eLTER

Site Catalogue

eLTER Site Catalogue

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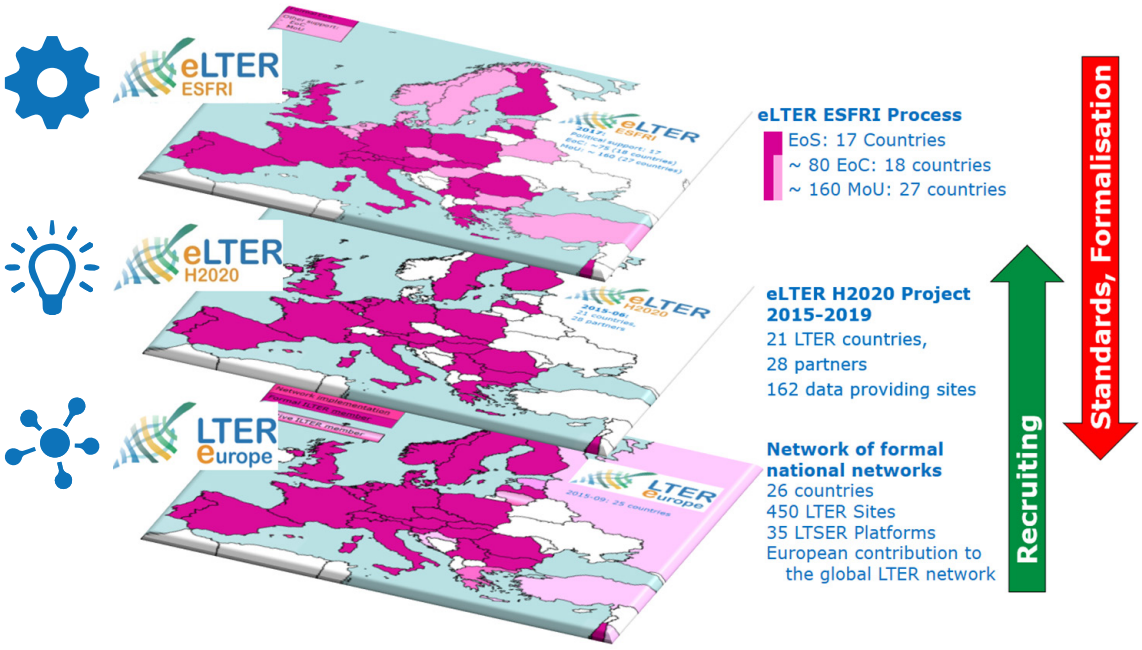
What is European Long-Term Ecosystem Research?

Long-Term Ecosystem Research (LTER) is an essential component of worldwide efforts to improve our knowledge of the structure and functions of ecosystems and of their long-term response to environmental, societal and economic drivers. LTER contributes to the knowledge base informing policy and to the development of management options in response to the Grand Challenges under Global Change. European Long-Term Ecosystem Research (eLTER) comprises three main inter-linked components: the LTER-Europe network of sites, projects such as the eLTER H2020 project (which produced this catalogue) and the eLTER ESFRI process that is aiming to establish the centrally-coordinated eLTER Research Infrastructure.



How the three components of eLTER are related

LTER-Europe is the formal European regional group of the global ILTER network. It is a distributed network of research sites for multiple purposes in the fields of ecosystem, biodiversity, and socio-ecological research. LTER-Europe was launched in 2003 and currently comprises 26 national site networks, approximately 450 eLTER Sites (foci for long-term ecosystem observation and research) and 35 eLTSER Platforms (large areas facilitating socio-ecological research). The LTER-Europe pool of in situ facilities, referred to as LTER infrastructure, provides numerous networking activities with permanent governance structures for a huge scientific community. LTER-Europe provides a framework for project development, conceptual work, education, exchange of know-how, communication and institutional integration.

R&D projects: Many developments within European LTER have been achieved through EU-funded projects, including ALTER-Net, LIFE+ EnvEurope and ExpeER. The four year Horizon 2020 INFRAIA project *eLTER H2020* (European Long-Term Ecosystem and Socio-Ecological Research Infrastructure), started in June 2015, was a flagship project enabling the further development of the European Long-term Ecosystem Research infrastructure and community. During the project LTER-Europe collaborated with the European Critical Zone Observatories (CZO) to jointly develop networks and achieve greater integration. eLTER H2020 aimed to catalyse conceptual and service developments of a distributed, highly integrated and widely used research infrastructure to support a broad range of ecosystem and critical zone research questions. Over 100 sites provided data on long-term trends in environmental change. Scientific test cases using these data addressed a range of environmental and social issues to foster innovation in network level services and to steer conceptual progress. The project's Transnational Access (TA) scheme, offered free-of-charge opportunities for researchers to visit selected sites to conduct small to medium scale ecological and socio-ecological research projects.

eLTER ESFRI process: ESFRI, the European Strategy Forum on Research Infrastructures, aims to develop the scientific integration of Europe and to strengthen its international outreach, through the coordinated development of major research infrastructures. The **eLTER Research Infrastructure (eLTER RI)** was accepted onto the 2018 ESFRI Roadmap in the summer of 2018, paving the way for its further development and formalisation as a sustainable Research Infrastructure. This work builds on past and current endeavours such as the eLTER H2020 project and draws from the extensive pool of the in situ LTER infrastructure of the LTER-Europe network. eLTER RI will be open for researchers and other users, and will offer a wide range of services, such as access to sites, data, tools and training, through a single access point. It will comprise carefully selected terrestrial, freshwater and transitional water sites. The RI will allow in situ, co-located acquisition of Essential Variables ranging from biophysicochemical to biodiversity and socio-ecological data and will adopt a whole system approach to observe and analyse the environmental system, including understand the human component of ecosystems. While several existing environmental RIs focus on impacts of climate change and/or other elements of environmental change, eLTER RI will be the only research infrastructure embracing holistically the integrated impacts of such stressors on a wide variety of European benchmark ecosystems. the eLTER RI is further described on pages 4-5.

OVERVIEW
of eLTER components

For links to further information about eLTER components, visit www.lter-europe.net/elter-overview

Which sites are included in the catalogue?

The 150 eLTER Sites and eLTSER Platforms in this catalogue (about one third of total LTER-Europe sites) were drawn from the initial selection of sites in the *Access* component of the eLTER H2020 Starting Communities project. The project provided Transnational Access (TA), i.e. in-person research visits, to 18 well-equipped sites across Europe. Furthermore, via its Information System, the project provided Virtual Access (VA) to various data sets from more than 100 sites.

The selection of sites is representative of the larger number of Sites and Platforms in the LTER-Europe network (including European CZOs). These sites are operated by the LTER networks of the 26 national members (Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Israel, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom). Sites from 22 of these countries are included in this catalogue.

The eLTER Information System

The eLTER Information System (eLTER IS) integrates, in a unique and innovative manner, a number of tools supporting the requirements for network level data management (see box). The components of the eLTER Information System can be accessed through the eLTER IS landing page: https://data.lter-europe.net/.

Information about LTER Sites and LTSER Platforms in Europe and around the world can be found on DEIMS-SDR, the Dynamic Ecological Information Management System Site and Data Repository. DEIMS provides harmonised and standardised documentation of long-term observation facilities and linked datasets using common metadata standards. DEIMS-SDR provides a wide range of information about the facilities and their characteristics. This includes information on the basic instrumentation as well as an overview on the main research topics addressed within the site. Links to DEIMS are provided throughout this catalogue.

Components of the eLTER Information System:

- **Site registration (DEIMS-SDR)**, standardised documentation of long-term observation facilities
- **Data nodes (CDN)**, hosting of time series data (including the link to data repositories)
- **Data Integration Portal (DIP)**, discovery and access to data sources provided through the data nodes
- **Common controlled vocabulary (EnvThes)**, providing a semantic backbone for keyword tagging and discovery

How to use eLTER Site Catalogue

Sites are grouped by country (arranged alphabetically), with each section introduced by a country network summary page. The QR codes on these pages direct you to network summary information on DEIMS (also accessible from https://deims.org/network/management/networklist). Each site is described in one page, and information is organised as follows:

- Site name
- Description of site
- Purpose of site, including the extent to which the site supports environmental observations and experimental research
- Location text. To determine the site's precise location, visit the site's record on DEIMS-SDR (see below)
- Main ecosystems at the site
- Research topics addressed by the site
- Site staff contact name(s) and a contact email if provided
- Information about site accessibility and infrastructure/facilities at the site. A key to the infrastructure symbols can be found on the inside back cover and online
- Links to related websites are included for most sites.

Links to DEIMS are provided in two forms:

1. via the site's unique **DEIMS.ID**. To use the DEIMS.ID, append it to the DEIMS-SDR root web address, as in this example:

https://deims.org/f30007c4-8a6e-4f11-ab87-569db54638fe *(Lago Maggiore, IT)*

URL root **DEIMS.ID**

2. Via **QR codes** for use with a smartphone or tablet: *(Wytham, UK)*

The eLTER Research Infrastructure

We live in a world of rapid social, economic and environmental change, facing major environmental issues such as global warming, biodiversity loss and unsustainable pressure on natural resources. To address these problems requires world-class ecosystem research by a well-connected, extensive community of experts, supported by advanced sites and facilities, openly shared, easily accessible data and capacity building programmes. This is the goal of the eLTER Research Infrastructure.

eLTER RI's ambition

To provide a pan-European integrated research infrastructure of long-term research sites for use in the fields of ecosystem, critical zone and socio-ecological research. With this we aim to secure and strengthen scientific excellence through the highest quality interoperable services in close interaction with related European and global research infrastructures. The planned organisational structure of the eLTER RI with its Central Services will pave the way towards meeting this vision in a cost-efficient manner via a well-established eLTER RI acting on the foundation of long-lasting public and industry partnerships.

The eLTER Research Infrastructure (eLTER RI) is the next stage in the European LTER community's journey to create a fully integrated, distributed site network. We are aiming to achieve this in the framework of the European Strategy Forum on Research Infrastructures (ESFRI), a strategic instrument to develop the scientific integration of Europe and to strengthen its international outreach.

The development of eLTER RI builds upon past and current endeavours such as the eLTER H2020 project, ALTER-Net and LIFE+ EnvEurope. eLTER RI is an evolution of the existing LTER-Europe network. It will be a legal entity, managed centrally via a Head Office and able to bid for funding. Participating organisations operating nationally-funded infrastructure (National Research Infrastructures, NRI) will commit to upgrading selected eLTER Sites and eLTSER Platforms to meet agreed criteria, measure harmonised parameters, provide comparable datasets and allow site access by a range of users. It will offer an agreed set of Services (e.g. data, access to sites and training), accessible through a Service Portal and delivered by the Head Office, the NRIs and supporting Topic Centres.

As well as supporting a wide range of ecosystem research, eLTER RI will have a research agenda aimed at addressing four Grand Challenges:

- Biodiversity loss and land use change
- Climate change and greenhouse gases
- Eutrophication and pollution – Reactive N in the environment
- Environmental protection, sustainable management of natural resources, water, biodiversity and ecosystems.

Integrated observations supporting whole ecosystem science

eLTER RI will adopt a fundamentally systemic approach to observe and analyse the environmental system, encompassing biological, geological, hydrological and socio-ecological perspectives.

Several existing thematic environmental RIs focus on impacts of climate change and/or other elements of environmental change. eLTER RI will be the only research infrastructure embracing holistically the integrated impacts of such stressors on a wide variety of European ecosystems.

eLTER RI will comprise terrestrial, freshwater and transitional water sites. It will allow in situ, co-located gathering of Essential Variables ranging from bio-physico-chemical to biodiversity and socio-ecological data. Ecosystem change caused by long-term pressures and short-term pulses will be investigated in a nested design from the local to the continental scale.

Key features of eLTER RI

- Wide scale and systematic coverage of major European terrestrial, freshwater and transitional water environments – 250 research sites selected from a wider pool of ≈ 400 sites
- Integrated environmental observations including socio-ecological research
- Investigations of the interactions between abiotic and biotic ecosystem components at multiple scales, including human-environment interactions
- Enables research into ecosystem processes influenced by multiple drivers, as well as socio-ecological research relating to ecosystem services
- Central Services provided by: Head office, Service Portal and thematic Topic Centres
- Strong links with other European environmental RIs and embedded in the context of international LTER (ILTER).

Who is eLTER RI for and what will it offer?

eLTER RI will serve a wide range of users including: ecosystem, critical zone, socio-ecological and related researchers; policymakers; students; authorities and civil society. eLTER RI will:

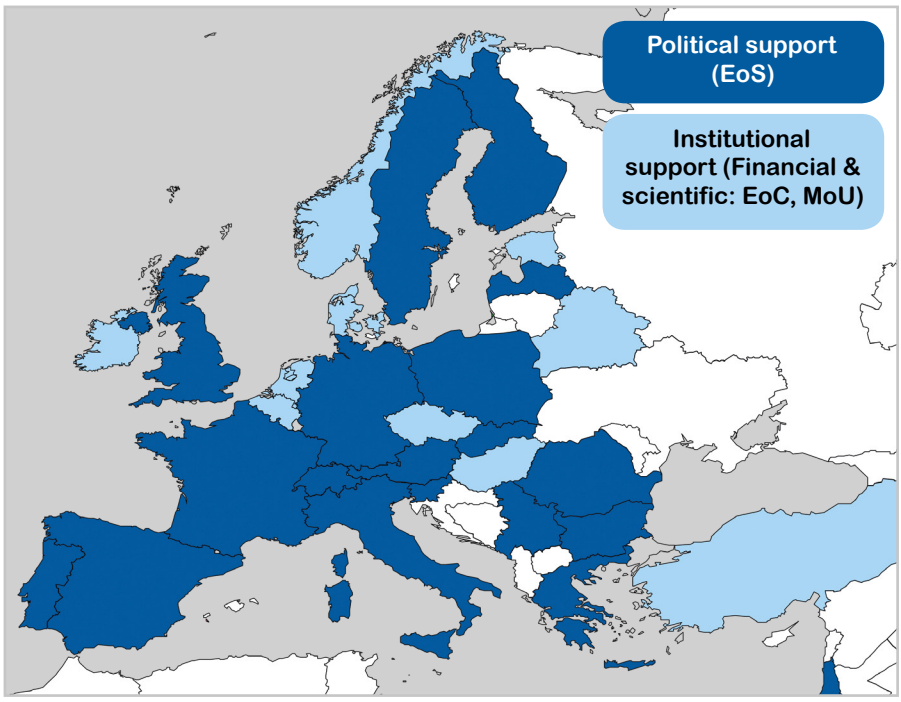
- Fill a critical gap for top-class, continental scale science
- Provide access to integrated research sites and local expert teams
- Enable easy access to long-term data, data products, models and analysis tools
- Support research project design
- Support ground-truthing and remote sensing service development
- Aid the development and testing of new observation technologies and approaches
- Offer education and training programmes for RI providers, RI managers, researchers, other data users and students
- Yield information on the state of European ecosystems and impacts of pressures.

When will eLTER RI be operational?

We anticipate the eLTER Research Infrastructure to be fully operational by 2026.

Support for eLTER RI

eLTER RI is on the 2018 European Strategy Forum on Research Infrastructures (ESFRI) Roadmap and, as at May 2019, is supported by 19 countries providing Expressions of Political Support (Eos). The RI has also received 78 Expressions of Financial Commitment (EoC), pledging support from organisations, most of whom operate NRIs. Finally, eLTER RI has received 161 Memoranda of Understanding (MoU) from organisations in 27 countries, signalling support for the scientific objectives of the RI.



Country support for eLTER RI
19 EoS = Expression of Political Support
78 EoC = Expression of Financial Commitment
161 MoU = Memorandum of Understanding

eLTER resource

DEIMS Site and dataset registry

https://deims.org

Information about LTER Sites and LTSER Platforms in Europe and around the world can be found on DEIMS-SDR, the Dynamic Ecological Information Management System Site and Data Repository. There are links to DEIMS records throughout this catalogue. DEIMS will be a central component of the eLTER Research Infrastructure (see pages 4-5).

Accredited sites

38

Network started

2002

Austria

LTER-Austria

www.lter-austria.at

Austria

Agricultural Research and Education Centre Raumberg-Gumpenstein

AGRICULTURAL AND ENVIRONMENTAL RESEARCH

The Agricultural Research and Education Centre Raumberg-Gumpenstein is the largest Austrian multidisciplinary research and education centre from the Austrian Federal Ministry of Sustainability and Tourism. It is driving-force for sustainable economizing and very well anchored internationally. The head office is situated in the Styrian Enns Valley at an altitude of 700 m a.s.l, embedded in a mountainous landscape, dominated by grassland and forests. More than 330 employees work in four research institutes (Livestock, Plant Production and Cultural Landscape, Animal Welfare and Health, Organic Farming, Farm Animal Biodiversity) and as teachers at the technical agrarian college (Agrarian Management and Marketing, Environment and Resource Management, with about 440 students) and at universities. AREC has external research areas and test sites with different climate conditions all over Austria (Wels, Lambach in Upper Austria, Winklhof/Salzburg, Admont/ Styria). AREC is specialized in research for multifunctional farm and environmental systems, developing complex landscape analysis with focus on agriculture, sustainable usage of natural resources, climate change, preservation of biodiversity and rural development. AREC offers a high expertise in dissemination of know-how. Workshops, trainings, national and international conferences are organized regularly with several hundred participants each year. Our experts are involved in manifold inter/national research projects and networks.

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

AREC provides a large variety of agricultural and environmental impact assessments. The main topics of research are grassland ecology, plant sociology, site specific greening, floristic biodiversity, preservation of nature, soil health, lysimetry, climate and its consequences, cultural landscape, animal husbandry, animal health and welfare, organic agriculture, biodiversity of farm animals, alternative cattle-keeping and herd-management, emissions and nuisance of animal

husbandry, animal housing systems, energy- and nutrient-flows in agriculture as well as quality of food. The long-term monitoring site is equipped with high tech infrastructure (e.g. weather station, lysimeters, different research plots), research stables, chemistry and water labs.

Location: Irdning-Donnersbachtal, 110 km northwestern of Graz and 130 km south-eastern of Salzburg

Ecosystems: Agricultural; Alpine; Forest; Grasslands; Lakes; Rivers

Research topics: conservation; animal ecology; wetland ecology; biodiversity; species diversity; ecosystem ecology; plant ecology; vegetation dynamics; population ecology; soil chemistry; water chemistry; environmental science; agriculture; climate change; climate monitoring; soil physics; land use history

Contact(s): Renate Mayer, renate.mayer@raumberg-gumpenstein.at; Andreas Bohner

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | 2WD | 4WD | Power - Dist | SR | Beds

DEIMS.ID: 11aff5a6-d464-40fa-b218-fcad8f57c81f

Web links

- http://www.raumberg-gumpenstein.at

Austria

Fuchsenbigl

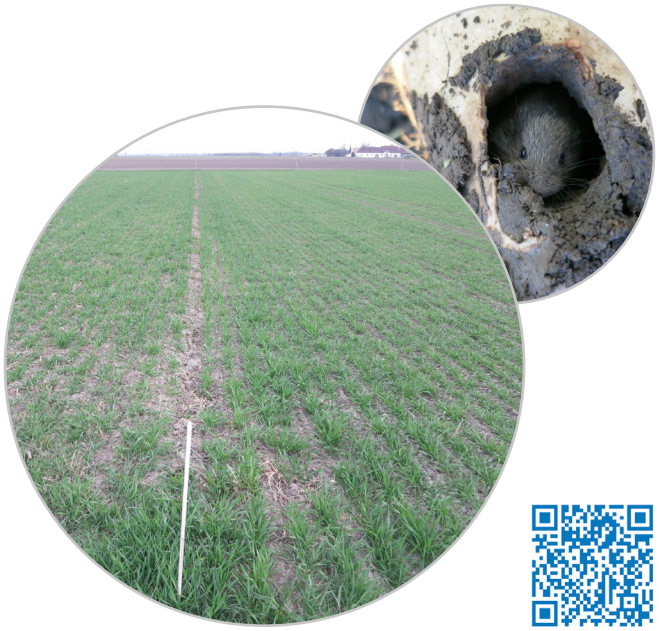
ARABLE EXPERIMENTS (AGRO-ECOSYSTEMS)

The Fuchsenbigl Field Station is an agricultural research site of the Austrian Agency for Health and Food Safety (AGES) and representative of productive soils managed as arable land.

This site is located in the Marchfeld (Lower Austria), the soil is described as a fine sandy-loamy Calcaric Chernozem (WRB). Cultivated crops include cereals (e.g. winter wheat, barley, rye), sugar beet, maize and potatoes. Current research objectives include to study the effects of different conventional arable management practices on crop yields and quality and on chemical, physical and biological soil parameters.

The following data are collected at the site:

- *Chemical soil data:* pH, Corg, Nt, CEC, carbonate content, plant available nutrients (P, K) - once a year from the tillage experiment, selected parameters at irregular intervals from the other field experiments; molecular characteristics of SOM (bulk samples, humic acids) with different spectroscopic methods - once (14C and tillage experiment)
- *Physical soil data:* texture, bulk density, aggregate stability, water capacity, pore volume, water permeability - once/twice (tillage experiment)
- *Microbial soil data:* once a year (substrate induced respiration; N-mineralisation; xylanase activity; pot. nitrification; phosphatase activity; protease activity) - till 2002 at the tillage experiment
- *Crop data (yields, nutrient contents):* each year



- Long term mineral P- and K-fertilisation (since 1956)
- Removal/return of crop residues, P-fertilisation (in Rutzendorf, Marchfeld, since 1982)

Location: Marchfeld, ca. 30 km from Vienna

Ecosystems: Agricultural

Research topics: biology; ecology; chemistry; environmental science; physics; toxicology

Contact(s): Adelheid Spiegel, adelheid.spiegel@ages.at

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SR | Power

DEIMS.ID: 09f126be-39db-4db8-af41-ac13cd12e8ea

Purpose of site

PARTLY OBSERVATION
MAINLY EXPERIMENTATION

At Fuchsenbigl soil organic matter and nutrient dynamics affected by different soil management (e.g. tillage, cropping systems, mineral and organic fertilisation, crop residues management) are investigated with the following long-term experiments:

- Long-term field experiment with 14C-labeled wheat straw and farmyard manure (since 1967)
- Long-term field experiment with different tillage treatments (since 1988)

Austria

Gesäuse National Park

CALCAREOUS MOUNTAINS DIVIDED BY RIVERINE LANDSCAPE

The Gesäuse National Park is located in the heart of Austria and covers an area of 120 km². It was founded in 2002 and shortly after accepted as an IUCN Category II protected area. The NP also forms the core of the Natura 2000 area Ennstaler Alpen & Gesäuse.

The Gesäuse is characterized by a mountainous landscape which is separated by the river Enns. High relief intensity shapes the scenery. Half of the National Park is covered by mountain forests. Other important habitats are alpine grassland, rock and scree habitats and pastures. The Enns with its alluvial forests and river banks as well as the numerous freshwater springs represent very unique habitats within the mountain ranges.

Due to the various altitudinal range there is a manifold mosaic of extremely diverse habitats and, consequently, a high density of animal and plant species, especially endemic species.

In the Gesäuse National Park the focus of research is on dynamic habitats like avalanche chutes, scree gullies or gravel banks in the river. Concerning long-term research, over the last 15 years the Gesäuse National Park has established a network of permanent monitoring sites. In addition to monitoring the vegetation in these sites, various groups of animals are studied as indicator species. Meteorological measurements at all altitudinal zones support climate change studies on flora and fauna at mountain Peaks (GLORIA).

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

The main purpose of the Gesäuse National Park is to safeguard natural processes. Thus, unmanaged domains were established considering IUCN criteria. In the management zone the maintenance of mountain pastures with a sustainable cultivation and the renaturation of artificial spruce forests are also important aims of the National Park. Moreover, environmental education and interpretation is a major purpose. For evaluating management actions, monitoring programs and (re)survey studies are implemented. Furthermore, the National Park

supports studies of researchers and students who carry out their field work within the National Park area. Additionally, there are various annual programs like “speleo alpin” (mapping caves), “spring week” (studying species composition of mountain water) or biodiversity awareness days.

Location: Gesäuse NP is an alpine landscape about 150-200 km from Salzburg or Vienna and 15-20 km from the next railway station or motorway ramp

Ecosystems: Alpine; Temperate broadleaf and mixed forests; Temperate coniferous forests; Montane grasslands and shrublands; Small lakes; Fresh Water Rivers

Research topics: biology; conservation; aquatic ecology; lake ecology; stream ecology; biodiversity; genetic diversity; species diversity; community ecology; community dynamics; successional dynamics; ecosystem ecology; ecosystem function; forest ecology; plant ecology; vegetation dynamics; population ecology; population changes over time; population dynamics; terrestrial ecology; genetics; taxonomy; soil chemistry; water chemistry; geology; geomorphology; hydrography; limnology; silviculture; meteorology; climatology; climate change; climate monitoring; social sciences; history; land use history; sociology

Contact(s): Alexander Maringer, alexander.maringer@nationalpark.co.at

All parts of site accessible: No

Infrastructure:

All yr

DEIMS.ID: f475dd9a-968f-4640-bac4-1eac12987e67

Web links

- http://www.nationalpark.co.at

Austria

ICP_Forests_Austria, Jochberg (ICP_FO_AU17)

MOUNTAINOUS MANAGED SPRUCE FOREST

The site Jochberg is part of the European Level II Forest Monitoring System in the frame of the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests). This site is one of 16 Austrian Level II sites; it was established in 1995 and is, since 2006, part of the LTER Austria network.

Purpose of site

ONLY OBSERVATION
NO EXPERIMENTATION

The main objective of the Level II Forest Monitoring System is to gain a better understanding of the cause-effect relationships between the condition of forest ecosystems and anthropogenic as well as natural stress factors (in particular air pollution). The plot infrastructure encompasses 2 meteorological stations (stand, open land), throughfall collectors, soil temperature and soil moisture measurements, soil solution samplers, litter collectors, throughfall and wet deposition collectors, and electronically diameter girth bands. Tree growth (increment of height and diameter) is assessed periodically as well as ground vegetation and the occurrence of biotic and abiotic damages. The site is equipped with remote data access and solar power supply. All assessments and (chemical) analyses are carried out at the Austrian Research Centre for Forests (BFW).

Location: In the east of the federal country Tyrol in the Austrian Central Alps, about 15 km south of the skiing resort Kitzbühel

Ecosystems: Forest

Research topics: ecology; forest ecology; terrestrial ecology; environmental science; silviculture; meteorology

Contact(s): Ferdinand Kristöfel, ferdinand.kristoefel@bfw.gv.at

All parts of site accessible: No

Infrastructure:

All yr | 2WD | 2WD | T: can | Power - Dist | <1 kW | Data: Int | Data: Ext

DEIMS.ID: 0da4be08-87f8-41e2-a564-2cd2ccdb3da2

Austria

ICP_Forests_Austria, Klausen-Leopoldsdorf (ICP_FO_AU09)

HOMOGENOUS 80 YEARS-OLD MANAGED BEECH STAND

The site Klausen-Leopoldsdorf is part of the European Level II Forest Monitoring System in the frame of the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests). This site is one of 16 Austrian Level II sites; it was established in 1995 and is, since 2006, part of the LTER Austria network.

Purpose of site

MAINLY OBSERVATION
NO EXPERIMENTATION

The main objective of the Level II Forest Monitoring System is to gain a better understanding of the cause-effect relationships between the condition of forest ecosystems and anthropogenic as well as natural stress factors (in particular air pollution). The plot infrastructure encompasses 2 meteorological stations (stand, open land), throughfall collectors, soil temperature and soil moisture measurements, soil solution samplers, litter collectors, throughfall and wet deposition collectors, and electronically diameter girth bands. Tree growth (increment of height and diameter) is assessed periodically as well as ground vegetation and the occurrence of biotic and abiotic damages. The site is equipped with remote data access and solar power supply. All assessments and (chemical) analyses are carried out at the Austrian Research Centre for Forests (BFW).

Location: Situated about 20 km west of Vienna

Ecosystems: Deciduous Forest

Research topics: ecology; forest ecology; terrestrial ecology; environmental science; silviculture; meteorology

Contact(s): Ferdinand Kristöfel, ferdinand.kristoefel@bfw.gv.at

All parts of site accessible: No

Infrastructure:

All yr | 2WD | T: can | Power - Central | <1 kW | Data: Int | Data: Ext

DEIMS.ID: bb472a51-f85f-4de0-8358-f21ecbe2a102

Austria

ICP_Forests_Austria, Mondsee (ICP_FO_AU11)

MANAGED MIXED SPRUCE-BROADLEAVED FOREST

The site Mondsee is part of the European Level II Forest Monitoring System in the frame of the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests). This site is one of 16 Austrian Level II sites; it was established in 1995 and is, since 2006, part of the LTER Austria network.

Purpose of site

MAINLY OBSERVATION
NO EXPERIMENTATION

The main objective of the Level II Forest Monitoring System is to gain a better understanding of the cause-effect relationships between the condition of forest ecosystems and anthropogenic as well as natural stress factors (in particular air pollution). The plot infrastructure encompasses 2 meteorological stations (stand, open land), throughfall collectors, soil temperature and soil moisture measurements, soil solution samplers, litter collectors, throughfall and wet deposition collectors, and electronically diameter girth bands. Tree growth (increment of height and diameter) is assessed periodically as well as ground vegetation and the occurrence of biotic and abiotic damages. The site is equipped with remote data access and solar power supply. All assessments and (chemical) analyses are carried out at the Austrian Research Centre for Forests (BFW).

Location: 25 km east of the city of Salzburg at 850 m a.s.l.

Ecosystems: Mixed Forest

Research topics: ecology; forest ecology; plant ecology; vegetation dynamics; terrestrial ecology; environmental science; hydrology

Contact(s): Ferdinand Kristöfel, ferdinand.kristoefel@bfw.gv.at

All parts of site accessible: No

Infrastructure:

All yr | 2WD | T: can | Power - Dist | Data: Int | Data: Ext

DEIMS.ID: 8a313716-ceed-4f41-8b0b-a8197bfc304a

Web links

- http://waldmonitoring.at/

Austria

ICP_Forests_Austria, Murau (ICP_FO_AU16)

SUBALPINE MANAGED SPRUCE-LARCH FOREST

The site Murau is part of the European Level II Forest Monitoring System in the frame of the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests). This site is one of 16 Austrian Level II sites; it was established in 1995 and is, since 2006, part of the LTER Austria network.

Purpose of site

ONLY OBSERVATION
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Location: Austrian Central Alps about 100 km west of the city of Graz in the federal country Styria

Ecosystems: Temperate coniferous forests

Research topics: biology; forest ecology; plant ecology; vegetation dynamics; terrestrial ecology; soil chemistry; soil solution chemistry; environmental science; hydrology; meteorology; climatology; climate monitoring

Contact(s): Ferdinand Kristöfel, ferdinand.kristoefel@bfw.gv.at

All parts of site accessible: No

Infrastructure: All yr | 2WD | T: can | Power - Dist | Data: Int | Data: Ext

DEIMS.ID: 580e2d1a-e45e-4b65-9962-1bdcc3d76ad3

Austria

ICP_Forests_Austria, Mürzzuschlag (ICP_FO_AU15)

MANAGED SUBMOUNTAINOUS SPRUCE FOREST

The site Mürzzuschlag is part of the European Level II Forest Monitoring System in the frame of the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests). This site is one of 16 Austrian Level II sites; it was established in 1995 and is, since 2006, part of the LTER Austria network.

Purpose of site

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Location: North-eastern part of the federal country Styria, about 65 km north of the city of Graz

Ecosystems: Mixed Forest

Research topics: community ecology; successional dynamics; forest ecology; plant ecology; vegetation dynamics; terrestrial ecology; depositions chemistry; soil chemistry; soil solution chemistry; environmental science; meteorology; climatology; climate monitoring

Contact(s): Ferdinand Kristöfel, ferdinand.kristoefel@bfw.gv.at

All parts of site accessible: No

Infrastructure:

All yr | 2WD | T: can | Power | <1 kW | Data: Int | Data: Ext

DEIMS.ID: f2dd51af-ad46-4710-bd5b-cac4b674b675

Austria

ICP_Forests_Austria, Unterpullendorf (ICP_FO_AU2)

HOMOGENOUS 100 YEARS OLD MANAGED OAK STAND

The site Unterpullendorf is part of the European Level II Forest Monitoring System in the frame of the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests). This site is one of 16 Austrian Level II sites; it was established in 1995 and is, since 2006, part of the LTER Austria network.

Purpose of site

MAINLY OBSERVATION
NO EXPERIMENTATION

The main objective of the Level II Forest Monitoring System is to gain a better understanding of the cause-effect relationships between the condition of forest ecosystems and anthropogenic as well as natural stress factors (in particular air pollution). The plot infrastructure encompasses 2 meteorological stations (stand, open land), throughfall collectors, soil temperature and soil moisture measurements, soil solution samplers, litter collectors, throughfall and wet deposition collectors, and electronically diameter girth bands. Tree growth (increment of height and diameter) is assessed periodically as well as ground vegetation and the occurrence of biotic and abiotic damages. The site is equipped with remote data access and solar power supply. All assessments and (chemical) analyses are carried out at the Austrian Research Centre for Forests (BFW).

