarly journal *Acta Silvae et Ligni*.

In recent years, significant development and boost of activities of the publishing centre were achieved through the available funding of EUFORINNO project and the efforts of professional editor. The number of works published through *Silva Slovenica* has risen significantly. Through several high-quality publications, the publishing centre has raised the quality of the publishing process and output on the professional international level. SFI has become a member of CrossRef, which helping publishers and users to identify content and provide a persistent link to its location on the Internet.

Studia Forestalia Slovenica is scientific and professional level monograph series published by *Silva Slovenica* Publishing Centre in cooperation with the Department of Forestry and Renewable Forest Resources and Department of Wood Science and Technology of the Biotechnical Faculty of the University of Ljubljana. The monograph series has been published since 1949, with more than 150 titles published so far. One of the goals of the EUFORINNO project was to develop the series to reach an international scientific level. Recent scientific publications are the first decisive steps in this direction.



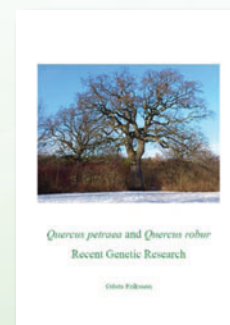
106. Izdaja revije *Acta Silvae et Ligni* /
106th Issue of *Acta Silvae et Ligni*



Atlas of Woody Plant Roots:
avtorici/by Tanja Mrak in Jožica Gričar
(2016)



Foto monografija Pragozd
(Hartman et al. 2014)
Virgin Forest photo monograph
(Hartman et al. 2014)



Quercus petraea in Quercus robur:
Recent Genetic Research,
avtor/by Gösta Eriksson
(2015)

Acta Silvae et Ligni je edina slovenska revija, ki se posveča objavljanju izvernih ali preglednih člankov s področij gozdov, gozdarstva, lesarstva in tehnologije, gozdnate krajine, narave in okolja. V zadnjih nekaj letih je revija izboljšala svojo prepoznavnost in dosegla, ali pa je v fazi doseganja, več pomembnih mejnikov:

- delujoč sistem elektronske predložitve z on-line uredniškim postopkom za predložitev člankov, recenzij in drugih komunikacij med avtorji;
- nadgradnja in modernizacija grafičnega oblikovanja, domače strani, programske strategije in odprtega dostopa;
- sprememba naslova za boljšo prepoznavnost in lažje iskanje člankov;
- ureditev vprašanj v zvezi z avtorskimi pravicami in možnost odprtega pristopa za vse članke, (od številke 1 do nedavnih);
- članki objavljeni v reviji, so vključeni v zbirke COBIB.SI, CAB Abstracts in FSTA;
- dodelitev DOI na voljo za vse tekoče članke.

Acta Silvae et Ligni is the only Slovenian scientific journal dedicated to publishing original or review articles from the fields of forests, forestry, wood science and technology, forested landscape, nature and the environment. In recent years, the journal improved its prominence and achieved or is in the process of achieving several important milestones:

- an operationalised fully electronic submission system is available with complete online editorial process for paper submission, revisions and other communication among authors;
- graphic design, home page, policy strategy, and open access were updated and modernised;
- change of title for better visibility and easier tracking of articles;
- copyright issues were resolved and an open access option finalised for all articles (from number 1 till recent);
- journal is indexed in COBIB.SI, CAB Abstracts and FSTA;
- the DOI allocation is available to all current articles.

Galerijska dejavnost

Kjer se razvijata znanost in umetnost, postaja tudi življenje plemenitejše

Stavba Gozdarskega inštituta stoji ob vznožju Rožnika v Ljubljani. Zgrajena je bila po načrtih arhitekta Edvarda Ravnikarja, zasnovana pa v strogo funkcionalistični doktrini kot preprost horizontalno razpotegnjen kubus. Vpisana je v register nepremične kulturne dediščine (profana stavbna dediščina).

