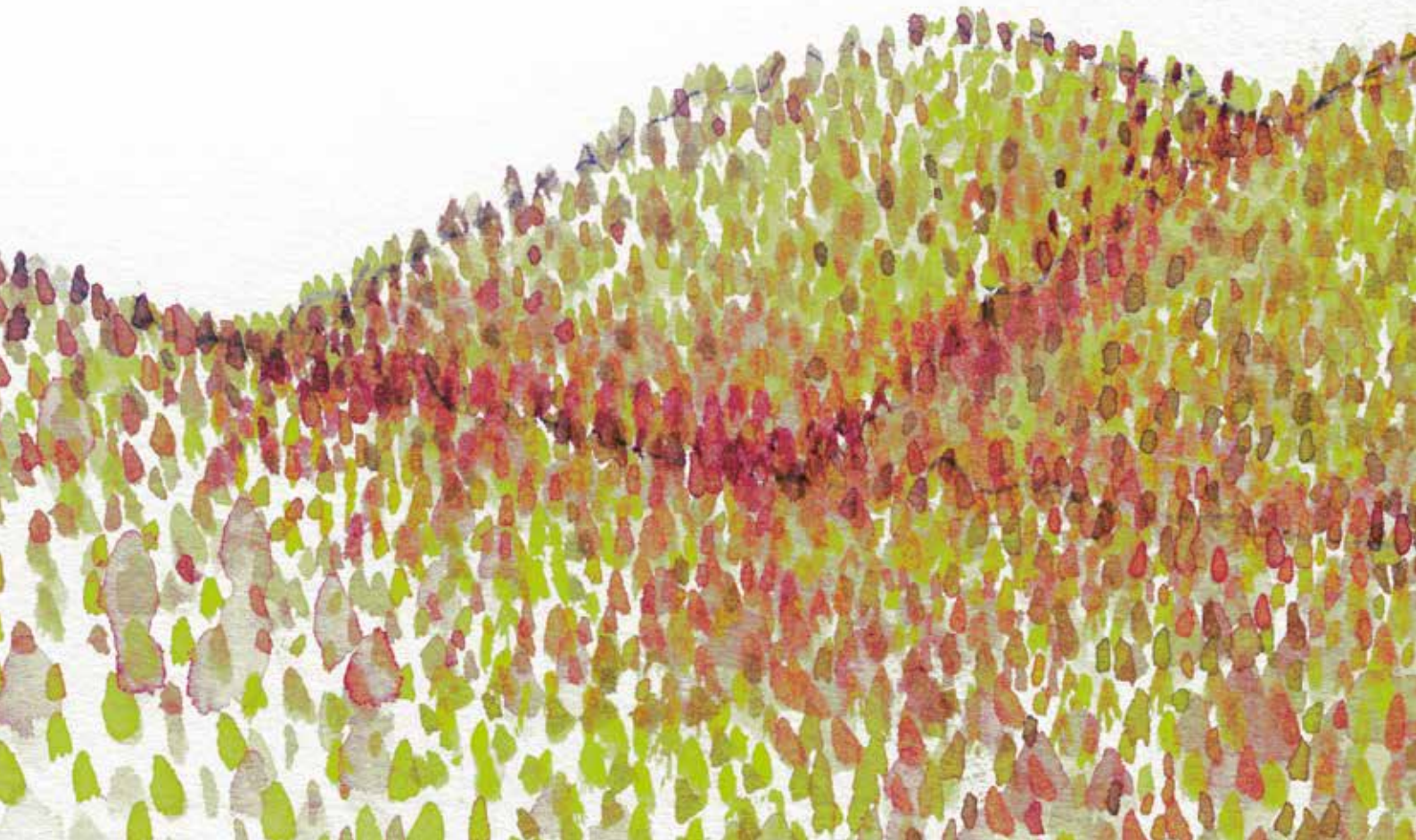
Forest Research Institute
Baden-Württemberg

ANNUAL REPORT **2018**

ForstBW

Baden-Württemberg

FVA



Annual report 2018

CONTENT

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Participants of a field excursion in the Black Forest

February 2019

FOREWORD

Dear Reader,

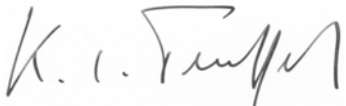
2018 was an anniversary year for the Forest Research Institute (FVA): 60 years ago, the Forest Research Institutes Baden and Württemberg merged to form the Forest Research Institute Baden-Württemberg and thus celebrated their diamond wedding anniversary in 2018. Liliental at the Kaiserstuhl has been under the care of the FVA as the "field laboratory" for forest genetic research for just as long. And wildlife ecology research has been practised at the FVA for half as long: fittingly also celebrating its 30 year anniversary. An honorary colloquium also took place to celebrate the 90th birthday of the former head of the FVA, Professor Hans-Ulrich Moosmayer.

For the forest, 2018 was a year of stress: heat, drought and bark beetles! The FVA could therefore not just celebrate but it had many other issues to attend to: Current topics demanded comprehensive and applied research, papers were published, presentations given at national and international seminars, and forest days, trade fairs and info markets were actively attended. Expert reviews were written, consultations took place and various committees and working groups were attended as well. Furthermore the FVA organised seminars, workshops and training courses and gave tours through the FVA to local and foreign guests. It also painstakingly and urgently worked on the relaunch of its internet presence. The FVA finally also launched its strategy for the coming five years by defining new research priorities and new working sections. Three members of the FVA Advisory Board also took their final bow after eight years of service and three new members were welcomed.

The current Annual Report gives a brief overview of the achievements and activities of the FVA in 2018. Moreover, a selection of research projects is presented in more detail, including essential facts and figures of the previous year.

Wishing our readers enjoyable reading,

Yours



Prof. Konstantin Frhr. von Teuffel
Director

FROM THE ADVISORY BOARD

Dear Reader,

The Advisory Board advises the FVA on matters related to content and strategic issues. Its tasks and responsibilities include evaluating the overall development and direction of the FVA and formulating recommendations for strategic alignment, priorities for future research work and specific research projects.

2018 was characterised by the planning of a new FVA strategy for the period 2019 to 2023. The objectives achieved under the 2014-2018 strategic plan were first evaluated within departments and on the FVA level before defining key research topics and work for the next planning period. This was followed by surveys conducted in four forestry sectors, viz. forest ownership, timber industry, recreation and sport in the forest and nature conservation in forests. The surveys sought opinions about social trends and developments the FVA should take into consideration and insights about the needs various stakeholders have of the FVA. The results of these internal and external opinions were discussed and weighted in the course of a convention. The outcome was a preliminary strategic orientation that was presented to the Advisory Board for discussion at its autumn meeting.

The draft strategy and the FVA mission statement will be presented to interested FVA employees at an information day where employees will be invited to discuss the draft and submit comments and proposals for solutions and changes. This will be based on the tried and tested info market format. The new strategy will then be drafted in written form so that it can put in place by mid-2019, subject to assessment and approval by the Ministry for Rural Affairs and Consumer Protection (MLR).

The membership of the Advisory Board changed in 2018, according to its planned rotation. Three members, **Prof. Dr. Jürgen Bauhus** (University Freiburg), **Prof. Dr. Bernhard Möhring** (University Göttingen) and **Prof. Dr. James Kirchner** (Swiss Federal Institute of Technology, Zurich) retired from their activities after eight years of service. As a result of cooperation between the FVA and the Office for

Photo T. Weidner

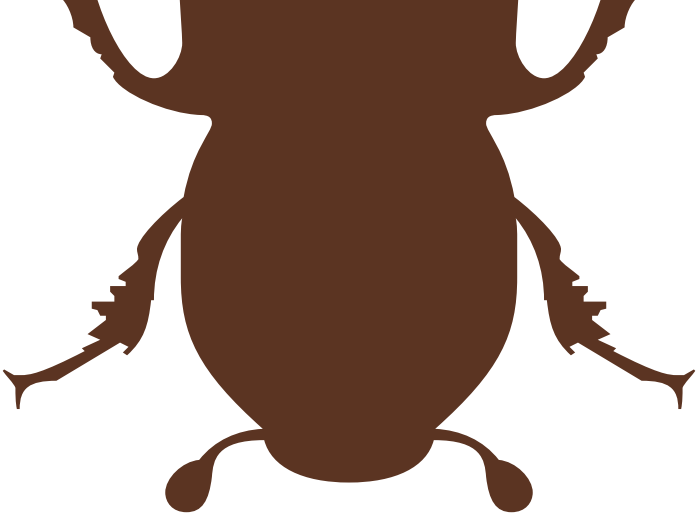
The Advisory Board

Forest Seeding and Planting (ASP) in Teisendorf, **Dr. Monika Konnert** had already retired from her position in 2016.

We are elated to have once again secured a high-profile Advisory Board in the persons of new members **Johannes Freiherr von und zu Bodman** (private forest owner), **Steffen Rathke** (Keck sawmills) and **Prof. Dr. Andreas Rigling** (Swiss Federal Institute for Forest, Snow and Landscape Research, WSL, representing research institutes).

Finally, I would like to say many thanks, also on behalf of my colleagues on the Advisory Board, for the interesting and open discussions with the Directorate as well as the heads and the vice heads of the departments of FVA. We hope that the exchange with the Advisory Board will lend the FVA an even broader and more comprehensive perspective. We also look forward to direct interaction with interested FVA staff members in the new year.

Dr. Peter Mayer
Chairman of the Advisory Board



2018: THE YEAR OF THE BARK BEETLE

KONSTANTIN VON TEUFFEL AND KAISU MAKKONEN-SPIECKER
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The prolonged drought and heat in 2018 posed a huge challenge to forests: In many places, Norway spruce fell prey to bark beetles. The leaves of many deciduous trees such as beech, hornbeam, maple, black locust and basswood already changed colour in August and shed prematurely. Almost all species of tree groaned under the weight of their fruit, detracting from growth in the following year. Climate change was on everyone's lips and a hot topic in the media. As the drought persisted, media representatives were eager to contact the FVA – especially the departments of Forest Health and Forest Growth.

The yearly State-of-the-Forest Report produced correspondingly alarming results: The condition of the crowns of all tree species except silver fir had deteriorated. Thirty-eight percent of the forests were clearly damaged and the average loss of needles and leaves was at 24.9 percent; 2.9 percent higher than the loss of the previous year. Could silver fir thus be the tree species of the future? Yet the FVA Forest Health team recorded bark beetles here also: the silver fir bark beetle and its close relatives as well as the small silver fir bark beetle.

Alternative tree species for the climate of the future

The FVA therefore started to search for alternative tree species in the face of climate change – not only by way of organising a conference on this topic but especially also in continuing its cross departmental research on the impact of climate change. Previous results have been summarised in the new multi-criteria tree species suitability maps V2.0, in vulnerability maps, in PNV [potential natural vegetation] cards, in briefing papers on alternative tree species and in tree species distribution models "alternative tree species". Beyond the year 2018, the following topics will be tackled: the competition between tree species, adaptability of native species, new native species provenances, functions of mixed forest species, optimisation of portfolios, conception of protected areas and socio-scientific questions on changed recreational forest function and perception by decision makers.

Compiling a forest target species concept recorded in the "Overall Concept of Forest Nature Conservation ForstBW" was another central topic at the FVA in 2018. This concept allows for effective forest habitat management in the Baden-Württemberg state forest, oriented to serve the needs of endangered species. Recommendations for action are being developed for target forest species to be made available to forest managers via the forest target species information system in 2019/20 (see article on page 14).