Location: Situated about 80 km south of Vienna near the Hungarian border

Ecosystems: Temperate broadleaf and mixed forests

Research topics: biology; biodiversity; species diversity; depositions chemistry; soil chemistry; soil solution chemistry

Contact(s): Ferdinand Kristöfel, ferdinand.kristoefel@bfw.gv.at

All parts of site accessible: No

Infrastructure:

All yr | 2WD | T: can | Power | <1 kW | Data: Int | Data: Ext

DEIMS.ID: 2e80048a-3b38-4a25-9764-bd7c3d2c6a7d

Austria

LTER Zöbelboden

MOUNTAIN FOREST CATCHMENT

The Zöbelboden was established in 1992 as the only Integrated Monitoring station in Austria under the UN Convention on long-range transboundary air pollution (CLRTAP). In 2006 it became part of LTER Austria. The Zöbelboden covers a small forested catchment (90 ha) of a karstic mountain range (500 to 950 m above sea level) in the Kalkalpen National Park. Monitoring and research is focusing on air pollution effects on forested catchments and its interaction with climate change. The Zöbelboden represents one of the best known karst catchments in Europe with long-term data series of the major components of its ecosystems. The Zöbelboden is managed by the Umweltbundesamt GmbH. Sampling of chemical specimens is done by local staff. Chemical analyses are carried out by the laboratory of the Umweltbundesamt in Vienna.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

LTER Zöbelboden is a small, well definable catchment of 90 ha in the Kalkalpen National Park in Austria. Material inputs, pollutants and nutrients via air and precipitation are measured as well as their effects on the ecosystem. Their behaviour within the ecosystem is studied in a comprehensive manner and effects are determined. With standardized methods the long-term trends of ecosystem water and element fluxes are studied. Outputs through surface waters are part of this work, as are trends in biodiversity and effects of climate change. The long-term data is used in the UNECE CLRTAP effects monitoring networks, in EMEP, and the national air pollution monitoring. LTER Zöbelboden is an important site within the Austrian LTER network so that many research institutions use the site in their projects.

Location: 200 km west of Vienna, 70 km south of Linz, Upper Austria

Ecosystems: Temperate broadleaf and mixed forests; Temperate coniferous forests

Research topics: biology; conservation; dendrochronology; animal ecology; biodiversity; species diversity; community ecology; community dynamics; successional dynamics; ecosystem ecology; forest ecology; microbial ecology; plant ecology; vegetation dynamics; population ecology; plants population changes over time; population changes over time; population dynamics; terrestrial ecology; phenology; air chemistry; biogeochemistry; depositions chemistry; isotopic chemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; geology; hydrology; silviculture; meteorology; climatology; climate change; climate monitoring; physics; soil physics; geography; biogeography; history; land use history

Contact(s): Johannes Kobler, johannes.kobler@umweltbundesamt.at; Thomas Dirnboeck; Ika Djukic

All parts of site accessible: No

Infrastructure:

All yr | 4WD | SC | 2WD | 4WD | SR | Beds | °C | T: >10m | °Power - Central | Data: Int | Data: Ext

DEIMS.ID: 8eda49e9-1f4e-4f3e-b58e-e0bb25dc32a6

Web links

- http://www.umweltbundesamt.at/en/services/services_pollutants/services_airquality/en_ref_zoebelboden/
- http://www.umweltbundesamt.at/umweltsituation/oekosystemareumweltkontrolle/oekosystem_monitoring/
- https://www.youtube.com/watch?v=rL-XnwiXr8Y

Austria

LTSER Platform Eisenwurzen (EW)

POST-MINING REGION IN THE NORTHERN LIMESTONE ALPS

The LTSER Platform Eisenwurzen was established in 2004. A network of LTER sites and institutions as well as high-quality documentation (data) provide good prerequisites for LTSER.The region represents both a natural space and a historically developed social and economic area. It extends over 91 municipalities and a total area of 5,904 km^2 in the provinces of Upper Austria, Lower Austria and Styria. 80 % of the LTSER Platform are part of the Northern Alps, 11 % of the area belong to the Northern Alpine Foothills and 9 % belong to the Central Alps. Altitudes range from 167 to 2,515 m a.s.l. The climate type is Continental. Depending on local conditions, annual precipitation values between 730 mm and 2,202 mm are measured. Annual mean temperatures range from -0.8 °C to 9.14 °C. The region is looking back on a more than 800-year-old land use history. It was characterised by a complex interaction of iron ore mining and transport as well as agriculture and forestry. After the decline of the mining industry overgrowth by woodland and depopulation became the most important trends for landscape and society. While mining and manufacture gave the region economic power in former times, tourism, agriculture and forestry are the main sources of income today.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The LTSER Platform Eisenwurzen represents a range of challenges for regional development, like a lack of jobs, migration of young people, a loss of local infrastructure or abandonment and afforestation. The distinct temporal and spatial land use gradients – embedded in global trends – make this post-mining region an interesting study area. Research projects cover questions of basic ecosystem research, of applied biodiversity and conservation research and of socio-ecological research. The results build a basis for sustainable ecosystem management and preservation as well as sustainable regional development. Findings from this LTSER Platform can be relevant for other regions within the same socio-ecological zone.

Location: Border area of Upper Austria, Lower Austria and Styria in the Northern Limestone Alps, 120 - 250 km WSW of Vienna and 70 - 120 km S of Linz

Ecosystems: Agricultural; Alpine; Temperate broadleaf and mixed forests; Temperate coniferous forests; Montane grasslands and shrublands; Fresh Water Lakes; Fresh Water Rivers, Urban

Research topics: natural science; biology; conservation; animal ecology; lake ecology; stream ecology; biodiversity; species diversity; community dynamics; trophic dynamics; ecosystem ecology; ecosystem function; ecosystem service; forest ecology; landscape ecology; long term ecological research; microbial ecology; plant ecology; vegetation dynamics; terrestrial ecology; physiology; ecophysiology; plant physiology; air chemistry; biogeochemistry; soil chemistry; geology; hydrology; limnology; agriculture; aquaculture; silviculture; climate change; climate monitoring; social sciences; land use history; sociology

Contact(s): Andrea Stocker-Kiss, andrea.stocker-kiss@umweltbundesamt.at

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | T: >10m | Power - Dist

DEIMS.ID: d0a8da18-0881-4ebe-bccf-bc4cb4e25701

Web links

- http://www.plattform-eisenwurzen.at

Austria

LTSER Platform Tyrolean Alps (TA)

ALPINE REGION IN THE WESTERN PART OF AUSTRIA

The LTSER platform 'Tyrolean Alps' was formally installed only in 2010. However ecological – and to a certain degree socio-ecological research - has been carried out in the Tyrolean Alps over many decades. Databases exist on climate, glacier balances, permafrost, hydrology, biodiversity, greenhouse gas fluxes, historical land-use changes, tourism, demography, agro-economy and a wealth of comprehensive but singular studies in the region. Research topics include responses of organisms and of biogeochemical processes to extreme life conditions and to global changes in both terrestrial and aquatic ecosystems. For two valleys/ valley sections socio-economic changes have been documented and past, current and possible future landscape changes have been assessed, evaluating also effects on ecosystem services. The recent research history at the Tyrolean Alps LTSER Platform has shown that a monitoring of the biogeochemistry of target ecosystems combined with an experimental unravelling of global change effects on processes, and the consideration of socioeconomic developments are a fruitful way forward increasing the value of LTSER sites also for international projects and networks. In this area, dominated by high mountains and their sensitive ecosystems, nine LTER sites (some of which comprised several habitat types) are embedded, including two lakes, grasslands at different altitudes, a treeline site, a glacier foreland, and several glaciers.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The Tyrolean Alps LTSER platform is a part of the European long-term research network LTER-Europe. In the framework of LTER-Europe, a network is being established of 50 LTSER platforms carrying out exemplary research into the natural and inhabited areas (socio-ecological regions) of Europe. Conclusions relating to these best-researched European regions can be applied to other regions within the same socio-ecological zone. These conclusions can be viewed as recommendations for regional policy and decision making on future strategy.

Location: LTSER Tyrolean Alps integrates nine research and monitoring sites ranging from 15 to 150 km from Innsbruck

Ecosystems: Agricultural; Alpine; Temperate coniferous forests; Montane grasslands and shrublands; Fresh Water Lakes; Urban

Research topics: biology; biodiversity; air chemistry; interstitial water chemistry; soil chemistry; water chemistry; terrestrial ecology; plant ecology; vegetation dynamics; ecosystem ecology; animal ecology; aquatic ecology; lake ecology; geography; biogeography; land use history; hydrology; limnology; agriculture; meteorology; demography

Contact(s): Ulrike Tappeiner, ulrike.tappeiner@uibk.ac.at

All parts of site accessible: No

Infrastructure:

All yr | 4WD | SC

DEIMS.ID: 8cf20f01-7aa1-418b-a613-a95ceeb350dd

Web links

- http://www.lter-austria.at/ta-tyrolean-alps/

Austria

Mondsee Limnological Institute

FRESHWATER LAKE & CATCHMENT, NATURA 2000 AREA

The Mondsee Limnological Institute site is a Natura 2000 area in Upper Austria. Connected to the Research Institute for Limnology, Mondsee of the University of Innsbruck this site has a long tradition of data sampling. The LTER Site Mondsee in the Salzkammergut lake district is of high ecological, socio-economic and touristic importance. In the 1960s and 1970s the lake underwent a period of eutrophication, followed by a period of re-oligotrophication due to sewage water treatment in the 1980s. The lake has been monitored since the 1950s, mainly by the Research Institute for Limnology, Mondsee of the University of Innsbruck and the Institute for Water Ecology, Fisheries and Lake Research of the Federal Agency for Water Management. Long-term data sets are available for physico-chemical parameters (temperature, oxygen, pH, conductivity), nutrients, and phytoplankton.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The purpose of the site is to investigate and advance scientific understanding of freshwater ecosystems, monitoring of ecosystem change.

Location: Mondsee, 35 km east of Salzburg city and international airport

Ecosystems: Fresh Water Lakes

Research topics: biology; animal ecology; aquatic ecology; lake ecology; biodiversity; genetic diversity; species diversity; ecosystem ecology; ecosystem function; evolutionary ecology; microbial ecology; paleoecology; population ecology; population changes over time; population dynamics; genetics; physiology; ecophysiology; taxonomy; water chemistry; environmental science; limnology; paleolimnology; fishery; toxicology; ecotoxicology

Contact(s): Thomas Weisse, thomas.weisse@uibk.ac.at

All parts of site accessible: Yes

Infrastructure:

All yr | BOAT | SC | 2WD | 4WD | BOAT | SR | Beds | Power - Central | 1-5 kW | Data: Int

DEIMS.ID: 89cf2c05-a05b-4033-b7ac-1b24190dd88c

Web links

- http://www.uibk.ac.at/limno/

Austria

Rosalia Lehrforst

MIXED FOREST ON THE WESTERN SLOPE OF ROSALIA RIDGE

The University forest is about 1000 ha and contains all the major tree species and forest types in Austria (Norway spruce, Fir, Larch, Scots pine, Beech, Oak, etc). The forest area is located in the Rosalia Mountains near the Lower Austria/Burgenland border. The Demonstration Forest (950 ha) was set up in 1972 by agreement between the Federal Forst of Austria and the University, though the University has managed the area since 1875, when it was documented extensively and a forest description and plan was elaborated. The site is located on the western slope of the mountainous „Rosaliengebirge“ ridge in the southeastern part of Lower Austria (LAT 47°42’N, LON 16°17’ E). Elevation is between 300 and 720 m a.s.l, annual mean temperature is 6.5 °C and annual precipitation is 800 mm. The forest is mainly composed of beech associations (*Fagetums*) , with a peripheral spruce-fir-beech forest association (*Abieti-Fagetum*).

Research focuses on the following areas:

- Collection of area-based data by means of a Geographic Information System (GIS) and development of user-support applications
- Collection of environmental data
- Establishent and monitoring of sample plots, especially for beech growth and treatment related questions
- Characterization of local and microclimate
- Environmental impacts on forest ecosystems
- Monitoring and modelling of small forested watersheds.

Research and educational infrastructure includes:

- 3 weather monitoring stations
- 2 scaffold towers for measurements at 35 m, with instrument cabin
- 1 measuring weir for runoff monitoring (Watershed 230 ha)
- Surveying and mapping equipment (terrestric and GPS)
- IT room with a range of software (GIS, planning tools etc.)
- Laboratories, work rooms, lecture rooms & accommodation.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The key task of the Forest Demonstration Centre is supporting the educational and research work of the University of Natural Resources and Life Sciences. Accordingly, accommodation, work and teaching facilities are provided.

Location: Rosalia Ridge, on the eastern border of Lower Austria, 70km south of Vienna

Ecosystems: Temperate broadleaf and mixed forests;Temperate coniferous forests; Small rivers

Research topics: forest ecology; terrestrial ecology; soil chemistry; soil solution chemistry; water chemistry; geology; hydrology; meteorology; geography

Contact(s): Josef Gasch, josef.gasch@boku.ac.at

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | 4WD | SR | Beds | T: can | T: <10m | Power - Central | 10-100 kW | Data: Int | Data: Ext

DEIMS.ID: 77c127c4-2ebe-453b-b5af-61858ff02e31

Web links

- http://www.wabo.boku.ac.at/lehrforst/

Austria

Sonnblick Observatory

HIGH ALTITUDE RESEARCH STATION

The Sonnblick Observatory is located in the Austrian Central Alps at an elevation of 3100 m a.s.l. It is situated at the alpine main divide, which is a clear climatological border. It also lies in the “Nationalpark Hohe Tauern” which covers 1856 km² of the Austrian Alps. Research of Sonnblick is currently formulated in the research programme ENVISON. It covers three main topics (the atmosphere, the cryosphere, and the biosphere) in an extensive monitoring programme and with many research projects. Sonnblick is outstanding with respect to its long-term climate observations and studies on glacier changes. Thus, the impact of Climate Change on the cryosphere is a major research topic at Sonnblick. Since 1886, Sonnblick was also involved in many international projects on atmospheric chemistry and atmospheric physics. The research is described on www.sonnblick.net. Sonnblick Observatory cooperates with several Austrian and international universities/research institutions. Within the frame of the GAW-DACH cooperation, Sonnblick has a special partnership with the observatories Jungfraujoch (in Switzerland), Zugspitze and Hohenpeissenberg (both Germany) for common research on atmospheric processes and Climate Change. The Sonnblick observatory ist part of several (WMO) networks.

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

Research of Sonnblick is currently formulated in the research programme ENVISON. It covers three main topics (the atmosphere, the cryosphere, and the biosphere) in an extensive monitoring programme and with many research projects.

Location: Located within the Austrian Alps at the top of mount “Hoher Sonnblick” at 3.106m altitude on an alpine ridge, close to Rauris, Kolm Saigurn

Ecosystems: Alpine

Research topics: biology; air chemistry; atmospheric chemistry; depositions chemistry; isotopic chemistry; glaciology; meteorology; climatology; physics; atmospheric physics; soil physics

Contact(s): Elke Ludewig, elke.ludewig@zamg.ac.at

All parts of site accessible: Yes

Infrastructure:

All yr | CABLE | SR | T: >10m | Power - Central | Data: Int | Data: Ext

DEIMS.ID: b2015216-ac0a-433f-8044-8ba8c46cc6c9

Web links

- http://www.sonnblick.net

Austria

Stubai (combination of Neustift meadows and Kaserstattalm)

GRASSLAND ECOSYSTEMS

The LTER grassland sites in the Stubai Valley are situated near the village of Neustift (47° 7' N, 11° 18' E). They include a valley bottom meadow at 970 m a.s.l., cut 3-4 times per year, as well as three grasslands differing in land use, which are located on the mountain slope in the vicinity of the Kaserstattalm: a mountain meadow at 1810 m a.s.l. (one cut, lightly grazed in late summer), a pasture at 1870 m a.s.l. and a grassland at 1980 m a.s.l., which was abandoned in 1984. Documentation of management history and vegetation dynamics of the whole area date back to 1865, and detailed information on the current socio-economic situation and future land-use scenarios is available.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

At the LTER-grassland sites ecological effects of global change on mountain regions have been experimentally studied since 1993.

A range of EU research projects (Integralp, Ecomont, Carbomont, Vital, Carbo-Extreme, GHG-Europe), five FWF-projects and numerous international and national projects have contributed studies on greenhouse gas fluxes (focus on CO_2, but also methane, N_2O and VOC), productivity, C sequestration, nitrogen cycling, water balance and potential risks such as erosion and snow gliding.

At all four sites micro-climate stations are continuously recording solar radiation, precipitation, air- and soil temperatures and moisture, as well as soil CO_2 concentrations Since 2001 the net exchange of CO_2 and water vapour between the valley bottom meadow and the atmosphere have been monitored at high time resolution, and contribute to the international Fluxnet database.

Furthermore on all LTER-sites experiments have been and are being performed assessing the impact of global changes (climate, land use) on ecological processes in mountain grassland.

Location: The Stubai site is about 15 to 20 km from Innsbruck airport and Innsbruck main railway station

Ecosystems: Agricultural; Alpine; Forest; Grasslands

Research topics: ecology; hydrology; social sciences

Contact(s): Ulrike Tappeiner, ulrike.tappeiner@uibk.ac.at; Michael Bahn

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | SC | Power - Central | Data: Int

DEIMS.ID: 324f92a3-5940-4790-9738-5aa21992511c

Web links

- http://www.uibk.ac.at/ecology/forschung/lter/stubai.html.en

Austria

WasserCluster Lunz

LAKE ECOSYSTEM IN KARSTIC WATERSHED

The Interuniversity Centre for Aquatic Ecosystem Research, WasserCluster Lunz Biologische Station GmbH (WCL), is located on the shore of Lake Lunz („Lunzer See“) in the south of the Austrian province of Lower Austria. It is an interdisciplinary freshwater research center and designed to advance and teach freshwater science. WasserCluster Lunz is an independent research institute, with close ties to three Universities (University of Vienna, University of Natural Resources (BOKU) and Applied Life Sciences, Danube University Krems). Currently four working groups are located at WCL, covering research on biogeochemistry, biodiversity & conservation, microbial ecology, food webs, ecotoxicology and restoration ecology. Research addresses lakes and running waters, including Lake Lunz and its watershed.

The location of the WCL provides an excellent opportunity to study the ecological processes in an ecosystem (terrestrial and aquatic) which is nearly undisturbed by human impacts. Especially the aquatic ecosystems “Lunzer See” (ecosystem lake) and “Oberer Seebach” (ecosystem catchment) are closed by the WCL and are equipped with measurement instruments in a very high quality. Moreover, WKL has a fully equipped laboratory for a lot of biochemical analyses regarding the aquatic research objectives.

Four working groups with different research objectives in aquatic systems are established:

- AQUASCALE - Aquatic Biodiversity across temporal and spatial scales (R. Ptacnik)
- BIGER - Biogeochemistry and Ecohydrology of Riverine Landscapes (G Weigelhofer)
- ECOCATCH - Stream Ecology and Catchment Biogeochemistry (J Schelker)
- LIPTOX - Aquatic Lipid Research and Ecotoxicology (M Kainz)

Purpose of site

PARTLY OBSERVATION
MAINLY EXPERIMENTATION

Experimentation & observation. WCL performs process-based research on aquatic ecosystems. WCL has excellent experimental facilities, and is participant of the H2020 project AQUACOSM,

therein contributing four experimental mesocosm facilities (https://www.aquacosm.eu/mesocosm/lunz-mesocosm-infrastructure-lmi/). WCL performs long-term monitoring of Lake Lunz and is member of the global lake observation network gleon (http://gleon.org/).

Location: Located on Lake Lunz, municipality Lunz am See, ca. 160 km west of Vienna

Ecosystems: Alpine, Lakes, Rivers

Research topics: biology; conservation; ecology; biodiversity; isotopic chemistry; sediment chemistry; water chemistry; environmental science; limnology; toxicology; ecotoxicology

Contact(s): Robert Ptacnik, robert.ptacnik@wcl.ac.at

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | BOAT | SR | Beds | Data: Int | Data: Ext

DEIMS.ID: 85773d69-f94a-4305-a56f-67b6891a0a73

Web links

- http://www.wcl.ac.at/

Accredited sites

39

Network started

2014

Belgium

LTER-Belgium

www.lter-belgium.be

Belgium

Brasschaat - De Inslag

MIXED TEMPERATE CONIFEROUS FOREST

The LTER-site of Brasschaat is a 2 ha scientific zone in a first generation plantation (1929) of Scots pine (*Pinus sylvestris* L.) on former heathland located in a mixed coniferous/ deciduous forest in the Campine plain of Flanders. The landscape is flat, with a gentle (0.3%) slope at a mean elevation of 16 m. To the South and East, the forest extends over 2 km before turning into rural, partially forested terrain. The site is equipped with a measuring tower and an intensive forest monitoring plot (ICP Forests level II). The site is also part of an ICOS monitoring site which is operated by the University of Antwerp in collaboration with the Research Institute for Nature and Forest.

The air pollution characteristics at this site are typical for a suburban forest exposed to vehicle emission (NO_x), which is strongly affecting the NO-NO_2-O_3 chemistry. The site is, additionally, located in the waste plume derived from stack emissions (SO_2, NO_x, black carbon) generated by the petrochemical refinery in Antwerp port. Although no important agricultural emission sources are present in close proximity to the site, ammonia levels are elevated when winds blow from the eastern wind sector (due to remote agricultural activities > 5 km).

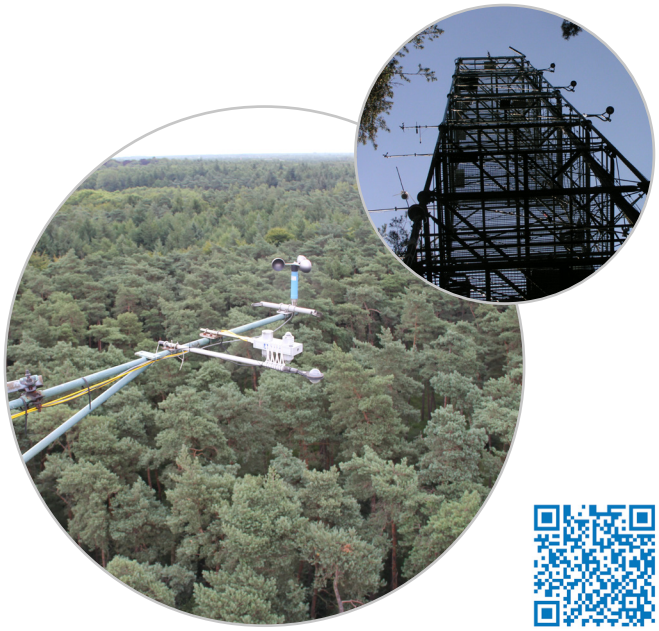
The monitoring of air pollutants will be continued with special focus on chemical and biological recovery of the forest ecosystem from historical elevated sulphur and nitrogen depositions and the combined effects of ozone, nitrogen and climate change on forest ecosystem functioning.

Purpose of site

MAINLY OBSERVATION
NO EXPERIMENTATION

The research infrastructure in Brasschaat is mainly used for intensive forest condition monitoring (ICP Forests), soil-vegetation-atmosphere transfer of nutrients (nitrogen, base cations, sulphur), dynamic soil chemistry modelling and observation of greenhouse gases (CO_2, N_2O, CH_4, O_3) in the atmosphere and soil compartment.

Meteorological variables are measured using sensors mounted at the 40m high measuring tower or located within the 2 ha-scientific zone.



Air concentration measurements are conducted at different heights along the measuring tower using slow response monitors (O_3, NO_x) for dry deposition calculations. Measurements of air pollutants (SO_2, reactive nitrogen compounds,...) are also made at a single height using passive samplers. There is an eddy-covariance set up for flux measurements (heat, momentum, water vapour, CO_2 and other GHG) to study the exchange of GHG.

Location: 20 km from Antwerp (main station)

Ecosystems: Mixed Forest; Temperate coniferous forests

Research topics: biology; dendrochronology; biodiversity; ecosystem ecology; ecosystem function; forest ecology; fungal ecology; plant ecology; vegetation dynamics; terrestrial ecology; phenology; physiology; air chemistry; atmospheric chemistry; biogeochemistry; depositions chemistry; soil chemistry; soil solution chemistry; environmental science; hydrology; meteorology; climatology; climate change; physics; atmospheric physics; soil physics

Contact(s): Johan Neirynck, Research Institute for Nature and Forest (INBO), Johan.Neirynck@inbo.be

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | SR | °C | T: >10m | Power - Central | Data: Ext

DEIMS.ID: 68e6a8e5-d6d2-4c8c-91c4-10e7f87ac556

Web links

- http://www.lter-belgium.be/22

Belgium

Gontrode - Aelmoeseneie Forest

MIXED DECIDUOUS FOREST

The Aelmoeseneie Forest is a 28.5 ha mixed deciduous forest in the community of Gontrode, just southeast of Ghent. The largest part of the forest is 'ancient forest', i.e. it is permanently forested since before 1775, while the forest is surrounded by agricultural land (mostly pastures). The soil consists of a silt loam to loam soil (Planosol), overlaying a mosaic of tertiary clayey and sandy deposits with high base saturation starting at 50 cm depth. Forest management is designed to obtain a more natural tree species composition and to conserve biodiversity. More info can be found at www.aelmoeseneiebos.ugent.be.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Since 1969 this forest was put at the disposal of the Department of Environment of Ghent University, where it serves an important educational and scientific role. Most research activities are concentrated in a marked scientific zone of 1.83 ha. The scientific zone contains an ICP Forests Level I plot , in which the condition of the trees is monitored. Also a Level II plot (0.25 ha) is located in the scientific zone, in which the effects of air pollution on the forest ecosystem are monitored, according to standard protocols. The scientific zone also contains a 35 m high meteorological tower since 1993. Furthermore, many projects, PhD and MSc theses, of both ForNaLab (www.fornalab.ugent.be) and the Laboratory of Plant Ecology (www.plantecology.ugent.be), have been conducted in the forest.

Location: 15 km southeast of Ghent

Ecosystems: Deciduous Forest

Research topics: biology; biodiversity; forest ecology; terrestrial ecology; biogeochemistry; environmental science; geology

Contact(s): Kris Verheyen, Kris.Verheyen@UGent.be

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SR | T:<10m | Data: Int | Data: Ext

DEIMS.ID: 4a469a86-868b-4160-b72e-10a1b4e09356

Web links

- http://www.aelmoeseneiebos.ugent.be/?p=inleiding
- http://www.lter-belgium.be

Belgium

Ichtegem - Wijnendale Forest

MIXED ATLANTIC BEECH-OAK-WOODLAND

The LTER-site of Wijnendale Forest is a 90 ha scientific zone located in a larger mixed atlantic beech-oak-woodland (300 ha), in the North-West of Belgium, 20 km south of Bruges. The site is located on moderately wet to dry sandy soils. The site is an ancient woodland that used to be managed as coppice with standards. Over the last 100 years it was gradually transformed to a mixed high forest, mainly of oak and beech.

The site contains:

- an ICP Forests Level II plot (0.25 ha), in which effects of air pollution on the forest ecosystem are monitored, according to standard protocols.
- a strict forest reserve of 65 ha: here, natural dynamics of forest structure and ground vegetation are monitored, and its effects on biological diversity.
- a 25 ha buffer zone, containing both forest and open grassland (extensively managed for nature conservation), where 'open field' measurements are performed.

The sampling network in the strict reserve includes >100 sampling plots (0.1 ha) combined with a 1 ha core area. In these plots, full dendrometric surveys (tree position, species, DBH, height, ...) and ground vegetation relevees are performed every 10 years. Additionally, standardised sampling of saproxylic beetles, mosses and fungi were performed and high-resolution air-borne LIDAR and hyperspectral data were recorded in 2012-2014. Main aims for the future are the continuation of the observational networks to provide longer robust time-series that allow more thorough analysis and investigation.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

On the ICP Forests Level II plot (0.25 ha): monitoring of the effects of air pollution on biogeochemical cycles and performance (growth, vitality) of the forest ecosystem, with special focus on long-term trends and potential for recovery.

In the strict reserve: study of natural dynamics (forest structure, ground vegetation) in formerly managed forests after installation of non-intervention, and its effects on biological diversity.

Location: 25 km southwest of Bruges

Ecosystems: Deciduous Forest

Research topics: biology; biodiversity; species diversity; forest ecology; fungal ecology; plant ecology; vegetation dynamics; population ecology; population dynamics; terrestrial ecology; air chemistry; depositions chemistry; soil chemistry; soil solution chemistry; history; land use history

Contact(s): Kris Vandekerkhove, Research Institute for Nature and Forests (INBO), Kris.Vandekerkhove@inbo.be

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | 2WD

DEIMS.ID: 5cdc558b-a0bc-4150-b8d1-8dd55870c7e8

Web links

- https://www.inbo.be/en/publications/bosreservaat-wijnendalebos-monitoringrapport-monitoring-van-de-dendrometrisc

Belgium

Ravels Forest

CORSICAN PINE FOREST

This LTER-site corresponds with a 0.25 ha intensive forest monitoring plot (ICP Forests Level II) including a 0.25 ha buffer zone. The site is located in a homogeneous stand of Corsican pine (*Pinus nigra* ssp. *laricio* var. *Corsicana* Loud.) planted in 1930 on former heathland and is part of Gewestbos Ravels, a landscape (about 1000 ha) with deciduous and coniferous forests, heathland, bogs and pastures in the northern part of the Campine ecoregion of Flanders. The terrain is gently sloping (1-2 %) and the soil is a well-drained sandy soil (Endogleyic Folic Brunic Albic Arenosol (Dystric)). Ground vegetation is dominated by ferns (*Dryopteris dilatata* and *D. carthusiana*) and *Vaccinium myrtillus*. After a storm in February 2007 felled several trees, an understorey of *Betula pubescens* started to develop. Intensive monitoring was started in 1987 with the main objective to study the effects of air pollution on biogeochemical cycling and forest performance (growth, vitality). This yielded a number of long-term data series including on atmospheric deposition, air quality, soil and soil solution chemistry, tree mineral nutrition, ground vegetation and growth. Monitoring will be continued in the future as a statutory task of INBO.

Purpose of site

MAINLY OBSERVATION
NO EXPERIMENTATION

This site belongs to the network of the international cooperative programme (ICP Forests) operating under the UNECE Convention on Long-Range Transboundary Air Pollution (CLRTAP). The main objective is to study the effects of air pollution on forest condition with specific attention for ecosystem processes. More specific research objectives at the site are to evaluate trends in acidifying and eutrophicating deposition in relation to target loads and critical loads and to evaluate ecosystem response and ecosystem status based on trends in soil solution chemistry in relation to critical limits.

Location: 20 km northeast from Turnhout, near the Dutch border

Ecosystems: Evergreen Forest

Research topics: biology; dendrochronology; biodiversity; species diversity; community ecology; successional dynamics; ecosystem ecology; ecosystem function; forest ecology; plant ecology; vegetation dynamics; terrestrial ecology; phenology; air chemistry; depositions chemistry; soil chemistry; soil solution chemistry; environmental science

Contact(s): Arne Verstraeten, Research Institute for Nature and Forest, Arne.Verstraeten@inbo.be

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | 2WD

DEIMS.ID: e74fdeaf-08ed-4306-9473-58e3f9a05e73

Web links

- http://www.lter-belgium.be/25

Belgium

Sonian Forest

ANCIENT BEECH FOREST

Large forest area, ancient woodland of beech forests, just south of Brussels. In this forest, numerous research activities covering silviculture, forest history, biodiversity inventories, geomorphology, recreation etc. have taken place. Therefore, the complete forest is proposed as an LTSER-platform.

Within the forest, two active long-term ecological monitoring programmes are present:

- one ICP Forests Level II intensive forest monitoring plot (permanent sampling since 1987)
- strict forest reserve monitoring programme on an area of 100 ha (periodic sampling of 15 ha since 1986, extended to 100 ha in 2000)

On July 7th 2017, the strict forest reserve 'Joseph Zwaenepoel', together with 4 other unmanaged reserves in the forest, was added to the UNESCO Natural Heritage Site ' Primeval Beech Forests of the Carpathians and Other Regions of Europe' (http://whc.unesco.org/en/list/1133). Besides these, a large number of former research projects, PhD research and a detailed management follow-up make the Sonian Forest one of the best mapped and documented forests in Belgium / Europe.

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

Research, conservation of biodiversity and historical heritage (UNESCO world heritage) and recreation. The main objective of the research in the ICP Forests Level II plot is to study the effects of air pollution on the forest ecosystem. Main objective of the monitoring programme in the strict forest reserve is the study of natural forest dynamics and related biodiversity. It includes a network of 65 large sampling plots (0.3 ha) combined with a 10.75 ha core area, where full dendrometric surveys (tree position, species, DBH, height, etc.) and ground vegetation relevees are performed every 10 years. Additionally, standardized sampling of saproxylic beetles, mosses and fungi were performed. Also several detailed studies and experiments (effects of liming treatments under different tree species on soil

invertebrates, natural generation of beech, soil organic carbon distribution, nutrient budget of dead wood, etc.) were conducted. With support of the Life+-program, a detailed monitoring on (de) fragmentation was set up during the last 5 years and is going on – as the Sonian Forest is also an 'urban forest' fragmented by traffic infrastructure. Research, inventories and monitoring of sylviculture, forest soils and vegetation mapping provide historical and actual sets of data, both in detail and on larger scale.