Obiskovalcu že sama stavba na robu gozda, svečan stopniščni vhod in pozdrav Savinškovega kipa (Drvar, 1950) dajejo estetske užitke in nakazujejo, da tu ne bo našel zgolj hladnih pisarniških prostorov. Tudi oz. prav zato je v avli inštituta našla svoj prostor Galerija Gozdarskega inštituta Slovenije (prej Galerija Inštituta za gozdno in lesno gospodarstvo). Znanost in umetnost z roko v roki – vsekakor, kreativnost pa ju določa in povezuje.

Na delo Galerije moramo gledati v širšem okviru in tako razločimo tri obdobja delovanja. Vsako s svojimi cilji, delovanjem in namenom.

Prvo obdobje razstavne dejavnosti – Galerija IGLG (Galerija Inštituta za gozdno in lesno gospodarstvo) je trajalo od obnove inštituta v letu 1983 do leta 1994. V tem času je galerija gostila odlične umetnike različnih zvrsti. Prevladovali so slikarji in grafiki, kot so Borut Vogelnic, France Slana, Tone Lapajne, Jože Ciuha, Bard Jucundus, Peter Adamič, Metka Krašovec, Miha Maleš, Zvest Apollonio, Alenka Kham Pičman, Ive Šubic, Klavdij Tutta, Jelka Reichman, Marjanca Jemec Božič, Milan Lorenčak, Boštjan Košir, vendar so obiskovalci videli tudi kiparje, kot so Peter Jovanovič, Janez Boljka, Tone Demšar, Peter Černe, tapiserije Ete Sadar Breznik, goslarja Vilima

Gallery Activities

Where science and art are developing, life is becoming nobler as well

The edifice of the Slovenian Forestry Institute stands at the foot of Rožnik Hill in Ljubljana. It was conceived in a strictly Functionalist doctrine as a simple horizontally elongated quadrangle and built according to the plans made by the architect Edvard Ravnikar. It is entered in the Register of Immovable Cultural Heritage (secular architectural heritage).

The edifice on the edge of the forest, the ceremonial staircase entrance and greeting from Savinšek's statue (The Logger, 1950) give the visitors aesthetic pleasure, indicating that they will find not merely cold offices in this building. For this very reason, the Gallery of the Slovenian Forestry Institute (formerly the Gallery of the Institute for Forest and Wood Economy) found its place in the Institute's hall. Science and art walk hand in hand – by all means, but are earmarked and correlated by creativity.

If the Gallery's work is looked at within a wider framework, three periods of its functioning are distinguished, each of them with its own goals, functions and purposes.

The first period of the gallery activities – The Gallery IFWE (Gallery of the Institute for Forest and Wood Economy) lasted from the Institute's reconstruction in 1983 till 1994. At this time, the Gallery hosted top artists from very different genres. Predominant among them were, however, painters and graphic artists such as Borut Vogelnic, France Slana, Tone Lapajne, Jože Ciuha, Bard Jucundus, Peter Adamič, Metka Krašovec, Miha Maleš, Zvest Apollonio, Alenka Kham Pičman, Ive Šubic, Klavdij Tutta, Jelka Reichman,

Demšarja, baročne kipe, otroške risbe in vrsto z gozdarstvom povezanih strokovnih razstav. Razstave so vključile tudi umetnike, ki so ustvarjali zunaj tedanjih državnih meja, kot so Zoran Mušič, Andre Masson, Karl Brandstatter, Jarle Rosseland in Nejib El Fidha. Na otvoritvah je bilo veliko udeležencev tudi iz negozdarskih vrst, s čimer je galerija tudi dosegala svoje cilje. Poleg same razstave so širše občinstvo na otvoritvah privlačili tudi povabljeni gostje, ki so bili v času pred osamosvojitvijo predvsem vplivni razumniki. To obdobje galerije je podrobno opisal in opredelil Marko Kmecl v knjigi Galerija IGLG 1984–1993 ali Pogled v slovensko gozdarstvo skozi neko drugo okno (Ljubljana, 2008).