Photo Walter Rist

Counting bark beetles: Daniel Straub and Catharina Hehn

Award for the "Wild Pasture" project

The "Wild Pasture Taubergießen" grazing project - a small project for the promotion of regional biodiversity – attracted media attention and was awarded the German Landespflegepreis [countryside care prize] at the end of June 2018. The Department of Forest Nature Conservation is a project partner of the Kappel-Grafenhausen municipality where approximately 90 hectares were designated protected "open forest" in 2016, within the framework of this project. The project aims at preserving and developing woodlands with its softwood and hardwood alluvial forests alternating with typical small riparian arid and humid biotopes, which is so typical for this landscape. The FVA is supporting the development of a wood pasture concept and is creating monitoring areas. Results obtained by photographic, structural and vegetation zone monitoring and research of the fauna are incorporated in the development of a countrywide concept for open forest (Overall Concept of Forest Nature Conservation ForstBW). Accurate management plans towards the promotion of regional species diversity can be developed based on experience gained and observations made in the course of such grazing projects. Furthermore, strategies for solutions will be developed to allow challenges related to wood pasture management arising from future projects such as controlling parasites, handling of neophytes, accessing difficult terrain or integrating local recreation on the land in the future.

Safety of forest work

The safety of forest operations is another cross-departmental research topic of the FVA. Using various quantitative and qualitative methods, the departments of Forest Utilisation, Forest and Society and Forest Economics are jointly examining accident incidence and occupational safety management in the Baden-Württemberg state forest. They are approaching the topic from various perspectives to identify potential areas of action. The individual sub-projects that comprise the main project are (1) the analysis of framework conditions in forest operations and their potential effect on occupational safety, (2) the analytical assessment of accident figures, (3) the comparative analysis of accidents and safety forest management in Baden-Württemberg and other Federal States and (4) a socio-scientific analysis of forest workers' views. The project is scheduled to continue beyond 2018.

Photo Thomas Weidner

Uli Riemer with the drone

Photo Walter Rist

Working in the nursery

Research from the air using drones

The FVA is increasingly considering the use of drones for forest management, e.g. for early detection of bark beetle infestations in Norway spruce and for the identification of individual trees during forest inventories. Drone technology will allow the effective automatic recording of current images and videos from above. In August, Minister Peter Hauk together with a FVA research team discussed the potential use of drones while viewing a demonstration flight over the riparian fauna conservation area Hochkopf as part of the project "space for capercaillie chicks in private and communal forests". Possibilities and potentials for documenting capercaillie habitats or early bark beetle detection were noted on this occasion (see also article on page 21).

How much forestry use can a forest tolerate, particularly considering the potential disturbance of soil nutrient balances? This question was addressed by researchers at the FVA Baden-Württemberg, the Bavarian State Institute of Forestry (LWF) and the Northwest German Forest Research Institute (NW-FVA) during the course of the collaborative project "Wood fuel harvesting and nutrient sustainability in Germany". From 2013 to 2017, this research was supported by the Agency for Renewable Resources of the Federal Ministry of Food and Agriculture and the results were presented shortly before Christmas 2018 at the event "Fuel wood harvest and nutrient sustainability" in Berlin (see also article on page 23).

A wolf came – and stayed

A wolf was sighted in Baden-Württemberg 252 times in 2018. Photos allowed the FVA monitoring team on three occasions to verify that the animal sighted was actually a wolf. One wolf, however, came and stayed: the wolf with the abbreviation ID GW852m. It was first seen in the High Black Forest in November 2017 and thereafter time and again for six months. It is thus now assumed to be a resident of the area. The FVA wolf research team certainly had its hands full responding to all the sightings and media enquiries. The topic became hot, however, when bite marks were reported on 165 occasions, all of which presumed to be by a wolf. Four incidents of bites on farm animals with a total of 50 victims and two wildlife killings (a deer and a red deer) were verifiably attributed to a wolf. Emotional discussions are ongoing at the political level whilst the FVA continues to monitor lynxes and wolves as usual. The wolf appears to overshadow the lynx. Five lynxes have so far been recorded in Baden-Württemberg.

Photo Walter Rist

Chainsaw course at Liliental with Jean-Louis Pinschack in the center

Photo Thomas Weidner

"The tone of wood" event at Liliental

Everyday communication in forestry

In 2018 the FVA, in cooperation with the German Forestry Council (DWFR), developed a practical qualification course to offer foresters concrete support in typical situations where they need to communicate with visitors to the forest. This FVA concept endeavours to make foresters aware of scientific know-how pertaining to their daily practice. The scientific base of such training also provides new insights into communication between forestry and the public sector. The now completed pilot phase included four seminars with a total of 48 participants. These pilot seminars tested the concept and then adapted it to fit the practical everyday needs of participants even better. Evaluations of this first project phase showed, among other things, that 90% of the participants rated the pilot seminars as good or very good and that 79% would recommend the seminar to others. The positive results of assessments, seen against the background of very high interest and demand for enrolment for the forestry seminars (internal survey of DFWR member organisations), motivated the provider of the project resources, the Agency for Renewable Resources (FNR), to approve the second phase of the project. This now allows the Everyday Communication Seminar to be presented on about 60 occasions nationwide in 2019/2020.

Special programme to foster biological diversity

The FVA has the future in mind with its Phase II proposals (2020/2021) and the conception of a special programme to foster biological diversity. The first phase (2018/2019) comprises various projects within the framework of the monitoring of forest habitats (e.g. biodiversity of forest floors), wildlife management (spaces for capercaillie chicks in private and communal forest), biodiversity management of forests, consultation and contractual nature protection (e.g. information system for forest nature protection; significance of temporary closure of forest areas) and the project "Management of forests in Natura 2000, overarching ownerships" (see article on page 12).

The results of research into selected FVA projects are summarised on the pages below. Please visit *www.fva-bw.de* for information on other projects and FVA activities.

Photo Andreas Schabel

The lesser purple emperor (Apatura ilia) is a forest conservation target species characteristically found along a forest's inner and outer edges.

SPECIAL PROGRAM FOR THE ENHANCEMENT OF BIODIVERSITY

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Conservation is an integral part of sustainable forest management. In 2018/2019, the FVA will be working on seven biodiversity-related projects as part of the state of Baden-Württemberg's "Special Program for the Enhancement of Biodiversity". The projects are focused on implementing concrete measures for protecting forest biodiversity and developing new concepts for increasing efficiency in conservation in addition to further developing and testing forest biodiversity monitoring systems.

Achievements

Various stages of the projects were completed in the spring and summer of 2018:

- Work contracts were awarded to qualified partners
- Plots and appropriate sites were selected for implementing conservation measures
- Some conservation measures (e.g. the creation of gaps for capercaillie chicks and a comprehensive sampling and species identification process) were completed
- Conflicts between the nature conservation management sector and forest management sector were mediated by creating working groups to coordinate project-related activities between stakeholders
- A date was set for the statewide land user workshop "Natura 2000 – Forest Management"
- Meetings with state politicians took place (e.g. with Minister Peter Hauk and the president of ForstBW)
- The projects and their objectives were presented at conferences and to the program's panel of experts.

Outlook

Work on the projects will continue in 2019 and will include:

- The further development of monitoring approaches
- The practical implementation of conservation measures
- Methods identified as "best practice" in the state forest will be transferred to all forested areas in Baden-Württemberg (a particular focus of the special program).

The successful completion of these projects is further ensured by the support of external project partners, especially that of the nature conservation management sector.

Photo Andreas Schabel

One goal of the Habitats Directive is the sustainable management of forests with dry as well as wet structural elements and high species diversity.

Photo Andreas Schabel

Trees with cavities are structurally important elements in our forest habitat types.

Brief Project Summaries

Forest Biodiversity Monitoring (Dept. of Biometry and Computer Science)
The goal of this project is to support existing forest biodiversity monitoring methods with remote sensing methods. Forest structural parameters relevant to biodiversity will be identified and made measurable through remote sensing. An efficient monitoring system should simplify the integration, maintenance and creation of the necessary structural components.

Biodiversity of Forest Soils (Dept. of Soils and Environment)
Until now, forest soil organisms have not been adequately considered in the development of forest monitoring systems, the goal is to derive correlations of soil properties, environmental factors and management intensities with soil biodiversity. This can serve as a basis for developing practical measures for protecting or promoting soil biodiversity.

Forest Conservation Information System (Dept. of Forest Nature Conservation, Protected Forest Areas Group)
This project aims to create a web-based platform making all forest conservation-relevant information (factual data and geodata) accessible to various target groups. After the platform has been established, the data within can be used to make informed decisions in management and politics, as well as to provide information to the public.

The Importance of Temporarily Set-Aside Forest Areas (Dept. of Forest Nature Conservation)
The project goal is to gain insight into the effects of the duration of set-asides on the structure, biodiversity and microhabitat development in the set-aside areas of large strictly protected forest preserves as well as in smaller, temporarily set-aside unmanaged forest areas. The importance of temporarily set-aside forest areas will be assessed.

Managing Forests in Natura 2000 Sites (Dept. of Forest Nature Conservation, Natura 2000 Group)
Natura 2000 conservation goals are defined disregarding forest ownership, but implementing conservation measures in connection with the Natura 2000 goals depends on forest ownership. The management concept at the focus of this project is developed in close cooperation with foresters to support implementing Natura 2000 management plans.

Biotope Network Wildcat (Dept. of Forest and Society, Wildlife Ecology Group)
The goal of this project is to support the further spread of the wildcat by removing migration barriers. A plan prioritizing areas will be developed to be used as the basis for conservation measures such as the establishment of wildlife corridors and a stakeholder network.

Gaps for Capercaillie Chicks in Privately and Communally Owned Forests (Dept. of Forest and Society, Wildlife Ecology Group)
Suitable clearings are to be created based on a prioritization of areas in privately and communally owned forest for the conservation of the capercaillie. Part of the project will be to develop a funding framework for successfully implementing conservation measures.

The target species are complementary in their requirements and represent those of other forest species
(Figure: Mark Hoschek)

FOREST TARGET SPECIES CONCEPT AND FOREST SPECIES INFORMATION SYSTEM

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Species conservation – one goal of forest nature conservation in Baden-Württemberg

Along with several objectives related to forest structure or biotope conservation, species conservation is one of the ten objectives of the general forest nature conservation concept of ForstBW. To achieve this goal, a forest target species concept was developed, which defines a set of surrogate species for effectively managing forest habitats in the state forest of Baden-Württemberg according to the requirements of endangered species. For the forest target species, detailed recommendations for action are developed and made available to the forest managers via the forest species information system.

The forest target species concept

Many of the species that occur in the forest are endangered or threatened with extinction, despite existing conservation concepts. These are mostly species that depend on forest structures that are underrepresented in forests under the prevailing management regime, such as open forest, clearings or structures of late successional stages.