Location: South of Brussels

Ecosystems: Deciduous Forest; Temperate broadleaf and mixed forests; Temperate grasslands, savannas, and shrublands

Research topics: natural science; biology; forest conservation; nature conservation; biodiversity; species diversity; forest ecology; fungal ecology; plant ecology; vegetation dynamics; terrestrial ecology; phenology; flowering time; atmospheric chemistry; biogeochemistry; critical load; depositions chemistry; soil chemistry; soil solution chemistry; geology; geomorphology; silviculture; meteorology; weather; soil science; soil physics; soil classification; soil chemistry; soil solution chemistry; social sciences; land use history; vegetation history

Contact(s): Patrick Huvenne, patrick.huvenne@vlaanderen.be; Arne Verstraeten; Kris Vandekerkhove

All parts of site accessible: Yes

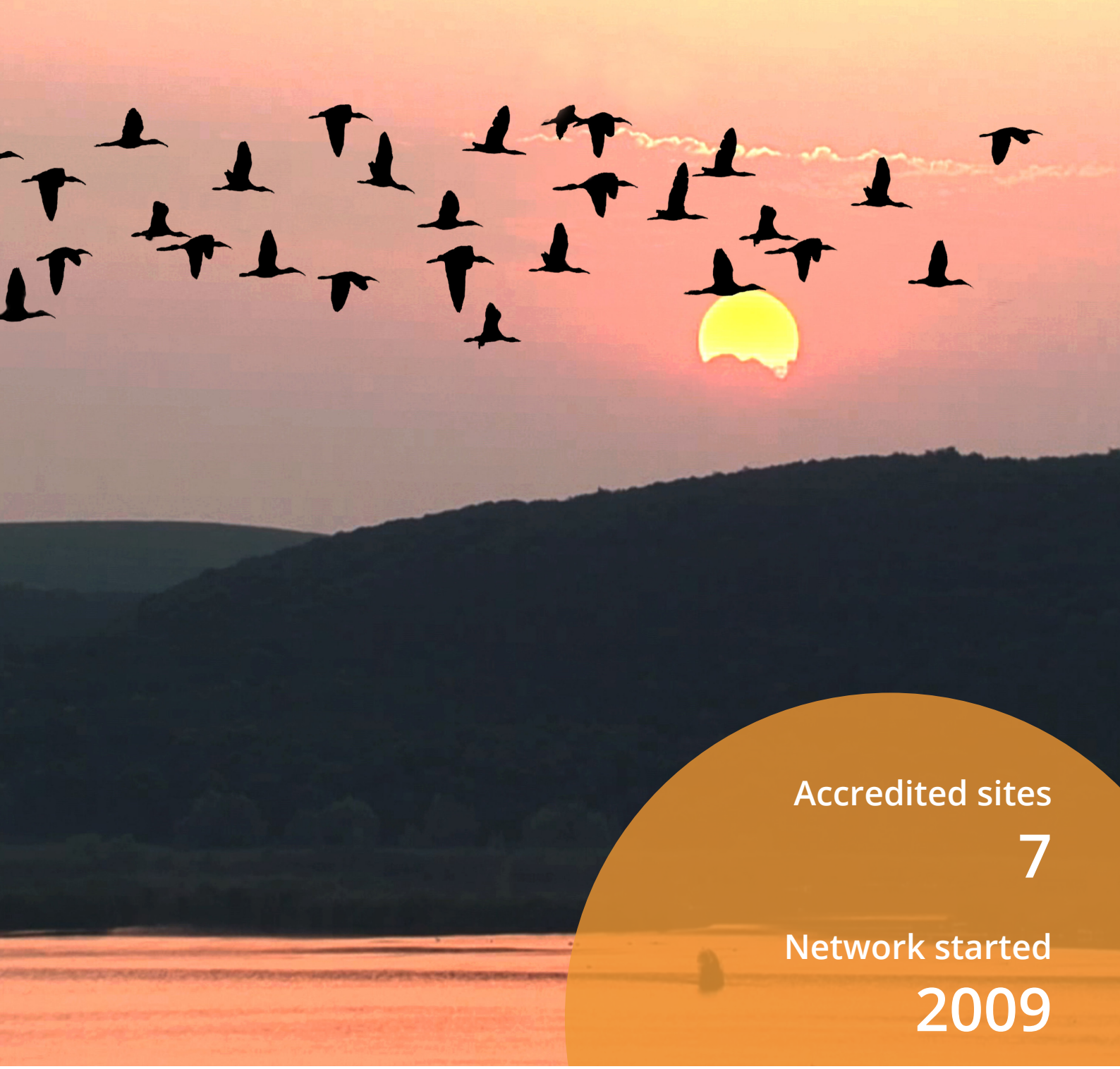
Infrastructure:

All yr | **4WD** | **2WD** | **Data: Int**

DEIMS.ID: 0fa0d44f-5314-405f-a647-a7dda423031f

Web links

- http://www.sonianforest.be
- http://www.lter-belgium.be



Accredited sites

7

Network started

2009

Bulgaria

LTER-Bulgaria

lter-bulgaria.net

Bulgaria

Belasitsa

UNIQUE ECOSYSTEM "NATURAL SWEET CHESTNUT FOREST"

This site is located on the territory of Belasitsa Nature Park. The southwest part of Bulgaria where the Belasitsa mountain is situated falls into the European Broadleaf Forest Region, Macedonian Province. The chestnut belt has area of 2592 ha and is situated between 250 m and 900 m altitude. The forest has complex spatial structure and distorted age structure. The mean age of trees is 95 years but individuals aging 350 years are present, with diameter 2,5 m and height up to 18 m. In the community a tendency for substitution of the chestnut by other tree species is present. The climate is characterized by rainy winter and hot and dry summer. The vegetation period is near 220 days. Data on climate are available from the near by site in the town of Petrich. There are 3 sites with dispositives for meteorological, hydrological and hydrobiological measurements and 3 Forest permanent sample plots.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The purpose of the site is the study of the interactions between biodiversity and ecosystem functioning. Potential indicator species, besides the chestnut trees, are lichens, mosses, birds, etc. The question of habitat fragmentation can be also studied. The site can also be a hot spot for socio-ecological studies in the context of the LTSER platform of LTER-Europe.

Location: Located in close proximity to the town of Petrich, easily accessible by any means of transport

Ecosystems: Deciduous Forest

Research topics: biology; conservation; biodiversity; community ecology; ecosystem ecology; forest ecology; population ecology; terrestrial ecology; chemistry

Contact(s): Nesho Chipev, nchipev@abv.bg

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD

DEIMS.ID: 7b0fab75-c658-453b-b4cb-67eb6e88d161

Bulgaria

Black Sea

BLACK SEA COMPLEX SITE

Black Sea site includes three areas: cape Kaliakra, cape Galata and Varna Bay (northern Bulgarian Black Sea Coast), and Koketrays Sand bank (only for macrozoobenthos) – southern Bulgarian Black Sea Coast. They were chosen on the base of historical data availability and eutrophication/ pollution impact. Kaliakra marine area is influenced mainly by the Danube river inflow. The local anthropogenic impact in the region is insignificant. It is a nature reserve. Cape Galata and Varna Bay – the site is exposed to long-term multiple pressure from local drivers as industry, tourism, port activities, urbanization, Varna Bay current and the system Beloslav Lake-Varna Lake - an example of a cascade, introducing nutrients and pollutants of industrial (chemical industry), agricultural and sewage origin and nearby ports. Koketrays Sand bank, the second marine area declared 'protected', is an unique benthic habitat.

The coordinates of the selected areas are as follow: c. Kaliakra: 28.416667 43.366667; c. Galata: 27.959813 43.171924; Varna Bay: 27.96005 43.206448; Koketrays bank: 27.888889 42.635556.

Its centre is Institute of Oceanology – BAS, Varna, Bulgaria. Facilities in the Institute of Oceanology-BAS: Research vessel "Akademik" with chemical and biological laboratories on board; Laboratories: Marine biology and ecology, Molecular taxonomy and ecology of marine organisms, Chemical; Field and laboratory equipment.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Marine biology and ecology studies in coastal areas, long-term monitoring, development and implementation of ecological state classification systems according to WFD and MSFD concepts.

Location: Cape Kaliakra, cape Galata and Varna Bay are within 60 km of the town of Varna and Koketrais is located in the north-east of Bourgas Bay

Ecosystems: Coastal; Marine

Research topics: natural science; biology; conservation; conservation status; aquatic ecology; lake ecology; marine ecology; biodiversity; genetic diversity; marine biodiversity; species diversity; community assembly; community ecology; community dynamics; successional dynamics; ecological impact; ecosystem ecology; ecosystem function; ecosystem service; genetics; microsatellite marker; molecular genetics; population genetics; indicator; bioindicator; biological indicator; ecological indicator; environmental indicator; invasion biology; molecular biology; molecular taxonomy; environmental chemistry; water chemistry; environmental science; environmental assessment; environmental impact assessment; management; aquaculture; fishery; meteorology; climatology; climate change; climate change impact

Contact(s): Kremena Stefanova, office@io-bas.bg

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | BOAT | Beds | Power - Central

DEIMS.ID: f4193165-b4de-4dc0-a5bd-7f051be25884

Web links

- http://www.io-bas.bg/

Bulgaria

Petrohan-Ponor

FOREST (BEECH AND SPRUCE) AND WATER ECOSYSTEMS.

The site Petrohan is situated in the West Balkan range with a total area of 7192 ha. The relief of the region is mountain, steep, with deeply cut river valleys and secondary watersheds with lowest point at altitude 350 m, and highest at 1900 m. The ecological station is situated between 23o04` N and 23o13` E at 1470 m. The hydrological network is dense with constant water flow during the whole year. The prevailing soil type is Distric-Eutric- Cambisols on granite with mean depth up to 80 cm, pH of the soil solution is 4.5- 6.0 pH, C/N- 12-14 and the content of nitrogen in the soil over 1 %. The part of protected forest is 74 %, differentiated as area for water resources including drinking water. The beech forest in the site has been managed since 1893. The total stock is 1 989 695 m3, stock per ha 298 m3, total annual growth 24271 m3 and growth per ha 3.64 m3. The site Petrohan is established in 1986. Hydrochemical investigations include bulk and throughfall (beech and spruce) deposition, stemflow, soil solution, water flow. The following parameters are measured: water amount of bulk precipitation, troughfall, stem flow, lysimetric flow, as well as pH, elecroconductivity and chemistry of all studied compartments (NO3-, SO42-, Cl-, NH4+, K+, Na+, Ca2+, Mg2+, Pd2+, Cd2+), soil chemistry, air temperature, humidity, phenology, annual growth, biomass chemistry. Critical loads of acidifying pollutants and heavy metals have been determined since 1994 for both forest and water.

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

Risk assessment of water resources acidification in forest ecosystems and impact of human activity on forest and water ecosystems.

Location: The site is located 32 km from the town of Berkovitsa, easily accessible by any transport

Ecosystems: Forest

Research topics: biology; ecology; chemistry; environmental science; hydrology

Contact(s): Sonya Damyanova, sonya_damyanova@abv.bg; Nadka Ignatova

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | 2WD

DEIMS.ID: 3d8dd081-e6c5-4233-b2bb-7a353bcab094

Web links

- http://lter-bulgaria.net/petrohanen.html

Bulgaria

Sozopol - Black Sea

BLACK SEA COASTAL MARINE ECOSYSTEMS

The Laboratory of Marine Ecology is one of the field stations of IBER-BAS, based in the town of Sozopol on the coast of the Black Sea. It is provided with upgraded equipment and modern laboratory facilities necessary for carrying out investigations on the biodiversity and functioning of the coastal marine ecosystems. The laboratory is equipped with facilities for general ecological studies, a chemical and instrumental laboratory, microscope facilities and a workshop. Main scientific equipment: spectrophotometer and instruments for sediment and water sampling and analysis, a combined pH/dissolved oxygen/ conductivity measuring Instrument (WTW), microscopes and equipment for phytoplankton and microbiological research. The laboratory is using SCUBA diving equipment and possess a small research vessel suitable for work in the coastal zone.

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

The main research areas include marine ecology studies in the shallow coastal zone; long-term functional monitoring of coastal marine ecosystems; assessment of the anthropogenic pressures and impacts in the coastal zone, including eutrophication and hydrocarbon contamination; assessment of coastal ecosystem services; assessment of the ecological status and health of the ecosystems and development and implementation of ecological status indices; scientific basis for the management of coastal ecosystems.

Location: Located 30 km South of the town of Burgas at the edge of the Burgas Bay

Ecosystems: Marine; Temperate shelfs and seas

Research topics: biology; conservation; animal ecology; aquatic ecology; marine ecology; biodiversity; community ecology; ecosystem ecology; plant ecology; population ecology; chemistry; environmental science

Contact(s): Ventzi Karamfilov, ventzi.karamfilov@gmail.com

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | Boat | Power - Central

DEIMS.ID: 04c70bae-b13c-4df5-bbdb-dc2be9e9d411

Web links

- http://www.iber.bas.bg/?q=en/node/111

Bulgaria

Srebarna

RIVER AND OXBOW LAKE ECOSYSTEM

The Srebarna Lake was designated as a Monument of World Cultural and Natural Heritage (1983), UNESCO Biosphere Reserve (1977), Ramsar site (1975) and Important Bird Area (1990) because of its extremely rich ornithofauna and mainly because of the breeding of globally threatened species Dalmatian Pelican (*Pelecanus crispus*), Pygmy Cormorant (*Phalacrocorax pygmeus*) and Ferruginous Duck (*Aythya nyroca*). During the second half of the 20th Century, the lake ecosystem underwent significant changes towards strong eutrophication and speeded-up succession. The main reason was the interrupted hydraulic connection with the Danube after the river embankment in 1948, the draining of ground waters and the changes of the land use in the watershed. The reconnection of the lake with the Danube and other restoration measures in 1993-2000 induce recovery of the lake ecosystem. Currently the dominant plant association is that of the Reed (*Phragmites australis*) occupying about two-thirds of the Reserve's total area mixed with Gray Willow (*Salix cinerea*) and Purple Willow (*Salix purpurea*) trees. The second widest spread plant species is the Lesser Reedmace (*Typha angustifolia*). The Reserve is a host of 139 vascular plant species, 11 of them rare or endangered. 27 fish species, 21 reptile and amphibian species and 41 mammal species occurred in the lake after 1990s. The avifauna numbered a total of 230 species, the nesting colony of Dalmatian Pelican being the pearl of the Reserve.

Purpose of site

MAINLY OBSERVATION
NO EXPERIMENTATION

Conservation of typical floodplain wetland ecosystem on the river terrace of Lower Danube with rich diversity of protected and rare plant and animal species as well as protected natural habitats. Model ecosystem for scientific research and educational purposes, bird watching and ecotourism.

Location: On the right bank of the Danube between the rkm 393 and 391, 18 km from Silistra city and 156 km from Varna city and Varna international airport

Ecosystems: Small lakes

Research topics: conservation; aquatic ecology; biodiversity; community ecology; trophic dynamics; plant ecology; population ecology; population changes over time; population dynamics; taxonomy; sediment chemistry; water chemistry; hydrology

Contact(s): Lachesar Pehlivanov, luchezarpehlivanov@gmail.com

All parts of site accessible: No

Infrastructure:

All yr | 2WD | BOAT | SR | Power - Central

DEIMS.ID: bc7e400a-ad18-4aeb-b11e-846362983a04

Web links

- http://lter-bulgaria.net/srebarnaen.html

Accredited sites

21

Network started

1996

Czech Republic

CZ-LTER

www.lter.cz/en

Czech Republic

Lysina & Pluhuv Bor catchments

MOUNTAIN SPRUCE FOREST ECOSYSTEMS

The study is focused on element fluxes, pools, wet and dry deposition, internal cycling in trees, soil exchange processes, chemical weathering, nutritional status of trees and toxic metals speciation assessments, modeling predictions of hydrological, hydrochemical, hydrobiological and soil chemical status. The catchments studied are situated 7 km apart in the Slavkov Forest. The catchments have similar altitude, area, topography, air temperature, atmospheric deposition fluxes, and tree cover (Norway spruce, Picea abies), but contrasting bedrocks and soils. The granite Lysina catchment represents sites with acid-vulnerable base-poor rock, extremely poor in magnesium (Mg). In constrast, the serpentine Pluhův Bor catchment represents sites with highly acid-resistant rock, extremely rich in Mg. At Lysina, Mg in spruce foliage is deficient and consequent acidification symptoms of needle-yellowing are visible. Annual increment of spruce bole biomass at Pluhuv Bor is low and attributed to K and P deficiency and Ni toxicity due to the substrate. Streamwater at Pluhův Bor exhibited high pH, alkalinity, and very high concentrations of Mg, Ni and Cr. Very low pH, negative alkalinity and elevated concentrations of toxic forms of Al mobilized from soils by acidification were found in the stream draining Lysina. Contrasting streamwater compositions in the studied catchmens were generated mainly by large differences in chemical weathering (Krám et al. 2012, Appl. Geoch., 27: 1854).

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The objective of long-term study at Lysina and Pluhův Bor is to compare biogeochemical patterns in forested catchments with contrasting lithologies that can serve as examples of distinct sensitivity to anthropogenic acidification. The catchments represent two geochemically contrasting, acidic (Podzols on granite) and ultrabasic (Stagnosols on serpentinite) sites, both covered with managed spruce forests.

Location: 10 km from Mariánské Lázně (Marienbad) railway station, 140 km from Prague international airport

Ecosystems: Forest

Research topics: biology; chemistry; ecology; environmental science; geology; hydrology; limnology; toxicology

Contact(s): Pavel Kram, Czech Geological Survey, Prague, pavel.kram@geology.cz

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | Beds | Data: Int | Data: Ext

DEIMS.ID: a7cf7d23-ffa1-45f0-bb3b-82ee8fdf725a

Accredited sites

17

Network started

2006

Finland

FinLTSER

www.helsinki.fi/en/inar-institute-for-atmospheric-and-earth-system-research/finltser-finnish-long-term-socio-ecological-research-network

Finland

Hyytiälä SMEAR II LTER

BOREAL MANAGED FOREST

The SMEAR site (Station for Measuring Ecosystem-Atmosphere Relations) is situated in the Hyytiälä Forestry Field Station of the University of Helsinki. The site consists of a managed, 50-yr old Scots pine forest stand, two open oligotrophic fen sites and a humic lake with forested catchment. The main idea of SMEAR type infrastructures is continuous, comprehensive measurements of fluxes, storages and concentrations in the land ecosystem–atmosphere continuum. The forest measurements are operated continuously since 1996, and include e.g. leaf, stand and ecosystem scale measurements of greenhouse gases, volatile organic compounds, pollutants (e.g. O_3, SO_2, NO_x) and aerosols, in addition to full suite of meteorological measurements. The biogeochemical cycles and vegetation–soil–atmosphere interactions are studied both experimentally and with long-term observations. The site has full carbon, water and nitrogen budgets made over 10 years, and it is a full ICOS ecosystem station.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The site is primarily focused on the studies on land surface–atmosphere relationships, mostly by conducting long-term observation. The overall aim is to provide information on climate and environmental changes; these questions are by definition such that they can be effectively studied only by collecting multidisciplinary, long-term data sets.

Location: By roads, 235 km north from Helsinki or 65 km northeast from Tampere

Ecosystems: Boreal forests/taiga; Evergreen Forest; Fresh Water Lakes

Research topics: biology; aquatic ecology; lake ecology; stream ecology; wetland ecology; biodiversity; ecosystem ecology; ecosystem function; ecosystem service; forest ecology; fungal ecology; microbial ecology; plant ecology; vegetation dynamics; population ecology; population dynamics; terrestrial ecology; phenology; physiology; ecophysiology; air chemistry; atmospheric chemistry; biogeochemistry; depositions chemistry; isotopic chemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; geology; limnology; silviculture; meteorology; climatology; climate change; climate monitoring; physics; atmospheric physics; soil physics; land use history

Contact(s): Janne Levula, janne.levula@helsinki.fi

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | 2WD | 4WD | BOAT | SM | SR | Beds | °C | T: Can | T:<10m | T:>10m | Power - Central | >100kW | Data: Int | Data: Ext

DEIMS.ID: 663dac80-211d-4c19-a356-04ee0da0f0eb

Web links

- https://www.helsinki.fi/en/inar
- http://www.atm.helsinki.fi/SMEAR/index.php/smear-ii
- https://www.helsinki.fi/en/research-stations/hyytiala-forestry-field-station

Finland

Lammi LTER

SOUTHERN BOREAL AQUATIC AND TERRESTRIAL RESEARCH

The Lammi LTER area is located 120 km north of Helsinki in uplands between two major river basins, i.e. rivers Kokemäenjoki and Kymijoki. The Lammi LTER area consists of several core sites/ areas from which the Evo Forest and Lake Area (EVO) is the largest one and has a special value in terms of long term ecological studies. Another important study area is Lake Pääjärvi and its surroundings. The EVO area is among the largest coniferous forest areas in southern Finland. Lake Pääjärvi and its surroundings have been studied since early 1960s as a result of the establishment of the Lammi Biological Station in 1953 by the University of Helsinki.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The aim of the Lammi LTER site is to enhance and deepen our understanding on the key biogeochemical and physical processes and their interaction and coupling with organisms, populations and ecosystems along space and time in the context of global change and multiple environmental stressors in the southern Boreal Zone. Thus, the Lammi LTER site will provide reliable multi-variable information on the ecosystems and their compartments in relation to unstable environment both in terms of time and space, and in particularly due to the gradual changes in our physical, chemical and biological environment caused by the human society. The research themes involved in the Lammi LTER site are:

- meteorology and lake physics,
- biogeochemical processes,
- climate change impacts and greenhouse gases fluxes,
- biodiversity studies,
- ecosystem and landscape studies,
- human-ecosystem interactions and forecasting long term changes,

- demographic structure of fish populations in small forest lakes, and
- natural long-term changes in food webs of small forest lakes.

Location: Lammi, location: About 120 km north from Helsinki by car. Accessible by bus through Lahti (40 km) and Hämeenlinna (40 km)

Ecosystems: Agricultural; Forest; Lakes; Rivers; Urban

Research topics: natural science; biology; ecology; genetics; gene expression; genotypic diversity; genotypic variation; population genetics; life history; phenology; plant phenology; physiology; plant physiology; population biology; chemistry; environmental science; geology; global change; global environmental change; hydrology; hydrography; limnology; meteorology; climatology; climate change; climate change impact; morphology; physics; social sciences; geography; remote sensing; history; land use history; natural history; vegetation history; life history theory

Contact(s): Lauri Arvola, lauri.arvola@helsinki.fi; John Loehr

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | 2WD | 4WD | SM | BOAT | SR | Beds | °C | Power- Central | 10-100kW | Data: Int | Data: Ext

DEIMS.ID: a43d31c8-6219-4ab8-ac41-6088cb56b12b

Web links

- http://www.helsinki.fi/lammi/english.html

Finland

Värriö Research Station (Värriö LTER)

SUBARCTIC MOUNTAINEOUS FOREST

Värriö Subarctic Research Station is located in the Värriö Strict Nature Reserve, Eastern Lapland, in the northern corner of the municipality of Salla. The station represents top scientific research of the University of Helsinki, the highest standards of education and co-operation with civil society in Northeastern Finland. The station has been in operation from 1967, first in mostly ecological studies, but later on also other research fields are represented (atmospheric sciences, palaeoecology etc.). The SMEAR I station (Station for Measuring Ecosystem-Atmosphere Relations) was established to the Värriö Subartic Research Station in 1991 to measure pollution levels in the area, especially those originating from the Kola Peninsula in Russia. The initial measurements focused on sulphur dioxide but during the 90s the scope of measurements was significantly widened to cover, e.g., atmospheric aerosols and ozone. Today, among other things, the SMEAR station measures weather, atmospheric aerosols and inorganic gases, carbon and energy fluxes and the relationships between the atmosphere and growth of forests. The site is a supporting ICOS ecosystem station.

The station is a part of the Institute for Atmospheric and Earth System Research (INAR) at the University of Helsinki. A similar measurement station (SMEAR II) is located at the Hyytiälä Forestry Field Station in Juupajoki, Southern Finland.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Ecosystem and atmospheric measurements.

Location: Värriö Strict Nature Reserve, 900 km N of Helsinki. The closest airport is Rovaniemi (250km) and nearest gravel road is 8 km away.

Ecosystems: Forest; Taiga; Small lakes; Small rivers; Tundra

Research topics: biology; animal ecology; community ecology; successional dynamics; ecosystem ecology; ecosystem function; forest ecology; microbial ecology; paleoecology; plant ecology; vegetation dynamics; population ecology; plants population changes over time; population changes over time; population dynamics; terrestrial ecology; phenology; physiology; ecophysiology; atmospheric chemistry; biogeochemistry; depositions chemistry; isotopic chemistry; soil chemistry; environmental science; geology; limnology; paleolimnology; silviculture; meteorology; climatology; climate change; climate monitoring; physics; atmospheric physics; history; land use history

Contact(s): Jaana Bäck, jaana.back@helsinki.fi

All parts of site accessible: Yes

Infrastructure:

All yr | FOOT | SC | Beds | SR | SM | T:<10m | °C | Data: Int

DEIMS.ID: b471311f-e819-4f6f-bbae-1ac86cd9777f

Web links

- http://www.atm.helsinki.fi/varrio/eng/?q=node/1
- https://www.helsinki.fi/en/inar, http://varrio.blogspot.fi/
- https://www.helsinki.fi/en/research-stations/varrio-subarctic-research-station

Accredited sites

83

Network started

2018

France

eLTER France

Zones Ateliers (ZA; started 2008)
www.za-inee.org

Critical Zone Observatories: Applications and Research (OZCAR; started 2016)
www.ozcar-ri.org

Cameroon

OZCAR-RI M-TROPICS/BVET, Cameroon

HYDROGEOCHEMICAL BUDGETS IN THE TROPICAL ZONE

The site is part of the CZO Multiscale TROPIcal CatchmentS (M-TROPICS). The site consists of a network of nested sub-basins within the Nyong River Basin (18,500 km^2) in tropical humid forest mildly impacted by anthropogenic activities on the South Cameroun Plateau monitored for hydrological and geochemical variables. The monitored site is located in a passive margin (slow uplift of about 5 m/My), on a Archean granito-gneissic craton and shows tropical temperatures. The network is comprised of the Nsimi small experimental watershed (SEW; 0.6 km^2), and the sampling/gauging stations of Messam on the Awout River (206 km^2), Pont So'o on the So'o River (3000 km^2), and Mbalmayo (13,500 km^2), Olama (18,500 km^2) on the Nyong River. The site has a granitoid bedrock and a secondary forest with low anthropogenic pressure. Monitoring was initiated in 1994 for some parameters (e.g. rainfall) and in 1998 for geochemical parameters (major anions and cations, dissolved organic carbon, suspended particulate matter). The sampling/acquisition frequencies range from 10 minutes for hydrological variables (water table level) to monthly for chemical variables. The site is maintained by the Observatoire Midi-Pyrénées (Toulouse, France), CNRS-INSU, IRD and is included in the distributed French Research Infrastructure OZCAR. The whole dataset is freely available on the site website. Every set of data is identified by Digital Object Identifiers (DOIs).

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The initiation of the site was motivated by the fact that among the Critical Zone Observatories (CZOs) very few were set in the tropics. The purpose of the site is to provide the international scientific community with unique decennial time series of climatic, hydrological and geochemical variables in tropical environments. The site aims at: (a) determining the fluxes of water, of inorganic and organic matter present in solution (major anions and cations, carbon) and in suspension (particulate organic carbon); (b) proposing budgets of chemical weathering and physical erosion; and (c) evaluating the impact of land use

upon the above parameters. Its strengths are: (1) multiscale approach of nested watersheds, from small experimental watersheds (SEW) to river basin and (2) multidisciplinary approach, currently involving hydrology, geochemistry, soil science, remote sensing and ecology.

Location: Intertropical zone; Cameroon; Nyong River watershed; 130 km south of Yaoundé

Ecosystems: Rainforest

Research topics: water chemistry; environmental science; hydrology

Contact(s): Stéphane Audry, stephane.audry@get.omp.eu; Jean Riotte

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | 4WD | SR | Power - Central | 5-10 kW | Data: Ext

DEIMS.ID: 9e9bd9c6-8a13-4705-a539-f3b8d42ed9cc

Web links

- https://mtropics.obs-mip.fr/
- https://twitter.com/mtropics_czo

France

LTSER Zone Atelier Alpes

RESPONSES OF MOUNTAINOUS SES TO GLOBAL CHANGES

The LTSER Zone Atelier Alpes is a research platform that embraces all the French Alps as defined by the European Alpine Convention. The platform hosts several sites dedicated to the long term monitoring of social-ecological systems : one GLORIA site (FR-AME), a large set of permanent plots located along several elevational transects (ORCHAMP project), a network of sentinel alpine pastures, etc. Infrastructures regroups all facilities and observatories maintained by the academic community Univ. Grenoble Alpes. More intensive research investigations concern three master sites: (1) the 'Lautaret-Galibier' master site includes the Station Alpine J. Fourier, an alpine field station member of the Anaee network (2) the 'Arves-Mont Blanc' master site ranges from urbanized valleys to the highest summit of Europe (3) the 'alpine trench Grenoble-Chambéry-Annecy' master site is a large area encompassing the urbanized valleys of the western border of the French Alps (Grenoble-Chambéry-Annecy) and nearby mountain ranges (Vercors, Chartreuse, Belledonne & Bauges). The LTSER Zone Atelier Alpes belongs to LTER-France network and is located in south eastern France.

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

Our research aims at better understanding the links between climate changes, ecological dynamics, and socio-economic trajectories of mountain landscapes. The LTSER platform fosters collaborative transdisciplinary research involving a range of natural and social scientists (ecologists, agronomists, climatologists, sociologists) and key regional stakeholders from the agriculture, tourism and nature conservation sectors. Particular attention is devoted to the following questions: the relationships between climate, land management and mountain biodiversity and its effects on the provision of ecosystem services, the long-term (Holocene) dynamics of human-nature interactions in the Alps and its legacy on current landscapes, the adaptation and resilience of mountain territories to climate and socio-economic changes.

Location: The French Alps with emphasis on three master sites (Lautaret-Galibier, Arves Mont Blanc, the alpine trench Grenoble-Chambéry-Annecy)

Ecosystems: Agricultural; Alpine; Deciduous Forest; Temperate broadleaf and mixed forests; Temperate coniferous forests; Grasslands; Montane grasslands and shrublands; Urban

Research topics: biology; conservation; animal ecology; biodiversity; genetic diversity; species diversity; community ecology; community dynamics; successional dynamics; ecosystem ecology; ecosystem function; ecosystem service; forest ecology; microbial ecology; paleoecology; plant ecology; vegetation dynamics; population ecology; plants population changes over time; population changes over time; population dynamics; terrestrial ecology; genetics; phenology; physiology; ecophysiology; biogeochemistry; depositions chemistry; soil chemistry; geology; geomorphology; hydrology; agriculture; silviculture; meteorology; climatology; climate change; climate monitoring; social sciences; anthropology; archeology; geography; biogeography; remote sensing; history; land use history; sociology

Contact(s): Philippe Choler, philippe.choler@univ-grenoble-alpes.fr; Thomas Spiegelberger

All parts of site accessible: No

Infrastructure:

All yr | 2WD | SC | SR | Beds | Power - Central | Power - Dist | >100kW | Data: Int | Data: Ext

DEIMS.ID: 79d6c1df-570f-455f-a929-6cfe5c4ca1e9

Web links

- http://www.za-alpes.org/

Antarctica

LTSER Zone Atelier Antarctique

FACTORS IMPACTING ANTARCTIC BIODIVERSITY

The LTSER Zone Antarctique (ZATA) belongs to the LTER-France network and is located in Antarctica (Adelie Land), French sub-Antarctic Islands (Crozet archipelago, Kerguelen Islands, Saint-Paul et Amsterdam Islands) and the Southern Ocean. In relationship with the French Polar Institute (IPEV), it supports long term monitoring of biodiversity for both endemic and invasive species (marine birds and mammals, oceanic communities, terrestrial plants and invertebrates, introduced vertebrates), on terrestrial, freshwater and marine ecosystems. The survey area is partly home to a Natural Reserve, and is also under the influence of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) and Antarctic Treaty (ATS).

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Our research is based on long-term data sets on the environment and its changes. This network of observatories is unique in its remoteness from inhabited continents and its distribution along a latitudinal transect across the Southern and Indian oceans. Biological communities studied have long been isolated and preserved, but they are now subject to an increasing anthropogenic pressure both on land and at sea: intentional or unintentional introductions of species, fisheries. In addition, they are very sensitive to the current climate change. Our research aims at assessing general patterns in biodiversity, tracking and explaining the dynamics of diversity and functioning under the pressure of climate change, introductions and fishing, and delivering data, knowledge and methods to environmental and fisheries managers, policy makers and countries involved in the Antarctic Treaty.