Galerija IGLG je postopoma prenehala z delom po letu 1993, ko so se razmere v družbi in stroki spremenile. V tem prehodnem času so delovanje galerije vzdrževali predvsem Sindikat SVIZ-IGLG in zanesenjaki, ki so (še) prepoznavali pomen te dejavnosti. Brez programa dela in sredstev, a z veliko zavzetostjo, je bil glavni cilj zadržati umetnost v prostorih inštituta in polepšati naše delovno okolje. V tem času so tu razstavljali slikarji: Aljoša Križ, Brigita Požegar, Vlado Ravnik in Jožica Medle. Predstavili so se fotografi: Matej Rupel, Stanko Pelc, Hrvoje Oršanič, Vlado Ravnik in člani fotokluba AT CANON. Skulpture so razstavili Igor Grabec, Marika Pogačnik, Ada Koller - Hauser in Anton Šantl.

Marjanca Jemec Božič, Milan Lorenčak and Boštjan Košir, although visitors could also admire sculptors such as Peter Jovanovič, Janez Boljka, Tone Demšar, Peter Černe, tapestries of Eta Sadar Breznik, violin maker Vilim Demšar, Baroque statues, children's drawings and a series of professional exhibitions closely associated with forestry. Also presented at the exhibitions were artists that worked outside the state borders of that time, such as Zoran Mušič, Andre Masson, Karl Brandstatter, Jarle Rosseland and Nejib El Fidha. Several exhibition participants came also from non-forestry ranks, through which the Gallery actually achieved its goals. Apart from the exhibitions themselves, the wider public was attracted at the openings also by the invited guests who were mostly influential intellectuals prior to the time when Slovenia attained its independence. This Gallery's period was described in detail by Marko Kmecl in the book entitled The IFWE Gallery 1984–1993 or A Look Into Slovenian Forestry Through Another Window (Ljubljana, 2008).

The Gallery IFWE gradually stopped functioning after 1993, when conditions in the society and within forestry itself changed a great deal. In this transitional period the Gallery's functioning was sustained by the SVIZ-IGLG Syndicate and enthusiasts who (still) recognized the significance of these activities. With no work programme and means, but with great enthusiasm, their main objective was to retain art in the Institute and to embellish our working environment. At that time, a few painters exhibited their works at the Institute: Aljoša Križ, Brigita Požegar, Vlado Ravnik and Jožica Medle. Then there were photographers such as Matej Rupel, Stanko Pelc, Hrvoje Oršanič, Vlado Ravnik and members of the photoclub AT CANON. Sculptures were displayed by Igor Grabec, Marika Pogačnik, Ada Koller - Hauser and Anton Šantl.

Novo obdobje Galerije Gozdarskega inštituta Slovenije (Galerija GIS) se je začelo leta 2014 v novi preobleki in v novem partnerstvu. Galerija GIS želi doseči in preseči začetke galerijske dejavnosti na inštitutu. Odprtost galerijske usmeritve se kaže s tem, da je inštitut postal le en odločevalec o galerijski dejavnosti, drugi trije pa so Zavod za gozdove Slovenije, BF-Oddelek za gozdarstvo in obnovljive gozdne vire ter Zveza gozdarskih društev. Vrstijo se razstave stanovskih kolegov (Janez Konečnik, Ivan Kolar, Matjaž Čater, Hrvoje Oršanič, Branko Žunič, Janez Černač, Samo Jenčič, Tomaž Hartman, Boštjan Košir, Miran Oražim), kiparjev in umetnikov Marka in Marike Pogačnik ter razstava Gornjesavskega muzeja Jesenice. Galerija postaja prostor druženja, umetnost postaja del našega vsakdanjika in s tem prispevamo svoj del k trajnostnemu razvoju družbe.