However, due to limited resources, species conservation always faces the problem of not being able to equally consider all endangered species of a region. Therefore, a set of surrogate species is needed, which are representative of the main ecological requirements of other species and on which protection efforts and monitoring can be focused. These target species should ideally represent all essential key structures of the forest communities of the target region. Species were selected from the following taxonomic groups, as they are associated to forest structures at different spatial scales, from the single tree to the landscape scale:

- mammals
- birds
- amphibians
- reptiles
- diurnal butterflies
- saproxylic beetles
- vascular plants
- mosses
- lichens
- fungi

Focusing on conservation-relevant species, target species were selected from these groups using systematic, algorithm-based methods as well as expert-based approaches. The aim was to represent all predefined forest structures and forest communities of Baden-Württemberg with as few species as possible while preferring species that are particularly sensitive to habitat changes.

The selection yielded 121 forest target species, complementary in their requirements and representative of those of other species. Specific habitat management is not necessary for all target species though. Some species associated to structures that are sufficiently present under the prevailing regime of "near-natural forestry" may only serve as indicators of habitat changes. For this purpose, a forest target species monitoring program is currently being developed. For the species with specific habitat requirements, management recommendations are developed and made available to forest managers. All recommendations are coordinated and reconciled with existing programs for biodiversity conservation (e.g. Natura 2000, ASP, action plans) to achieve coherency in the state's forest nature conservation activities.

The forest species information system bundles species-related information from different sources and makes it available to forest managers. (Figure: Mark Hoschek, Simona Moosmann, ForstBW)

Photo Nora Magg

The endemic zygaenid Zygaena angelicae ssp. Elegans is one of the target species with an urgent need for action. It is severely threatened by the ongoing succession in the formerly open steppe heath forests of the Swabian Alb. Habitat restoration includes a heavy canopy reduction in suitable stands.

The forest species information system

The forest species information system represents the information technology component of the target species concept. This central system stores data on species distributions, ecological requirements, as well as management recommendations in a spatially explicit way. It makes data easily accessible to forest managers and the broader public. The information system integrates existing data and allows data exchange with external databases. It provides interfaces and tools for managing different types of data generated by monitoring and research activities of the FVA, or by various other sources. The system integrates into the existing forest data infrastructure and additionally provides a web-based interface to allow access to users outside the forest administration (e.g. experts, researchers, interested public) through the address: *waldarten.fva-bw.de*

Implementation

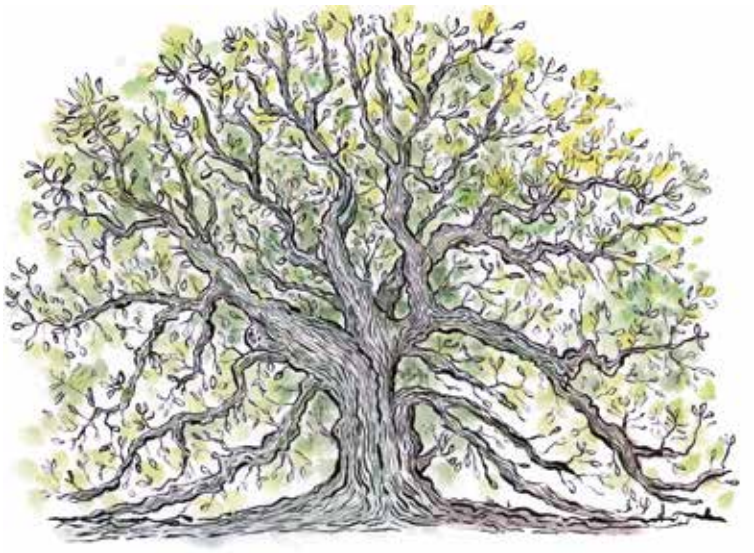
The forest target species concept and the information system provide the scientific and technical background for integrating species conservation into silvicultural planning and management. For implementation on the ground, a strong cooperation with the forest planners and the commitment and knowledge of local forest practitioners is required. First exemplary measures for several threatened target species have already been carried out, funded by the "100,000-€ program" of ForstBW. This program provides financial support to the Lower Forest Authorities when implementing specific measures related to the State's forest nature conservation concept.

Photo Felicitas Wesnie

The lichen Lobaria pulmonaria occurs in ravine forests, in ash stands along stream banks and in deciduous hardwood forests, especially on ash and sycamore trees. In very rainy and humid areas it also grows on oak and beech trees. Conservation measures include the protection of host trees as well as the establishment of habitat tree groups or forest refuges in the surrounding area.

Further literature

Magg, N., E. Ballenthien & V. Braunisch. 2019. Faunal surrogates for forest species conservation: A systematic niche-based approach. Ecological Indicators 102: 65-75.



NEW RECREATIONAL FOREST MAPPING

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The mapping of forest functions is basic to managing the protection and recreation functions of forests and is an important element of forest management in Germany. At present, the focus of many discussions is primarily on the forest as a recreational area – daily many people use forests as a place of retreat and leisure. In Baden-Württemberg, the mapping of recreational forests was lastly updated in 1988. To take into account significant increases in the number of recreationists and types of leisure activities in forests, the FVA revised these maps recently. The new recreational forest map does not show the daily observed use by recreation seekers, but rather the potential of forests for visitor frequency.

In the 1980s the maps were essentially based on orienting counts of forest visitors, empirical knowledge and qualified estimates by local practitioners. In contrast, the revision of the recreational forest is now based on socio-empirical surveys and modelling on the basis of Geographical Information Systems (GIS). The model was developed by the FVA and the University of Freiburg and is an improvement both in terms of methodology and content.

One important data basis for the model are three telephone surveys (from 2009-2012) each with 2,000 citizens from Baden-Württemberg, as well as 25 qualitative interviews with forest visitors. The aim of this intensive data collection was not only to obtain information on how many people use forests, how often and for what purposes, but also to gain expertise on how forests are perceived, experienced and used for recreation.

Additionally, cartographic recording of recreation-relevant landscape attractions and the modelling of so-called source areas (e.g. settlements, parking lots) were used to develop a GIS-based model, which can be periodically adapted to changes in recreational use in future. To additionally include local knowledge, extensive internal and external validations were also carried out (participation of forest authorities, private forest owners, recreation seekers, etc.).

The recreational forest areas are divided into three stages depending on how many people are potentially to be found in the forest:

Stage 1a: Forest with very high importance for recreation in urban areas (densely populated urban areas and respective peripheral zones)
Stage 1b: Forest with high importance for recreation
Stage 2: Forest with relatively high importance for recreation
Forest areas that are not assigned to any of these stages can also be used for recreational purposes to a certain extent. However, their potential is not considered to be particularly high in this respect.

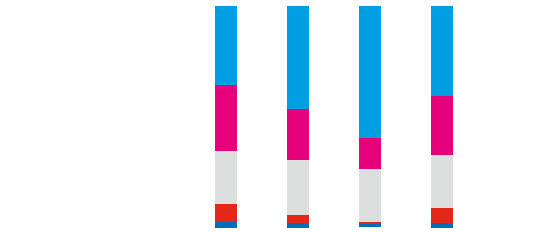
Photo Ulrich Schraml

Forest as a resort

Looking at the results of the state-wide mapping, this reflects the changed recovery situation in the country since the 1980s. The current recreational forest backdrop is considerably larger than in the old mapping. The proportion of recreational forest has risen from 28% in the past to 71% today and thus reflects societal changes with their consequences for leisure behavior. Among the types of property, municipal forest owners still account for the largest percentage of the recreational forest backdrop (40.6%) (figure 1).

Table 1 shows the increase in area by type of forest ownership. Due to the different methodology, the direct comparison of old and new share of recreational forest area might be misleading. However, the increase in forest areas assigned as important for recreation depict the more or less continuous increase and diversification of recreational use since 1988.

Recreational forest mapping serves above all, as an instrument for protection of forest area , as a basis for various sectoral plans and thereby approval procedures of public agencies. The new mapping does not lead to changes in legal obligations or rights for forest owners. In the future it is conceivable that it will also become more important in the context of visitor guidance measures, certification of recreational forests or public funding systems. The mapping thus can serve to identify possible conflicts of use and interest in forests or to develop new instruments for public funding.



stage	2	1b	1a	total
communal forest	35,6	46,3	59,6	40,6
private forest	29,6	23,2	14,0	26,5
state forest	24,1	24,5	23,9	24,2
large private forest	8,3	3,9	0,7	6,4
other	2,4	2,1	1,8	2,3

Fig. 1: Percentage of forest ownership type in the recreational forest backdrop by stages. Stage 1a: Forest with very high importance for recreation in urban areas; Stage 1b: Forest with high importance for recreation; Stage 2: Forest with relatively high importance for recreation

Table 1: Area access of the recreational forest backdrop in hectares by type of forest ownership and stage (stages 1a and 1b were combined for comparability).

	large private forest	private forest	communal forest	state forest	other
stage 1	10.564	72.420	140.237	63.436	5.039
stage 2	39.584	141.563	73.955	52.802	7.833
total	50.148	213.983	214.191	116.238	12.872

THE IMPLEMENTATION AND THE FURTHER DEVELOPMENT OF THE RED DEER MANAGEMENT CONCEPT SOUTHERN BLACK FOREST

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Photo Erich Marek

The management concept for the red deer area in the Southern Black Forest has been implemented since 2008 (*Suchant et al. 2008*). It was developed by the Forest Research Institute Baden-Württemberg (FVA) in cooperation with the "Arbeitsgemeinschaft Rotwild" (red deer management group). The concept is based on extensive research conducted prior to the development process. The rights of landowners, the demands of humans, as well as the requirements of the red deer were considered. The key element of this management concept is a spatial concept (subdivision of the area into core, transition and border zones) with regulations concerning not only recreational uses, but also hunting, forestry and habitat management.

Further development

After 10 years of implementation, the concept of red deer management has been evaluated over the past two years. The main objective of the evaluation was to answer the question if the management concept is still relevant or if there is a need to make improvements.

The basis for this evaluation was the scientific analysis of the red deer population size, the habitat, the hunting management as well as local land users' habits and attitudes. Besides the results presented below, public relations, possibilities for wildlife experiences, nature and animal protection as well as the needs of the red deer management group were also evaluated (*Suchant & Haydn 2018*).

Red deer management

Generally, the numbers of a red deer population are quite difficult to determine. Therefore, we applied numerous methods to analyse the number of red deer in the deer area of the Southern Black Forest. Red deer abundance was estimated using data obtained from visual counts at winter feeding sites and track counts. An age- and sex-structured population model to estimate the winter population size was also constructed using bag records.