Location: Antarctic continent, Southern Ocean, sub-Antarctic islands

Ecosystems: Grasslands; Lakes; Marine; Polar; Rivers; Tundra

Research topics: biology; conservation; demography; animal ecology; aquatic ecology; lake ecology; marine ecology; stream ecology; wetland ecology; biodiversity; genetic diversity; marine biodiversity; phylogenetic diversity; species diversity; community ecology; community dynamics; successional dynamics; trophic dynamics; trophic interaction; ecosystem ecology; evolutionary ecology; paleoecology; plant ecology; vegetation dynamics; population ecology; metapopulation dynamics; plants population changes over time; population changes over time; population dynamics; terrestrial ecology; genetics; comparative phylogeography; founder effect; genotypic diversity; genotypic variation; phylogenetic analysis; population genetics; invasion biology; life history; phenology; physiology; ecophysiology; taxonomy; isotopic chemistry; environmental science; epidemiology; fishery; meteorology; climatology; climate change; climate change impact; global climate change; regional climate change; climate monitoring; oceanography; toxicology; ecotoxicology; social sciences; geography; biogeography; history; sociology

Contact(s): Jacques Labonne; Jean-Patrice Robin

All parts of site accessible: No

Infrastructure:

BOAT | 2WD | BOAT | SM | HELI | SR | Beds | °C | Aqua | Power - Central | 10-100kW | Data: Int | Data: Ext

DEIMS.ID: 5d621971-e68c-4015-b01f-a259f27dd6a0

Web links

- https://zaantarctique.org
- https://twitter.com/ZA_Antarctique

France

LTSER Zone Atelier Arc Jurassien

GRASSLANDS, FORESTS, KARST AND RIVERS, LAKES AND WETLANDS IN THE JURA MOUNTAINS

The LTSER Zone Atelier Arc Jurassien belongs to LTER-France network and is located in eastern France.The LTSER site Jurassian Arc (ZAAJ stands for Zone atelier Arc jurassien, in French) federates a network of research partnerships around interactions between the environment, society and the dynamics of mountain socio-ecological systems. ZAAJ helps to capitalise on field data and to analyse and promote the results from long-term observation schemes at the interface between ecology, the environment and society. Benefiting from more than 25 years of experience on the issue, accredited by the CNRS Ecology and Environment Institute (INEE) in 2013, ZAAJ is a cluster of five research units totalling 40 researchers.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The LTER site Jurassian Arc is designed to promote long-term interdisciplinary research into the environment and ecosystems in relation to societal issues, in particular, socio-ecological interactions in ecosystems of mid-altitude mountains.

Location: The site is located in the north east part of France, along the Swiss border

Ecosystems: Agricultural; Alpine; Temperate grasslands, savannas, and shrublands; Montane grasslands and shrublands; Small lakes

Research topics: biology; conservation; animal ecology; lake ecology; stream ecology; wetland ecology; biodiversity; genetic diversity; species diversity; community ecology; community dynamics; trophic dynamics; trophic interaction; disturbance ecology; ecological impact; ecosystem ecology; ecosystem function; ecosystem service; microbial ecology; paleoecology; plant ecology; vegetation dynamics; population ecology; population changes over time; restoration ecology; soil microbial ecology; spatial ecology; terrestrial ecology; urban ecology; indicators; physiology; ecophysiology; pollen analysis; biogeochemistry; sediment chemistry; soil chemistry; environmental health; epidemiology; environmental epidemiology; geology; geomorphology; global change; global environmental change; hydrology; limnology; paleolimnology; management; agriculture; agricultural economics; meteorology; climatology; climate change; climate monitoring; toxicology; ecotoxicology; social sciences; archeology; demography; economy; geography; biogeography; history; land use history; vegetation history; sociology

Contact(s): Daniel Gilbert, Daniel.Gilbert@univ-fcomte.fr

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | Power - Central | 10-100kW | Data: Int | Data: Ext

DEIMS.ID: 4d05311c-6fb5-4a4c-b25f-b35214ad3554

Web links

- http://zaaj.univ-fcomte.fr/?lang=en

France

LTSER Zone Atelier Armorique

LANDSCAPE ECOLOGY AND MANAGEMENT

This LTSER consists of two landscape gradients: an agricultural gradient ranging from traditional grove to open fields and marshlands, and a gradient ranging from urban to agricultural peri-urban environments. It comprises three complementary entities and landscapes:

- The landscape of Pleine-Fougères, which is a grove area more or less degraded, dominated by polyculture-farming systems
- The marshland of Couesnon located in the lower Couesnon valley and comprising an eco-complex of several marshlands of varied landscape patterns, resulting from different historical trajectories in terms of water management and agricultural practices
- The Urban Observatory of Rennes Métropole dedicated to the study of the peri-urban gradient.

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

The main purposes of the site are:

- Spatio-temporal heterogeneity of landscape: from the short term (season, year) to the long term (century, millennium)
- Management of landscapes (farming systems, urban parks and planning)
- Impact of landscape structures and their modification on ecosystem services (regulating service, conservation of species, soil protection, maintaining water quality, etc.)
- Role of public environmental protection policies on the dynamics of landscape engineering and use.

Location: The agricultural landscape and freshwater streams of Pleine-Fougères, the marshland of Couesnon, and the city of Rennes in north west France

Ecosystems: Agricultural; Deciduous Forest; Temperate grasslands, savannas, and shrublands; Small lakes; Fresh Water Rivers; Urban

Research topics: biology; conservation; animal ecology; aquatic ecology; stream ecology; wetland ecology; biodiversity; genetic diversity; species diversity; community ecology; community dynamics; trophic dynamics; ecosystem ecology; evolutionary ecology; microbial ecology; paleoecology; plant ecology; vegetation dynamics; population ecology; plants population changes over time; population changes over time; population dynamics; terrestrial ecology; genetics; phenology; taxonomy; air chemistry; biogeochemistry; isotopic chemistry; sediment chemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; geology; geomorphology; hydrology; hydrography; limnology; agriculture; meteorology; climatology; climate monitoring; physics; soil physics; toxicology; ecotoxicology; social sciences; archeology; geography; biogeography; history; land use history; sociology

Contact(s): Cendrine Mony, cendrine.mony@univ-rennes1.fr; Christophe Piscart; Thomas Houet

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | 2WD | 4WD | SR | Beds | Data: Int

DEIMS.ID: 31e67a47-5f15-40ad-9a72-f6f0ee4ecff6

Web links

- https://osur.univ-rennes1.fr/za-armorique/

France

LTSER Zone Atelier Bassin de la Moselle

AQUATIC RESOURCES IN FORESTS, AGRICULTURAL LANDS AND URBANIZED SYSTEMS

The LTSER Zone Atelier Bassin de la Moselle belongs to the LTER-France network and is located in eastern France, Lorraine / Moselle. The ZAM acquires knowledge for better controls the impact of human activities on the quality of the water resources in Lorraine County (France), in the watershed of the Moselle River.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The ZAM acquires knowledge for better controls the impact of human activities on the quality of the water resources in Lorraine County (France), in the watershed of the Moselle River.

Location: French part of the Moselle catchment, North-East of France

Ecosystems: Agricultural; Temperate broadleaf and mixed forests; Temperate coniferous forests; Small lakes; Small rivers; Large rivers

Research topics: natural science; biology; aquatic ecology; stream ecology; ecosystem service; forest ecology; forest degradation; forest management; land cover classification; land use classification; microbial ecology; restoration ecology; river restoration; food security; genetics; gene transfer; chemistry; hydrology; management; agriculture; agricultural economics; silviculture; soil science; soil solution chemistry; toxicology; ecotoxicology; social sciences; economy; geography

Contact(s): Sylvie Dousset, sylvie.dousset@univ-lorraine.fr

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | SR | 2WD | 4WD | Data: Int | Data: Ext

DEIMS.ID: 67d34e08-c377-4b1c-b6b8-14a7e47f717e

Web links

- https://zam.univ-lorraine.fr/

France

LTSER Zone Atelier Bassin du Rhône

A LARGE AND DIVERSE REGULATED RIVER BASIN

The LTSER platform Zone Atelier Bassin du Rhône belongs to LTER-France network and is located in south eastern France, ranging from the Alp mountains to the Camargue delta, in the mediterannean sea. The LTSER focuses on aquatic continental ecosystems (lakes, rivers and wetlands) from alpine to mediterannean climates. The ZABR aims at elucidating the relationship between a large river, the Rhône, its channel and associated ecosystems and the societies established in its landscape, using a multidisciplinary approach. Research topics include physical and chemical characteristics, ecosystem dynamics and sociological studies. Long term changes in ecological processing and pollution are taken into account using paleoecological studies. Perception of the natural and anthropised environment are considered through geographical and sociological studies.

Purpose of site

PARTLY OBSERVATION
MAINLY EXPERIMENTATION

Rhone Basin Long Term Environment Research is organized in Observatory and / or Experimental subsites. Research programs provide knowledge to stakeholders and decision makers, contributing to the sustainable management of rivers and watersheds. It is a researchers' and partners' network with a scientific label of the CNRS, 23 universities, schools or research organisations and 300 researchers. It aims to provide to decision makers with a methodology to evaluate the effects of watershed rehabilitation or restoration on river hydrosystems, in terms of biodiversity, sustainability (lasting effects), ecological services and potential uses. Four research themes are crossed with experimental sites: 1) climatic change and resources, 2) flows, forms, habitats and biocoenocis, 3) pollution fluxes, ecotoxicology and ecosystems, 4) social observation of riverine territories.

Location: Rhône River Catchment, Southeastern France, with 9 subsites

Ecosystems: Fresh Water Lakes; Large rivers

Research topics: biology; conservation; animal ecology; aquatic ecology; lake ecology; stream ecology; wetland ecology; biodiversity; genetic diversity; species diversity; community ecology; community dynamics; successional dynamics; trophic dynamics; ecosystem ecology; ecosystem function; ecosystem service; evolutionary ecology; microbial ecology; paleoecology; plant ecology; vegetation dynamics; population ecology; population changes over time; population dynamics; genetics; physiology; ecophysiology; taxonomy; biogeochemistry; isotopic chemistry; interstitial water chemistry; sediment chemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; geology; geomorphology; hydrology; hydrography; limnology; paleolimnology; agriculture; fishery; silviculture; meteorology; climatology; climate change; climate monitoring; toxicology; ecotoxicology; social sciences; anthropology; archeology; geography; biogeography; history; land use history; sociology

Contact(s): Nicolas Lamouroux, nicolas.lamouroux@irstea.fr; Laurent Simon; Anne Clemens

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | 2WD | 4WD | SR | °C | Power - Central | >100kW | Data: Int | Data: Ext

DEIMS.ID: 7bafe09f-1fd9-4014-a038-650bada37ca5

Web links

- http://www.zabr.org

France

LTSER Zone Atelier Brest Iroise

LAND-OCEAN CONTINUUM

The LTSER Zone Atelier Brest Iroise, created in 2012, is located in Brittany, NW France. It aims to understand the functioning and long-term dynamics of the social-ecological system located along the land-ocean continuum. It combines work along different gradients and at different interfaces: between Earth compartments (sediment-water-atmosphere, land-ocean), tools (observation, experimentation, modeling), disciplines (especially between natural and human and social sciences) and between science and society. About half of the area (3000 km^2) is terrestrial, including the watersheds of the Elorn (280 km^2, 285,000 inhabitants mostly in the Brest area) and the Aulne (1820 km^2, 70,000 inhabitants) rivers which are characterized by intensive agricultural practices. The Bay of Brest is a semi-enclosed coastal bay, with an area of 180 km^2. Part of this bay, and of the Aulne estuary, is a Natura 2000 site operated by the "Parc Naturel Regional d'Armorique" (PNRA). The marine part (3550 km^2) of this land-ocean continuum is the Iroise Sea, comprising beaches, the continental shelf, Sein Island and the Molène-Ouessant archipelago. This area corresponds to the limits of the first marine natural protected area created in France in 2007 (the "Parc Naturel Marin d'Iroise", PNMI). This area presents exceptional natural and human heritage, including a rich marine biodiversity, human traditions and emblematic activities (e.g. great scallop fishing).

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

Located at the forefront of Western Europe, this area is strongly affected by climate change which combines with other aspects of global change (e.g. eutrophication, proliferation of invasive species, anthropisation of the littoral, fishing and destruction of habitats), making this area particularly vulnerable. ZABrI scientists and stakeholders work together towards improving the sustainability of this area, in four directions: (i) Vulnerability of coastal ecosystems to erosion and submersion risks, (ii) Land-Ocean transfers and their effects on the structure and the functioning of the Bay of Brest ecosystem, ecosystem services and activities (tourism, fisheries, aquaculture and agriculture), (iii) Biodiversity conservation and management of uses in the marine protected area PNMI and (iv) Human-Environment interactions from the Prehistory to the present-day.

Location: Bay of Brest, Aulne and Elorn river catchments, Iroise Sea, Ouessant and Sein islands and archipelago of Molene

Ecosystems: Coastal; Marine; Temperate shelfs and seas; Small rivers

Research topics: biology; conservation; marine ecology; stream ecology; biodiversity; genetic diversity; marine biodiversity; species diversity; community ecology; community dynamics; trophic dynamics; trophic interaction; disturbance ecology; ecological impact; ecosystem ecology; ecosystem function; ecosystem service; paleoecology; population ecology; population changes over time; biological indicator; ecological indicator; invasion biology; physiology; ecophysiology; taxonomy; biogeochemistry; isotopic chemistry; sediment chemistry; water chemistry; environmental assessment; environmental impact; geology; geomorphology; global change; hydrology; limnology; paleolimnology; aquaculture; fishery; meteorology; climatology; climate change; oceanography; toxicology; ecotoxicology; social sciences; anthropology; archaeology; demography; economy; geography; biogeography; history; political science; sociology

Contact(s): Pierre Stephan, pierre.stephan@univ-brest.fr; Olivier Ragueneau

All parts of site accessible: Yes

Infrastructure:

All yr | BOAT | SC | 2WD | 4WD | BOAT | SR | Beds | Aqua | Power - Central | >100kW | Data: Int | Data: Ext

DEIMS.ID: 023645a3-8639-43c2-919d-f085721ff920

Web links

- http://www-iuem.univ-brest.fr/zabri/en

France

LTSER Zone Atelier Environnementale Urbaine

FOCUS ON URBAN SOCIOECOSYSTEM RESEARCH QUESTIONS

The LTSER Zone Atelier Environnementale Urbaine belongs to LTER-France network and is located in eastern France.The Zone Atelier Environnementale Urbaine ZAEU was created in 2010. It focuses on urban areas and urban socioecosystem research questions. The main objective is to define how to facilite an harmonious development according to the city needs without badly impacting the natural system around. The Eurometropole of Strasbourg is a close partner of the ZAEU: local authorities participate to the research experimentations and observation campains. Six working groups are dealing with natural systems in order to better understand the urban ecosystem (biodiversity, hydrology, air and climate, urban metabolism) and the socio system (social and economic dimensions of the society and the individuals, groups behavior and values, politics strategies). In the working groups, we study issues like hydrological system processes in the urban area, population health, energy consumption and production at the city scale, pollution and contamination of the various spheres, waste management with regards to the context of global changes, sustainable development and transitions (economy, ecology, energy).

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

The ZAEU is an environmental monitoring system on urban areas. The research teams are working in relation with regional public collectivities and communities to define the main study issues and objectives. The ZAEU structures researches on complex issues related to natural processes and social dynamics. Multiscale drivers are proposed in relation with the ones used by public authorities. Observation processes have been set up for biodiversity, hydrology and nature restoration, for example run-off water mitigation systems. Experimentation fields complete the modelling developments on hydrosystem and atmospheric spheres, as well as the urban spread. Remote sensing and cartographic data are already

available. Perception or behavioral data have also been collected for various purposes.

Location: Strasbourg Eurometropolis

Ecosystems: Urban

Research topics: natural science; biology; conservation; ecology; biodiversity; ecosystem ecology; genetics; physiology; air chemistry; environmental science; geomorphology; hydrology; limnology; meteorology; climate change; social sciences; geography; biogeography; sociology

Contact(s): Sandrine Glatron, sandrine.glatron@misha.fr; Nadège Blond; Isabelle Charpentier

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC

DEIMS.ID: 9a22f36d-1f22-4c1b-96be-5e8ef8b66dc6

Web links

- https://zaeu-strasbourg.eu/

France

LTSER Zone Atelier Loire

WATERSHED OF THE FRESH WATER RIVER (LA LOIRE)

The LTSER Zone Atelier Loire belongs to LTER-France network. The ZAL studies the Loire River basin (127,000 km²) on a long term scale (-15000 years until today). It focuses on the functioning of the hydrosystem, the human societies living there and on the co-evolution of the hydrosystem with society. The LTSER hosts several study sites subjected to measurement or data collection campaigns during work involving different disciplines as well as managers around a key question. The Maine watershed site is a large area to study dynamics of a low-energy river draining a 22,000 km² basin. The Louroux (Indre-et-Loire) site includes operation of an agricultural catchment area (24 km²). The bog of la Guette (Cher, Sologne, 0.25 km²) is an instrumented site to follow the rehabilitation of eco-hydrological services (storage of carbon, hydrology, biodiversity). Mareau-aux-prés islands (Loiret, St-Mesmin, 0.13 km²) is a site subjected to river dynamics which allows to understand the impacts of works carried out in the dyked bed and dynamics of the landscapes.

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

The studies of the LTSER mainly concern the society-environment interactions in direct or indirect connection with the river or its main tributaries. The network also aims to meet the social, economic and political expectations and to provide elements to develop a relevant prospective approach. The LTSER Zone Atelier Loire develops transdisciplinary research involving natural and social sciences (ecology, geoscience, biology, geography, sociology) and regional stakeholders. The research aims at better understanding and documenting the functioning and dynamics of the Loire through the abiotic, biotic and socio-systemic components of the Loire watershed, as well as their interactions over the long term, thus favoring an approach based on observation. We developed research questions on energy and matter transfers, biodiversity, ecosystem functioning and dynamis, and landscape trajectories.

Location: LTSER Zone Atelier Loire integrates four research sites along the Loire river. These sites ranging from 25 (Mareau) to 300 km (Val d'Allier)

Ecosystems: Agricultural; Temperate broadleaf and mixed forests; Grasslands; Small lakes; Small rivers; Large river headwaters; Large rivers; Urban

Research topics: aquatic ecology; stream ecology; wetland ecology; community ecology; ecosystem ecology; plant ecology; terrestrial ecology; geology; geomorphology; hydrography; limnology; paleolimnology; social sciences; archeology; demography; geography; biogeography; history; land use history; sociology

Contact(s): Sylvie Servain, sylvie.servain@insa-cvl.fr; Jean Secondi; Mathieu Bonnefond; Nicolas Legay

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | 2WD | BOAT | SR | Power - Central | >100kW | Data: Int | Data: Ext

DEIMS.ID: d2ffb931-ecac-48f9-8474-3d382d43f3f6

Web links

- http://www.za-loire.org/

France

LTSER Zone Atelier Plaine et Val de Sevre

CALCAREOUS PLAINS WITH AGRICULTURE, FORESTS, VILLAGES AND SUBURBAN AREAS

The LTSER Zone Atelier Plaine & Val de Sèvre belongs to LTER-France network and is located in the Poitou-Charentes Region, Western France (46°11'N, 0°28'W, 43 m average altitude). The main interests of this zone lie in its large size and the historical data related to monitoring of land use by the CNRS-CEBC since 1994. The site is bordered by the town of Niort to the north, and Chizé forest massif to the south. Approximately 28,000 inhabitants live in the area, in c. 40 villages. The study area size is 45,000 ha, of calcareous plains which are subjected to a warm-temperate oceanic climate. With a mean annual precipitation of 840 mm and regular summer dryness, mixed oak forests would be the potentially natural vegetation. Rain is scarce in summer. Woodlands are mostly reduced to small and scattered remnant patches (mean patch size = 1.87 ha) and hedgerows are widespread in some areas especially in the cattle breeding sectors. Woods are composed of medium-sized trees, maple, ash, cherry and oak (*Acer*, *Fraxinus*, *Prunus cerasus* and *Quercus*), with a strong presence of elm (*Ulmus*). Some of the main human derived landscape features of this area are a suburban zone in the North including many garden areas, a motorway on a North-South axis carrying heavy road traffic, and an electricity substation creating a concentration of high voltage power lines in some areas.

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

The ZAPVS aims to elaborate an alternative agricultural system to the productivist model, for ensuring the sustainable management of natural resources.

Location: South of Niort in the Poitou-Charentes Region, Western France

Ecosystems: Agricultural; Urban

Research topics: biology; phenology; taxonomy; genetics; biodiversity; species diversity; genetic diversity; conservation; terrestrial ecology; population ecology; population dynamics; population changes over time; plants population changes over time; plant ecology; vegetation dynamics; evolutionary ecology; community ecology; successional dynamics; community dynamics; trophic dynamics; ecosystem ecology; ecosystem function; ecosystem service; animal ecology; environmental science; geography; biogeography; agriculture; meteorology; climate change; social sciences; sociology; toxicology; ecotoxicology

Contact(s): Vincent Bretagnolle, Vincent.BRETAGNOLLE@cebc.cnrs.fr; Sabrina Gaba

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | 2WD | 4WD | SR | Beds | °C | Power - Central | >100kW | Data: Int | Data: Ext

DEIMS.ID: 08a263dc-8b7b-4ebb-8fbc-7e0dc9eab7f5

Web links

- http://www.za.plainevalsevre.cnrs.fr/

France

LTSER Zone Atelier Seine

MIXED LAND-USE, HIGHLY ANTHROPIZED

The LTSER Zone Atelier Seine belongs to LTER-France network and is located in Seine River Basin. The ZA Seine general aim is the study of a whole region. How its inhabitants construct the aquatic environment, as well as the quality of surface- and ground-waters may be seen as the dominant scientific question. The question is posed at various scales in space (from sub-catchments to the whole basin), and in time (from historical analysis starting in the Middle-Age to prospective studies for the next century).

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The ZA Seine is based on a set of three sub-programs. The PIREN-Seine program focuses on the river basin. It provides models of water, heat and nutrient circulation at various scales, including soils and water compartments, which the best way to study such a large system as a whole. These models include modeling of fish population, their behavior in a perturbed aquatic environment. The program also works on micro-pollutants circulation and their ecotoxicological impact. It relies on master sites at the sub-catchment scale for more detailed studies of biogeochemical, ecological and social processes. The Seine-Aval program focuses on the estuary and the near coastal area. The Seine-Aval program also proposes a detailed study and modeling of the whole ecosystem and food-web in the estuary. The OPUR program focuses on the Paris conurbation with a special emphasis on pollutant circulation, including analysis of products utilization by inhabitants and the potential for change.

Location: The zone-atelier Seine covers the complete Seine river basin, from upstream first order catchments to its estuary

Ecosystems: Agricultural; Temperate grasslands, savannas, and shrublands; Flooded grasslands and savannas; Small lakes; Large river deltas; Large river headwaters; Large rivers

Research topics: biology; aquatic ecology; lake ecology; marine ecology; stream ecology; wetland ecology; biodiversity; genetic diversity; species diversity; community ecology; paleoecology; genetics; physiology; ecophysiology; taxonomy; air chemistry; atmospheric chemistry; biogeochemistry; depositions chemistry; interstitial water chemistry; sediment chemistry; soil chemistry; water chemistry; environmental science; geology; geomorphology; hydrology; hydrography; limnology; agriculture; meteorology; climatology; climate change; climate monitoring; oceanography; toxicology; ecotoxicology; social sciences; anthropology; archeology; geography; biogeography; history; land use history; sociology

Contact(s): Jean-Marie Mouchel, jean-marie.mouchel@upmc.fr; Nicolas Bacq; Ghassan Chebbo

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | 2WD | 4WD | BOAT | SR | Beds | °C | Power - Central | >100kW | Data: Int | Data: Ext

DEIMS.ID: 10183aae-f8d2-4a39-af12-22a8e38a8a6a

Web links

- https://www.za-seine.fr
- https://www.piren-seine.fr/
- https://www.seine-aval.fr/
- https://www.leesu.fr/opur/

France

OZCAR-RI H+ PLOEMEUR - GUIDEL CZO

FRACTURED ROCK ANTHROPIZED AND NATURAL CZO

The Ploemeur-Guidel observatory (Britanny, France) is focusing on surface-depth relationships in a fractured crystalline geological context and oceanic climate. It is built on 2 sub-sites, one highly anthropized, the other in natural state. In Ploemeur, groundwater has been pumped since 1991, supplying more than 1 million m3 of clean drinking water annual at a sustainable rate. Such high productivity is explained the specific fractured network in granite and micaschists, draining deep geological layers (~400 m). Extracted water quality is very good, with limited nitrate concentration, in a region that has been strongly affected by widespread pollution. Guidel site is in a similar, but natural context. Deep iron-rich groundwater is upflowing, creating surface and deep groundwater-dependent ecosystems, and feeding a classified coastal wetland. Both sites have a very dense equipment to study rapid to long-term surface-depth exchanges: a flux tower, unsaturated zone monitoring, a network of ~50 shallow (<10 m) and deep boreholes (>80 m), hydrochemical, temperature and deformation. An well-characterized fractured experimental site offers the possibility to conduct experiments to test innovative instruments and develop new methodologies.

Purpose of site

MAINLY OBSERVATION
MAINLY EXPERIMENTATION

Ploemeur combines both monitoring and experimental objectives: (1) Develop innovative methods for imaging subsurface structure and flow in highly heterogeneous environments; (2) Investigate the aquifer vulnerability to climatic and anthropogenic pressures: (3) Study the environment's chemical reactivity, and water quality as extraction proceeds; (4) Estime water residence time and travel time distributions; (5) Acquire the data necessary for testing and validating hydrogeologic modeling methods designed for fractured environments. Close interactions are maintained with the local water development board.

Location: Ploemeur is located in the far west of Europe and France (Brittany), 150 km west of Rennes and 100 km east of Brest

Ecosystems: Agricultural; Coastal; Temperate broadleaf and mixed forests; Temperate grasslands, savannas, and shrublands; Small lakes; Small rivers; Fresh Water Rivers; Urban

Research topics: natural science; biology; genetics; microbiology; biogeochemistry; environmental chemistry; interstitial water chemistry; water chemistry; environmental science; geology; geomorphology; global change; global environmental change; hydrology; limnology; agriculture; meteorology; weather; soil physics; social sciences; geography; remote sensing; sociology; theory

Contact(s): Laurent Longuevergne, laurent.longuevergne@univ-rennes1.fr

All parts of site accessible: No

Infrastructure:

All yr | 2WD | 2WD | 4WD | T: can | Power - Central | 5-10 kW | Data: Int | Data: Ext

DEIMS.ID: 731f3ced-148d-4eb5-aa46-870fa22be713

Web links

- http://hplus.ore.fr/en/ploemeur
- http://www.ozcar-ri.org/

France

OZCAR-RI OHGE Strengbach Watershed OHGE Observatoire Hydro-Géochimique de l'Environnement

MOUTAINOUS FOREST ECOSYSTEM

The Strengbach Watershed is a granitic watershed (80 ha) located in NE of France, in the Vosges Mountains at altitudes between 880 and 1150 m (omsl) and with highly incised side slopes (mean 15°). This catchment is situated in a remote area lacking human activities except forest management. The forest covers 90% of the area and corresponds about to 80% spruce (mainly Piceas Abies L.) and 20% beech (Fagus Sylvatica). The climate is temperate oceanic mountainous. The site is manage by Ecole et Observatoire des Sciences de la Terres (University of Strasbourg / CNRS-INSU-France).

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Understanding how the natural environment reacts to anthropological or natural disturbances corresponds at both societal and scientific stakes, in particular for predicting future changes of our environment. The purpose of research on Strengbach Watershed are to better understand the complex physical, chemical and biological processes in the Critical Zone (CZ) which control the transfer and storage of water, elements, or energy. By combination of geochemical, geophysical, hydrological, mineralogical, physical, ecological studies we aim to built and test global numerical models able to modeled water and elemental cycles at the watershed scale. This step is essential to be able to predict future evolutions of ecosystem to disturbance as intensive agricultures, forest management or climate and rain changes.

Location: Situated 60 km from Strasbourg, France, in the Vosges massif

Ecosystems: Deciduous Forest; Temperate coniferous forests; Small rivers

Research topics: Natural science

Contact(s): Marie-Claire Pierret, marie-claire.pierret@unistra.fr

All parts of site accessible: No

Infrastructure:

4WD | SC | SR | Power - Central | Data: Int | Data: Ext

DEIMS.ID: 26cfa0da-c5bc-489f-8490-beee0e79a9de

Web links

- http://ohge.unistra.fr

eLTER component

LTER-Europe

www.lter-europe.net/lter-europe

LTER-Europe is the formal European regional group of the global ILTER network. It is a distributed network of research sites for multiple purposes in the fields of ecosystem, biodiversity, and socio-ecological research. LTER-Europe was launched in 2003 and currently comprises 26 national site networks, 450 LTER Sites and 35 LTSER Platforms where long-term interdisciplinary research and monitoring is carried out. Selected LTER-Europe sites will be upgraded to form the distributed site component of the eLTER Research Infrastructure (see pages 4-5).

Accredited sites

39

Network started

2004

Germany

LTER-D

https://www.ufz.de/lter-d/

Germany

AgroScapeLab Quillow (ZALF)

AGRICULTURAL ECOSYSTEM RESEARCH AND MONITORING

The site covers the whole catchment of the small river "Quillow" and it is called "AgroScapeLab Quillow". It is located in the north-east lowlands (Uckermark) which is about 90 km North of Berlin and has an area of about 160 km^2. It's a hummocky landscape characterized by gently rolling hills which are the results of glaciation during the Pleistocene. Unconsolidated sediments in a complex setting dominate. The soil pattern of the Quillow catchment is related to topography and the heterogeneity of Pleistocenic deposits. Albic Luvisols, Calcaric Regosols, Calcic Luvisols and Gleyic-Colluvic Regosols can be found. Another result of the ice age forces are the kettle holes (little ponds) which developed in drainless depressions. 74% of the land is in agricultural use. Small forest patches can be found in the western and southwestern part of the catchment, grassland more in the eastern lowlands. In general the area is only sparsely populated. The ZALF research platform is located in Dedelow.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Monitoring activities in the Quillow region started in the 1990s. The complex interplay of various landscape elements, integrating methods and expertise from different scientific disciplines are the focus of research on various long-term effects. ZALF activities cover aspects of agronomy, soil science, hydrology, biology and microbiology, socio-economics etc. at different temporal and spatial scales. The four pillars of monitoring (e.g. meteorological data, bird surveys, mycotoxins), process studies (e.g. CarboZALF, BioMove), landscape experiments and modelling/integrated data analysis form this landscape. Long-term and consistent multivariate data sets are an ideal basis for developing and testing numerical models as well as for application and further development of modern data mining approaches in order to reveal complex interdependencies in landscapes.

Location: North-east lowlands (Uckermark) of Germany, about 90 km North of Berlin, near the city of Prenzlau

Ecosystems: Agricultural; Temperate broadleaf and mixed forests; Temperate grasslands, savannas, and shrublands; Small lakes; Small rivers

Research topics: biology; conservation; aquatic ecology; biodiversity; species diversity; terrestrial ecology; biogeochemistry; geology; hydrology; agriculture; social sciences; demography

Contact(s): Gunnar Lischeid, lischeid@zalf.de; Kristin Meier

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | 4WD | SR | Beds | °C | Power

DEIMS.ID: 270a41c4-33a8-4da6-9258-2ab10916f262

Web links

- http://www.zalf.de

Germany

National Park Bavarian Forest

FOREST ECOSYSTEM MONITORING AND RESEARCH

The Bavarian Forest National Park with an area of 245 km² is situated in the Bohemian Forest. Management follows a strict non-intervention nature conservation strategy on more than 67% of the area. The large non-intervention zone together with an elevational gradient of more than 800 m allows the monitoring of global change on biodiversity and ecosystem processes. The bedrock consists of magmatic and metamorphic rocks. Mean annual temperature and precipitation is 7–4°C and 1100–2000 mm depending on altitude.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Long-term monitoring programs have been carried out in the Große Ohe catchment to detect hydrological and hydrogeochemical changes due to land use, to vegetation changes and to air pollution. In 2015, extended monitoring activities of climate change effects on macroinvertebrates in surface waters and on bog hydrology have been launched. Changes in vegetation composition and cover are detected by remote sensing methods. In biodiversity monitoring, the park administration follows a strategy of a multitrophic and multitaxon survey from bacteria, to plants, to fungi to animals. Since 2011 the National Park set up experiments in the buffer zone to gain a deeper mechanistic understanding of patterns observed in the non-intervention zone.