Živimo v nemirnih in vznemirljivih časih, ko si ljudje težko vzamejo čas zase in kulturo, zato želimo umetnost prenesti v naše delovno okolje. Z razstavami želimo vrata inštituta odpreti širši javnosti in predstaviti umetnike, ki se skrivajo v gozdarskih vrstah in širše v Sloveniji. Načrt za prihodnost je ambiciozen in le želimo si lahko širše podpore za ohranitev galerijske dejavnosti tudi v prihodnosti. Marko Kmecl, Jože Dobrin, Igor Smolej, Boštjan Košir, Irena Tavčar, Zvone Kastelic, Jože Falkner, Andrej Breznikar, Robert Brus, Primož Simončič, Nike in Robert Krajnc smo le nekateri, ki smo in še prispevamo k oblikovanju kulturne identitete Gozdarskega inštituta Slovenije.

Sledimo misli Pabla Picassa: »Namen umetnosti je, da izpere vsakodnevni prah iz naših duš.«

The new period of the Slovenian Forestry Institute's Gallery (SFI Gallery) began in 2014 with its new attire and new partnership. The SFI Gallery wishes to achieve as well as to surpass the beginnings of gallery activities at the Institute. The openness of the gallery orientation is demonstrated by the fact that the Institute became just one decision-maker in the gallery activities, while the other three are the Slovenia Forest Service, BF-Department of Forestry and Renewable Forest Resources and the Union of Forest Associations. Several exhibitions by our colleagues have been held (Janez Konečnik, Ivan Kolar, Matjaž Čater, Hrvoje Oršanič, Branko Žunič, Janez Černač, Samo Jenčič, Tomaž Hartman, Boštjan Košir, Miran Oražim), sculptors and artists Marko and Marika Pogačnik, and by the Gornjesavski Museum Jesenice. The Gallery is becoming the place of socializing, art is becoming part of our everyday life, and thus we contribute our part to the sustainable development of the society.

We live in restless and disturbing times, when people find it difficult to take time for themselves and culture, and this is why we wish to transfer art into our working environment. With exhibitions we attempt to open the Institute's door to the wider public and to present the artists hiding in forestry ranks and wider in Slovenia. Our plan for the future is ambitious and we could only wish for a wider support for the gallery activities to be retained in the future as well. Marko Kmecl, Jože Dobrin, Igor Smolej, Boštjan Košir, Irena Tavčar, Zvone Kastelic, Jože Falkner, Andrej Breznikar, Robert Brus, Primož Simončič, Nike and Robert Krajnc are just some of those who have and still are contributing to the creation of cultural identity of the Slovenian Forestry Institute.

We are following the following thoughts of Pablo Picasso: »The purpose of art is washing the dust of daily life off our souls.«



Gozdarska knjižnica

Gozdarska knjižnica je bila ustanovljena leta 1948 pri Gozdarskem inštitutu Slovenije, kasneje pa sta se kot soustanovitelja pridružila še Oddelek za gozdarstvo in obnovljive gozdne vire Biotehniške fakultete Univerze v Ljubljani in Zavod za gozdove Slovenije.

Tako je Gozdarska knjižnica visokošolska in specialna knjižnica, ki sistematično zbira, obdeluje in hrani vso slovensko literaturo s področja gozdarstva. Kot osnovna in najbogatejša zakladnica virov za zgodovino gozdov in gozdarstva na Slovenskem povezuje gozdarsko izobraževanje, raziskovanje na področju gozdarstva in gozdarstvo v praksi. Za potrebe študentov in raziskovalcev v svojo zbirko uvršča gradivo s področij gozdarstva, gojenja gozdov, pridobivanja lesa, ekologije, gozdne fitocenologije, sonaravnega gospodarjenja z gozdovi, entomologije, mikologije, pedologije, hudourništva, obnovljivih naravnih virov, ohranjanja naravnega okolja, ekologije in ekologije krajine, strokovnega dela v gozdarski operativi, ergonomije (v gozdarstvu), ekonomije (v gozdarstvu), geodezije, botanike, zoologije in statistike (v gozdarstvu). Knjižnica zagotavlja informacijske in knjižnične storitve z gozdarskega področja zaposlenim in študentom na institucijah ustanoviteljic ter drugi zainteresirani javnosti. Storitve knjižnice temeljijo na strokovnosti, kakovosti, prijaznosti do uporabnikov in sodobni tehnologiji.