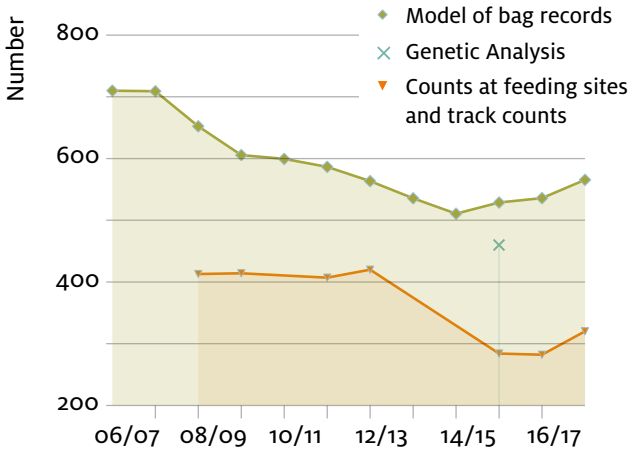

Figure 1: Calculated numbers of red deer and their development between 2006/07 and 2016/17 by different methods

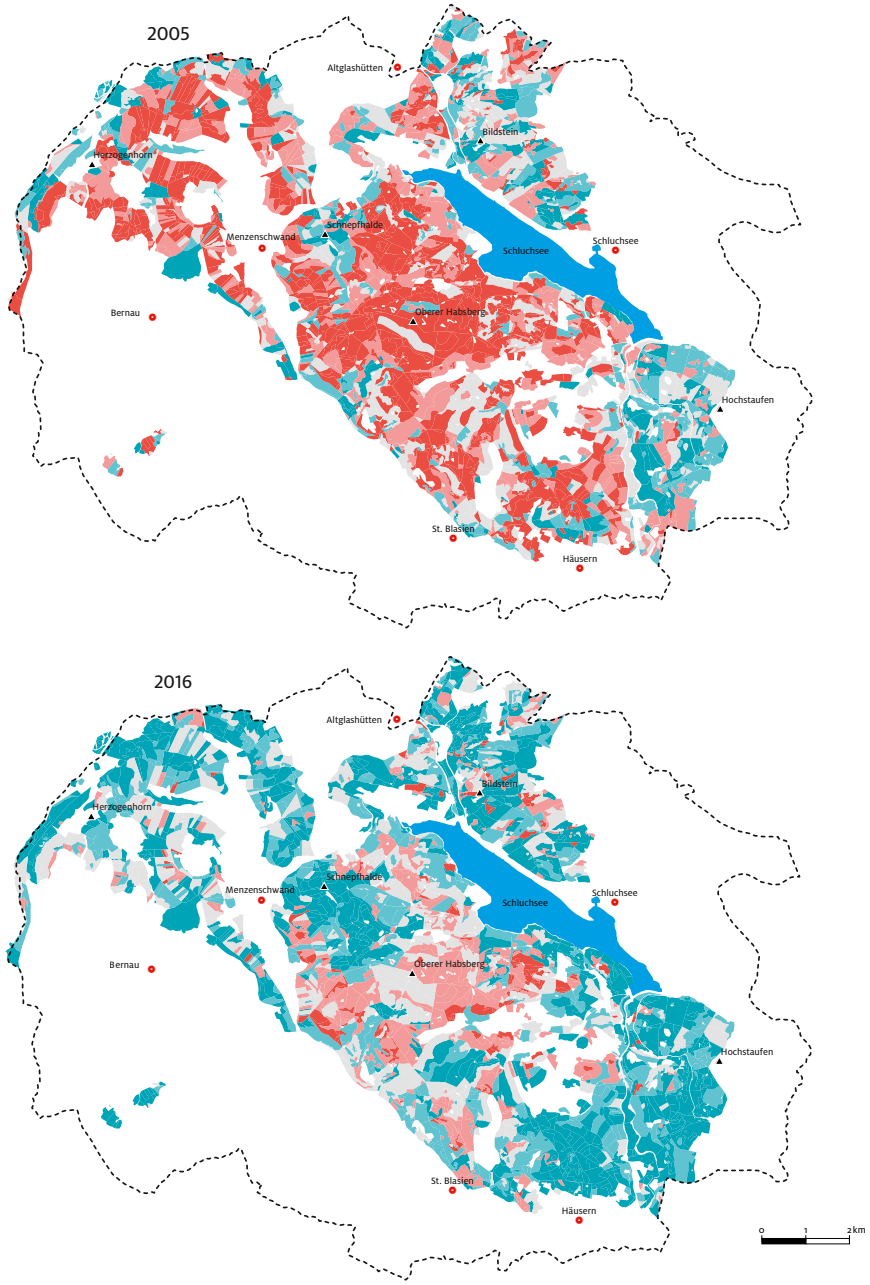

Figure 2: The food availability in winter 2005 and 2016

- Very bad
- Bad
- Average
- Good
- Very good

To verify stock sizes calculated according to these different methods, a non-invasive genetic capture-mark-recapture approach based on collected faeces was used. Genetic analysis of feacal DNA were performed to calculate the population in 2016.

The calculated population ranged between 280 and 710 individuals (figure 1). The analysis of the feacal DNA yielded a population of 460 individuals. At the same time the combination of the other methods calculated a population between 450 and 500 individuals in 2016.

All in all, the different methods showed a decline in the numbers of red deer. Thus, the population has been reduced within the past 10 years, which is the result of changes in hunting management (e.g. higher increase of using battues and of the number shot females).

The forest as a habitat and the damage caused by game

To improve habitat capacity, especially the natural food supply, specific silvicultural measures were carried out (e.g. thinning of the stand, improving and cultivation of forest margins). In combination with a reduced red deer population, these measures were aimed at decreasing the damage caused by red deer stripping off the bark of trees.

We used data from the forest inventory (forstliche Betriebsinventur, BI) to detect the development of the ground cover. Additionally, in 2016 we repeated the habitat survey done in 2006 to assess the red deer habitat and to analyse changes in habitat quality.

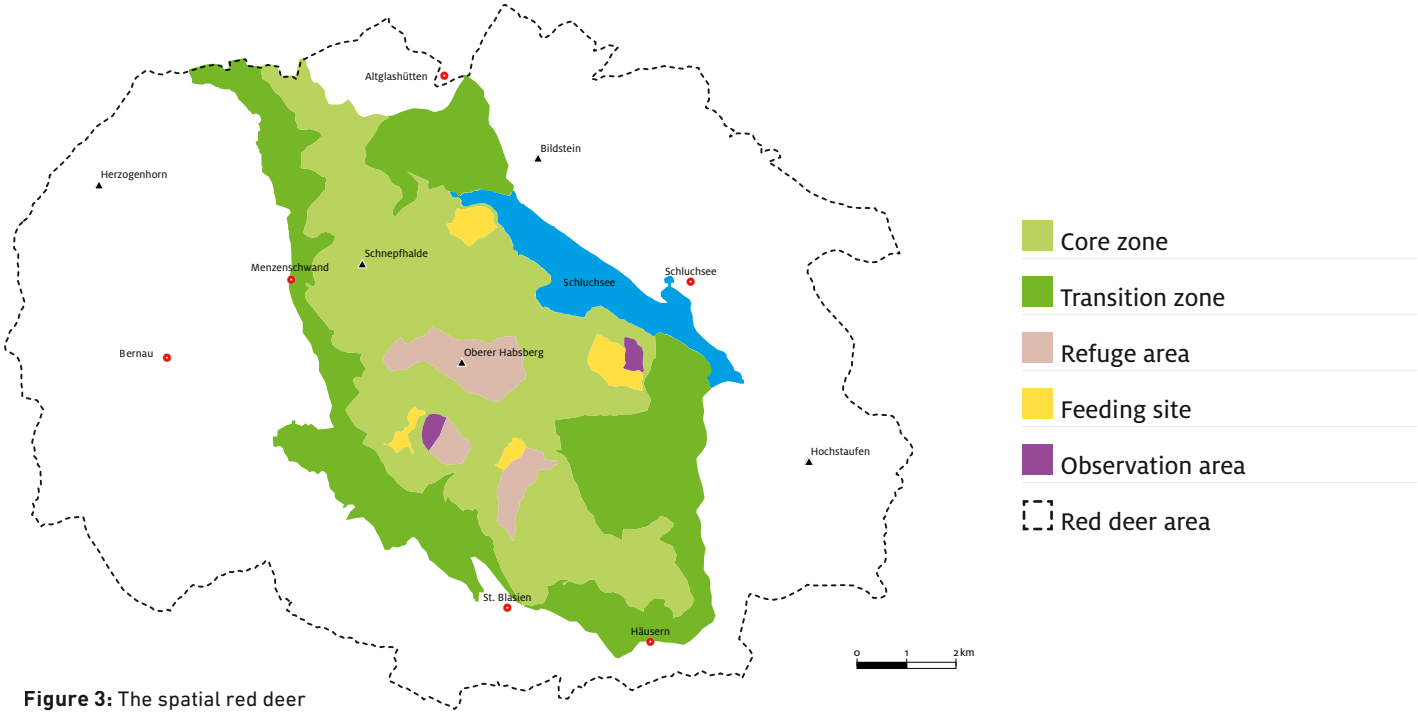

Figure 3: The spatial red deer management concept 2018

The results show a positive change in food cover. Therefore, the measures to increase habitat quality were effective. For example, the former high proportion of areas with almost no ground cover has decreased and now large parts are covered with herbs and shrubs (*Suchant & Haydn 2018*). The natural food availability in winter has improved as well (figure 2), which has been caused by reducing population size and improving habitat quality.

For an objective assessment of the damage caused by game, we used existing data from previous forestry inventories (BI). The analysis of the BI data showed no new stripping damage in spruce in the state forest in 2015/2016. Nevertheless, the stripping damage is still an issue because new stripping damage can occur at any time and many landowners' attitudes are influenced by the widespread old stripping damage.

Further results and conclusions

The implementation of the red deer management concept is well on track, but there is still potential for optimization in various ways. The greatest success relates to the more detailed description of change in the relationship between red deer population and their habitat: the significant improvement in habitat quality and the simultaneous reduction of the red deer population prevented new stripping damage and created better living conditions for the red deer.

With the spatial concept further developed in 2018 based on the evaluation results and the associated measures (figure 3) coordinated by the red deer management group, a first step has been taken to further improve implementing the red deer management concept (*Suchant & Haydn 2018*).

Literature

Suchant, R.; Burghardt, F.; Gerecke, K. L. 2008: Rotwildkonzeption Südschwarzwald.
Suchant, R.; Haydn, A. 2018: Rotwildkonzeption Südschwarzwald - Umsetzung und Weiterentwicklung.

Photo: Jason Blackeye

SURVEYING FOREST STANDS AND SINGLE TREES USING DRONES

PETRA ADLER, SELINA GANZ, ANDREAS UHL, GERALD KÄNDLER, ULI RIEMER
Dept. Biometry and Computer Science | petra.adler@forst.bwl.de

A drone is also called UAV ("Unmanned Aerial Vehicle") or UAS ("Unmanned Aerial System") according to its specification. The FVA has started to investigate the possible applications of this technique for forestry research. For this purpose, the FVA has a DJI Matrice 200 at its own disposal. The project "Walddrohnen" (forest drones) evaluates the usability of UAVs for forest applications and implements a department-independent workflow. The processes can expand into forest inventory, forest growth, forest health, forest production, wildlife ecology and forest protection.

The benefit of drone technology is defined by the platform, the sensors, the flight parameters and the analysis options. The construction of the platform, e.g. fixed wing, copter or a combination of both, determines the ground coverage, the payload, the starting and landing capability, the flight time, flight stability and flight quality.

Different sensors can be mounted on drones. The data collected by UAVs have a very high spatial resolution, between one and a few centimeters.

- Multispectral- and hyperspectral cameras register different wavelengths and can indicate tree condition by characteristics of the tree crown reflection.
- Cameras, which operate in the visible spectrum, can be used for detailed assessment of forest structure or single tree properties.
- A laser-sensor on a UAV provides very high point densities and therefore a detailed image of the stand and crown structure as well as the ground surface structure.
- Thermal imaging cameras register the different thermal reflections and can probably be useful for ecological topics.

Aerial image flight with a HT-8 C180

Photo: FVA

Orthophoto with a ground resolution of 1 cm.

Figure 1: Drone based data have a very high spatial resolution.