Location: South-East Germany, at the Czech-German border, between Munich (Germany 200 km), Prague (Czech Republic, 200 km) and Vienna (Austria, 300 km)

Ecosystems: Temperate broadleaf and mixed forests; Temperate coniferous forests; Montane grasslands and shrublands

Research topics: biology; conservation; ecology; biodiversity; environmental science; meteorology

Contact(s): Jörg Müller, joerg.mueller@npv-bw.bayern.de

All parts of site accessible: No

Infrastructure:

All yr | 2WD | SC | Beds | SR | T:>10m | °C | Power - Central | Data: Int | Data: Ext

DEIMS.ID: 993ed2fc-1cb0-4810-a619-8bcf78b6ecee

Web links

- http://www.nationalpark-bayerischer-wald.de/

Germany

Rhine-Main-Observatory

RIVER AND FLOODPLAIN ECOSYSTEM

The Rhine-Main-Observatory (RMO) covers the drainage basin of the Kinzig River in Hesse, Germany (~1060 km²). Situated at the fringe of the Rhine-Main area, the second largest metropolitan area in Germany, the Kinzig River divides three lower mountain ranges (Rhön, Vogelsberg, Spessart). Therefore, the Rhine-Main-Observatory includes both densely populated areas on the outskirts of the Rhine-Main metropolitan region as well as natural landscapes with little anthropogenic disturbance. This creates a highly diverse mosaic of land uses along a wide gradient of exploitation activities, from vibrant city centers to dense industrial areas; and from intensively and extensively used agricultural land, to heavily managed forests and natural reserves. The RMO was started officially in 2007, however many of the data series started much earlier. The scientific focus of the work in the RMO lies in understanding the role of land use and (micro-) climate in shaping meta-community structures in a fragmented river-floodplain ecosystem. The monitoring comprises a broad variety of permanent biotic and abiotic monitoring sites, as well as additional context-dependent monitoring schemes.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Research within the RMO aims at investigating biodiversity patterns and ecological processes in complex, fragmented landscapes. Research focusses on different habitats in streams and their floodplains, along a gradient of land use intensity, including areas with natural vegetation, agricultural and settlement areas. It is through this comprehensive long-term and large-scale approach that far-reaching conclusions about the causes of changes in biodiversity can be drawn. This in turn, allows the prediction of the effects of future land-use or climate-induced changes on biodiversity as well as to infer recommendations for the protection of endangered species and habitats.

Location: 50 km from Frankfurt and Frankfurt International Airport

Ecosystems: Agricultural; Mixed Forest; Grasslands; Rivers; Urban

Research topics: natural science; biology; conservation; aquatic ecology; stream ecology; wetland ecology; community ecology; community dynamics; successional dynamics; plant ecology; vegetation dynamics; soil chemistry; water chemistry; environmental science; hydrology; limnology; meteorology; weather

Contact(s): Beatrice Kulawig, beatrice.kulawig@senckenberg.de

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | 2WD | 4WD | SR | Beds | Power - Central | >100 kW | Data: Ext

DEIMS.ID: 9f9ba137-342d-4813-ae58-a60911c3abc1

Web links

- http://www.senckenberg.de/root/index.php?page_id=15596

Germany

TERENO - Bad Lauchstädt

EXPERIMENTAL FIELD STATION

The Experimental Research Station in Bad Lauchstädt allows scale-dependent experimental investigations of different ecological systems in climatic chambers, heated and unheated greenhouses as well as in field sites on an area of 40 ha. The experiments contribute to a better understanding of the complex relationships in the soil-plant-atmosphere system. In particular, factors arising from the changes in land use, climate and species pool system are investigated. Thus, it is the experimental basis for numerous departments of UFZ and the German Centre for Integrative Biodiversity Research, iDiv (www.idiv.de).

Purpose of site

PARTLY OBSERVATION
MAINLY EXPERIMENTATION

The main focus of research is on experiments simulating global change, thus climate and land use change. This is mainly addressed by (a) the GCEF Global Change Experimental Facility, (b) the static fertilization experiment, (c) a lysimeter station, (d) succession experiments, (e) oak phytometers, (f) intensive measuring fields, (g) an incremental farmyard manure experiment and (h) small plot experiments.

Location: 15 km south-west of Halle (Saale) and 35 km east of Leipzig

Ecosystems: Agricultural

Research topics: natural science; biology; community assembly; community ecology; community dynamics; successional dynamics; trophic dynamics; trophic interaction; disturbance ecology; ecosystem function; ecosystem service; plant ecology; vegetation dynamics; genetics; phenology; plant phenology; environmental science; environmental assessment; environmental risk assessment; environmental impact assessment; global change; global environmental change; hydrology; management; agriculture; meteorology; weather; soil science; soil physics; soil classification; soil chemistry; soil solution chemistry

Contact(s): Ines Merbach, ines.merbach@ufz.de

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | Power | Data: Int | Data: Ext

DEIMS.ID: 102ae489-04e3-481d-97df-45905837dc1a

Web links

- http://www.ufz.de/index.php?de=15278

Germany

TERENO - Friedeburg

BIODIVERSITY RESEARCH RELATED LANDSCAPE TEST SITE

The sites Friedeburg, Greifenhagen, Harsleben, Schafstädt, Siptenfelde and Wanzleben are part of the TERENO Harz / Central German Lowland Observatory in Saxony-Anhalt run by the Helmholtz Centre for Environmental Research UFZ. These sites have a focus on biodiversity monitoring in the “normal landscape” which is characterized by agricultural use (about 60% coverage of Saxony-Anhalt). Each site is a 4x4 km landscape of mainly arable land and semi-natural habitats like e.g. hedges and forests. The site Friedeburg is characterized by a distinct topography with valleys and slopes with a mean elevation of 122 m asl. According to the topography the average size of crop fields is lowest (12 ha) compared to the other sites, but the total area covered by crop fields is still 71% and semi-natural habitats are summing up to 10%.

Purpose of site

ONLY OBSERVATION
NO EXPERIMENTATION

The main purpose of the TERENO biodiversity research sites is to investigate effects of land use, landscape characteristics and climate on biodiversity patterns in agriculturally dominated landscapes. We focus on vascular plants (surveyed each second to third year), arthropods (mainly pollinators like wild bees, surveyed yearly and butterflies) and birds (surveyed each third year). Vegetation and land use data is available since 1960. Vegetation, bird and arthropod data are available from 2001-2002 (EU project Greenveins) and since the TERENO project started from 2009 (birds: 2009, 2012, 2013, 2014, 2017) and 2010 (insects) onward. A central weather station provides temperature, precipitation and humidity data and temperature loggers are attached to each trap to measure the local conditions.

Location: 20 km northwest of the city of Halle (Saale), close to the Saale river

Ecosystems: Agricultural

Research topics: biology; animal ecology; biodiversity; species diversity; community ecology; community dynamics; ecosystem ecology; ecosystem function; ecosystem service; plant ecology; vegetation dynamics; terrestrial ecology; phenology

Contact(s): Mark Frenzel, mark.frenzel@ufz.de

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | Data: Ext

DEIMS.ID: a4dc71c4-de05-4883-ae53-7f57d51555fc

Web links

- https://www.ufz.de/index.php?en=40483

Germany

TERENO - Gimritz

BIODIVERSITY RESEARCH SITE

The site is located within a protected area near Halle and due to the rain shadow of the Harz mountains the annual precipitation in this area is low (497 mm). The climate is subcontinental with relative high mean yearly temperatures (average 9.1 °C). The area is characterized by a distinct topography with a complex mosaic of soils. On rhyolithic bedrocks rankers are dominating while brown soils and tschernosemic soils occur in the valleys between the hills. This mosaic leads to a considerable variation of soil properties (soil pH varies between 4.6-7.4). On the small rhyolitic bedrocks a mosaic of dry grassland communities occurs correlated with depth of the soil layer, soil pH and exposition. Four plant communities are dominating: *Brachypodietum pinnati* (soil-pH: 7.4), *Euphorbio-Callunetum* (4.8), *Festucetum rupicolae* (5.8), *Thymo-Festucetum* (4.6). On top of the hills and on the southern slopes, the shallow soils do not allow the establishment of shrubs and trees. Part of the area was irregularly grazed by sheep. Areas with deeper soils were used as arable fields. In 1990 the grazing regime was partially reduced and arable fields were transformed into grassland, which is mown once per year.

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

The site is a long term observation site with a focus on changes in plant communities due to land use and climate change. Since 1990 the vegetation is surveyed once per year. Additional experiments (e.g.disturbance, plant-animal interaction) are conducted irregularly. A central weather station provides temperature, precipitation and humidity data.

Location: 13 km north-west of Halle (Saale)

Ecosystems: Temperate grasslands, savannas, and shrublands

Research topics: plant ecology

Contact(s): Jutta Stadler, jutta.stadler@ufz.de

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | Power | <1 kW |

DEIMS.ID: f5493145-a658-4004-b8ef-6942fcdda5f5

Germany

TERENO - Greifenhagen

BIODIVERSITY RESEARCH RELATED LANDSCAPE TEST SITE

The sites Friedeburg, Greifenhagen, Harsleben, Schafstädt, Siptenfelde and Wanzleben are part of the TERENO Harz / Central German Lowland Observatory in Saxony-Anhalt run by the Helmholtz Centre for Environmental Research UFZ. These sites have a focus on biodiversity monitoring in the "normal landscape" which is characterized by agricultural use (about 60 % coverage of Saxony-Anhalt). Each site is a 4x4 km landscape of mainly arable land and semi-natural habitats like e.g. hedges and forests. The site Greifenhagen is characterized by a distinct topography with valleys and slopes and a mean elevation of 270 m asl. The area covered by crop fields (mean field size 14 ha) is 71 % and all semi-natural habitats sum up to 6 %.

Purpose of site

ONLY OBSERVATION
NO EXPERIMENTATION

The main purpose of the TERENO biodiversity research sites is to investigate effects of land use, landscape characteristics and climate on biodiversity patterns in agriculturally dominated landscapes. We focus on vascular plants (surveyed each second to third year), arthropods (mainly pollinators like wild bees, surveyed yearly and butterflies) and birds (surveyed each third year). Vegetation and land use data is available since 1960. Vegetation, bird and arthropod data are available from 2001-2002 (EU project Greenveins) and since the TERENO project started from 2009 (birds: 2009, 2012, 2013, 2014, 2017) and 2010 (insects) onward. A central weather station provides temperature, precipitation and humidity data and temperature loggers are attached to each trap to measure the local conditions.

Location: 40 km northwest of Halle (Saale), 5 km west of Hettstedt

Ecosystems: Agricultural

Research topics: biology; community ecology; community dynamics; ecosystem ecology; ecosystem function; ecosystem service; plant ecology; vegetation dynamics; terrestrial ecology; phenology

Contact(s): Mark Frenzel, mark.frenzel@ufz.de

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | Data: Ext

DEIMS.ID: 6d59c59d-bf96-4764-8a2d-d3feb77088a7

Web links

- https://www.ufz.de/index.php?en=40484

Germany

TERENO - Rollesbroich

GRASSLAND HYDROLOGICAL OBSERVATORY

The Rollesbroich site is located in the low mountain range “Eifel” near the German-Belgium border and covers the area of the small Kieselbach catchment (40 ha) with altitudes ranging from 474 to 518 m.a.s.l.. The climate is temperate maritime with a mean annual air temperature and precipitation of 7.7 °C and 1033 mm, respectively, for the period from 1981 to 2001. Soils are dominated by (stagnic) Cambisols and Stagnosols on Devonian shales with occasional sandstone inclusions that are covered by a periglacial solifluction clay–silt layer. The mountainous grassland vegetation is dominated by perennial ryegrass (*Lolium perenne*) and smooth meadow grass (*Poa pratensis*). The study site is highly instrumented. All components of the water balance (e.g. precipitation, evapotranspiration, runoff, soil water content) are continuously monitored using state-of-the-art instrumentation, including weighable lysimeters, runoff gauges, cosmic-ray soil moisture sensors, a wireless sensor network that monitors soil temperature, and soil moisture at 189 locations in different depths (5, 20 and 50 cm) throughout the study site. Periodically also different chamber measurements were made to access soil or plant gas exchange.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Scientific purpose, TERENO and ICOS test site, observation of mass and energy fluxes, water balance, energy balance, soil-vegetation-atmosphere processes.

Location: Western part of the Eifel low mountain range, about 23 km SW of the city of Aachen

Ecosystems: Temperate grasslands, savannas, and shrublands

Research topics: terrestrial ecology; hydrology; agriculture; physics; soil physics

Contact(s): Heye Bogena, h.bogena@fz-juelich.de

All parts of site accessible: Yes

Infrastructure:

All yr | FOOT | T: <10m | Power - Central | Data: Int | Data: Ext

DEIMS.ID: 356417de-5a3c-429d-82c1-08a4e924ab3b

Web links

- http://www.tereno.net
- https://www.icos-cp.eu

Germany

TERENO - Schafstädt

BIODIVERSITY RESEARCH RELATED LANDSCAPE TEST SITE

The sites Friedeburg, Greifenhagen, Harsleben, Schafstädt, Siptenfelde and Wanzleben are part of the TERENO Harz / Central German Lowland Observatory in Saxony-Anhalt run by the Helmholtz Centre for Environmental Research UFZ. These sites have a focus on biodiversity monitoring in the "normal landscape" which is characterized by agricultural use (about 60% coverage of Saxony-Anhalt). Each site is a 4x4 km landscape of mainly arable land and semi-natural habitats like e.g. hedges and forests. The site Schafstädt is part of the "Querfurter Platte" ranking about the richest soils in Germany. It is characterized by a quite flat topography and a mean elevation of 177 m asl. The average size of crop fields is highest (67 ha) compared to the other sites and the total area covered by crop fields is 97%, all semi-natural habitats summing up to 2%.

Purpose of site

ONLY OBSERVATION
NO EXPERIMENTATION

The main purpose of the TERENO biodiversity research sites is to investigate effects of land use, landscape characteristics and climate on biodiversity patterns in agriculturally dominated landscapes. We focus on vascular plants (surveyed each second to third year), arthropods (mainly pollinators like wild bees, surveyed yearly and butterflies) and birds (surveyed each third year). Vegetation and land use data is available since 1960. Vegetation, bird and arthropod data are available from 2001-2002 (EU project Greenveins) and since the TERENO project started from 2009 (birds: 2009, 2012, 2013, 2014, 2017) and 2010 (insects) onward. Weather data are available from the nearest official DWD weather station and temperature loggers are attached to each trap to measure the local conditions.

Location: 20 km southwest of Halle (Saale), 9 km east of Querfurt

Ecosystems: Agricultural

Research topics: biology; animal ecology; biodiversity; species diversity; community ecology; community dynamics; ecosystem ecology; ecosystem function; ecosystem service; plant ecology; vegetation dynamics; terrestrial ecology; phenology

Contact(s): Mark Frenzel, mark.frenzel@ufz.de

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD

DEIMS.ID: 68ef735c-bd72-4400-ab15-0c3c3a8a37ee

Web links

- https://www.ufz.de/index.php?en=40486

Germany

TERENO - Selhausen

CROPLAND CARBON BALANCE EXPERIMENTAL SITE

The Selhausen site represents the heterogeneous agricultural rural area of the lower Rhine valley. The climate is temperate maritime with a mean annual temperature of 10°C and annual precipitation of 700 mm for the period from 1961 to 2014 (meteorological tower, Forschungszentrum Jülich). The most important crops in the region of Selhausen are sugar beet (*Beta vulgaris*), winter wheat (*Triticum avesticum*), winter barley (*Hordeum vulgare*), maize (*Zea mays*) and rape seed (*Brassica napus*). Only parts of the region are managed as grasslands. The underlying Quaternary sediments are mostly fluvial deposits covered with loess. Major soil types are luvisols and gleyed cambisols, partly with large contents of gravel. The land surface is generally flat with slopes up to 4° in the area of a former channel of the Rur River system. From 2007 to 2010 a first long-term eddy covariance study was conducted within the Selhausen region (measurements can be found at the European fluxes database cluster, ID: DE-Seh). In spring 2011 a new station (50.865°N, 6.447°E, 203m a.s.l.) was equipped with a CSAT3 sonic anemometer and LI7500 gas analyzer. Besides flux measurements and typical climate parameters (radiation, air temperature, air humidity, soil moisture, soil temperature etc.), also the phenological development of the crops and farming activities were recorded. The station fits now the standards of a Level-1 site for the European project ICOS (Integrated Carbon Observation System). As a pan-European long-term research infrastructure ICOS aims at providing harmonized and high-precision scientific data on carbon cycle and greenhouse gas budget and perturbations.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Long-term Observation of mass and energy fluxes, water balance, energy balance, soil-vegetation-atmosphere processes in an agricultural environment.

Location: Southern part of the Lower Rhine Embayment in Western Germany. About 38 km WSW of Cologne and 28 km ENE of Aachen

Ecosystems: Agricultural

Research topics: biology; ecosystem ecology; plant ecology; terrestrial ecology; phenology; environmental science; agriculture; meteorology; climatology; climate change; climate monitoring

Contact(s): Marius Schmidt, ma.schmidt@fz-juelich.de

All parts of site accessible: Yes

Infrastructure:

All yr | FOOT | T: can | Power - Central | Data: Int | Data: Ext

DEIMS.ID: 0a006b69-5134-4c0a-864c-f86c0c61288f

Web links

- http://www.tereno.net
- https://www.icos-cp.eu

Germany

TERENO - Siptenfelde

BIODIVERSITY RESEARCH RELATED LANDSCAPE TEST SITE

The sites Friedeburg, Greifenhagen, Harsleben, Schafstädt, Siptenfelde and Wanzleben are part of the TERENO Harz / Central German Lowland Observatory in Saxony-Anhalt run by the Helmholtz Centre for Environmental Research UFZ. These sites have a focus on biodiversity monitoring in the "normal landscape" which is characterized by agricultural use (about 60% coverage of Saxony-Anhalt). Each site is a 4x4 km landscape of mainly arable land and semi-natural habitats like e.g. hedges and forests. The site Siptenfelde is in the eastern part of the Harz mountains and characterized by a distinct topography. Nearby the village are arable fields and meadows, and in a distance it is surrounded by forests The mean elevation is 423 m asl. Thus within the 4x4 km landscape the area covered by forest amounts to 61%, crop fields 18% (mean field size 25 ha) and all semi-natural habitats sum up to 15%.

Purpose of site

ONLY OBSERVATION
PARTLY EXPERIMENTATION

The main purpose of the TERENO biodiversity research sites is to investigate effects of land use, landscape characteristics and climate on biodiversity patterns in agriculturally dominated landscapes. We focus on vascular plants (surveyed each second to third year), arthropods (mainly pollinators like wild bees, surveyed yearly and butterflies) and birds (surveyed each third year). Vegetation, bird and arthropod data are available since the TERENO project started from 2009 (birds: 2009, 2012, 2013, 2014, 2017) and 2010 (insects) onward. A central weather station provides temperature, precipitation and humidity data and temperature loggers are attached to each trap to measure the local conditions. For hydrological investigations a many devices are installed (weather station, groundwater gauges, soil moisture sensor network).

Location: 7 km west of Harzgerode (Harz mountains)

Ecosystems: Agricultural; Temperate broadleaf and mixed forests

Research topics: biology; animal ecology; biodiversity; species diversity; community ecology; community dynamics; ecosystem ecology; ecosystem function; ecosystem service; plant ecology; vegetation dynamics; terrestrial ecology; phenology

Contact(s): Mark Frenzel, mark.frenzel@ufz.de

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | Power

DEIMS.ID: 1f66bede-0ecf-4529-9fd5-b09e96b363f0

Web links

- https://www.ufz.de/index.php?en=40487

Germany

TERENO - Wanzleben

BIODIVERSITY RESEARCH RELATED LANDSCAPE TEST SITE

The sites Friedeburg, Greifenhagen, Harsleben, Schafstädt, Siptenfelde and Wanzleben are part of the TERENO Harz / Central German Lowland Observatory in Saxony-Anhalt run by the Helmholtz Centre for Environmental Research UFZ. These sites have a focus on biodiversity monitoring in the “normal landscape” which is characterized by agricultural use (about 60% coverage of Saxony-Anhalt). Each site is a 4x4 km landscape of mainly arable land and semi-natural habitats like e.g. hedges and forests. The site Wanzleben is situated in the “Magdeburger Börde”, a flat area with highest ranking of soil quailty in Germany. It is characterized by a mostly flat topography with a mean elevation of 113 m asl. The area covered by crop fields is 77% (mean field size 26 ha), semi-natural habitats summing up to 8%.

Purpose of site

ONLY OBSERVATION
NO EXPERIMENTATION

The main purpose of the TERENO biodiversity research sites is to investigate effects of land use, landscape characteristics and climate on biodiversity patterns in agriculturally dominated landscapes. We focus on vascular plants (surveyed each second to third year), arthropods (mainly pollinators like wild bees, surveyed yearly and butterflies) and birds (surveyed each third year). Vegetation and land use data is available since 1960. Vegetation, bird and arthropod data are available from 2001-2002 (EU project Greenveins) and since the TERENO project started from 2009 (birds: 2009, 2012, 2013, 2014, 2017) and 2010 (insects) onward. A central weather station provides temperature, precipitation and humidity data and temperature loggers are attached to each trap to measure the local conditions.

Location: 14 km west of Magdeburg

Ecosystems: Agricultural

Research topics: biology; animal ecology; biodiversity; species diversity; community ecology; community dynamics; ecosystem ecology; ecosystem function; ecosystem service; plant ecology; vegetation dynamics; terrestrial ecology; phenology

Contact(s): Mark Frenzel, mark.frenzel@ufz.de

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | Data: Ext

DEIMS.ID: 9b85ef18-d41b-48ca-87e8-6e0735406a60

Web links

- https://www.ufz.de/index.php?en=40488

Germany

TERENO - Wüstebach

NORWAY SPRUCE DEFORESTATION EXPERIMENT

The Wüstebach catchment is located in the Eifel National Park and covers an area of 38.5 ha, with mean altitude of about 610 m. The geology is dominated by Devonian shale, which is covered by a periglacial solifluction layer of about 1–2 m thickness. Cambisols and Planosols have developed on the hillslopes, whereas Gleysols and Histosols have formed in the valley. The main soil texture is silty clay loam and the litter layer has a thickness between 0.5 and 14 cm. The mean annual precipitation is about 1200 mm. Norway Spruce planted in 1946 is the prevailing vegetation type. During late summer/early autumn of 2013, trees were almost completely removed in an area of 9 ha by the national park forest management in order to promote the natural regeneration of near-natural deciduous forest from spruce monoculture forest.

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

Investigation of deforestation effects on the ecosystem, hydrological and biogeochemical processes using an integrated observation approach. To this end the site was instrumented to allow for a detailed long-term monitoring of meteorological states and fluxes (above and below the canopy), runoff discharge, groundwater levels, dynamics of soil water content patterns, soil respiration, chemical soil properties, solute concentrations in soil and stream of important elements and stable isotopes, and sediment transport.

Location: Western part of Eifel mountain range on the german site of the German-Belgian border and about 35 km SSE of the city of Aachen

Ecosystems: Temperate coniferous forests

Research topics: biology; biodiversity; ecosystem ecology; terrestrial ecology; biogeochemistry; geology; hydrology; limnology; meteorology

Contact(s): Heye Bogena, h.bogena@fz-juelich.de ; Thomas Pütz

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | 2WD | 4WD | °C | T: >10m | Power - Central | >100 kW | Data: Int | Data: Ext

DEIMS.ID: 9fe5a5d1-ccc0-41ab-b555-5ca44da24cd8

Web links

- http://www.tereno.net

Accredited sites

8

Network started

2016

Greece

LTER-Greece

www.lter-greece.gr

Greece

LTSER Platform Koiliaris Critical Zone Observatory

KARSTIC MEDITERRANEAN WATERSHED

The Koiliaris River watershed is a Critical Zone Observatory that represents severely degraded soils due to heavy agricultural impact such as grazing, over many centuries. It represents Mediterranean soils under imminent threat of desertification (soil carbon loss) due to climate change that is predicted by the UN IPCC for the region over the next century. It is located in Western Crete, Greece. There are 17 communities in the catchment. The total area is 130 sqkm and the total length of the river is 36 km. Intensive hydrologic and geochemical monitoring has been conducted since 2004 while the site has historical data since the '60s. In addition, high-frequency hydrologic and water quality monitoring stations have been deployed to obtain data for the characterization of the hydrologic and biogeochemical processes with varying process response-times. There are 3 meteorological stations within the watershed and several outside. Water quality data of surface and groundwater have been collected since 2004. Koiliaris-CZO is managed by the Laboratory of Hydrochemical Engineering & Remediation of Soil (H.E.R.S. Lab) of the Technical University of Crete.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Koiliaris CZO is an exemplary site for studying the Mediterranean soils under imminent threat of desertification due to climate change. The main type of soil degradation in the basin is water erosion, which is due to the clearing of forests and natural vegetation for cropping and livestock grazing. De-vegetation and inappropriate cultivation practices induces soil organic matter losses making soils susceptible to erosion and desertification with global consequences for food security, climate change, biodiversity, water quality, and agricultural economy. Key research questions investigated at Koiliaris CZO are the following: Water resources management and sustainable management of soils; hydrological modelling of complex terrains; high frequency environmental monitoring; soil degradation and soil formation; stream and ground water chemistry.

Location: Koiliaris CZO is located in western Crete, 20km east of the city of Chania.

Ecosystems: Agricultural; Mediterranean forests, woodlands, and scrub

Research topics: biodiversity; terrestrial ecology; sediment chemistry; soil chemistry; soil solution chemistry; water chemistry; geology; hydrology; hydrography; agriculture; meteorology; climatology; climate change; climate monitoring; history; land use history

Contact(s): Nikolaos Nikolaidis, Technical University of Crete

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | 2WD | Power - Central | Power: 1-5kW | Data: Int | Data: Ext

DEIMS.ID: 65d7bf15-841a-4fb7-a36e-6f4d95a8d64e

Web links

- http://www.koiliaris-czo.tuc.gr
- http://www.herslab.tuc.gr

Accredited sites

11

Network started

1995

Hungary

LTER Hungary

http://www.lter.hu/en

Hungary

Balaton LTSER

LARGE SHALLOW FRESHWATER LAKE AND ITS WATERSHED

The Balaton LTSER Platform is dedicated to the study of the largest shallow lake in Eastern Europe, situated in the mid-western part of Hungary. The site, which is a popular holiday resort, consists of the lake and its watershed. Lake Balaton went through considerable changes in trophic state during the past decades. After a period of anthropogenic eutrophication from the late 1960s until the mid '90s, restoration measures aimed at reducing the nutrient load reaching the lake led to gradual reoligotrophication. The Balaton Limnological Institute of the MTA Centre for Ecological Research, situated on the Tihany peninsula, had an important role in improving the water quality and the ecological status of the lake by providing sound scientific knowledge for the decision-makers and the general public.

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

Research at the Balaton Limnological Institute focuses on aquatic ecology, with an emphasis on shifts in community structure and on causal relationships between the observed changes and ecosystem processes. The main areas of research include nutrient cycling, humic substances, phytoplankton and macrophyte ecophysiology, zooplankton and zoobenthos, food web relationships, fish population dynamics, invasive species and environmental toxicology. The institute also maintains an algal culture collection for laboratory experiments. Due to regular monitoring, there is an extensive data set on Lake Balaton covering the last 20 years. Phytoplankton research has yielded a particularly long data series dating back to the 1930s. Water samples are collected on a biweekly/monthly basis at two stations in the eastern and western part of the lake, or occasionally at five stations along the E-W axis.

Location: 140 km from Budapest

Ecosystems: Fresh Water Lakes

Research topics: biology; animal ecology; aquatic ecology; lake ecology; biodiversity; species diversity; community ecology; community dynamics; ecosystem ecology; ecosystem function; microbial ecology; population ecology; population changes over time; population dynamics; physiology; ecophysiology; taxonomy; limnology

Contact(s): Károly Pálffy, palffy.karoly@okologia.mta.hu

All parts of site accessible: Yes

Infrastructure:

All yr | BOAT | 2WD | 4WD | BOAT | SR | Beds | Power: Cent | 10-100kW | Data: Int | Data: Ext

DEIMS.ID: 30e906bb-7ed6-4fee-8ae9-539db55dfd35

Web links

- http://bli.okologia.mta.hu/en

Hungary

KISKUN LTER

HIGHLY HETEROGENEOUS LAND ON KISKUNSÁG SAND RIDGE

The study area of KISKUN LTER is the Kiskunság Sand Ridge and its periphery, 14000 km^2 altogether, 17% of the area of Hungary. The primarily sandy area is extremely heterogeneous. It consists of arable lands, planted forests, meadows, abandoned fields, settlements, alkaline lakes, wetlands, and species rich remnants of forest steppe. It is also very varying in time: ploughing and setting aside, extensive plantation of alien trees, drainage, wild fires, biological invasions, and fast demographic movements have been happening in the last 100 years, and beyond all those, the area is particularly sensitive to the climate change.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

KISKUN LTER aims to study the living environment, to detect and monitor its changes, to understand and model the underlying causes and mechanisms, and to use the knowledge acquired to help preserving the biodiversity and associated ecosystem services. The major actor behind the changes is the human being, the the quality of the changed living environment impact the quality of the human life. We study the living environment and its ecological processes embedded into the social and economical environment. Major topics: organization and structure of the sand grassland; climate change simulation field experiment on sand grassland; spontaneous regeneration of vegetation after agricultural field abandonment and fire; recent changes in ecosystem services due to changes of water availability; restoration of high diversity vegetation.

Location: Central and northern part of Bács-Kiskun county and southern part of Pest county. Its centre is 100 km SSE of Budapest

Ecosystems: Agricultural; Temperate broadleaf and mixed forests; Temperate grasslands, savannas, and shrublands; Small lakes

Research topics: conservation; aquatic ecology; lake ecology; community ecology; community dynamics; successional dynamics; ecosystem ecology; ecosystem function; plant ecology; population ecology; terrestrial ecology; environmental science; limnology; meteorology; social sciences; history; land use history

Contact(s): Miklós Kertész, kertesz.miklos@okologia.mta.hu

All parts of site accessible: No

Infrastructure:

All yr | 4WD | 2WD | 4WD | Boat | SR | Beds | T:<10m | °C | Power: Cent | 1-5kW | Data: Int | Data: Ext

DEIMS.ID: 124f227a-787d-4378-bc29-aa94f29e1732

Web links

- http://www.kiskun.lter.hu/en

Hungary

LTER Fulophaza Site, KISKUN LTER

CLIMATE CHANGE EXPERIMENT ON SAND GRASSLAND

LTER Fulophaza is a high diversity site, both in terms of habitats and species, in the Kiskunság Sand Ridge. It harbors some of the central facilities of the KISKUN LTER, such as the meteorological station and the field research station with accommodation opportunities, as well as highly equipped experimental sites, and a couple of long term monitoring sites and field experiments.

Purpose of site

PARTLY OBSERVATION
MAINLY EXPERIMENTATION

There are two highly equipped field experiments on the site, namely the VULCAN/INCREASE climate change simulation experiment and the “extreme drought and precipitation simulation” experiment. There is also restoration and reintroduction research focuses on open sand grassland habitat and includes clear-cut black locust forest experiment, milkweed eradication, seeding by native species, and nitrogen immobilization trials. On a 50 ha monitoring site the vegetation dynamics of the high diversity protected Pannonian sand grassland is studied. Spontaneous restoration after abandonment of cultivation is studied on another 50 ha long-term monitoring site.

Location: The site is in the centre of the Kiskunság Sand Ridge, 100 km SSE of Budapest and 20 km W of Kecskemét

Ecosystems: Temperate grasslands, savannas, and shrublands

Research topics: biology; conservation; ecology; meteorology; social sciences

Contact(s): Miklós Kertész, kertesz.miklos@okologia.mta.hu

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | 2WD | SR | Beds | T:<10m | Power: Cent | Power: Dist | Data: Int | Data: Ext

DEIMS.ID: b4b76a9a-cbf9-4739-9162-83a31798ff0d

Web links

- http://www.kiskun.lter.hu/en

Hungary

Sikfokut LTER

TEMPERATE DECIDUOUS FOREST

Síkfőkút LTER Europe site is a temperate deciduous forest site, unmanaged since the late 1960s. It is situated in the Szőllőcske forest reserve area on the southern foothills of Bükk Mountains, NE Hungary. The site is covered by a mature coppice oak forest (105 years old) with *Q. petraea* and *Q. cerris* in the upper canopy layer and other woody species occurring in the secondary canopy layer and shrub layers (*Acer* sp., *Cornus* sp, *Euonymus* sp., *Crataegus* sp.) The site was seriously impacted by oak decline during the 1980s.

The soil has been classified as a brown forest soil type according to the Hungarian Soil Classification System which corresponds to Luvisol according to FAO WRB.

Long-term data are available on climate, soil variables and forest structural and functional characteristics (for period 1973-2016).

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The site was originally established to study the structure and production biological processes of a forest representing the most dominant forest ecosystem type in Hungary during the IBP and MAB period. The current research is dedicated to reveal the effects of climate change on growth, carbon allocation and water balance of main tree species and ecosystem function.

Location: 130 km from Budapest and Liszt Ferenc International Airport (Budapest)

Ecosystems: Temperate broadleaf and mixed forests

Research topics: biology; dendrochronology; biodiversity; genetic diversity; species diversity; ecosystem ecology; ecosystem function; forest ecology; terrestrial ecology; physiology; chemistry

Contact(s): Ilona Meszaros, immeszaros@unideb.hu; Viktor Oláh

All parts of site accessible: No

Infrastructure:

All yr | 2WD | SR | Beds | T:<10m | Power: Cent | 5-10kW

DEIMS.ID: 632895f6-b954-4fd9-90bb-b427b22585ac

Web links

- http://sikfokutlter.unideb.hu/en

Hungary

Kiskun Restoration Experiments, KISKUN LTER

RESTORATION EXPERIMENTS ON SAND GRASSLAND

The restoration sites are located in abandoned arable land and clear-cut tree plantations mostly, but not entirely within LTER Fulophaza that is a high diversity site, both in terms of habitats and species, in the Kiskunság Sand Ridge. It uses some of the central facilities of the KISKUN LTER, such as the meteorological station and the field research station with accommodation opportunities, and a couple of long term monitoring sites and field experiments.

