Can natural dynamics increase resilience and multifunctionality of floodplain forest ecosystems?

- An interdisciplinary approach

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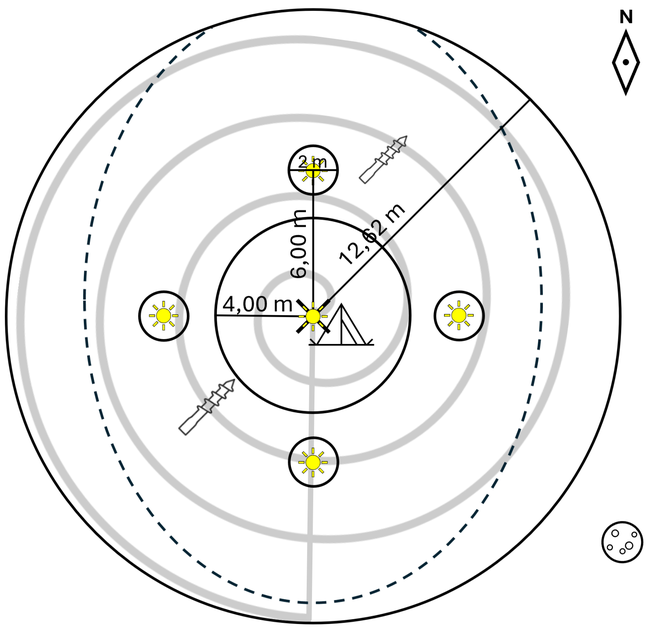
Different angles, one project - Summary

The **A-DUR** project investigates the benefits and challenges of addressing biodiversity and climate issues following the designation of the Middle Isar as a 'natural forest' in 2020. It is an **interdisciplinary effort** structured into **five subprojects** focusing on carbon storage, forest dynamics, natural processes, species conservation, climate impact and social value, all using a **common research design**.

Combining different disciplines - Methods

Plot-Design

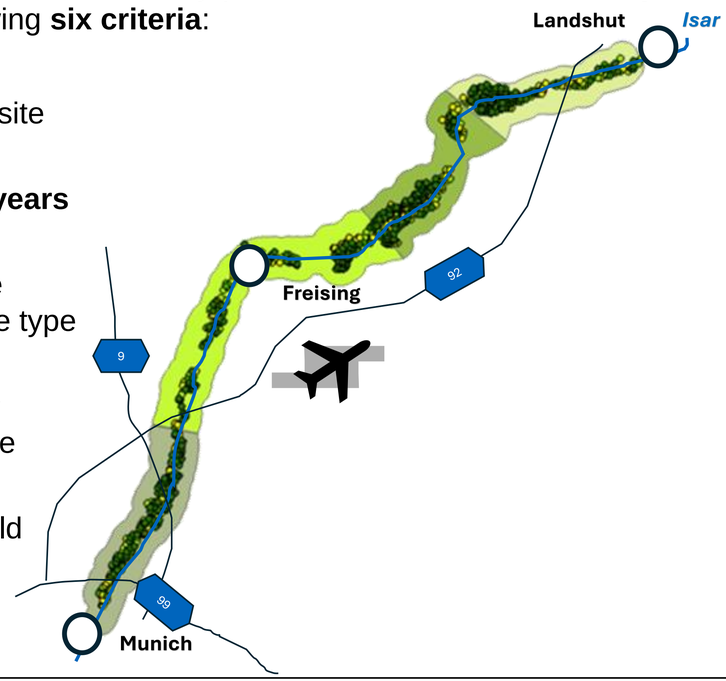
- Center / **Soil sample** and **moisture** / 360° Photo
- Subplots for **forest regeneration** inventory
- **Light** measurements
- **Wood core sample** for dendrochronology
- **Malaise trap** (insects) and **audio box** (birds) combined with **climate** data loggers
- Path with **butterfly net**
- Path with **handheld laserscanner**
- **Pollen trap** and **meteo station**



Stratification

The stratification is based on the 200 x 200 m **inventory network of the Bavarian state forestry** (BaySF). Out of more than 1000 inventory plots in the research area **120 plots** were chosen according to the following **six criteria**:

1. **Forest type** (six types based on dominant tree species including site typical and planted trees)
2. **Potentially flooded every 100 years** (yes/no)
3. **Water availability** (height above nearest water level and substrate type in three categories)
4. **Location** (four regions to evenly spread the plots across the whole area)
5. **Age** of the forest stand (young/old growth)
6. **Managed** actively (yes/no)