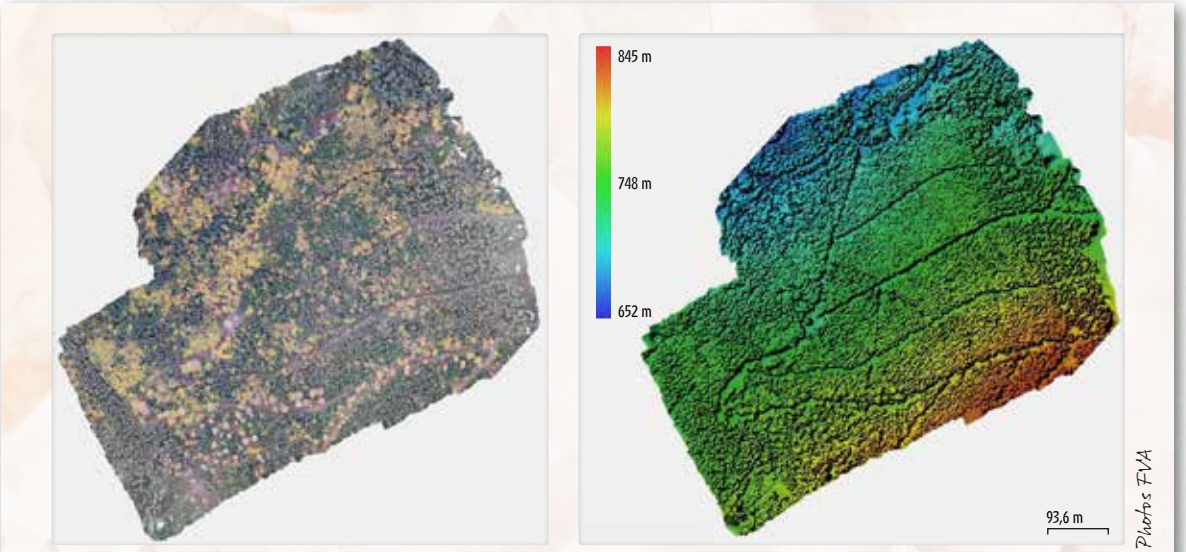

Figure 2: Orthophotomosaic (left) and digital surface model (right) of one test site.

The quality of analysis options is influenced by the sensors for positioning and orientation of the platform during data capture. In general: The more precise the data, the better the subsequent analysis can be and the less ground control points are necessary. Additionally, the flight parameters flying height above the forest stand and image overlap determine the usability of drone-based data.

The current weather conditions are crucial for the quality of data capture. In order to prevent tree crowns from moving, absolute calm is required. For passive optical recording, irregular clouds and ground-level fog has to be excluded. When using laser sensors rain, fog or snowfall lead to disturbing data noise. A drone flight can capture several hundreds of images, which then must be stitched in to a single mosaic or must be prepared for an analysis of the stand situation or for single tree geometry.

In 2018 several test areas were recorded. Based on these data, the initial calculations for assessing 3D information of the areas have been completed. The aim of these evaluations was to assess the influence of different flight parameters. First steps in standardizing and facilitating the workflow of importing drone data into the FVA data infrastructure have been developed. The influence of flight parameters on the accuracy of tree height measurements derived from drone data was investigated within a test area. In the upcoming year the investigations will be expanded to other areas and workflows will be further developed. Furthermore, different algorithms and software will be evaluated according to their suitability for FVAs purposes.

How accurate are derived tree heights, crown radii and crown base heights using different sensor systems?

This question is addressed by the project: "Further development of statistical timber volume forecasting tools for differentiation of roundwood assortments and product quality (Pro-Qual-Tools)". The project is funded by the Federal Ministry of Food and Agriculture. Beside drone-based data with laser sensor and camera, gyrocopter-based data and aerial images from state survey flights have been included in the investigation. The study site is located in an even-aged 50-year-old Douglas fir stand.

Overall, the results for deriving tree height and crown radius were promising with regards to the accuracy achieved. The differences between the results of laser and photogrammetric data were smaller than expected. However, the photogrammetric data indicated that a high point density is an important factor for successfully deriving single tree attributes. Consequently, the best results were achieved with drone data.

Deriving crown base height at the single tree level did not turn out to be applicable. Even the very high-resolution laser data failed in deriving crown base height. An important consideration here is the definition of the crown base height, which can be either the first green or first dead branch. Both can be very small and are therefore not recorded by the sensor system or detected in the automatic algorithms.

Altogether, results show that drone technology is a tool for small scale assessment of forest and tree properties and can complement the existing remote sensing techniques. However, more research and development is necessary to exploit the potential of the drone technique for practical applications.

Photo Erik-Jan Leusink

HOW MUCH FORESTRY USE CAN A FOREST (SOIL) TOLERATE?

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This question was the objective of the project "Wood fuel harvesting and nutrient sustainability in Germany" (EnNa), which was successfully completed after more than five years of work. The project was coordinated by the FVA (Department of Soil and Environment, Department of Biometry and Computer Science) in collaboration with the Bavarian State Institute of Forestry (LWF) and the Northwest German Forest Research Institute (NW-FVA). It was funded from2013 to 2017 by the Agency for Renewable Resources (FNR), the project management agency of the Federal Ministry of Food and Agriculture.

The study was motivated by significant increases in the demand for wood as a renewable raw material since 2008, especially as a source of energy. However, intensive harvesting of wood and biomass strongly impacts the nutrient balance of forest soils because nutrients are primarily found in the crown material. An overuse of nutrient supplies can, in turn, lead to long-term growth loss. The consequences of intensive litter removal from the forest, a practice that was carried out for centuries, are still visible and is impressive evidence for this negative effect on the forest.

Against this background, the project EnNa assessed the natural site potential of forest soils in Germany and examined how different intensities of use impact nutrient supplies in soils. The basis for the assessment was site-specific balances of three plant nutrients, calcium, magnesium and potassium, calculated at the sampling points of the Federal Forest Inventory (BWI). Nutrient balances compare nutrient input (through deposition by precipitation and through rock weathering) with nutrient loss (through logging and the seepage water) on a site.

For each BWI sampling point, calculations were made to determine what maximum intensities of use are possible before reaching negative nutrient balances, i.e., before depleting nutrient supplies in the soil. The results show a much differentiated picture of feasible forestry use options and restrictions (Fig. 2). On just under one fifth of the sites nationwide, the balances of the three observed nutrients are still positive, even when nutrient losses through stem wood harvesting are taken into account (blue and green dots in Fig. 1). Here, a more intensive use of the crown material is conceivable without endangering the sustainability of the sites with regard to calcium, magnesium and potassium. On the other hand, the nutrient balances would be already negative on 8% of sites nationwide even if there would be no or only slight logging (red and orange dots in Fig. 1). On these sites, the loss through seepage water is higher than the element input through rock weathering and deposition, and nutrient supplies in the soils are continuously decreasing. This is caused by the long-term effects of "acid rain" and the acids stored in the soils. In order to not overuse nutrient supplies 14% of the forested area needs to have a reduction in use in comparison to conventional forestry use (yellow dots, scenario, 'MIN' in Fig. 1). Sites with negative nutrient balances should in principle not be used for the harvesting of fuel wood. Additionally, two different alternatives are generally available to avoid losses in growth and essential soil functions: 1. reducing use intensity and with it the nutrient export through harvesting; 2. reducing the nutrient deficit by returning relevant nutrients to the forest.

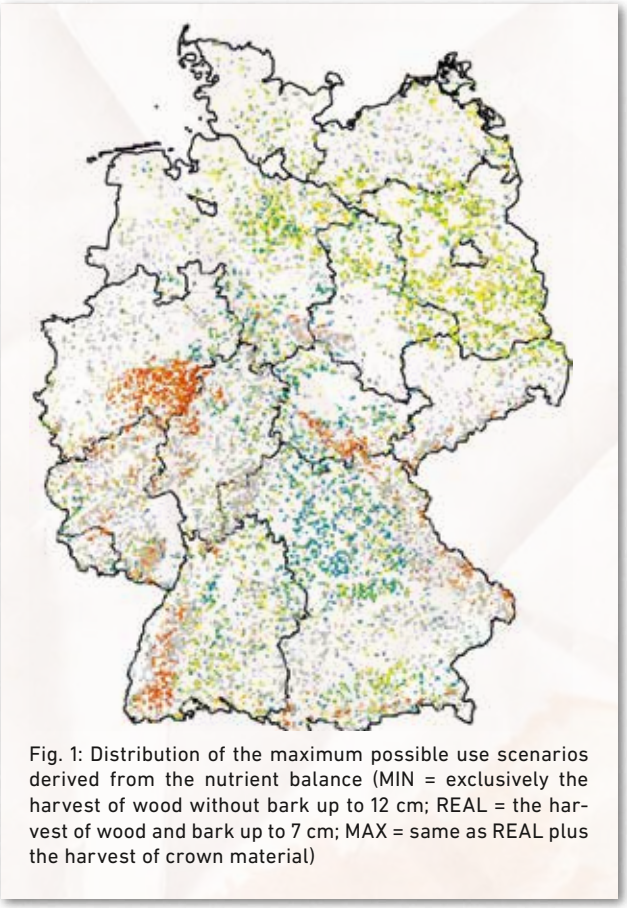

Fig. 1: Distribution of the maximum possible use scenarios derived from the nutrient balance (MIN = exclusively the harvest of wood without bark up to 12 cm; REAL = the harvest of wood and bark up to 7 cm; MAX = same as REAL plus the harvest of crown material)

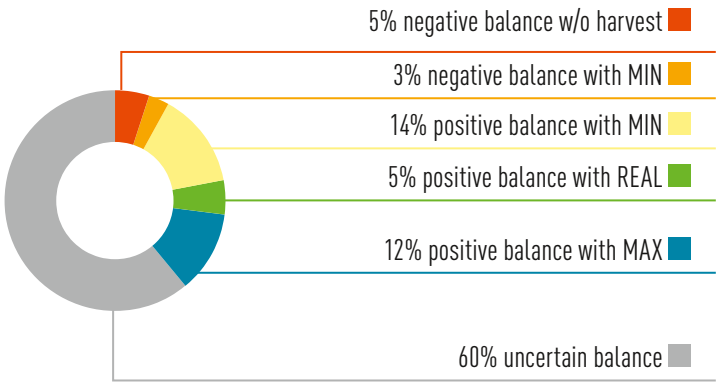

Fig. 2: Percentage distribution of the dots in Fig. 1 according to the maximum possible use scenarios. Grey dots are forests sites where the balance does not differ significantly from zero.

The calculations of EnNa showed that, in particular, leaving bark in forest stands can contribute to minimizing nutrient loss. If, for example, the bark was left behind on the forest floor during a conifer harvest, 12% less biomass would be harvested, but nutrient exports would decrease by 40-60%. This would generally be possible using harvester heads that remove the bark directly. This technology should be pursued quickly in order to enable widespread application. Reductions in use can therefore be an important step towards closing deficits in nutrient balances. However, an across-the-board use reduction on a large scale is not reasonable when climate change is taken into account because the necessary reduction of CO_2-emissions will not be possible without the continued use of wood and other biomass from forests. Particularly on sites where the nutrient balances are already negative even without forestry use, the option "use reduction" is evidently at its limit, and it becomes necessary to close the nutrient balance by soil liming and concepts of nutrient-recycling into the forest (e.g. by wood-ash application).