Purpose of site

PARTLY OBSERVATION
MAINLY EXPERIMENTATION

Restoration and reintroduction research focuses on open sand grassland habitat and includes black locust and milkweed eradication, seeding by native species, and nitrogen immobilization trials.

Location: The site is in the centre of the Kiskunság Sand Ridge, 100 km SSE of Budapest and 20 km W of Kecskemét

Ecosystems: Temperate broadleaf and mixed forests

Research topics: conservation; community ecology; plant ecology; terrestrial ecology

Contact(s): Katalin Török, torok.katalin@okologia.mta.hu

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | SR | Beds

DEIMS.ID: c7a1d72c-7296-49e7-813a-890a11cf0ae9

Web links

- http://www.okologia.mta.hu/en/node/4777

Accredited sites

17

Network started

1997

Israel

Israel LTER network

http://lter-israel.org.il/

Israel

Arava Platform (ARV)

HYPERARID DOMINATED LANDSCAPE WITH CULTURAL AREAS

LTER_EU_IL_016

The Arava LTSER Platform includes one LTER sites (Wadi Shita) and many satellite sites embedded in an hyper-arid dominated landscape, with some cultural areas. It is a flood-dependent system and the main activities on the platform are research, agriculture, education, and tourism. The desert several landscape units including includes areas of Acacia trees in the valleys with irregular floods, salt marshes, sand dunes and areas of stone and sand desert. The cultural areas include agricultural systems (mainly date farming), villages and kibbutzim and the city of Eilat. Rainfall used to be between 30 mm in the south and 50 mm in the north of the platform, but in the last 50 years it went down to about 20-40 mm a year. The main land uses are agricultural areas, mostly dates, small villages (Kibutzs and Moshavs) and nature reserves. Research examples: Cultural Ecosystem Services, Sense of Place and Open Spaces; Resilience to Earthquakes in the Eilat/ Dead Sea Region; Business and Environmental Interests; The impact of floods on open spaces, humans and the ecosystem; Ecosystem Services and Dis-services to agriculture in arid climates; Flood experiments in Wadi Shita; Genetics and physiology of Acacia trees in Sheizaf reserve; Long term monitoring of reptiles, rodents, spiders and beetles in sand dunes; The influence of oil spills in Evrona nature reserve on the distribution and behavior of wildlife; Rainfall and flash flood events monitoring in the Arava valley.

Purpose of site

MAINLY OBSERVATION

PARTLY EXPERIMENTATION

To construct a model of the Arava LTSER platform based on long term observation, experiments, and research. Socio-ecology model that includes scientists, stakeholders, and landscape units as an interacted network. The objectives of the model are to produce applicable knowledge for the residents, stakeholders, and decision-makers of the Arava, including landscape planning with the regional stakeholders, towards a sustainable desert community. Long-term monitoring of ecosystem functions, Geo-hydro-ecology of Acacia trees and floods in satellite sites.

Studies about ecosystem services, especially in a socio-ecological framework. Long-term desert studies and monitoring including impacts of humans on the desert and vice versa Bottom-up, applicable research according to the needs of the area.Connecting the residents and stakeholders to research, including environmental education.

Location: The northern point in the platform located 1.5 hour drive from Eilat, which is the big city in this area and has an airport nearby.

Ecosystems: Deserts and xeric shrublands

Research topics: biology; animal ecology; biodiversity; species diversity; community ecology; community dynamics; successional dynamics; ecosystem ecology; ecosystem function; ecosystem service; plant ecology; vegetation dynamics; population ecology; plants population changes over time; population changes over time; population dynamics; genetics; phenology; taxonomy; environmental science; hydrology; meteorology; climatology; climate change

Contact(s): Jessica Schaeckermann, jessica@adssc.org

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | 2WD | SR | Beds | Power - Central | 10-100 kW | Data: Int | Data: Ext

DEIMS.ID: 07736d90-a399-4e0c-9cce-9e676ee227a4

Web links

- http://lter-israel.org.il/

Israel

Avdat (AVD)

DESERT ROCKY WATERSHED WITH HIGH GEO-BIODIVERSITY

The site was established in 1958. The legend of the site is terraces from the Nabatean agriculture runoff farming. The main research topics being studied in the site are: biodiversity, climate change, runoff hydrology, initial ecosystem development, self-restoration of ancient terraces. We are studying ecosystem services provided by natural and human modified watersheds structure and function that includes interactions among climate, geodiversity, biodiversity and agriculture. To study ecosystem and landscape processes, we are combining in-situ and earth observation measurements to understand cross level and cross scale interactions as a factor in landscape development and function. This site is a part of the Negev Highland LTSER that is aiming to understand the landscape as integrated human settlements within the natural desert matrix as a unified cultural landscape and how to conserve the unique features of the Negev Highlands in terms of geodiversity, biodiversity and human diversity.

Purpose of site

PARTLY OBSERVATION
MAINLY EXPERIMENTATION

The purpose of the site is to study the effect of rainfall and runoff patterns on ecological processes dynamics that includes population, community, ecosystem and landscape processes. The site develops ecosystem management practice with emphasis on runoff harvesting methods for agricultural and ecological purposes. Specifically, our objective is to study how connectivity of water flow affects watershed function, i.e. interactions among source and sink patches on the slopes and slope-riverbeds (wadi) interactions to determine biodiversity and bio-productivity. In watershed studies, our purpose is to understand the system as hydro-geo-eco system that functions under low precipitation and under an unpredictable pattern. A new research direction is to study ecosystem development under various rainfall and runoff patterns.

Location: 50 km south to Beer Sheva, the capital of the Negev, and two hours ride from Ben Gurion national airport

Ecosystems: Agricultural; Deserts and xeric shrublands

Research topics: biology; conservation; animal ecology; biodiversity; species diversity; community ecology; community dynamics; successional dynamics; trophic dynamics; ecosystem ecology; ecosystem function; ecosystem service; microbial ecology; plant ecology; vegetation dynamics; population ecology; plants population changes over time; population changes over time; population dynamics; phenology; physiology; ecophysiology; taxonomy; biogeochemistry; depositions chemistry; sediment chemistry; soil chemistry; soil solution chemistry; water chemistry; geology; geomorphology; hydrology; agriculture; meteorology; climatology; climate change; climate monitoring; soil physics; social sciences; anthropology; archeology; history; land use history

Contact(s): Arnon Karnieli, karnieli@bgu.ac.il

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | 2WD | SR | Beds | Power - Central | >100 kW | Data: Ext

DEIMS.ID: fcc28bb3-551a-4396-819c-0589abc6be6f

Web links

- http://lter-israel.org.il/

Israel

Gilat (GLT), LTSER Northen Negev

AGRO-ECOSYSTEM & CLIMATE CHANGE RESEARCH

A Loess plain that is devoted to agro – ecosystem and climate change research. The site is subdivided into permanent plots which are exposed to various manipulations. The manipulations include introducing of various crops and various grazing regimes. The manipulation provides data on the effects of management and rainfall regime on agricultural productivity. In addition, the area includes ecological plots to study a natural succession, phenology and productivity under various rainfall regimes. The site is also used to study climate change in relation to rainfall and runoff patterns. An important study is the dynamics of geophytes that are important as cultural ecosystem service in the area.

Purpose of site

PARTLY OBSERVATION
MAINLY EXPERIMENTATION

To study the structure and function of agro - ecosystems in drylands and its development and responses to climate change. Specifically, to understand agricultural and natural productivity under various climatic conditions and intensity of grazing by domestic animals. Also, the objective of the research in the site is to understand the combined effect of climate variability and grazing. Another aim is to study the effects of agro-ecological manipulations on soil quality and soil function. The overall aim is construct a model for dryland eco agricultural management that takes into consideration water flow and the interactions among trophic levels. A new research direction is to study ecosystem development under various rainfall and runoff patterns.

Location: 20 km from Beer Sheva, the capital of the Negev, and 1.5 hr ride from Ben Gurion national airport

Ecosystems: Agricultural; Deserts and xeric shrublands

Research topics: biology; animal ecology; biodiversity; species diversity; community ecology; successional dynamics; trophic dynamics; ecosystem ecology; ecosystem function; ecosystem service; plant ecology; vegetation dynamics; phenology; physiology; ecophysiology; soil chemistry; agriculture; meteorology; climatology; climate change; climate monitoring

Contact(s): Eli Zaady, zaadye@agri.gov.il

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | 2WD | SR | Power - Central | >100 kW | Data: Int | Data: Ext

DEIMS.ID: f6fcfb89-8194-4aa1-b4b2-427bf6e00e54

Web links

- http://lter-israel.org.il/

Israel

LTSER Northern Negev

NATURAL & CULTURAL LANDSCAPE UNDER CLIMATE CHANGE

The LTSER Northern Negev Platform includes four established LTER sites embedded in a cultural landscape. The cultural area includes semi-arid scrubland, agricultural systems, forested areas and settlements. Research: 1. Long-term earth observation of land use–land cover dynamics; 2. Long term observation of ecological functional restoration of desertified areas based on runoff harvesting; 3. Long-term experiments for monitoring changes in abundance, diversity, species composition and distribution in natural, grazing and restored areas; 4. Development of biological soil crusts, perennial plants and winter annuals in relation to rainfall, runoff, soil disturbance, patch distribution, functional restoration and livestock grazing; 5. Short-term experiments and surveys for testing hypotheses about the detailed processes, mechanisms and interactions involved in the development, dynamics and stability of grassland, shrub land and crust-land, their landscape mosaic patterns and their feedback relationships with flows of materials through the landscape; 6. Research on natural and human made landscape pattern formation and its ecological services.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The overall aim is to construct a model of the northern Negev cultural landscape based on long term observation and experimentation. The model is based on landscape ecology theory that view all the landscape units as an interacted network. The objectives of the model are functional restoration of desertified area and landscape planning with the regional stakeholders. Specific aims:

- Using remote sensing
- Long term observation of ecological functional restoration of desertified areas based on runoff harvesting
- Ecosystem and landscape research of a cultural landscape composed of natural and human made ecosystem under climate change
- Studies of cross scale relationship between landscape, vegetation, hydrology, nutrient dynamics

- Sustainable management of livestock, land degradation and functional restoration
- landscape responses to extreme climatic events.

Location: The semi-arid part of Israel surrounded Beer Sheva, the capital city of the Negev, between 30-60 minutes drive by car

Ecosystems: Agricultural; Forest; Grasslands; Savanna

Research topics: natural science; biology; conservation; animal ecology; biodiversity; species diversity; community ecology; community dynamics; successional dynamics; trophic dynamics; ecosystem ecology; ecosystem function; ecosystem service; forest ecology; landscape ecology; plant ecology; vegetation dynamics; population ecology; plants population changes over time; population changes over time; population dynamics; terrestrial ecology; phenology; soil chemistry; agriculture; social sciences; sociology

Contact(s): Moshe Shachak, shachak@bgu.ac.il

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | 2WD | SR | Beds | Power - Central | 10-100 kW

DEIMS.ID: 871a90b2-e372-456a-93e3-518ad1e11239

Web links

- http://lter-israel.org.il/

Israel

Park Shaked (PSK), LTSER Northern Negev

FUNCTIONAL RESTORATION & CLIMATE CHANGE RESEARCH

Ecosystem and landscape research of desertified area and functional restoration under climate change. Climate: Mean annual precipitation 150-200 mm between November and April; mean maximum summer temperature 34° C, mean minimum winter temperature 6° C. Principal biomes: Semiarid shrub land, rocky and loess watersheds, ephemeral streams. Vegetation is dominated by patch-forming dwarf shrubs with species-rich annual winter vegetation in the inter shrub and shrub patch understory. Management: Livestock grazing excluded in central watershed (20 ha) since 1987; restricted/controlled grazing by Bedouin sheep herds in surroundings; in the outer parts of the area functional restoration were taking place in 1985-87 in contour dykes. Research: 1. Long-term experiments for monitoring changes in abundance, diversity, species composition and distribution, and development of biological soil crusts, perennial plants and winter annuals in relation to rainfall, runoff, soil and patch disturbance and climate extreme; 2. Short-term experiments and surveys for testing hypotheses about ecosystem development under climate extreme, their landscape mosaic patterns and their feed-back relationships with flows of materials through the landscape; 3. Long term research on watershed ecology and its state changes in relation to climate variability.

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

- Ecosystem research and functional restoration of desertified area under climate and land-use changes;
- Cross level - cross scale relationship between population, community, ecosystem and landscape;
- Sustainable functional restoration by landscape manipulation, runoff harvesting and pattern formation;
- Temporal landscape responses rainfall-runoff patterns;
- Patch and pattern formation by dwarf shrubs, annual herbs and biological soil crusts;

- Biological soil crust development, disturbance, function and species composition;
- Regional and global comparisons of dryland ecosystems.

Location: The site located 25 km from Beer Sheva, the capital city of the Negev, and 1.5 hours ride from Ben Gurion national airport

Ecosystems: Agricultural; Deserts and xeric shrublands; Grasslands; Savanna

Research topics: biology; forest conservation; nature conservation; animal ecology; biodiversity; species diversity; community assembly; community ecology; community dynamics; successional dynamics; trophic dynamics; trophic interaction; disturbance ecology; ecological engineering; ecological integrity; ecosystem ecology; ecosystem function; ecosystem service; forest ecology; land cover classification; landscape ecology; microbial ecology; plant ecology; vegetation dynamics; population ecology; population changes over time; population dynamics; restoration ecology; soil ecology; soil microbial ecology; spatial ecology; terrestrial ecology; indicators; phenology; physiology; ecophysiology; biogeochemistry; depositions chemistry; soil chemistry; geology; geomorphology; global environmental change; hydrology; forest hydrology; management; agriculture; silviculture; meteorology; climatology; climate change; climate change impact; climate monitoring; weather; soil physics; soil science; soil chemistry

Contact(s): Shayli Dor - Haim, shaylidh@post.bgu.ac.il

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | 2WD | SR | Beds

DEIMS.ID: 869ec32d-7530-4975-a9de-604374eaece6

Web links

- http://lter-israel.org.il/

Israel

Ramon (RMN)

ECOTONE BETWEEN ARID AND HYPER-ARID ECOSYSTEMS

The site is located between two bio-geographical zones arid and hyper-arid, the research is carried out by both sides. The arid side is characterized by remains of terraces from the Nabatean agriculture runoff. The main research topics that being studied in the site are: biodiversity, climate change, runoff hydrology. The arid zone is a geo-hydrological-ecological system which is dependent on a combination of rainfall and runoff that creates water enriched parches that support relatively high biodiversity. The hyper-arid zone is a runoff dependent system, the source of runoff are stipes. Slopes consist of bare bedrock. Biological activities are constructed in the dry riverbeds that function as sinks for the runoff generated from the slopes.

Purpose of site

ONLY OBSERVATION
NO EXPERIMENTATION

To study the structure and function of arid and hyper-arid ecosystems. The purpose of the site is to study the effect of rainfall and runoff patterns on ecological dynamics that includes population and community properties and ecosystem and landscape processes. In addition the site provides ecosystem management knowledge with emphasis on runoff harvesting for agricultural purposes.

Location: The site is located 20 kmfrom Mizpe Ramon in a nature reserve, and 2.5 hours drive from Ben Gurion national airport

Ecosystems: Deserts and xeric shrublands

Research topics: biology; phenology; biodiversity; species diversity; population ecology; population dynamics; population changes over time; plants population changes over time; plant ecology; vegetation dynamics; community ecology; community dynamics; ecosystem ecology; ecosystem function; animal ecology; geology

Contact(s): Elli Groner, elligroner@gmail.com

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | 2WD | Beds | Power - Central | 10-100 kW | Data: Int | Data: Ext

DEIMS.ID: 52d25867-33e7-4f27-8e0c-4f8a74bf22e0

Web links

- http://lter-israel.org.il/

eLTER initiative

eLTER Research Infrastructure

www.lter-europe.net/elter-esfri

The eLTER Research Infrastructure (eLTER RI) is the next stage in the European LTER community's journey to create a fully integrated, distributed site network. Constructed in the framework of the European Strategy Forum on Research Infrastructures (ESFRI), eLTER RI will offer a range of services such as data provision, access to sites and training, all accessible through a Service Portal and delivered by the Head Office, National Research Infrastructures (i.e. eLTER Sites and eLTSER Platforms) and supporting Topic Centres. eLTER RI is described on pages 4-5, and information is also available online.

Accredited sites

79

Network started

2006

Italy

LTER-ITalia

www.lteritalia.it/

Italy

Appennino settentrionale

ALPINE/SUBALPINE GRASSLANDS ON OROGRAPHIC ISLANDS

The site consists of “orographic islands” with high elevation vegetation in central Mediterranean basin, along the Apennines mountain range, within the Appennino Tosco-Emiliano National park and partially in the Appennino Modenese Regional park. It includes 64 permanent plots for plant species monitoring, distributed from timberline zone to the subalpine/alpine belt (1722-2000 m), that belong to the GLORIA project’s world network (GLobal Observation Research Initiative in Alpine ecosystems). The plots lie at the top of four summits, displayed along an altitudinal gradient, chosen following the GLORIA target region selection criteria. Furthermore, another 26 permanent plots, detached from the GLORIA project, have been established on mount Prado. The observation and the long term monitoring of vegetation and alpine plant species population started in 1999, and the collection of soil temperature and osmotic potential started in 2001 and 2013 respectively. The site is resurveyed regularly to collect vegetation data (in term of presence/absence and coverage) and climatic data (temperature and osmotic potential data series recorded every 30 minutes by data loggers) in order to assess impacts of climate change on plant communities and single plant species of interest.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The purpose of this long-term monitoring site is to record with a standardized design, vegetation, temperature, and soil osmotic potential data over time. These data could be extremely useful to detect, assess and predict changes in vegetation composition and losses in biodiversity in the plant communities of this alpine ecosystem, that are currently experiencing an accelerating climate change pressure. Focused investigations are also currently carried out on population dynamics of several target plant species of interest (endemism and species growing at the southern boundary of their distribution range) and it’s relation to climate change.

Location: Five monitoring stations placed in the northern Apennines, between Tuscany and Emilia Romagna, 130 km south from Parma and 100 km west from La Spezia

Ecosystems: Alpine; Montane grasslands and shrublands

Research topics: biology; biodiversity; species diversity; plant ecology; vegetation dynamics; meteorology; climatology; climate change

Contact(s): Graziano Rossi, graziano.rossi@unipv.it; Marcello Tomaselli

All parts of site accessible: Yes

Infrastructure:

FOOT | 4WD

DEIMS.ID: a9bed11f-a08d-45f7-b3fe-8f549bfdca23

Web links

- http://www.lteritalia.it/siti/appennino-settentrionale-appennino-tosco-emiliano

Italy

Delta del Po e Costa Romagnola

FIXED OBSERVATORIES IN THE NORTHERN ADRIATIC SEA

The site is equipped with two fixed stations: the E1 meteo-oceanographic buoy, off the coast of Rimini, and the S1-GB dynamic pylon, in front of the Po river delta.

The fixed stations were deployed in the framework of multidisciplinary research projects that use automated stations to study the marine environment, through a cooperation between the Institute of Marine Sciences (CNR - ISMAR) in Bologna and other public and governmental Research Institutes. The S1 buoy was installed in 2004 and was recently (2015) implemented being now a dynamic pylon. Both the observatories measure meteo and physico-chemical oceanographic parameters at different depths in the water column every 5-10-15-30 minutes (atmospheric pressure, air temperature, relative humidity, wind speed , wind gust, wind direction, net solar radiation, water temperature, salinity, dissolved oxygen, fluorescence, turbidity, speed and direction of the currents, height, direction and period of the waves).

Data are transmitted, in near real time, via GSM and downloaded (on average every 2-4 hours) at the Data Center of the ISMAR. Data are daily validated and analysed, in order to be used for different studies.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The main purposes of the site are to implement forecasting oceanographic model to detect and monitor ipo-anoxic events and to study:

- the variability of the oceanographic properties of the Northern Adriatic sea;
- the Po River impact on the continental Adriatic Sea platform;
- the air-water physical-chemical interactions;
- the role of the seabed in the dystrophic processes of the Northern Adriatic sea;
- the sedimentation and re-sedimentation processes of the fine particulate materials in the prodelta Po area.

Location: The site integrates two fixed stations 3.5 nm off the coast of Rimini and 4 nm south of the Po delta, respectively

Ecosystems: Coastal; Marine; Temperate shelfs and seas

Research topics: biology; aquatic ecology; marine ecology; biodiversity; paleoecology; biogeochemistry; sediment chemistry; water chemistry; environmental science; geology; hydrology; meteorology; climatology; climate monitoring; oceanography

Contact(s): Mariangela Ravaioli, mariangela.ravaioli@ismar.cnr.it; Francesco Riminucci

All parts of site accessible: Yes

Infrastructure:

All yr | BOAT | Aqua | Power - Central | Data: Int | Data: Ext

DEIMS.ID: 6869436a-80f4-4c6d-954b-a730b348d7ce

Web links

- http://e1.bo.ismar.cnr.it/perl/e1_home.pl
- http://s1.bo.ismar.cnr.it/perl/s1_home.pl

Italy

Golfo di Trieste

COASTAL SITE

The coastal marine observatory site Gulf of Trieste lies within the Marine Protected Area (MPA) of Miramare and includes the biological time-series station "C1", part of the Italian Long-Term Ecological Research (LTER) network, and the in situ continuous MAMBO meteo-oceanographic buoy. Marine Protected Areas represent one of the most effective systems for marine biodiversity preservation and management. Since 1986, the time-series station "C1" in the Gulf of Trieste (GoTTs, Gulf of Trieste Time series) represents a crucial site for marine ecological research, as it is subject to the interaction among several natural forcing (river, groundwater discharge, tides, general circulation, intense meteorological) and numerous anthropogenic activities (maritime transport, harbours of Trieste and Monfalcone, urban waste discharge, mussel- and fish-farming, fishing and recreational activities). In 1999, the ecological research site has been equipped with a meteo oceanographic buoy (MAMBO) in order to acquire continuous data on meteorological conditions at sea and on seawater physical and biogeochemical properties. Due to the high temporal dynamics of ecological processes in coastal ecosystems, continuous and real-time data of the main meteorological, physical and biogeochemical properties are fundamental for a better understanding of marine ecosystem functioning.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The main purposes of the site are:

- to assess the status of planktonic and benthic communities in terms of biodiversity and ecosystem functioning;
- to identify long term changes of marine coastal ecosystem in the northernmost part of the Adriatic Sea;
- to evaluate temporal dynamics of nutrients, dissolved and particulate organic matter;
- to evaluate the role of meteorological, physical and biological drivers on marine acidification;
- to evaluate relationships among meteorological drivers and the marine ecosystem;

- to assess the vulnerability to major global changes (global warming, ocean acidification, pollution, biodiversity loss, introduction of NIS (Non Indigenous Species) and HAO (Harmful Aquatic Organisms);
- to provide knowledge needed to improve management of the MPA;
- to contribute with data, information and knowledge to the main EU marine environmental strategies and directives.

Location: The site is located at 0.2 Km from the coast at the outer border of the Protected Sea Area of Miramare in the northernmost part of the Adriatic Sea

Ecosystems: Coastal; Marine; Temperate shelfs and seas

Research topics: natural science; biology; conservation; species conservation; microbiology; molecular biology; molecular taxonomy; phylogenetic relationship; physiology; ecophysiology; population biology; taxonomy; biogeochemistry; environmental chemistry; interstitial water chemistry; sediment chemistry; water chemistry; environmental science; environmental impact; global environmental change; hydrology; hydrography; management; fishery; meteorology; climatology; weather; oceanography; physics; atmospheric physics; toxicology; ecotoxicology; social sciences; economy; environmental ethics; geography; remote sensing

Contact(s): Bruno Cataletto, bcataletto@inogs.it

All parts of site accessible: Yes

Infrastructure:

All yr | BOAT | Aqua

DEIMS.ID: 96969205-cfdf-41d8-979f-ff881ea8dc8b

Web links

- http://gotts.inogs.it/
- http://www.lteritalia.it/siti/golfo-di-trieste

Italy

IT22 - Mar Piccolo of Taranto

TRANSITIONAL WATER SYSTEM

The Mar Piccolo is an inner, semi-enclosed sea located on the North of the town of Taranto with lagoon features. It has a surface area of 20.72 km^2 and is divided into two inlets: the First and the Second Inlet, with a maximum depth of -12 m and -8 m, respectively. The basin is subject to urban, industrial and agricultural pollution and to the impact of aquaculture, shipping and commercial fishing. 34 submarine freshwater springs and several small tributary rivers flow into the basin. Salinity ranges from 34.3 to 37.7. Seawater temperature ranges from 7.1°C to 33.6°C.

The Mar Piccolo basin was been studying since the first years of the last century. Chemical-physical studies were the first to be carried out. The first investigations on the biota were those on macroalgae which date back to the beginning of the last century. They were floristic studies and all the samples collected are kept in exsiccata in a rich herbarium (Pierpaoli Herbarium), which can be considered in the same way as a historical series of data. Also studies on zoobenthos date back to the half of the last century. Studies on the diversity of bacteria began in the 1980's, whereas investigations on phytoplankton and inorganic and organic chemicals are more recent; however, important series of data are already available.

Data guaranteed on a long-term perspective are: salinity, temperature, pH, oxygen; floristic lists and vegetational data on macrophytes and phytoplankton; lists of zoobenthic species.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The current scientific activities performed on the Mar Piccolo concern the continuation of studies on biodiversity of phytobenthos (seaweeds and phaerogams), zoobenthos, phytoplankton, microbial communities, as well as the chemical-physical features of the basin, and the impact of metals, IPAs and PCBs in marine sediments and edible molluscs. New investigation issues are: alien species, bioactive compounds from marine biomasses, new species in aquaculture, zooplankton, cyanopicoplankton. The Project "Life4MarPiccolo" (LIFE14 ENV/IT/000461) is ongoing, which provided the set up of a pilot

plant for sediment treatment based on innovative microfiltration technology. On may 2018, within Horizon 2020 "Cyano Alert" (H2020-EO-2016-Earth Observation-730141), remote sensing calibration with in situ phytoplankton sampling started, aiming to forecast blooms.

Location: North of Taranto city, 75 km from Salento Airport, 102 km from the Bari International Airport

Ecosystems: Coastal

Research topics: biology; ecology; chemistry; environmental science; oceanography

Contact(s): Ester Cecere, ester.cecere@irsa.cnr.it; Antonella Petrocelli

All parts of site accessible: No

Infrastructure:

All yr | BOAT | BOAT

DEIMS.ID: ac3f674d-2922-47f6-b1d8-2c91daa81ce1

Web links

- http://www.irsa.cnr.it/index.php/ita/
- http://www.lteritalia.it/node/988

Italy

Lago Bidighinzu

WARM MONOMITIC MEDITERRANEAN ARTIFICIAL LAKE

Bidighinzu Lake is a warm monomitic and hypereutrophic reservoir located at 334 m a.s.l. in N-E Sardinia. Built in 1956, it is mainly used for drinking. The site covers a surface area of 1.7×10^6 m^2, has a max volume of 12×10^6 m^3, a mean depth of 7.3 m and its watershed is extended for 52 km^2. The supplies of water from the catchment to the lake are insufficient to make up for the losses and human demands. Consequently, the lake receives additional water from Temo Lake and Rio Mannu-Su Tulis river lock, localized in different watersheds. Problems of potabilization have arisen since the early years of filling due to its high trophic status. To face this situation, restoration actions were carried out: in 1966 the installation of an aeration system near the water intake tower and in 1987 the reduction of nutrient loads by the diversion of civil and industrial wastewaters downstream of the dam. Recently it was conducted an experimental activity with an aeration system with micro-bubbles. The aim was to maintain sufficient oxygen in the hypolimnetic waters in order to improve the purification process, prevent phosphorus release from sediments and mitigate eutrophication. The site has a real-time remote monitoring station equipped with a multiparameter probe housed on floating platform. Available data sets include information on phytoplankton and limnological variables since the last 70s.

Purpose of site

MAINLY OBSERVATION

PARTLY EXPERIMENTATION

The main scientific studies at present concern the relationships between trophic status and phytoplankton dynamics, cyanobacteria and toxins; nutrient loads from watershed. The collected data series mainly regard the phytoplankton dynamics and trophic status, with particular attention to toxic blooms of cyanobacteria, being waters used mainly for drinking. In particular are investigated the main limnological variables (Secchi depth, temperature, pH, conductivity, dissolved oxygen and saturation, alkalinity, D.I.N. components, total nitrogen, soluble reactive phosphorus, total phosphorus, dissolved silica, iron and manganese); chlorophyll a; phytoplankton cell abundances and biomass; class and species composition.

Location: 32 km from the town of Sassari, 50 km from the Alghero airport, 54 from the Porto Torres harbour

Ecosystems: Fresh Water Lakes

Research topics: biology; aquatic ecology; lake ecology; limnology

Contact(s): Bachisio Mario Padedda, bmpadedda@uniss.it

All parts of site accessible: No

Infrastructure:

BOAT | BOAT | SR | Power - Central | 10-100 kW | Data: Int | Data: Ext

DEIMS.ID: 3707cf71-7e04-41e3-8afc-518b293f6c07

Web links

- http://www.lteritalia.it/siti/lago-bidighinzu, http://laea.altervista.org, http://www.enas.sardegna.it/il-sistema-idrico-multisettoriale/laghi-artificiali/bidighinzu.html

Italy

Lago Maggiore

LARGE AND DEEP SUBALPINE LAKE

Lake Maggiore was studied since the beginning of the last century although not systematically. Regular research started by the foundation in 1938 of the Italian Institute of Hydrobiology "Dr. Marco De Marchi", located in Verbania Pallanza. A limnographic (level and temperature profile) and weather station came into operation in 1952. Studies on plankton and on hydrochemistry of Lake Maggiore continued between the 1950s and the 1970s, showing the progressive eutrophication of the lake. Thanks also to the research of the institute, in the 1980s effective actions to control the eutrophication were undertaken, with the large-scale activation of waste water treatment plants. In the same period a program, still active, of systematic monitoring and research sponsored by the CIPAIS (International Commission for the Protection of the Italian Swiss Waters) started. It allowed collecting an uninterrupted and long-time series, with high sampling frequency, of data related to meteorology, hydrology, physics and chemistry of the lake, organic carbon and bacterial populations, phyto-and zooplankton. The analysis of these time series highlighted an oligotrophication process leading to the current state of oligotrophy of Lake Maggiore. Recent studies also showed the effects of global warming on Lake Maggiore, which went towards the gradual warming of deep hypolimnion as well as the raising of the average temperature of the surface layers.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Continuous or systematic monthly sampling (profiles and samples at 0-20, 50, 100, 150, 200, 250, 300, 350 m); data in a proprietary format DataBase; meteorology (data measured continuously), hydrology of the tributaries, physical limnology (transparency, underwater PAR radiation, continuous temperature profile 0-350m); hydrochemistry of the lake and of the tributaries (base chemical variables, dissolved oxygen, chlorophyll, major ions, nutrients, total and particulate organic carbon, trace metals); bacterioplankton (abundance), phytoplankton (abundance and composition), zooplankton

(abundance and composition); data on ecological processes (occasionally estimates of primary production, bacterial activity, grazing, sedimentation).

Location: Lake Maggiore, about 100 km North-West from Milan and about 50 km North of the International Airport Milan Malpensa

Ecosystems: Fresh Water Lakes; Large lakes

Research topics: biology; aquatic ecology; lake ecology; biodiversity; species diversity; paleoecology; population ecology; population changes over time; population dynamics; genetics; phenology; taxonomy; water chemistry; environmental science; hydrology; limnology; paleolimnology; fishery

Contact(s): Michela Rogora, michela.rogora@irsa.cnr.it

All parts of site accessible: Yes

Infrastructure:

All yr | BOAT | BOAT | SM | SR | Beds | Power - Central | Data: Int | Data: Ext

DEIMS.ID: f30007c4-8a6e-4f11-ab87-569db54638fe

Web links

- http://www.lteritalia.it/siti/lago-maggiore
- https://www.idrolab.irsa.cnr.it/en/lake-maggiore-and-the-deep-subalpine-lakes/

Italy

Montagna di Torricchio

CENTRAL APENNINES, OLD BEECH FOREST AND GRASSLAND

The protected area "Riserva Naturale Montagna di Torricchio" is a strict nature reserve and education since 1970, Biogenetic Reserve since 1979, State Nature Reserve since 1991 then it became part of the Nature 2000 network as SIC & ZPS. A part of the reserve is covered by mowing lawns, subjected to an orientated regime in order to maintain this type of semi-natural vegetation, otherwise destined to disappear through the processes of secondary succession. It covers 317 ha and represents the typical landscape of the Central Apennines: 90 ha deciduous mountain forests (old beech and mixed woods); 220 ha dry grasslands (abandoned pastures with shrubs; *Bromus erectus*, *Cytisus sessilifolius*); 7 ha mesic grasslands (mowed and pastured meadows; *Cynosurus cristatus*). The Reserve is equipped with meteorological instrumentation for the detection of air/soil temperature and moisture and wind / rain gauge. It provides permanent plots and a field mountain hut. Various types of ecological investigations are carried out as flora and fauna inventory and monitoring; structure and dynamics of beech forest; population dynamics and secondary succession on xeric grasslands; plant diversity evaluation by estimation methods; structure and functions of mowed meadows, effects of extreme events.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The protected area "Riserva Naturale Montagna di Torricchio" is a strict nature reserve and education addressed primarily for scientific research, visitors can only access through dedicated access routes. Its principal aim is the protection of the natural dynamics (succession); the reserve has also become a site focused in research activities for different research groups and students belonging to the University of Camerino or others academic institutions, engaged in biological-naturalistic degree courses.