V zadnjih letih se je dejavnost knjižnice razširila tudi na področja vodenje bibliografij raziskovalcev, izobraževanje uporabnikov na področju seznanjanja informacijskih virov, odprtega dostopa, znanstvene komunikacije in skrb za delovanje e-repozitorija SciVie.

Že od začetka delovanja se knjižnica povezuje s sorodnimi domačimi in tujimi institucijami, s katerimi izmenjuje strokovne in znanstvene publikacije, sodeluje z domačimi in tujimi založbami, prek katerih pridobiva pomembne informacije o domači in svetovni literaturi s področij gozdarskih znanosti.

Forestry Library

The Forestry Library was founded in 1948 at the Slovenian Forestry Institute. Later on, the Department of Forestry and Renewable Forest Resources of the Biotechnical Faculty at the University of Ljubljana and Slovenia Forest Service were joined as its co-founders.

As an academic and research library, the Forestry Library systematically collects, processes and keeps the entire Slovenian literature from the sphere of forestry. As a basic and richest treasury of sources for the history of forests and forestry in Slovenia, it embraces forestry education, research in forestry sector and practical forestry. For the needs of students and researchers it keeps in its collection materials from the spheres of forestry, silviculture, wood production, ecology, forest phytocoenology, sustainable forest management, entomology, mycology, pedology, torrentology, renewable natural resources, conservation of the natural environment, ecology and landscape ecology, professional work in forestry operations, ergonomics (in forestry), economics (in forestry), geodesy, botany, zoology and statistics (in forestry). The library provides information and library services from the forestry sector to students and employees at the founding institutions and other stakeholders. The Library's services are based on expertise, quality, kindness to users and modern technology.

In the last few years, the Library's activities have spread to the fields of managing the researchers' bibliographies, education of the users involved in the sphere of information sources, open access, scientific communication and concern for the functioning of the SciVie e-repository.

From the very beginning of its functioning, the Library associates with related domestic and foreign institutions, exchanging publications from the field of forestry sciences.

KNJIŽNIČNI KATALOGI

- Klasični listkovni katalog (abecedno - imenski katalog in sistematski katalog urejen po GDK - Gozdarski decimalni klasifikaciji) od 1948–1997;
- vzajemni računalniški katalog COBISS/OPAC od 1997 dalje; v računalniškem katalogu je zavedenega 75 % gradiva.

KNJIŽNIČNA ZBIRKA (december 2016)

Vrsta gradiva	Št. enot
Monografije	23.546
<i>Od tega posebno strokovno gradivo (zaključne naloge, elaborati, poročila)</i>	<i>4.605</i>
Serijske publikacije (št. naročenih naslovov: 126)	10.920
Neknjižno gradivo	280
SKUPAJ	34.746

LIBRARY CATALOGUES

- Traditional card catalogues (author-title catalogue and classified catalogue arranged per FDC - Forest Decimal Classification) from 1948–1997;
- union computerized catalogue COBISS/OPAC since 1997, with 75% of the material entered in it.

LIBRARY COLLECTION (December 2016)

Type of material	No. Of units
Monographs	23.546
<i>Of this special professional material (thesis, project reports)</i>	<i>4.605</i>
Serial publications (No. of subscribed titles: 126)	10.920
Non-book material	280
TOTAL	34.746





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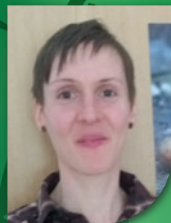
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Andreja Kavčič



Tanja Mrak



Katarina Stanko



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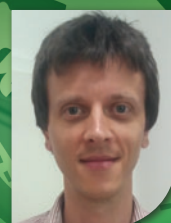
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