The methods that were developed in EnNa for assessing site-specific nutrient potentials allow for an objective assessment on a regional level of what logging intensity and which compensation strategy may be reasonable and sustainable at a site. For operational application, the balancing approach that was developed in EnNa is meant to be transferred into a practical and usable decision support system. Current research projects of the departments of Soil and Environment as well as Biometry and Computer Science will tackle this goal in the coming years.

On December 18th 2018, the results of EnNa were presented at a conference in Berlin. Concrete concepts for possibilities and limits of forest use intensification and of the compensation of high atmospheric acid inputs and resulting soil acidification were discussed during a lively panel discussion. The results of the project were published within a final report as a volume of the "Freiburger Forstliche Forschungsberichte" (Freiburg Forestry Research Reports) series at the same time as the conference.

Further information about the project can be found on *www.enna.fva-bw.de*

DATA CRUNCHING AND STATS TALK: THE FVA-FORUM OF METHODS

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"Missing data", "managing literature references", "theoretic and applied studies", "methods in social sciences" – these are some of the more self-explanatory topics covered in the Forum of Methods at FVA. But also, more complicated sounding topics such as "analyzing categorical response variables", "documentation of R-Code with Latex" or "collinearity", were dealt with. But what is the Forum of Methods and what purpose does it serve?

The Forum of Methods at FVA was founded in 2012 and is a cross-department exchange platform aimed at increasing the methodological competence and efficiency of scientific analyses. Classical topics cover statistical methods, analytical approaches and techniques, efficient computer programming and data handling as well as software specific topics in geographical information systems and statistical software – it can get tough!

Usually there are six to eight sessions of the Forum of Methods per year. FVA scientists present their specific methodological knowledge and discuss their applicability across department boundaries. Between 2012 and 2017, 34 sessions were held as part of the Forum of Methods. Starting from a stricter focus on statistical and IT (informational technology) questions, the range of topics was broadened over the years to include qualitative methods in social sciences, access to different data sources including forest inventory and geoinformation, or methods in the in-house laboratory.

In 2018 the Forum of Methods hosted ten sessions and was as popular as never before, based on the average of 25 participants per session. Quite amazing, since six out of ten sessions were dedicated to programming techniques with special focus on the programming language R. Who would have guessed? Additional topics dealt with management of literature references using EndNote software, qualitative interviews in social sciences, statistical topics like regression trees and boosting algorithms and new tools in gap detection based on remote sensing.

Photo: Thomas Weidner

Meeting of the FVA-Forum of Methods in the conference hall "Hans-Ulrich Moosmayer-Saal"

ORGANIZATION of the FVA

ADVISORY BOARD

DIRECTORATE | DIRECTOR
Prof. Konstantin von Teuffel
- Administration and Management
- Central Technical Services and Library
- Knowledge Transfer and Public Relations
- Controlling

Dept. 1 FOREST GROWTH

PROF. DR. ULRICH KOHNLE
- Network of Longterm Experiments
- Growth and Environment
  (incl. Coordination of FVA-Research on Climate Change)
- Growth Simulation

Dept. 2 FOREST NATURE CONSERVATION

DR. JÖRG KLEINSCHMIT
- Forest Plant Ecology
- Forest Biotops
- Forest Nature Reserves
- NATURA 2000
- Forest Tree Breeding[1]
- Forest Plant Genetics

[1] in Cooperation with ASP Teisendorf

Dept. 3 SOIL AND ENVIRONMENT

DR. HEIKE PUHLMANN
- Environmental Monitoring
- Soil Physics
- Forest and Water
- Forest Nutrition and Element Budgets

Dept. 4 FOREST HEALTH

DR. HORST DELB
- Forest Entomology, Zoology and Forest Pathology
- Monitoring, Prognosis and Control of Forest Pests and Diseases
- Forest Health Advisory Service

FACTS, FIGURES AND NEWS

As a departmental research institute for forestry, the Forest Research Institute of Baden-Württemberg (FVA) is associated with the Baden-Württemberg Ministry for Rural Affairs and Consumer Protection (MLR) and is very closely linked in terms of organisation with the State Forest Service ForstBW. In accordance with the task defined in the State Forest Act (§76 LWaldG), the FVA investigates the relationships between the forest and the environment and develops efficient, rational ways for forestry and the timber industry to protect the commercial as well as the ecological and recreational functions of the forest. The FVA strategy for 2014 - 2018 sets out the following research priorities: 1) climate change research, 2) forest nature conservation, and 3) measurement and evaluation of sustainability. The new strategy for the next five years is being developed. It will, among other things, address the expansion of key research topics and changes in working areas.

New appointments to the Advisory Board

The FVA comprises eight specialist departments according to the scope of tasks that are required; these departments are coordinated and managed by the Directorate (see organization chart). An Advisory Board advises the FVA on projects and strategic issues. Three new members were appointed to the Advisory Board in 2018:

- **Johannes Frhr. von und zu Bodman** (forest owner)
- **Steffen Radtke** (B. Keck sawmills GmbH)
- **Prof. Dr. Andreas Rigling** (Federal Research Institute for Forest, Snow and Landscape WSL, Birmensdorf, Switzerland)

Apart from forestry research and ForstBW, forest ownership and the timber industry are now also represented.

STAFF COUNCIIL AND EQUAL OPPORTUNITY COMMISSIONER

Dept. 5 FOREST AND SOCIETY

PROF. DR. ULRICH SCHRAML
- Social Cultural Forest Monitoring
- Recreation & Human Health
- Forest Politic Tools
- Wildlife Management

Dept. 6 FOREST UTILISATION

DR. UDO HANS SAUTER
- Harvesting and Logistics
- Wood Measurement, Scaling and Grading
- Applied Wood Research
- Energy Wood

Dept. 7 FOREST ECONOMICS

DR. CHRISTOPH HARTEBRODT
- Accontancy Networks
- Forest Managerial Economics
- Risk and Crisis Management

Dept. 8 BIOMETRY AND COMPUTER SCIENCE

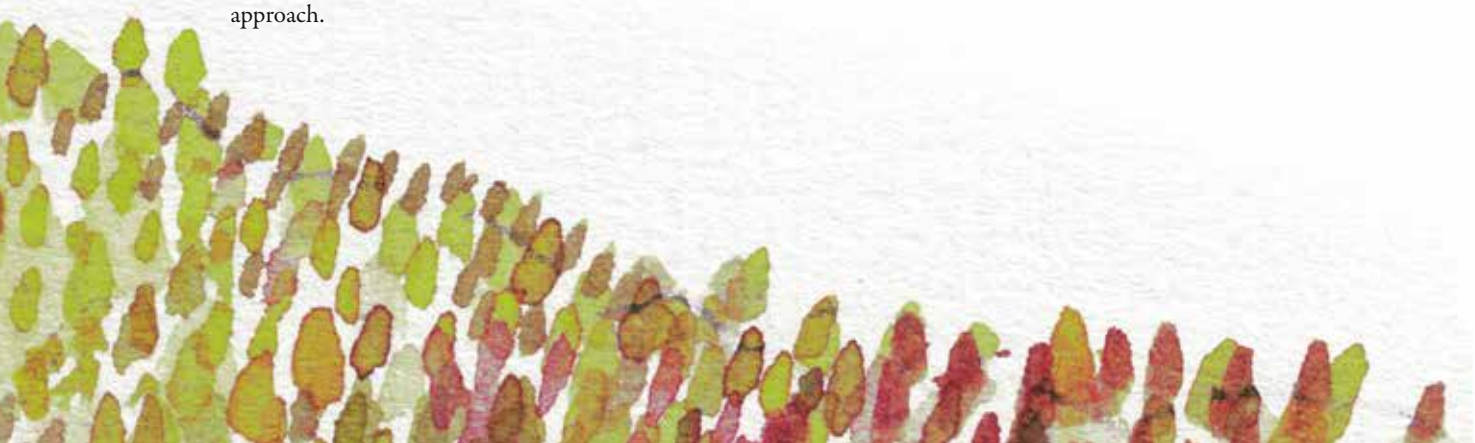
DR. GERALD KÄNDLER
- Forest Inventory and Management Planning
- Modelling
- Climate Change Research and Integrated Risk Management
- Statistics and GIS Consulting; Geodata Management
- Software Engeneering
- Information- and GIS Technology

The term of office of a member of the Advisory Board comprises two sessions of four years each. The following members entered their second period of office in 2018: **Prof. Dr. Daniela Kleinschmit**, **Prof. Dr. Barbara Koch**, **Prof. Dr. Friederike Lang**, all of whom are from Albert-Ludwigs-University, Freiburg; **Dr. Peter Mayer**, Austrian Research Centre for Forests, Vienna and **Felix Reining**, ForstBW.

The Chief of the Baden-Württemberg Forest Service **Max Reger**, the Head of Unit responsible for forest research in MLR **Bernhard Panknin** and the FVA Director **Prof. Konstantin von Teuffel** also attended the biannual meetings of the Advisory Board. An Advisory Board consultant is responsible for managing the Advisory Board.

The Advisory Board's tasks and responsibilities include evaluating the overall development and direction of the FVA and formulating recommendations for strategic alignment, priorities for future research work and specific research projects. The Advisory Board also evaluates individual projects before they start with respect to their practical relevance and scientific approach.

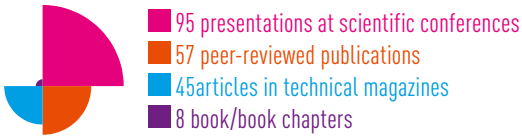
Extended Advisory Board (from the left): Daniela Kleinschmit (deputy Chair), Andreas Rigling, Friederike Lang, Steffen Radtke, Sibylle Werner, Konstantin von Teuffel, Peter Mayer (Chair), Johannes Frhr. von und zu Bodman, Barbara Koch and Felix Reining.



Active transfer of knowledge

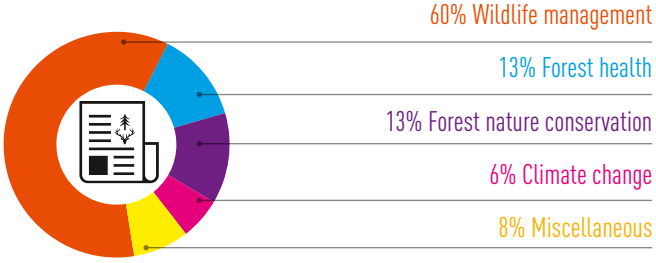
In 2018, FVA scientists actively distributed their research results in 95 presentations at scientific conferences, in 57peer-reviewed publications and in 45 non-peer-reviewed articles in technical magazines (see graphic). They provided direct information on forest practice in at least as many technical contributions, including special issues, practical weeklies and association pamphlets, among others. Conference presentations were usually also published as conference proceedings. In addition, a FVA research team also published a book and other researchers submitted chapters for scientific books.

In addition to its own publications, the FVA increasingly also was present in the media: From less than 160 contributions mentioning the FVA in media such as newspapers, radio or television in 2010, these contributions increased annually to reach 481 by the end of 2018 – 25 of these in television and 10 over the radio.