The reserve also promotes and hosts environmental education initiatives through a dedicated centre (CEA "Videsott") to carry out school programmes and in-depth courses for naturalists.

Location: WNW of Monti Sibillini National Park, 101 km from Civitanova Marche, 154 km from Falconara airport (Aereoporto delle Marche) and 145 km from Ancona

Ecosystems: Deciduous Forest; Mediterranean forests, woodlands, and scrub; Temperate broadleaf and mixed forests; Montane grasslands and shrublands

Research topics: biology; animal ecology; biodiversity; species diversity; community ecology; successional dynamics; ecosystem function; forest ecology; plant ecology; vegetation dynamics; population ecology; population changes over time; phenology; geology; geomorphology; agriculture; meteorology; climate monitoring; land use history

Contact(s): Roberto Canullo, roberto.canullo@unicam.it

All parts of site accessible: No

Infrastructure:

4WD | 4WD | SR | Beds | Data: Int | Data: Ext

DEIMS.ID: 6b62feb2-61bf-47e1-b97f-0e909c408db8

Web links

- http://riservatorricchio.unicam.it/
- http://torricchiolter.unicam.it/

Italy

IT04-001-T Monte Rufeno LAZ1

BROADLEAVED (TURKEY OAK) FOREST

Monte Rufeno LAZ1 is a monitoring plot within the Mediterranean Forests LTER Italy site. It belongs to the Italian branch of the ICP Forests Network and it has been included in LTER-Europe since 2007. Monte Rufeno (690 m asl) is part of the typical hilly landscape of northern Lazio, which suffered intense exploitation in the past by man. The dominant tree species is the oak (*Quercus cerris* L.). For a long time and up until the 1960s, the extensive oak woods were subjected to coppice cutting for the production of firewood. With the interruption of the practice of the cut, the forest stands have suffered a progressive aging and present themselves today as predominantly monospecific woods and monoplanes. There are also reforestations of conifers. Peculiarities of the territory are the water richness and the accentuated dynamism linked to the landslides. Monte Rufeno LAZ1 has been active as a monitoring plot since 1995. Data collection is carried out in collaboration with several organizations and universities. The research site is included in the Monte Rufeno Regional Natural Reserve.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The set of parameters studied at this area represents a valid basis for the deepening of specific "case studies" concerning the physiological responses of vegetation to the variations of their physical-chemical and biological life environment (hence the denomination of "intensive" monitoring in reference to level II monitoring). Climatic extremes, whose frequency and intensity are expected to rise locally, due to global changes, have an increasing impact on the health and vitality of forests. Significant events occurred in the springs of 2016 and 2017 when extensive late frosts affected the Apennine beech forests, and in summer 2017 with extensive desiccation and mortality in the forests of central Italy following a strong heatwave and drought. These events are a warning sign for the health and integrity of forests. Data from this monitoring plot are frequently requested by students, reasearchers and technicians, and lately have

also been used to facilitate participation of the general public in natural sciences, through dissemination events in the field.

Location: pre-Apennines belt, North of Rome city

Ecosystems: Forest

Research topics: plant ecology

Contact(s): Giancarlo Papitto, g.papitto@forestale.carabinieri.it; Cristiana Cocciufa

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD

DEIMS.ID: 05e96829-e64a-48d3-a96d-de2aa4cde146

Web links

- http://www.lteritalia.it/siti/monte-rufeno-laz1
- http://www.carabinieri.it/arma/oggi/organizzazione/organizzazione-per-la-tutela-forestale-ambientale-e-agroalimentare

Italy

Monumento Naturale Torre Flavia (Roma)

MEDITERRANEAN COASTAL SAND DUNES OF CENTRAL ITALY

Torre Flavia is a protected reserve consisting of 43 ha of coastal wetland located on the Tyrrhenian seashore (Central Italy). The site has a high conservation value since it represents one of the last relicts of a larger wetland that once covered a wide area of the Tyrrhenian coast, which was partially drained and transformed in the last fifty years. For these reasons, the flora and the fauna of the site are highly specialized with relevant ecological and naturalistic values. In spite of the ongoing erosion process, the site includes natural and semi-natural habitats of European interest (EU habitats according to the 92/43 Directive), such as coastal dunes, retrodunal wet depressions with halophyte vegetation, reed beds and rush flooded meadows. The coastal dune sector is longitudinally homogeneous and it is characterised by a narrow strip of strandline vegetation in the upper beach and a valuable vegetation of embryo and mobile dunes habitats. The site is also a Special Protection Area (SPA, according to the 79/409 Directive), as it includes suitable territories for endangered, migratory and nesting bird species.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The site is enclosed in a highly urbanized/ agricultural landscape context. It hosts endangered ecosystems including among the most threatened habitats at national and European level. In particular, coastal dune habitats are highly threatened due to direct and indirect human pressures. As coastal dunes are considered priorities for international conservation goals, biodiversity monitoring is crucial to identify early changes in plant and animal communities. On these bases, the main purposes of the site are: to address temporal changes of dune vegetation and nesting birds and to analyse the main anthropogenic impacts on coastal habitats (such as human trampling, beach litter accumulation, invasion of alien species). An open standards for the Practice of Conservation protocol (IUCN) was conducted for this site with the scope to develop successful conservation strategies.

Location: Between the cities of Ladispoli and Cerveteri, ca. 40 km north from Rome city, in the Lazio region (central Italy)

Ecosystems: Coastal

Research topics: natural science; biology; conservation; animal ecology; biodiversity; species diversity; community ecology; community dynamics; successional dynamics; ecosystem ecology; ecosystem service; plant ecology; vegetation dynamics; environmental science; environmental awareness

Contact(s): Alicia Acosta, acosta@uniroma3.it

All parts of site accessible: No

Infrastructure:

All yr | 2WD

DEIMS.ID: e618c7ca-2b92-46cb-9156-d87336c5a81f

Italy

Renon BOL1

UNEVENLY AGED SUBALPINE CONIFEROUS FOREST

Picea abies dominated forest, since 1995 included in the ICP Forest European network and in ICP IM network code 01. This site is located in the Central Alps and is grouped with LOM1;TRE1;FRI2 and Valbona in a cluster of sites called Forest of the Alps.

The Renon-Selva Verde site is located in the municipality of Renon, at a distance of 12.2 km North-Northeast from the town of Bolzano. Eddy covariance measurements started in the year 1997. The site is placed on a porphyric plateau; the soil is classified as Haplic Podsol following F.A.O. The site vegetation, a subalpine coniferous forest, is of natural origin and is used for wood production. As a result of the traditional harvesting method, which consists of irregular cuttings of 50-80 cubic m, overall the forest is unevenly aged, but with homogenous groups. The largest group present in the area is growing approximately since the year 1820, after the Napoleonic wars. The main forest species is spruce (*Picea abies* (L.) Karst., 85% in number) followed by cembran pine (*Pinus cembra* L., 12%) and larch (*Larix decidua* Mill., 3%). In the clearings, covering approximately 15% of the area, the dominant grass species is *Deschampsia flexuosa* (L.) Trin. The canopy is irregular, with maximal height of 29 m. The mean leaf area index (LAI), measured by hemispherical photographs, is 5.1 m^2 m^{-2}. The climate is strongly influenced by elevation, with cool summer and moderately cold winter. Annual average temperature 4,6°C, average annual precipitation ammount 903 mm. An increase of the annual average temperature by 0,8°C were observed during the period 1990-2014.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Biological, chemical and physical state of ecosystems over time are monitored in order to provide an explanation of changes in terms of causative environmental factors, including natural changes, air pollution and climate changes. It includes also the study of CO_2 and H_2O exchange between the forest ecosystem and the atmosphere.

Location: Southern side of the Alps at a distance of 12 km NNE from the town of Bolzano

Ecosystems: Evergreen Forest; Montane grasslands and shrublands

Research topics: ecology; chemistry; meteorology

Contact(s): Stefano Minerbi, stefano.minerbi@provinz.bz.it

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | 2WD | SR | T: <10m | Power - Dist | 10-100 kW | Data: Int | Data: Ext

DEIMS.ID: 5d32cbf8-ab7c-4acb-b29f-600fec830a1d

Web links

- http://www.provinz.bz.it/forst

Research & Development

eLTER H2020 Starting Communities project

www.lter-europe.net/elter

The four year Horizon 2020 project *eLTER H2020* (European Long-Term Ecosystem and Socio-Ecological Research Infrastructure), started in June 2015, was a flagship project enabling the further development of the European Long-term Ecosystem Research infrastructure and community. There is more information on page 1 and online.

Accredited sites

5

Network started

2004

Latvia

Latvia LTER

http://lter.lu.lv/

Latvia

LTSER Engure

DRAINAGE BASIN OF COASTAL LAKE

Lake Engure drainage area (644 km^2) includes the Lake which is a remnant of Litorina sea formed about 4000 years ago. Part of the territory is the Lake Engure Nature Park, the Ramsar site including unique inland and marine wetlands. Most of the drainage area is covered by pine forests, but there are also large areas of marshlands, meadows, deciduous forests, dunes and agricultural lands. Avifauna lists 186 species, vascular plants – 844 species. 44 species of birds, 5 fish species and 3 plant species are protected at European level, 23 habitats are in EU habitat directive. The ecosystems of the area have been changed by different human activities historically well documented. The most important activities in ancient times included regulation of water level, hay making, pasturing, hunting and fisheries. The traditional settlement type was the former fishermen's village, which is characterized by its linear structure along the seashore and farmsteads inland. During the past decade, such settlements have been subject to a wave of summer cottage, second home and guest house construction. The agriculture and main industry (fishing and fish processing) has sharply declined. Nowadays, the highest number of employees is in the service sector (wholesale, catering, tourism and leisure industries). It sets a new kind of pressure to the ecosystems of the region.

Purpose of site

ONLY OBSERVATION
NO EXPERIMENTATION

The site serves as a model territory for studies of functioning of socio-ecological system of boreonemoral zone under moderate anthropogenic pressure. Solving the problem of optimization of ecosystem services and sustainable development of the region. Investigation of long-term processes in lake water and sediment communities on the backround of climate warming and changing land use in the drainage area of the lake. Investigation of long-term successional changes in different plant communities. Investigation of grass-dwelling arthropod communities on the background of climate warming. Studies of dynamics of breeding bird fauna (species richness and abundance) in relation to different environmental both natural

and anthropogenic factors, with the main focus on ducks, larids, waders and coot. Waterbird habitat management and maintaining.

Location: About 90 km from Riga on the west coast of the Gulf of Riga

Ecosystems: Agricultural; Coastal; Temperate coniferous forests; Fresh Water Lakes

Research topics: biology; dendrochronology; aquatic ecology; lake ecology; marine ecology; biodiversity; species diversity; community ecology; successional dynamics; population ecology; population changes over time; population dynamics; sediment chemistry; water chemistry; environmental science; geology; hydrology; limnology; meteorology; social sciences; demography; history; land use history; sociology

Contact(s): Viesturs Melecis, viesturs.melecis@lu.lv

All parts of site accessible: No

Infrastructure:

All yr | 2WD | 2WD | SR | Beds | Power - Central | 5-10 kW

DEIMS.ID: 66431807-ebf1-477f-aa52-3716542f3378

Web links

- http://lter.lu.lv

Latvia

Mazsalaca Pine

PINE FOREST ECOSYSTEMS

The Mazsalaca Pine forest site is located in the central part of the North Vidzeme Biosphere Reserve. The site was established In 1992. It represents three Scots pine (*Pinus sylvestris*) forest stands of different age – young stand (30-40 years old), middle age stand (50-70 years old), and old stand (150-200 years old) on sandy podzol soils with 2-30 cm thick organic horizon. The forest floor vegetation is dominated by *Vaccinium myrtillus*, *V. Vitis-idaea* and *Melampyrum pratense*. The moss cover consists mainly of *Hylocomium splendens* and *Pleurozium schreberi*. The aim of study was to evaluate the long-term change in forest vegetation and soil mesofauna on the background of climate warming. Measurement of soil variables (moisture, pH, metal content), assessment of pine needle longevity and necroses, and litter decomposition rates is performed. Data on temperature and precipitation are provided by local meteorological station. Soil sampling is performed once per year on the end of August. Extraction of soil mesofauna (enchytraeids, soil mites and springtails) is performed by wet funnel and high gradient extractor techniques. A decrease in heavy metal pollution of soils resulting from industry decline after the restoration of independence of Latvia in 1991 was observed. A significant reduction of species richness and changes in community structure of soil mesofauna were observed against the background of climate warming.

Purpose of site

ONLY OBSERVATION
NO EXPERIMENTATION

Long-term study of climate warming effects and changing soil pollution on Scots pine forest ecosystem.

Location: 150 km from Riga near the town Mazsalaca

Ecosystems: Temperate coniferous forests

Research topics: biology; dendrochronology; biodiversity; species diversity; forest ecology; terrestrial ecology; soil chemistry; environmental science; silviculture

Contact(s): Viesturs Melecis, viesturs.melecis@lu.lv

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | 4WD | SR | Beds | °C | Aqua | T: can | T: <10m | T: >10m | Power - Central

DEIMS.ID: ebdf1a2b-b815-4808-92cd-971a501d356d

Web links

- http://lter.lu.lv

Latvia

Randu meadows

COASTAL GRASSLAND ECOSYSTEMS

Randu Meadows represent a botanical reserve which is situated on the northern coast of the Riga Gulf. It represents 192.2 ha of unique coastal meadows. Heterogeneous parent material and changing moisture conditions, mosaic pattern of local depressions, lagoons and man-made ditches interspersed with elevations are a cause of highly patchy vegetation. 531 plant species and more than 500 invertebrate species have been recorded there. Humans have participated in the development of these meadows for hundreds of years by cattle grazing and hay harvesting. Recently, the intensity of grazing and mowing has sharply decreased , and the meadows are gradually overgrowing by reeds and shrubs. The long-term study of changes in grassland vegetation and grass-dwelling insect communities has been performed since 1996 on 20 permanent sample plots. Natural succession, efects of management practice (mowing, spring burning, introduction of wild cows) are studied. Assessment of plant community structure is perfomed on permanent vegetation quadrats by the Braun-Blaquet survey method. Grass dwelling insects are collected three times per season by entomological sweep net. Flies dominate among insects. Till now 470 species were recorded. Insects appeared to be better indicators of environmental changes than plants. Data on temperature changes and precipitation were taken from the local meteorological station. Ellenberg values characterizing temperature indicated the effect of climate warming.

Purpose of site

ONLY OBSERVATION
NO EXPERIMENTATION

Long-term study of climate warming and management effects on coastal grassland ecosystems.

Location: Site is located 100 km from Riga on the eastern coast of the Gulf of Riga

Ecosystems: Temperate grasslands, savannas, and shrublands

Research topics: biology; biodiversity; species diversity; community ecology; community dynamics; successional dynamics; ecosystem ecology; ecosystem service; plant ecology; vegetation dynamics; history; land use history

Contact(s): Viesturs Melecis, viesturs.melecis@lu.lv

All parts of site accessible: Yes

Infrastructure:

2WD | 2WD | SR | Beds | Power - Central

DEIMS.ID: 61c188bc-8915-4488-8d92-6d38483406c0

Web links

- http://lter.lu.lv

Latvia

Reservoir of Riga Hydropower Station on the River Daugava

RIVERINE RESERVOIR ECOSYSTEM

Riga Reservoir was formed on the River Daugava after building of Riga Hydropower station (Riga Hydroelectric Power Plant, Riga HPP). Building took place from1966 to 1974, and Riga HPP has been in operation since 1974. In order to build Riga HPP, a dam was constructed on the River Daugava across the middle of Doles Island, half of which has since been flooded to make room for Riga Reservoir. Riga Reservoir is is the largest artificial reservoir in Latvia and the last one in the cascade of three HPPs on the River Daugava. It is situated 35 km from the river mouth.

The ecosystem of the reservoir is still under development. Active sedimentation and accumulation is ongoing. Investigations of water chemical composition, species structure and biomass of planktic and benthic organisms have been made since 1976 with different regularity, most recently once per year at the end of the vegetation season. A decrease of water temperature and dissolved oxygen in the reservoir with depth is observed, as well as an increase in phosphates. Increase in phytoplankton biomass and cyanobacterial blooming occurs. Re-structuring of benthic invertebrates communities in the reservoir is typical, especially when comparing with data from 1961 when there was a natural fast-flowing river stretch with rapids. Changes in benthic and planktic communities are leading to their simplification and decrease of biodiversity.

Purpose of site

ONLY OBSERVATION
NO EXPERIMENTATION

Long-term studies on the development and changes in water chemical composition, planktic and benthic biota in riverine reservoir ecosystem since 1976.

Location: Site is located 35 km from the inflow of the River Daugava in the Gulf of Riga at Riga City

Ecosystems: Large rivers

Research topics: biology; aquatic ecology; biodiversity; species diversity; water chemistry; environmental science

Contact(s): Ilga Kokorite, ilga.kokorite@lu.lv; Gunta Springe

All parts of site accessible: Yes

Infrastructure:

All yr | BOAT | BOAT | SR

DEIMS.ID: 32370e5d-9da5-4f8c-9198-875f61b9c695

Web links

- http://hydrolab.lu.lv

Latvia

River Salaca

RIVER ECOSYSTEM

The River Salaca is situated in northern Latvia, North Vidzeme Biosphere Reseve. It is 90 km long and flows from Lake Burtnieks to the Gulf of Riga. Salaca is anthropogenically little affected river. In the Salaca drainage basin natural territories are dominating: forests (56,17%), bogs (3,77%) and waterbodies (1,88%). Arable lands are 37,5%, and urban territories 1,88% from the drainage area. The river flows through three towns, Mazsalaca, Staicele and Salacgrīva. The river banks feature Devonian red sandstone cliffs, and many caves and rapids as well. The Salaca is the largest salmon river in Latvia. It is internationally recognized as a river with high biodiversity. In Salaca chemical and biological investigations of water and sediment have been provided more or less regularly since 1982. In recent years, field studies are performed once per year at the end of July.

In the Salaca, the increase of annual and spring temperature is obvious. Changes of river discharge confirm runoff increase during winter and decrease in summer, approving principal shifts in the hydrological regime of the river. The content of dissolved oxygen is quite high, but still there is a decrease in the mean annual concentrations of oxygen versus evidently increasing temperature. Because of these changes, enlarged phytoplankton biomasses and the dominance of filamentous cyanobacteria during blooming are typical as we increased growth of macrophytes.

Purpose of site

ONLY OBSERVATION
NO EXPERIMENTATION

Investigation of long-term ecological changes in a river ecosystem on the background of climate warming and changing riverine load.

Location: The River Salaca is situated in northern Latvia, North Vidzeme Biosphere Reserve about 100 km from Riga city

Ecosystems: Fresh Water Rivers

Research topics: aquatic ecology; stream ecology; biodiversity; species diversity; community ecology; community dynamics; water chemistry; environmental science

Contact(s): Gunta Springe, gunta.springe@lu.lv; Ilga Kokorite

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | 2WD | BOAT | Power - Central | Data: Ext

DEIMS.ID: 81a2b50d-76ea-426b-8e5b-0560dc07ee57

Web links

- http://hydrolab.lu.lv

Accredited sites

2

Network started

2014

Netherlands

LTER Netherlands

Netherlands

LTSER Dutch Wadden Sea Area

HUGE UNBROKEN SYSTEM OF INTERTIDAL FLATS

Coastal area bordering the north of the Netherlands. A range of inhabited barrier islands (included in LTSER Dutch Wadden Sea Area) separates the Dutch Wadden Sea from the North Sea. The Dutch Wadden Sea consists of intertidal mudflats and subtidal areas. The southern border of the area consists of inhabited polders. Many polders consist of reclaimed saltmarsh areas.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

For its globally unique geological and ecological values, the Wadden Sea is listed by UNESCO as World Heritage. The aim is to preserve the unique natural values of the area, like the large number of migratory birds depending on the area, while allowing human use in such a way that it contributes to identity, wellfare and well-being of inhabitants and visitors. Similarly, the vision of the Trilateral Wadden Sea Cooperation is a Wadden Sea which is a unique, natural and dynamic ecosystem with characteristic biodiversity, vast open landscapes and rich cultural heritage, enjoyed by all, and delivering benefits in a sustainable way to present and future generations. Monitoring and research focus on ecosystem changes, invasive species, shellfish fisheries, tourism, climate change, and impact of mining.

Location: Northern part of the Netherlands, spanning the entire northern coastline

Ecosystems: Agricultural; Coastal; Mixed Forest; Urban

Research topics: biology; conservation; biodiversity; species diversity; genetics; phenology; physiology; chemistry; isotopic chemistry; sediment chemistry

Contact(s): Rick Hoeksema, rick.hoeksema@rws.nl; Bruno Ens

All parts of site accessible: Yes

Infrastructure:

All yr | BOAT | SC | BOAT | SR | Beds | Power - Central | Data: Int | Data: Ext

DEIMS.ID: fcbf044b-20e2-4e87-894d-10bfe6e3a7ac

Web links

- https://www.basismonitoringwadden.nl/
- https://www.waddenacademie.nl/en/
- https://rijkewaddenzee.nl/

Accredited sites

17

Network started

1996

Poland

PoLTER

www.lterpoland.pl/

Poland

Brenna

FOREST ECOSYSTEM

The Brenna monitoring site in the Silesian Beskid (Polish part of the West Carpathians) was established in 1991and consists of a monitoring station (meteo parameters and air pollution level) at the elevation of 865 m a.s.l. and 7.5 ha and 50 ha catchments at the elevation of 750 m a.s.l under 120-year-old spruce stand.

The main goals of the monitoring programme were the investigation of:

- Response of spruce stands to air pollution and forest management practice in the mountain area which has been influenced by emissions from the industrial complexes of Silesia and the Czech Republic
- The balance of nutrients in a small mountain catchment
- Changes in floral characteristics.

These monitoring activities have been continuing and moreover, the effect of forest management (falling, skidding) on soil (erosion) is monitored.

In 2016 a particulate analyzer (PM10/PM2.5) (model 5030 Synchronized Hybrid Ambient Real-time Particulate SHARP Monitor) was installed at the station to measure the inflow of pollutants from industrial regions.

Equipment for meteorological measurements is as follows: Barometer LB-716, thermohigrometer LB-710R, wind speed meter LB-746, pyranometer PQS1, thermometer LB-711 (air and soil), pluviometer RG50A. Additionally, continuous measurements of ozone have been carried out since the nineties (Monitor Thermo Scientific).

Purpose of site

MAINLY OBSERVATION
NO EXPERIMENTATION

Response of tree stand to air pollution. Use of bioindicators to determine heavy metals and PAHs levels. The balance of nutrients in a small mountain catchment. Changes in floral characteristics under forest stand reconstruction. Effect of forest management (falling, skidding) on soil (erosion).

Location: 130 km from Cracow international airport 120 km from Katowice international airport

Ecosystems: Temperate coniferous forests

Research topics: biology; dendrochronology; ecology; biodiversity; species diversity; ecosystem ecology; ecosystem function; ecosystem service; chemistry; air chemistry; depositions chemistry; soil chemistry; soil solution chemistry; water chemistry; hydrography; meteorology; climatology; climate change; climate monitoring

Contact(s): Jacek Borgulat; j.borgulat@ietu.pl

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | Power - Central | Data: Ext

DEIMS.ID: 0ff5485d-4436-4153-b6fb-d6eac9c9dd23

Web links

- http://www.lterpoland.pl/index.php?site=1&siteId=253&d=67

Poland

The City of Lodz LTSER

SUBURBAN-URBAN SYSTEM

Lodz is the third-largest city in Poland. The city originates from the 19th century., when it was established as a centre of the textile industry. During the economic transition of the 1990s Lodz lost its industry.

Lodz has a network of numerous but small water courses, and is located in the hills that constitute the first order watershed between the largest Polish rivers, the Wisła and the Odra. This situation affords benefits in eliminating the risk of flooding posed by one major river, on the other hand, exposing the source areas to adverse environmental conditions resulting from urbanization, is unfavourable, and increases the risk of flood and drought.

Research in the LTSER is focused on: urban sprawl and its effects on environment, society and health; development of blue-green infrastructure; social inclusion and marginalization; eco-gentrification; ecosystem services and their valuation; development of ecohydrological NBS to support regulatory services in the city.

The platform consists of two big demonstration - implementation areas with a monitoring system for discharges and water quality, however, based on la earning-alliance group of stakeholders, it is linked to many data sources on environmental monitoring, biodiversity, economy, societal information.

The future research-implementation-collaboration challenge is NBS linked revitalization of the old town, increased adaptive potential of urban areas to climate change, and protection of the green ring and blue-green network of the city.

Purpose of site

PARTLY OBSERVATION
MAINLY EXPERIMENTATION

The site is focused on implementations in the area of integrative city revitalization, water management, and restoration of rivers. It emerged from the actions undertaken within FP6 SWITCH Project "Water for the City of the Future". The city is a global reference site of the UNESCO IHP Ecohydrology Programme due to established demonstration projects on ecohydrological NBS for river restoration and rainwater management.

It is covered by national and local monitoring programmes as well as data gathering projects run by institutes of Polish Academy of Sciences, University of Lodz and Technical University of Lodz. They include general information on city infrastructure, air and water quality, health, demography, economic status and development of the city and its inhabitants, long-term data related to water management and biodiversity.

Location: International airport in Lodz. Approximately 140 km from Warsaw city (main airport)

Ecosystems: Forest; Grasslands; Lakes; Rivers; Urban

Research topics: biology; aquatic ecology; biodiversity; species diversity; ecosystem ecology; ecosystem service; water chemistry; environmental science; hydrology; meteorology; social sciences; demography

Contact(s): Kinga Krauze; Tomasz Jurczak

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | SR | Beds | Power - Dist

DEIMS.ID: 6c81a46f-a830-4bc1-8ccd-a0f023583ec7

Web links

- http://www.lterpoland.pl/index.php?site=1&siteId=250&d=67
- http://www.switchurbanwater.eu/cities/8.php
- http://ecohydrology-ihp.org/demosites/view/57
- http://ecohydrology-ihp.org/demosites/view/70

Poland

The Sulejow Reservoir LTER

EUTROPHIC LOWLAND RESERVOIR

The site is situated in the lowlands of Central Poland and is arranged around the Sulejowki Reservoir. It was built in 1969-1974 on the Pilica River mainly as a source of drinking water for the City of Lodz (the third biggest city in Poland) and other cities like Tomaszow, Piotrkow, Sulejow, and a power generator. With time it also became an important touristic and recreational place.

The research area includes the reservoir and its direct catchment, where smaller plots have been located for analysing surface flow, groundwaters, and the role of land/water ecotones in regulation of nutrient cycling. There are a number of sampling sites/points located also on the reservoir. Three of them are permanent since the 1980s and serve as a source of data on water chemistry, the others are sampled periodically for certain purposes, e.g. fish (including 1+), phytoplankton, zooplankton, sediment depositon, groundwater level, groundwater chemistry.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

- cause-effect analysis with reference to water quality: landscape structure, land use, structure of buffering zones, biomanipulation, cyanobacteria blooms
- application of ecohydrological and phytoremediation methods for enhancement of ecosystem quality
- experimentation site on biotechnology and ecohydrology.

Location: 60 km from Lodz city and Lodz international airport. 12 km from Tomaszow Mazowiecki (bus and train station)

Ecosystems: Agricultural; Fresh Water Lakes

Research topics: agriculture; biology; aquatic ecology; lake ecology; wetland ecology; biodiversity; species diversity; water chemistry; environmental science; fishery; hydrology; climatology; toxicology; ecotoxicology

Contact(s): Katarzyna Izydorczyk, k.izydorczyk@erce.unesco.lodz.pl

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | BOAT | SM | SR | Beds | °C | Power - Central

DEIMS.ID: 8b9d04ca-0798-4f7f-91cd-82c91f881c8e

Web links

- http://www.lterpoland.pl/index.php?site=1&siteId=255&d=67%3B

Poland

The UNESCO/UNEP Pilica River Demonstration Site

RIVER-RESERVOIR SYSTEM

The UNESCO/UNEP demonstration project of the Pilica River is an LTSER platform comprising four spatial levels: the river and its catchment, the floodplains, and a lowland reservoir. The main activities focus on: implementation of the operational procedures for hydro-biomanipulation at the dam; enhancing the absorbance capacity of floodplain for nutrients and pollutants; identification of hot-spots for the eutrophication of the reservoir in the Pilica catchment; enhancing the potential for nutrient assimilation by small rivers and streams through restoration of plant buffering zones. The site covers the upstream part of the Pilica River catchment (above the Sulejow Reservoir) with marshes, flooded meadows, willow shrubs, arable land, woodlands and small streams. The site was launched in 1996 within the UNESCO-IHP Ecohydrology programme as a demonstration and experimental project that incorporates social factors and refers to management issues of a complex catchment-river-reservoir system. Part of the project has been to establish a multi-stakeholder platform and permanent collaboration with local and regional decision makers.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The overall goal of the demonstration project is mitigation of eutrophication and toxic algal blooms in the Pilica River catchment by:

- the development of ecohydrological biotechnologies for reducing the impact non-point pollution;
- identification of pressures coming from municipal and agricultural sources based on the mathematical models;
- development of a method of reduction of matter transport by a river to the reservoir by optimization of nutrient retention in floodplain areas;
- elaboration of a method for reduction of point source pollution originated from a sewage treatment plant upstream of the reservoir, by harmonisation of technological and ecological measures;
- establishing of multi-stakeholder platform.

Location: 60 km from Lodz city and Lodz international airport. Between Tomaszow Mazowiecki (bus and train station) and Pilica City (Silesian Voivodeship)

Ecosystems: Grasslands; Lakes Rivers

Research topics: agriculture; biology; aquatic ecology; lake ecology; stream ecology; wetland ecology; biodiversity; genetic diversity; species diversity; ecosystem ecology; ecosystem service; water chemistry; environmental science; fishery; hydrology; hydrography; meteorology; social sciences; demography; toxicology; ecotoxicology

Contact(s): Katarzyna Izydorczyk, k.izydorczyk@erce.unesco.lodz.pl

All parts of site accessible: Yes

Infrastructure:

All yr | SC | BOAT | SR | Beds | °C | Power - Central

DEIMS.ID: 8c19445a-ed76-43b8-acfb-4cc18e3fd8b3

Web links

- http://www.lterpoland.pl/index.php?site=1&siteId=217&d=67
- http://ecohydrology-ihp.org/demosites/view/64

Access to sites

Transnational Access in the eLTER H2020 project

www.lter-europe.net/elter/ta

18 sites offered for access, in **17** countries. **3** calls for proposals, in response to which **75** proposals were received. **12** multi-site proposals and **12** applications from outside the EU. **53** projects funded, receiving a total of **0.5 million €**, enabling **116** users to make research visits. **1068** access units (users/day) supported.

Photo: Joaquim Pedro Ferreira

Accredited sites

4

Network started

2011

Portugal

LTER Portugal

https://www.lterportugal.net/

Portugal

Baixo Sabor LTER

ARTIFICIAL LAKE IN A MEDITERRANEAN LANDSCAPE

The Baixo Sabor LTER site encompasses the lower reaches of the Sabor River and the catchment of its tributaries (1590 km^2), parts of which were flooded in 2015 by the two reservoirs of the Baixo Sabor Hydroelectric Infrastructure. Elevation ranges between 100 and 1100m. Climate is predominantly Mediterranean with continental influence. Annual rainfall ranges between about 500 mm and 1000 mm, and mean annual temperature ranges between about 10 ºC and 16 ºC. The site is mostly included in the Meso-mediterranean and Supra-mediterranean zones. Land cover is dominated (>80%) by Mediterranean oak forests and shrublands, pine plantations, olive groves and other permanent crops, and arable cropland and pastures. Most of the Baixo Sabor LTER site is included in the Natura 2000 network. There are relevant populations of endangered species, including some flagship species such as golden eagle (*Aquila chrysaetos*), Bonelli's eagle (*Hieraaetus fasciatus*), Egyptian vulture (*Neophron percnopterus*), and wolf (*Canis lupus*). Human population density is low (12–22 inhabitants/km^2, in different municipalites), and it has declined from about 25% to >50% since 1960. Over the past decades there has also been a tendency for the population to concentrate in the main urban centres. Agriculture is an important economic activity, but there is a pervasive trend for agricultural abandonment due to population declines and ageing.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The main purpose of research at Baixo Sabor LTER is to improve our understanding of the long term consequences of river damming on freshwater and adjacent terrestrial ecosystems, and how these effects interact with other socio-economic and environmental drivers operating at scales from local (e.g., land use changes) to global (climate change, biological invasions). In addition, research aims to understand the effects of land abandonment on socio-ecological systems, exploring the importance of extensive land use systems for the conservation of biodiversity and the delivery of ecosystem services.