Different paths, one goal - Subprojects

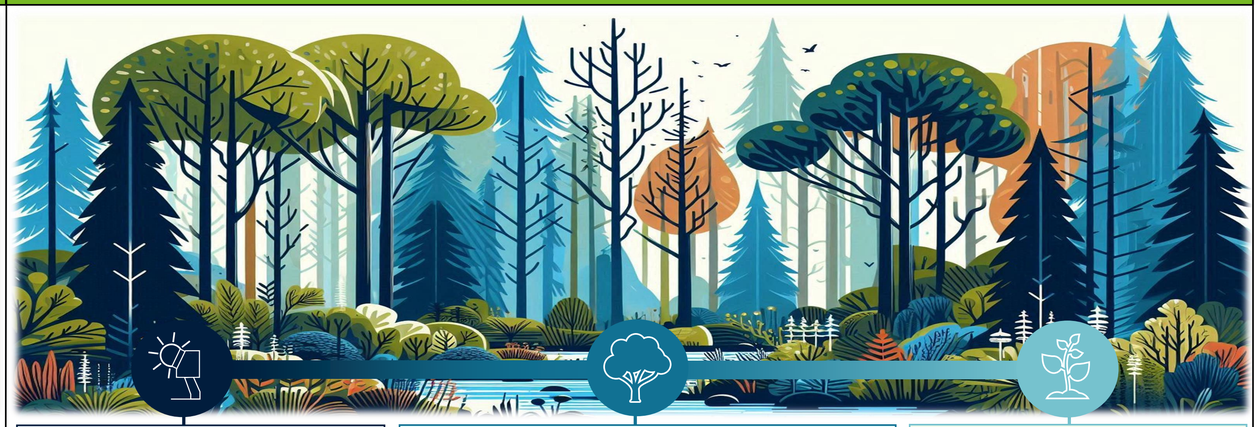
01: Hydrodynamics & succession paths

Hydrological Model:
- Creation of a **groundwater model** (MODFLOW)
- Further development of the model on the basis of the existing surface water-groundwater model for the river section **Ismaning-Mintraching**

Forest dynamics:
- Conclusions from **growth dynamics** of young and old plants are drawn about the site requirements of the species, particularly with **regard to light** and reaction to **(summer) drought**.
- Investigation using **stable isotope analysis** to determine the depth from which trees obtain their water

Greenhouse trial:
- **Four target tree species** (*Q. robur*, *T. cordata*, *U. laevis* and *P. nigra*) in five replicates Investigation of **water stress** and **competition** with *I. glandulifera*

02: Forest dynamics & carbon sequestration

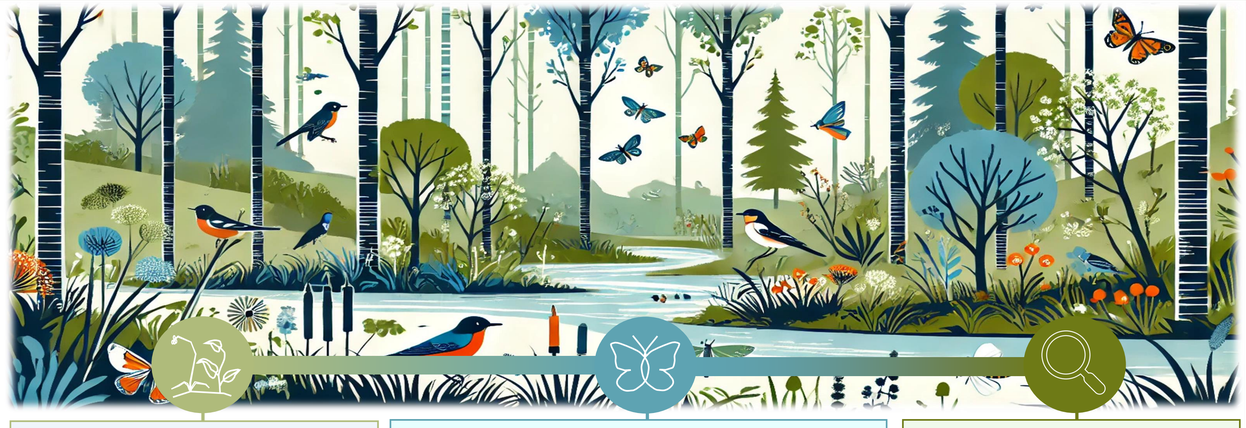


Forest structure:
- Assessment of the **structure of different forest types** via Mobile Laser Scanning (LiDAR)
- Combination with existing inventory data
- **Airborne upscaling**

Carbon storage and sequestration:
- Estimation of **above-ground carbon storage** via translation of point clouds into quantitative structural models (QSM)
- Retrospective analysis of **carbon sequestration** and prediction of future sequestration potentials with the help of core samples

Forest dynamics:
- Combination of **light measurements** and **forest (regeneration) inventory** to predict dynamics under non-managed conditions
- Derivation of advices for **future management**

03: Process protection vs. species protection



Flora:
- Full **vegetation** recording on 500 m²
- Recording of **epiphytic moss**

Fauna:
- Capturing **insects** with Malaise traps
- Recording of **butterflies** in 4 runs
- Recording **bird** calls

Citizen science:
- The recording on the plots is supplemented by **citizen science** projects

Recording the diversity along the trophic chain, to investigate **key habitats** and impact gradients within the ecosystem to find **conflicting goals** and develop **management options**

04: Climate impact, recreation & health

Climate and forest:
- Analysis of **forest structure-dependent** climate and health services in the riparian forests
- Development of methods to **optimize the recreational effect**

Bioclimate:
- Small-scale identification and measurement of **bioclimatic parameters** that contribute to the optimal recreational effect in the riparian forest ecosystem
- These parameters will be used **to model the climate impact** for recreationists, walkers and athletes

Activity and health:
- Investigation of relationships between bioclimatic, physiological and psychological parameters of **human recreation**

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