Knowledge transfer through presentations and publications

Sixty percent of all contributions in 2018 discussed topics about wildlife ecology (wolf, lynx, capercaillie), and 13 percent each were contributions dealing with forest health and forest nature conservation respectively. Climate change was featured in six percent of all reports and the remaining eight percent dealt with other FVA issues.



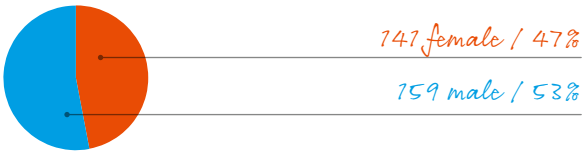
Contributions in media according to topics

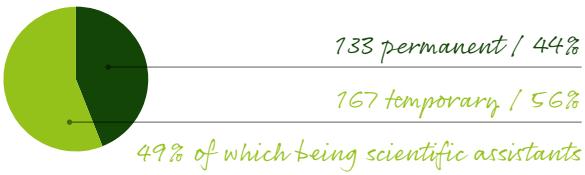
Total number of employees:

300 (31.12.2018)

Staff structure virtually unchanged

At 300 persons at the end of 2018, the total staff remained virtually unchanged from the 2017 level (296). The gender ratio also remained the same: 47% female and 53% male. The structural changes of staff overall were minimal compared to the previous year: 44% were employed fulltime (-2%) and 56% part-time (+2%). Forty-four percent of all staff had permanent contracts at the end of 2018 (+1%): 61% male (+2%) and 39% female (-2%). One-hundred-twenty were scientists (40%, -3), 81 were scientific assistants (27%, +1) and 99 were non-scientific personnel (33%, +2). Six percent of employees (19 persons, +1) were nationals from other countries. They came from the following countries: Brazil, Bulgaria, China, Finland, Greece, Iran, Italy, Latvia, the Netherlands, Poland, Rumania, Spain, Switzerland, UK and Venezuela.





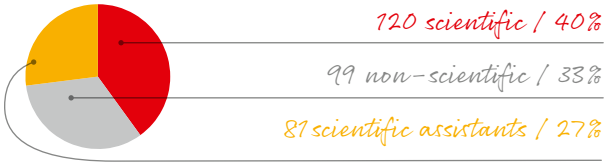


Photo T. Weidner

Minister Peter Hauk (2nd from left) talking to the State Forestry President (right), FVA Director (2nd from right) and FVA department heads.

Visit by Minister Hauk

The Minister of Forestry, Peter Hauk, paid the FVA a short visit on the 18th of May. The Minister learned about the disturbing bark beetle situation within the country and discussed countermeasures within the framework of integrated plant protection and compliance with certification regulations, especially the protection of bees. The second important topic put forward by the FVA Director dealt with FVA's current plans to renovate their laboratories and greenhouses. The space at FVA has been very cramped for many years. Moreover the technical facilities, especially the FVA laboratory, are completely outdated and are no longer reliable. During his tour of the FVA, the Minister viewed the soil science laboratory and greenhouses, which provided a convincing example of the urgency for the need of new laboratories.

Photo T. Weidner

"The tone of wood" event at Liliental

The sound of 60 years FVA research in Liliental

In mid-June, on the occasion of 60 years of forest genetic research in Liliental, the FVA invited the public to a local acoustic "journey" under the theme "Wood and music in harmony – hearing and seeing how sound is produced". About 130 enthusiasts of music and art came to this open air event and were not disappointed: The program, lasting three hours, was packed with valuable information about the interaction of wood and music by presenting interesting facts about the origins and properties of the wood from which the instruments are made. The sounds were produced by Frank Bockius (percussion of all kinds), Wolfgang Fernow (contrabass), the Liliental alphorn players, Karin Stock (alphorn and trumpet), Thomas Kellner (instrument and furniture making – including a world rarity: a contrabass made of service tree, (*Sorbus torminalis*), Sebastian Stenzel (guitar making), Walter Montero (on a Stenzel guitar from the sorb tree, *Sorbus domestica*), Martin Wagner (organ building), Marc de Sterke (violin making) and Felicitas Frey (on a de Sterke violin made of maple and a Kellner viola made of service tree). The icing on the cake for the event were two scary forest fairy tales presented by storyteller Kathinka Marcks.

Horst Delb member of the JKI academic advisory council

In 2018, the Federal Ministry of Food and Agriculture appointed Dr. Horst Delb, Head of the Forest Health Department, to the Academic Advisory Council of the Julius Kühn Institute, Federal Research Institute for Cultivated Plants (JKI), for four years. The advisory council members are drawn predominantly from internationally distinguished scientists from Germany and abroad.

Recent doctorates

Four scientists completed their doctoral thesis in 2018:

Joy Coppes (Forest and Society Department) on the topic "Variation in impacts of recreational outdoor activities on wildlife"

Adrian Danescu (Forest Growth Department) on the topic "Structural diversity as a driver of growth dynamics in irregular, mixed forests"

Stefan Ehrhart (Forest and Society Department) on the topic "Wildtierkonflikte im Kontext deutscher Prozessschutzgebiete: Verbindung von Erklärungsmodellen zur Entwicklung von Managementlösungen" ("Wildlife conflict in the context of German areas for the protection of natural processes: Combining explanatory models towards the development of management solutions")

Ophelia Soliku (visiting scientist in the Forest and Society Department) on the topic "Competition, Conflict and Co-Management in Protected Areas: Understanding Park-People Interactions in Ghana and Germany".

Photo T. Weidner

Honorary colloquium with the guests of honor: Prof. Moosmayer with wife and granddaughter

Big birthdays

Dr. Rudi Suchant, Deputy Head of the Forest and Society Department, turned 60 on 30 January 2018. He fittingly celebrated this in July on the occasion of the 30-year anniversary of his working section "Wildlife Management".

Prof. Dr. Hans-Ulrich Moosmayer turned 90 on the 27th of July. Until his retirement in 1993, he shaped the FVA as Director for close to 17 years. To mark this occasion, an honorary colloquium took place on the 28th of November.

Dr. Udo Hans Sauter, Head of the Forest Utilisation Department, and **Dr. Joachim Klädtke**, Deputy Head of the Forest Growth Department, also celebrated their 60th birthdays on 17 August 2018.

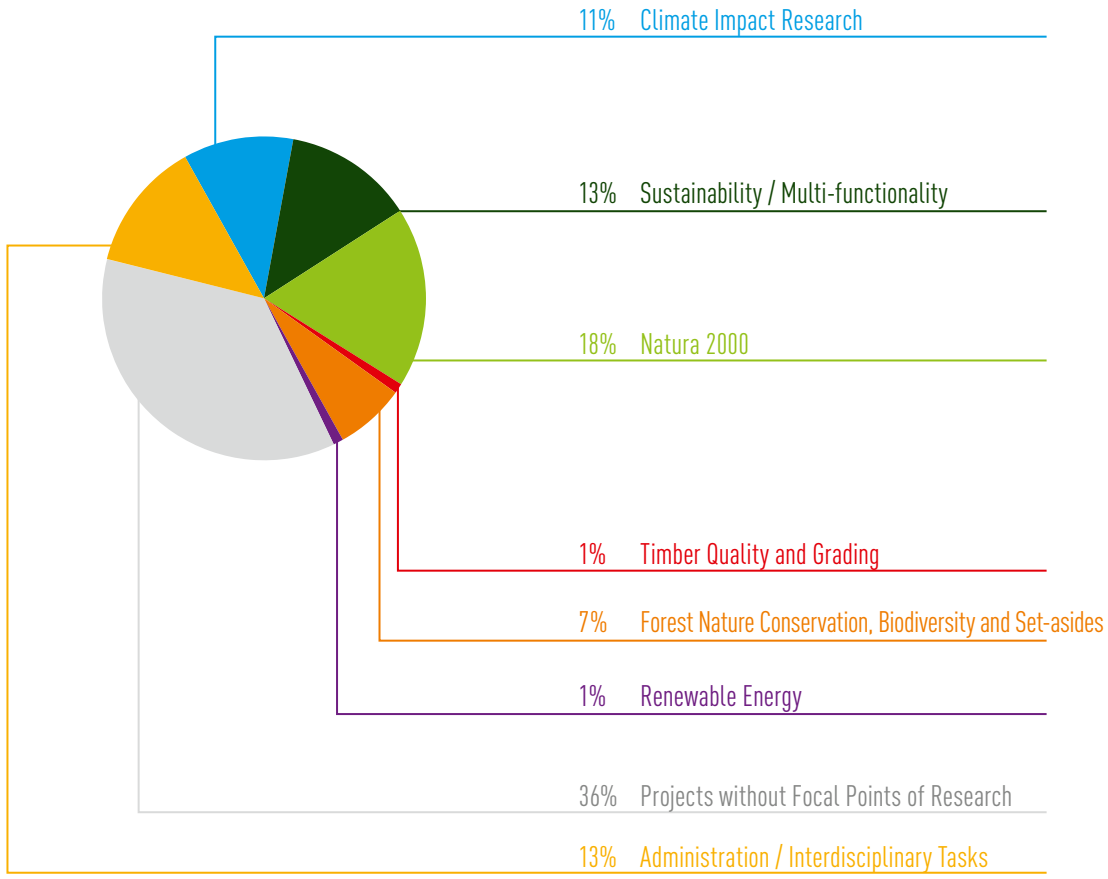
The FVA extends its congratulations!

Total budget up

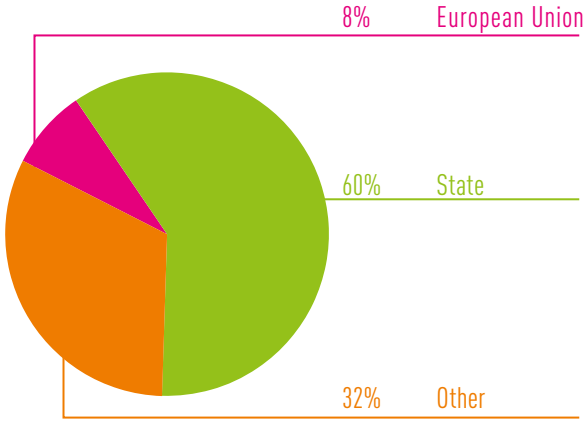
FVA's total budget for 2018 was around 17.5 million euros, approximately two million euros up from the previous year. Eighty-seven percent went to research and 13% to administration and cross-sector tasks. At 1.9 million euros, the percentage of third party funds raised constituted close to 12% of the total budget, about 6 percentage points less than the previous year. Federal funding has clearly decreased from the previous year, down to 1.2 million euros and thus was just under 60% of all third party funds. EU funds at 164,933 euros are also clearly down in absolute terms yet remain unchanged at 8%. Thirty-two percent of third party funds came from other sources in 2018.

The graphic below shows how the resources were deployed.

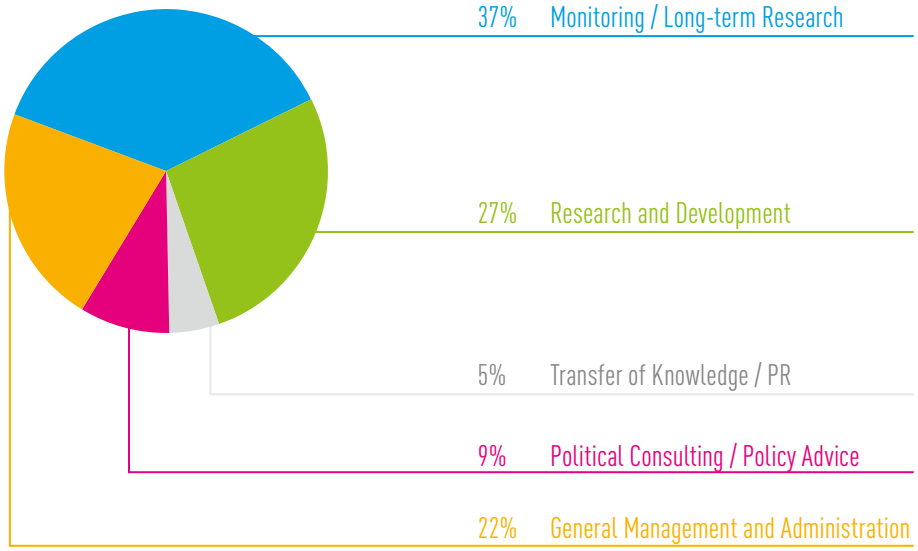
Resources According to Focal Points of Research (17.528.321 €)



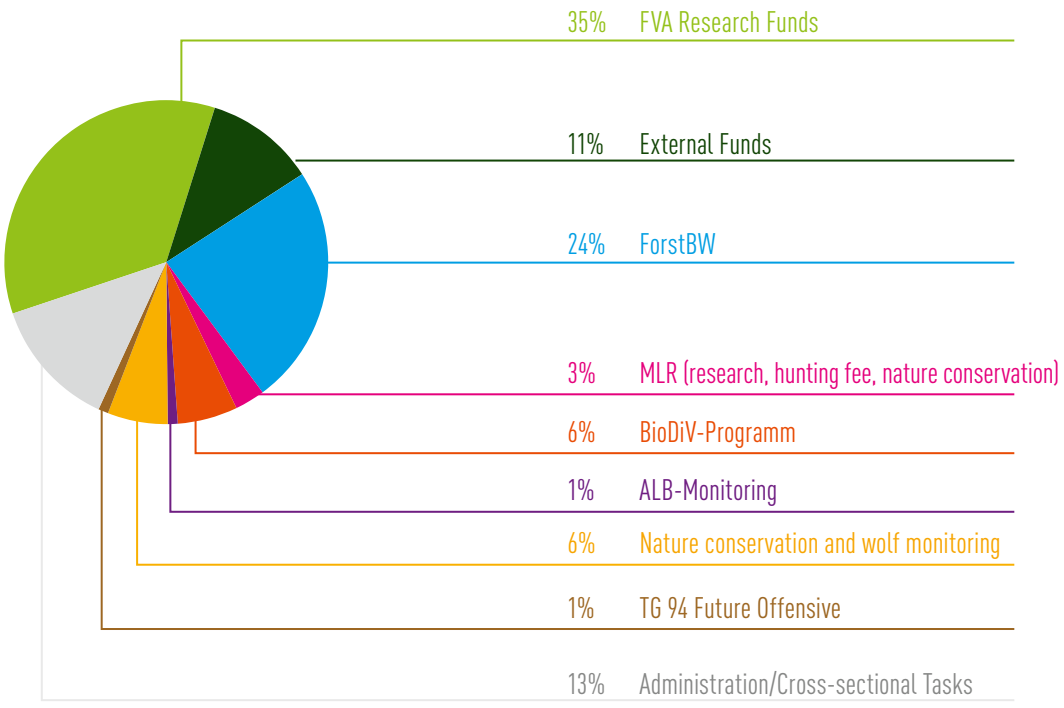
Origin of External Funds (1.945.206 €)

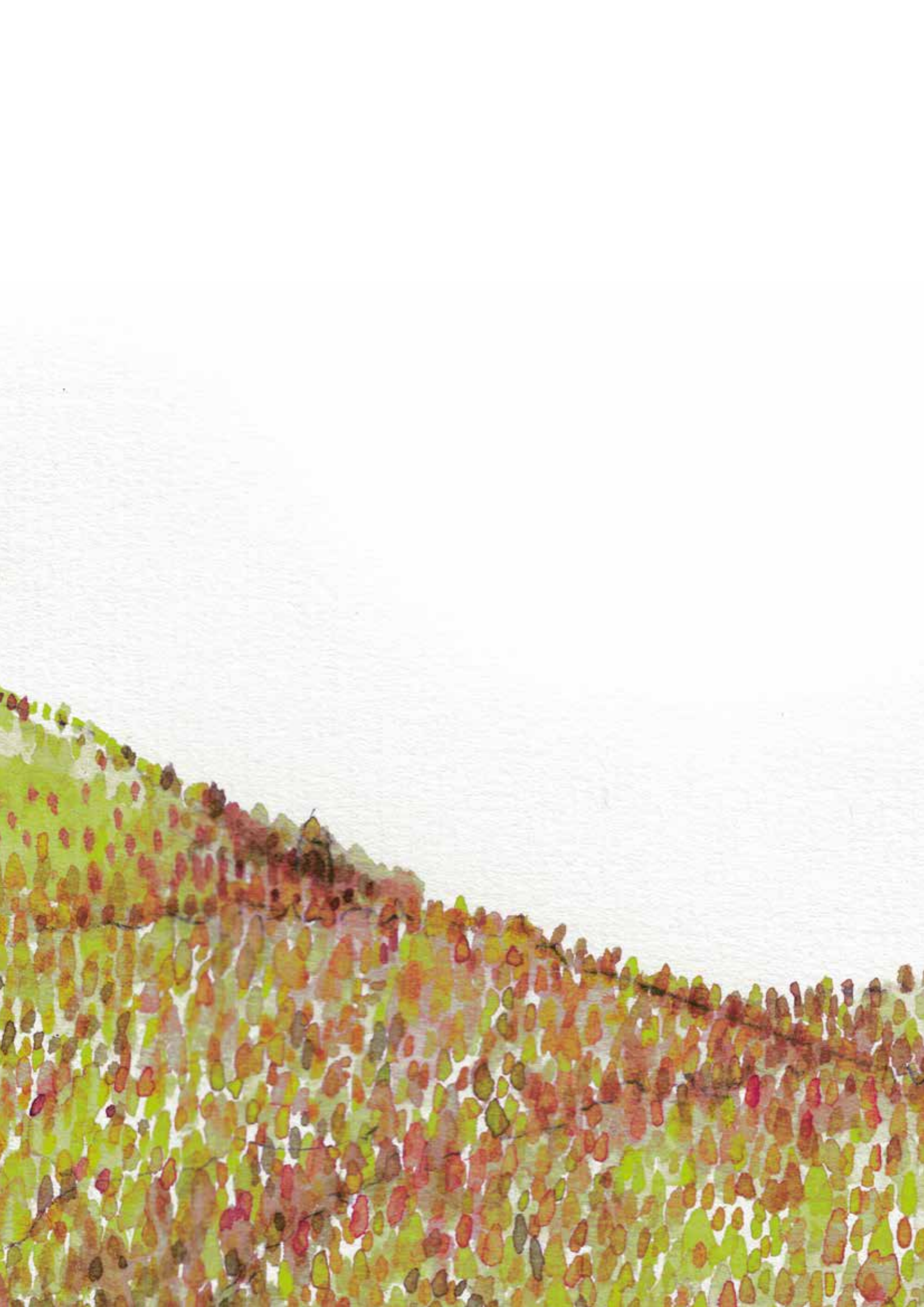


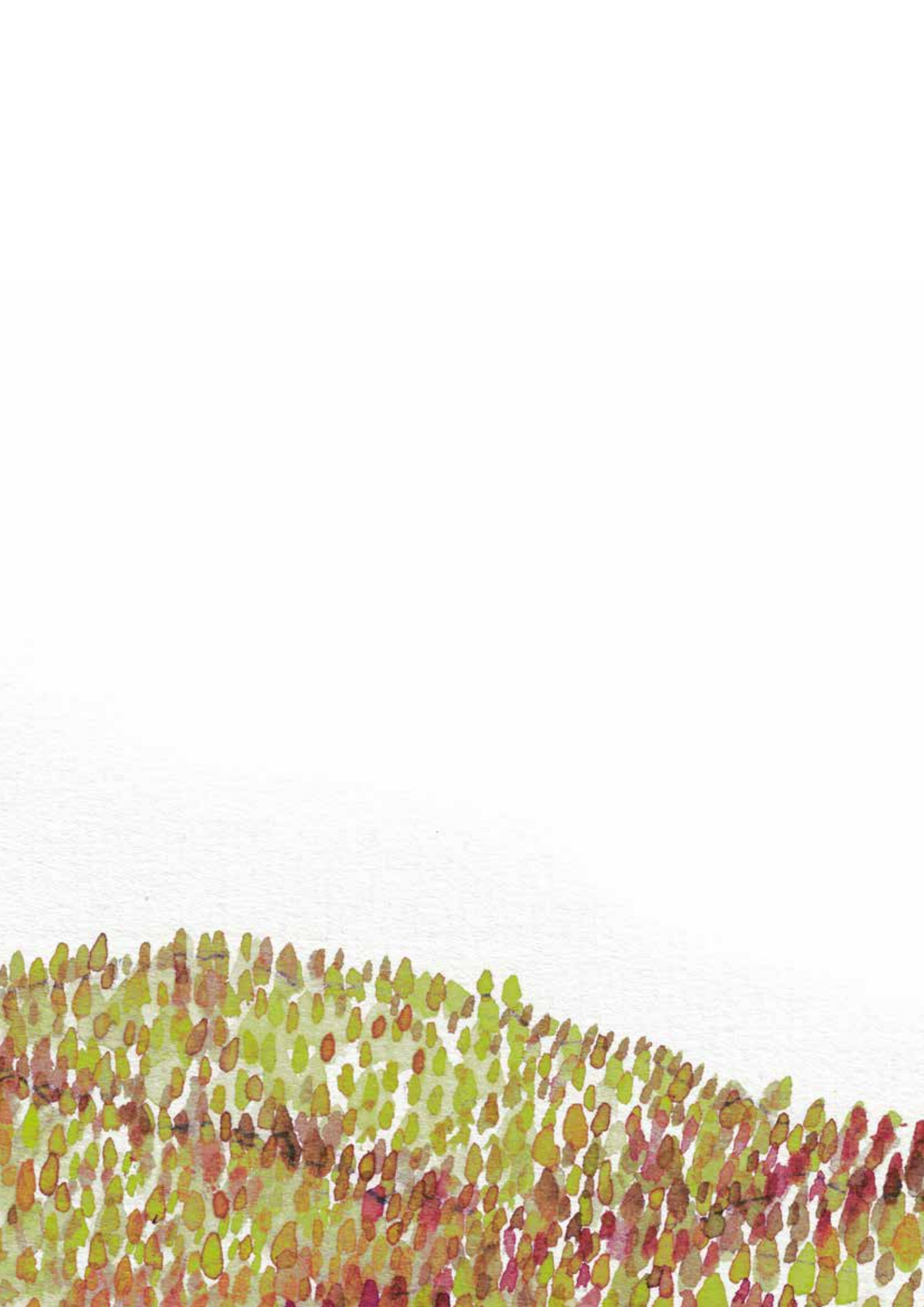
Resources Based on Competencies (17.528.321 €)



Resources Based on the Origin of Funds (17.528.321 €)







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