Location: Baixo Sabor is located in north-east Portugal, in the region of Trás-os-Montes, within the watershed of the Sabor River

Ecosystems: Agricultural; Mediterranean forests, woodlands, and scrub; Large lakes; Large river headwaters; Large rivers

Research topics: biology; conservation; animal ecology; aquatic ecology; lake ecology; stream ecology; biodiversity; genetic diversity; species diversity; community ecology; community dynamics; successional dynamics; trophic dynamics; ecosystem ecology; ecosystem function; ecosystem service; plant ecology; population ecology; terrestrial ecology; genetics; water chemistry; environmental science; hydrology; limnology; agriculture; silviculture; meteorology; social sciences; archeology; history; land use history; sociology

Contact(s): Pedro Beja, pbeja@cibio.up.pt; João Cabral

All parts of site accessible: No

Infrastructure:

All yr | 2WD | 2WD | 4WD | SR | Beds | Power - Central

DEIMS.ID: 45722713-80e3-4387-a47b-82c97a6ef62b

Web links

- https://www.lterportugal.net/sabor

Portugal

LTER Ria de Aveiro

SOCIAL-ECOLOGICAL COMPLEX COASTAL LAGOON

The Ria de Aveiro is a shallow coastal lagoon located on the north-west coast of Portugal (40°38'N, 08°45'W), integrated in the Vouga River catchment area. The geographical location of the Ria and its natural resources contributes largely to its recognised value at national and international levels (e.g. Natura 2000 network, SPA, areas classified as SCI). The lagoon area has a complex history, both geologically and related to human activity. Since the 19th century, the settled population has shaped the ecosystem, contributing to the increase of habitat diversity and associated biodiversity. The Ria's natural capital is an important factor for the development of the municipalities situated in the lagoon area. The main objective of this LTER site is to contribute to the improvement of integrated management of coastal areas, from catchment to coast, involving the concepts of Science-policy-stakeholders interface. To achieve this objective research has been addressing a clear practical focus on: engagement of stakeholders at different levels; mapping and assessment of ecosystem processes and services using data and indicators available at national and European level; assessment of the impacts and emerging drivers of change; common frameworks and tools for the conservation and sustainable management of biodiversity and ecosystem services. The site infrastructure includes laboratory facilities for environmental monitoring (data available at https://data.lter-europe.net/deims/).

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The LTER site Ria de Aveiro aims to contribute to the effective implementation of the Water Framework Directive and to the following EU Biodiversity Strategy targets:

- Full implementation of EU nature legislation to protect biodiversity (e.g. to integrate protection and management needs into key policies within Natura 2000 areas)
- Better protection for ecosystems, and more use of green infrastructure, namely through Action 5 (e.g. mapping and assessment of ES; valuing biodiversity and ES; promoting the integration of these values into decision-making processes).

The approach by the LTER site team includes environmental monitoring, field observation (e.g. habitat mapping), remote sensing and mesocosms experiments addressing ecosystem processes and functions underpinning ecosystem services. The generated science based knowledge aims to support ecosystems-based management approaches.

Location: Ria de Aveiro is geographically situated in mainland Portugal ≈250 km north from Lisbon and ≈75 km south from Porto

Ecosystems: Agricultural; Coastal; Marine

Research topics: biology; animal ecology; aquatic ecology; marine ecology; wetland ecology; biodiversity; ecosystem ecology; ecosystem function; ecosystem service; microbial ecology; plant ecology; vegetation dynamics; physiology; ecophysiology; biogeochemistry; sediment chemistry; soil chemistry; water chemistry; environmental science; geology; aquaculture; fishery; toxicology; ecotoxicology; social sciences; geography; sociology

Contact(s): Ana Isabel Lillebø, lillebo@ua.pt; Daniel Cleary; Ana I. Sousa; Ana Genua

All parts of site accessible: No

Infrastructure:

All yr | 2WD | BOAT

DEIMS.ID: dfc24538-730e-4e4b-9f04-8e84608b9999

Web links

- https://www.lterportugal.net/ria-de-aveiro

Portugal

LTsER-Montado

MONTADO AGRO-SILVO-PASTORAL SYSTEM

Cork (*Quercus suber*) and holm (*Quercus ilex* L.) oaks were the dominant oaks in the Iberian Peninsula since the last glaciation. Millennia of land clearing led to the elimination of most oaks. However, in the dry lowlands south of river Tagus (Alentejo), the impossibility of land irrigation and the poor soil quality led to the establishment of the montado agro-silvo-pastoral system. Today, roughly 90% of Portuguese cork-oak montados are found in this region and represent the largest cork oak montado area in the world. Montados occur on two soil types: skeletal schist and the alluvial plains of the Tagus and Sado rivers. When compared with holm oaks, cork-oaks are relatively fragile, being unable to withstand severe droughts and continental climates. Thus, as one proceeds south, the flatlands become divided between the coastal cork-oak montados and the inland holm oak montados (western limit of the Spanish dehesas); their aggregated area is the largest extension of montado in the world.

The LTsER montado stations represent different land-use regimes and desertification scenarios. More relevance was given to cork oak montados, due to the importance of cork for the national PIB, as well as to the global importance of Portugal for this ecosystem.

Our main goal is to improve understanding on the long term consequences of land use practices and management options, and how these interact with drivers operating at global scale (e.g. climate change, desertification).

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

To achieve our goal, two main contrasts will be monitored: i) vulnerability to dryness (also related to land use) and ii) vulnerability to grazing intensification. In this approach the LTsER Montado uses data series concerning the main key drivers of change such as climate historical time series; satellite images; aerial photographies or forestry inventories. Other used datasets include CO^2 and H^2O fluxes (in one site), soil respiration and soil water content, vegetation cover and land use changes, growth and health of individual cork-oaks, acorn production, plant and animal diversity. Also, by involving the key stakeholders in the process, we envision to pro-actively contribute to agriculture and conservation policies in the frame of the EU CAP and the Convention of Biological Diversity.

Location: This platform, situated in Alentejo region (mainland south Portugal), includes 3 formal accredited and 3 potential research and monitoring stations

Ecosystems: Mediterranean forests, woodlands, and scrub

Research topics: biology; conservation; dendrochronology; animal ecology; biodiversity; species diversity; ecosystem ecology; ecosystem service; forest ecology; plant ecology; terrestrial ecology; phenology; agriculture; silviculture; meteorology; climatology; climate monitoring; social sciences; demography; history; land use history

Contact(s): Margarida Santos-Reis, mmreis@fc.ul.pt; Ines Teixeira do Rosário

All parts of site accessible: No

Infrastructure:

All yr | 4WD | 4WD | Beds | Power - Central

DEIMS.ID: ecfcc7e2-82e5-4ec1-adee-a3f9f815fc0d

Web links

- http://www.ltsermontado.pt/

Accredited sites

13

Network started

1996

Romania

Romanian LTER Network

www.lter-romania.net

Romania

Braila Islands

PROTECTED WETLANDS IN THE LOWER DANUBE RIVER

"Braila Islands" site with a total surface of over 2600 km^2 is situated in the South-East of Romania corresponding to a 78 km long Danube sector that stretches between Harsova (kilometer 253) and Braila (kilometer 175) cities. This socio-ecological system is inhabited by nearly 300,000 people and comprises heavily modified ecosystems (e.g. Big Island of Braila, former wetland transformed into agricultural land) but also systems under a natural functional regime (e.g. Small Islands of Braila), being of a crucial natural and socio-economical value.

The Danube river along the Braila Islands section has been ranked as a heavily modified water body according to criteria 2.1 (embankment works) due to the hydro-technical works on more than 79% of the river stretch sector and a candidate to "heavily modified" according with the WFD criteria 2.2 (regulation works) as a result of dredging of 21% of the river bed for intensive navigation. The main remnant of the natural floodplains consists in the wetlands from the Small Island of Braila Natural Park with a total surface of 210 km^2 and the floodplains between the riverbanks and dikes of almost 93 km^2.

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

Large scale ecological systems studies: population/species, compartments (primary producers, consumers, decomposers), ecosystems, complex of ecosystems (landscapes/waterscapes), integration of socio-economic research data and monitoring, stakeholder integration.

Location: LTSER Braila Island integrates 20 communes and 25 monitoring stations on a surface of about 2600 km^2, including Braila city at 200 km east of Bucharest

Ecosystems: Agricultural; Temperate broadleaf and mixed forests; Temperate grasslands, savannas, and shrublands; Flooded grasslands and savannas; Small lakes; Large rivers

Research topics: biology; conservation; aquatic ecology; lake ecology; stream ecology; wetland ecology; community ecology; trophic dynamics; ecosystem ecology; ecosystem function; ecosystem service; forest ecology; plant ecology; vegetation dynamics; terrestrial ecology; phenology; taxonomy; biogeochemistry; interstitial water chemistry; sediment chemistry; water chemistry; environmental science; geology; hydrology; hydrography; limnology; agriculture; fishery; silviculture; meteorology; climatology; climate change; climate monitoring; soil physics; toxicology; ecotoxicology; social sciences; history; land use history; sociology

Contact(s): Mihai Adamescu, adacri@gmail.com

All parts of site accessible: Yes

Infrastructure:

All yr | BOAT | 4WD | BOAT | SR | Beds | °C | Power - Central | Data: Int | Data: Ext

DEIMS.ID: d4854af8-9d9f-42a2-af96-f1ed9cb25712

Web links

- http://rcses.unibuc.ro/

Romania

Bucegi-Piatra Craiului National Park

REPRESENTATIVE FOREST AND ALPINE ECOSYSTEMS

Bucegi - Piatra Craiului are located in the Romanian southern Carpathians (Bucegi NP (32.500 ha) and Piatra-Craiului NP (13.800 ha). In 2003, these areas were nominated as two ILTER Sites and in 2008 as LTER-Europe sites (Bucegi - Piatra Craiului). The diversity and vast richness of Bucegi - Piatra Craiului vegetation, with many endemic species and rich fauna which includes endangered species and unique plant communities like chamois, bear, lynx and wolf were the main reasons for the natural and national park designated status of Bucegi - Piatra Craiului.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Two monitoring networks consisting of 22 permanent plots (LTERp) were established in 2006-2009. These plots were located within Bucegi - Piatra Craiului parks in the forest zone at elevations ranging from 800 to 1800 m. They were selected by considering the criteria of species composition, age distribution, and potential exposure to trans-boundary pollution. Monitoring plots were located in representative forest ecosystems, well exposed to incoming air masses allowing good measurements of air pollution status and its effects on forest ecosystems.

Location: The site is located in the south-central part of Romania, in the Bucegi and Piatra-Craiului Mts of the Southern Carpathians

Ecosystems: Alpine; Temperate broadleaf and mixed forests; Temperate coniferous forests; Grasslands; Fresh Water Lakes; Small rivers

Research topics: natural science; biology; forest conservation; nature conservation; dendrochronology; biodiversity; species diversity; ecosystem ecology; ecosystem function; ecosystem service; forest ecology; plant ecology; vegetation dynamics; population ecology; population dynamics; terrestrial ecology; physiology; air chemistry; depositions chemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; geology; hydrology; hydrography; silviculture; meteorology; climatology; climate change; climate monitoring; soil science; geography

Contact(s): Stefan Leca, stefan.leca@icas.ro

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | 4WD | Beds

DEIMS.ID: 4050c5c8-fccc-4a3c-af65-7507a064d5f5

Web links

- http://www.bucegipark.ro
- http://www.pcrai.ro

Romania

LTSER Neajlov catchment

AGRICULTURE, FOREST, WETLAND AND GRASSLAND

The area is located in the south part of Romania (24°51'12"-26°13'52" E, 43°55'31"-44°49'32" N). The Neajlov River and its catchment are a tributary and a sub-catchment of the river Arges, which in turn is one of the main tributaries for the lower Danube river stretch. The Neajlov river catchment belongs also to the four administrative units (counties) – Arges, Dimbovita, Giurgiu and Teleorman.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Interdisciplinary and multi-scale research is focused on simultaneous and comprehensive measurements of major nutrient and pollutant fluxes, improvement of knowledge on key factors influencing different processes of the regional nutrient turnover, biosphere–atmosphere–hydrosphere exchange processes, mechanisms between microorganisms and plants, assessment of impact of land use management and climate changes upon biodiversity of terrestrial and aquatic ecosystems, identifying best management options needed to be developed in order to minimize negative environmental impacts, priorities of the societal and policy dialogue.

Location: Neajlov Basin is at approximately 100 km west of Bucharest; integrating several research and monitoring stations

Ecosystems: Agricultural; Temperate broadleaf and mixed forests; Fresh Water Lakes; Small rivers

Research topics: biology; chemistry; hydrology; hydrography; limnology; meteorology; social sciences; geography

Contact(s): Carmen Postolache, carmen_postolache83@yahoo.com; Mihai Adamescu; Constantin Cazacu

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | 2WD | Power | Data: Int | Data: Ext

DEIMS.ID: a6af4965-8352-461a-84b0-0cac30559ad7

Romania

Retezat Biosphere Reserve

REPRESENTATIVE FOREST AND ALPINE ECOSYSTEMS

Retezat massif was declared a biosphere reserve in 1979, due to its landscape diversity, geological complexity, composition of the flora and vegetation. Retezat National Park is famous for its floral diversity, hosting more than 1190 species of plants. Forests cover about 49% of the area, the most widespread species are beech (*Fagus sylvatica*), spruce (*Picea abies*), mountain pine (*Pinus mugo*), fir (*Abies alba*), maple (*Acer pseudoplatanus*), birch (*Betula pendula*), alder (*Alnus viridis*), elm (*Ulmus glabra*), Rowan (*Sorbus aucuparia*). Currently the park covers 380.47 km^2. The area shelters one of Europe's last remaining intact old-growth forest and the continent's largest single area of pristine mixed forest. The highest peak of the Retezat Mountains, Vf. Peleaga, 2,509 m, is located in the park. The park also includes about 80 glacier lakes. The *Pinus cembra* population is probably the most representative of the Carpathian Mountains.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The site was established in order to assess the effects of transbonduary air pollution on forests ecosystems in Retezat mountains, a pollution-free area in Romania (the Park is a protected area for more than 50 years, with no nearby pollution sources).The long term research network was placed in Retezat National Park in 2000, comprising 11 research plots (with a 0.25 ha surface) placed in representative forest or alpine ecosystems.

Location: Retezat LTER site is located in the western part of the Southern Carpathians

Ecosystems: Alpine; Temperate broadleaf and mixed forests; Temperate coniferous forests; Grasslands; Fresh Water Lakes; Rivers

Research topics: natural science; biology; forest conservation; nature conservation; dendrochronology; biodiversity; ecosystem function; ecosystem service; long term ecological research; plant ecology; vegetation dynamics; population ecology; population dynamics; genetics; chemistry; environmental science; hydrology; hydrography; limnology; meteorology; soil science; geography

Contact(s): Diana Pitar, diana.silaghi@icas.ro

All parts of site accessible: No

Infrastructure:

All yr | 4WD | Data: Int | Data: Ext

DEIMS.ID: 41d84799-0ef0-48a0-ac20-ae192850c895

Web links

- http://www.retezat.ro

Supporting place-based scientific research

Blogs from the field

www.lter-europe.net/elter/ta/ta-blogs

Long-Term Ecosystem Research Sites and Socio-Ecological Research Platforms support a wide range of research. During the eLTER H2020 project, we invited research users and site managers involved in our Transnational Access scheme to write blog posts. We received posts on a diverse range of topics describing research in many different places, including Scottish peat bogs, Israeli deserts, Slovenian cave systems and the Danube river in Romania.

Accredited sites

5

Network started

2008

Serbia

LTER-Serbia

Serbia

Fruška gora

TEMPERATE DECIDUOUS FOREST

Fruška gora is an isolated, narrow, island mountain in the Pannonia plain, completely surrounded by lowland. It extents to 80 km in length and 15 km in width. Its highest peak, Crveni cot, is 549 m. Its location, specific geological history and different microclimatic conditions (from lowland semi-arid climate to the relatively cold and humid submontane climate) make it very interesting and important to science. Thanks to unique and very rich deposits of fossil fauna and flora, Fruška gora is called the 'mirror of geological past'. More than 90% of the area is covered by deciduous forests with varied types of climatogenous forest communities that have been under constant and increasing pressure from surrounding urban areas, building, traffic, agriculture and economic use. The dominant forests are mesophillous mixed forests of sessile oak (*Qeuercus petraea*) and European hornbeam (*Carpinus betulus*), orographically conditioned beech forests, as well as thermophilous forests of Turkey oak (*Quercus cerris*), pubescent oak (*Quercus pubescens*) and *Quercus frainetto*. Fruška gora is home to around 1500 of plant species which is more than 1/3 of the total Serbian flora.

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

Fruška gora site was established to study the impact of climate change and air pollution on forests and steppe habitats with special focus on climate change and land-use change relation and forest biodiversity.

Location: Fruška gora is 24 km from the nearest city, Novi Sad, and 74 km from Belgrade, the Serbian capital

Ecosystems: Deciduous Forest

Research topics: biology; conservation; animal ecology; biodiversity; genetic diversity; species diversity; community ecology; successional dynamics; ecosystem ecology; ecosystem service; forest ecology; plant ecology; vegetation dynamics; terrestrial ecology; genetics; physiology; environmental science; meteorology; climatology; climate change; climate monitoring

Contact(s): Dušanka Krašić, dusanka.krasic@gmail.com

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | 2WD | 4WD | SR | Beds | T: >10m | Power - Central | Data: Ext

DEIMS.ID: f1c571d2-11e3-4072-ac66-073600ce152c

Web links

- http://www.npfruskagora.co.rs/pages/onama-eng.htm

Serbia

Koviljsko-petrovaradinski rit

DANUBE RIVER ISLAND

Krcedinska ada is a Danube river island and a part of a larger floodplain complex, Nature Reserve and Ramsar site Koviljsko-petrovaradinski rit. It has a semi-circular shape and a surface area of 870 ha, making it one of the largest river islands in the Serbian Danube region. The area is characterized by moderate continental climate. The area is of special importance as a migratory habitat for waterfowl and as a feeding resource during reproductive periods. Given that micro-relief is in constant change, plant associations are in apparent dynamics. Vegetation is composed of different vegetation types dominated by pastures with open grown veteran willow trees, scattered thorny shrubs and forest fragments. Open habitats of Krcedinska ada with veteran willow trees indicate that the area has been managed as a wood pasture throughout history. According to historical documents, ranching (of horses, donkeys, cows, pigs) has been practiced on the island for more than 400 years. Such land use practice resulted in the preservation of wet habitats suitable for spawning and rearing fish as well as wet meadows, habitats for rare plant species.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The purpose of the site is to (a) monitor vegetation succession and land use change due to grazing intensity fluctuations and (b) investigate plant-herbivore interactions and wood pasture dynamics.

Location: Koviljsko-petrovaradinski rit is located 20 km from Novi Sad and 70 km away from Belgrade, the capital

Ecosystems: Deciduous Forest; Grasslands

Research topics: community ecology; successional dynamics; ecosystem ecology; ecosystem service; plant ecology; vegetation dynamics; agriculture; history; land use history

Contact(s): Dušanka Krašić, dusanka.krasic@gmail.com

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | BOAT

DEIMS.ID: 127a5bea-daf5-48ed-8199-bf9ae6065d04

Web links

- http://www.biosens.rs

Serbia

Tara

MIXED FOREST

Tara mountain is a part of the Dinaric Alps with an average height of 1200 m above sea level and is a typical forested area located in western Serbia. Its forests are among the best preserved and most productive forests in Europe and represent the greatest natural value of Tara. The area has a temperate continental climate with subalpine influences. High humidity is caused by currents from the Drina canyon and daily mist. More than 75% of the area is covered with mixed forest of beech, fir and spruce. Tara is a well known refugium for many relict and endemic plant species among which the most valuable and recognizable is the endemic and relict Serbia spruce, *Picea omorica* (Pancic) Purkyně with very limited range to about only 60 ha.

Purpose of site

ONLY OBSERVATION
NO EXPERIMENTATION

Monitoring of forest parameters (physical, chemical, biological), forest disturbances and forest land use changes.

Location: The shortest route from Belgrade to Tara is 180 km, while Tara is 246 km from Novi Sad

Ecosystems: Evergreen Forest

Research topics: biology; biodiversity; species diversity; forest ecology; fungal ecology; terrestrial ecology; physiology

Contact(s): Saša Orlović, sasao@uns.ac.rs

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC

DEIMS.ID: 31f51481-40c9-4047-9043-79fae33ec9a8

Web links

- http://nptara.rs/site/about-us/

Serbia

Velika Morava

MAJOR RIVER SYSTEM

Velika Morava is 175 km long river originating from Western and Southern Morava Rivers. The whole catchment area (including Western and Southern Morava) is about 38.000 km², while the basin area of Velika Morava is 6.760 km². The mean annual flow is 245 $m^3 s^{-1}$ (gauge station Ljubicevo, near to the mouth of the Danube - Annual Water Quality Reports 1999-2008). Based on the size of catchments area and its flow, Velika Morava is one of the major tributaries of the Danube. Over 95% of the basin is located at the territory of the Republic Serbia. The water regime is unimodal, characterized by the prominent seasonal fluctuations. In the spring the river can be almost torrential (the mean flow near to the mouth 560 m³/s), while in the rest of the year there is a "low water" period, particularly in the autumn, when mean flow does not exceed 100 m³/s. The riverbed is 80-200 m wide, and up to 10 m deep, although average depth usually does not exceed 2 m. The silicates are the dominant geological substrate in entire catchment area. According to the main geographical features, the river could be divided into two main parts. The lower one, from the confluence with the Dunav to the Resava River mouth (near Svilajnac), is 85 km long typical lowland watercourse (altitude lower the 100 m), with 0.35 ‰ declination, and with sand and mud/silt as dominant fractions of the riverbed. This part of the Velika Morava River belongs to Ecoregion 11 (ER11_Ser). The upper one, from the Resava river mouth to Stalac (the confluence of Southern and Western Morava Rivers), is 90 km long. The mean altitude is over 100 m a.s.l. (to 135 m), declination is 0.44 ‰ and in the riverbed the dominant part are sand and gravel fractions. Upper part belongs to Ecoregion 5 (ER5_Ser). Velika Morava river basin has four permanent monitoring sites. The area is densely populated and the river is under the influence of various pollution sources (organic, agricultural, industrial), as well as hydromorphological pressures (meander cutting, shortening, channeling, as well as gravel and sand extraction).

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Investigation of aquatic biota, physico-chemical, chemical parameters, hydromorphological degradation, relation biota-stressors, influence of basic socioeconomic factors on ecosystem imbalance.

Location: The gauge station Ljubicevo is 76 km away from Belgrade and Nikola Tesla international airport

Ecosystems: Fresh Water Rivers

Research topics: aquatic ecology; water chemistry; hydrology; hydrography

Contact(s): Vladica Simic, simic@kg.ac.rs

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | 4WD | BOAT

DEIMS.ID: 5bc9428a-46e2-48c3-beb5-aec13d06f0fe

Web links

- http://baes.pmf.kg.ac.rs/

The international dimension

International Long-Term Ecological Research Network

www.ilter.network

ILTER is a network of networks, encompassing hundreds of research sites located in a wide array of ecosystems that can help understand environmental change across the globe. ILTER's focus is on long-term, site-based research and monitoring. ILTER's vision is a world in which science helps prevent and solve environmental and socio-ecological problems. ILTER contributes to solving international ecological and socio-economic problems through question and problem-driven research, with a unique ability to design collaborative, site-based projects, compare data from a global network of sites and detect global trends. European LTER practitioners are very active within ILTER.

[Photo: NASA on Unsplash.com]

Accredited sites

9

Network started

1993

Slovakia

LTER Slovakia

Slovakia

Bab

LOWLAND OAK-HORNBEAM AND OAK FOREST ON LOESS

The Bab forest (66 ha) was selected as an example of a lowland deciduous broad-leaved forest on loess for ecosystem research in the International Biological Programme (IBP) in 1967. More than 60 researchers performed a comprehensive ecosystem research at the site within IBP and MaB programmes in 1967-1975. This period finished by production of syntheses in micro-meteorology and micro-climate, soils, soil microbiology, ecophysiological processes of plants (photosynthesis, water relations, mineral nutrition), primary productivity, nutrient cycles, water circulation, and secondary productivity. The ecophysiological studies continued in 1975-1980, later the research was focused to plant population biology and alien plants invasions. The ecosystem research was re-established in 2007. The inventory of shrub and trees, herb vegetation, selected animal groups allowed identification of changes during 40 years caused probably by the climate changes and anthropogenic disturbances. The differences in decomposition of selected native and invasive plant species were assessed. The biomonitoring of the air pollution was done using mosses as indicator organisms. Now the research is focused to dynamics of forest ecosystem (vegetation, selected invertebrate groups, small mammals) and impact of forestry management (clear-cuts) to structure and dynamics of forest ecosystem.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The ecosystem research in Bab forest in period of IBP and MaB programme (1967-1975) was aimed at obtaining knowledge on mechanisms of production processes, identification of principles of ecosystem functioning and interactions between its components. Later (1975-1980) the ecophysiological research of plant functional groups continued. After 1980, the research was limited to several topics, including primary production, plant population dynamics and invasions of alien species. More complex research was re-established in 2007 aiming at identification of changes in the structure and composition of forest ecosystem (vegetation and selected invertebrate groups) and impact of

forestry management (clear-cuts) to structure and dynamics of forest ecosystem. The site was used for the ALTER-Net multi-site trampling experiment and the ILTER tea bag decomposition experiment.

Location: The LTER site is located in the south-western part of Slovakia, about 70 kilometers north-east of the capital city Bratislava and 10 km from Nitra

Ecosystems: Deciduous Forest

Research topics: biology; animal ecology; biodiversity; species diversity; community ecology; community dynamics; successional dynamics; ecosystem ecology; ecosystem function; ecosystem service; forest ecology; plant ecology; vegetation dynamics; population ecology; population changes over time; population dynamics; terrestrial ecology; phenology; taxonomy; silviculture; meteorology; climatology; climate change; climate monitoring; history; land use history

Contact(s): Peter Gajdos, p.gajdos@savba.sk

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | 2WD

DEIMS.ID: 79e10639-dd60-4f30-9c43-7b2bae0f359a

Slovakia

Jalovecka dolina

ACID ALPINE GRASSLAND – IMPACT OF INCREASED N

The high-mountain valley in High Tatra National Park is dominated by spruce forests and alpine grasslands. Experimental research is focused on the impact of increased nitrogen and phosphorus deposition to an ecosystem of acid alpine grasslands. The experimental site is located in Jalovecka dolina valley (Western Tatra Mts., Slovakia) on a west-facing ridge top at 1900 m, ca. 2 km west of the summit Mount Salatin. Soils are shallow, humic-ferruginous podzols, derived from biotite granodiorite parent material. The average yearly precipitation is ca 1,600 mm, average yearly temperature 1.3˚C. The vegetation belongs to the alliance Juncion trifidi with dominance of graminoid species: *Oreochloa disticha*, *Festuca supina*, *Agrostis rupestris*, *Juncus trifidus*, and *Carex nigra*. Less abundant are forbs (*Campanula alpina*, *Hieracium alpinum* agg., *Homogyne alpina*, *Bistorta major* and dwarf shrub species *Vaccinium vitis-idaea*. The lichen layer has a high coverage with dominance of *Cetraria islandica*, lower coverage has moss layer with dominant *Polytrichum alpinum*. The site is equipped with a complex climatic station, rain gauge, collector for wet deposition measurements, microlysimeters and resin bags (later replaced by ion exchange discs). Vegetation, epigeic invertebrates, microbiological activity, soil solution chemistry, biomass production and decomposition are studied since 2002. The ILTER teabag decomposition study has been run at the site since 2017.

Purpose of site

PARTLY OBSERVATION
MAINLY EXPERIMENTATION

The site was established in May 2002 to study effects of increased nitrogen input to ecosystem of acid alpine grassland. Three treatments of N addition (20, 60, and 150 kg.ha^{-1}.year^{-1} applied as NH_4NO_3 in solution), one treatment of phosphorus addition (50 kg.ha^{-1}.year^{-1}, as KH_2PO_4 in solution) and control plot are replicated 5-times, i.e. 25 plots of size 2 x 2 m. The experiment showed that the ecosystem is saturated by N and capacity of system plant-microbe-soil to absorb and retain N is depleted. Phosphorus is limiting factor, aboveground production increased after its addition. Addition of N is followed by decrease of biomass

production due to combination of increased release of Al and Fe from bedrock and low soil concentration of Ca, P, K, Mg. Since 2009 the application of chemicals continues in half of each plot, in the second half the ecosystem recovery is studied.

Location: Located ca 8 km north of the city Liptovský Mikuláš (north Slovakia) in upper part of Jalovecka valley in Western Tatra Mts. - High Tatra National Park.

Ecosystems: Montane grasslands and shrublands

Research topics: biology; animal ecology; biodiversity; species diversity; community ecology; community dynamics; ecosystem ecology; ecosystem function; microbial ecology; plant ecology; vegetation dynamics; terrestrial ecology; depositions chemistry; soil chemistry; water chemistry; environmental science; geology; geomorphology; hydrology; meteorology; climatology; climate monitoring; history; land use history

Contact(s): Lubos Halada, lubos.halada@savba.sk

All parts of site accessible: Yes

Infrastructure:

FOOT | Data: Int

DEIMS.ID: e13f1146-b97a-4bc5-9bc5-65322379a567

Web links

- http://www.uke.sav.sk/lter

Slovakia

Kremnicke vrchy Ecological Experimental Station

SUBMOUNTAIN BEECH FOREST – COMPLEX ECOLOGICAL RESEARCH

The research is focused on complex study of ecological processes running within the beech ecosystem at the lower edge of its occurrence. The Ecological Experimental Station (EES) was founded in the Kremnické vrchy Mountains (Western Carpathians, Slovakia) in 1986. It is located at 470 m a.s.l., on SW slope. The leading stand-forming association is Dentario bulbiferae-Fagetum Zlatnik 1935, with locally admixed Carici pilosae-Fagetum Oberd. 1958. For both associations, to the permanent constituents (at different dominances and abundances) belong: *Carex pilosa*, *Carex sylvatica*, *Carex digitata*, *Galium odoratum*, *Dentaria bulbifera*, *Anthyrium filix-femina*, *Dryopteris filix-mas*. The dominant tree species at the locality is beech (80–95%); fir, oak and hornbeam are the associated species. The soil type is andic cambisol with high skeleton content (20–60%) and mild acid reaction (pH 5.4–6.4), the humus form is acid mull. The long-term mean (1951–1980) annual air temperature is approximately 6.8 °C, with a mean of 17 °C in the warmest month (July) and -4 °C in the coldest month (January). The mean annual precipitation is approximately 780 mm. An increasing value (+1.1 °C) of the mean annual air temperature was observed during the last two decades; however, the mean annual precipitation did not change significantly. The site is equipped with a few climatic microstations, collectors for precipitation and litterfall, lysimeters, dendrometers, etc.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The main goal is to evaluate the productivity, carrying capacity and functioning of the beech ecosystem. In February 1989 five plots were established. Four plots were subjected to cutting of different intensities (clear-cut and shelterwood cut: light, medium and heavy). A fifth plot was left without any management treatments as a control (original parent stand). The second cutting was performed in 2004 and after five years was the final cutting. Currently, the research is carried out not only within the parent stand (115–120 years old) but also in the young stands growing

after human intervention. It is focused on the examination of beech ecosystems development, especially on the microclimate conditions, productivity of trees, herbs and fungi, plant phenology, biochemistry, etc. Some global issues – the impact of climate change on ecosystem seems to be very important to investigate.

Location: 10 km from Sliač international airport and 10 km from Zvolen city (200 km east of Bratislava)

Ecosystems: Deciduous Forest

Research topics: biology; animal ecology; biodiversity; species diversity; forest ecology; fungal ecology; terrestrial ecology; phenology; depositions chemistry; soil chemistry; silviculture; meteorology; climatology; climate monitoring; physics; soil physics; history; land use history

Contact(s): Milan Barna, barna@ife.sk

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | 2WD

DEIMS.ID: 4c3159e4-4630-4309-940b-8ece71514b77

Slovakia

Polana Biosphere Reserve (Hukavsky grun)

MIXED BEECH MOUNTAIN FOREST

Permanent research site Polana Biosphere reserve (Hukavský grúň) is located in central Slovakia, in the east part of Polana Protected Landscape Area, where forest ecosystems as well as rural cultural landscape of the highest volcanic mountain in Slovakia is protected. The site is situated at 850 m a.s.l with annual mean temperature 5.5 °C and annual precipitation 860 mm. Tree species composition consists of beech (70 %), Norway spruce (19,6 %) and the rest is fir, maple and ash. The age of this forest stand is 90 – 120 years. The research site was established in 1991 and from the beginning research has focused on the individual components of the forest environment and the forest ecosystem (trees including the rhizosphere, soil, air quality), their relationships (the influence of the atmospheric deposition on the woods), the cycle of elements and substances (nutrition, litter, biochemical processes), physiological processes, phenology and tree growth, their vitality and ecological stability, as well as practical forestry issues such as natural and artificial regeneration. So there was a very wide range of detection, measurement and evaluation. In 1995, this area was integrated with the ICP Forests system of permanent monitoring areas (PMA). Close to the forest monitoring plot is a series of seven other permanent research areas (PRA), as a base for comparison close-to-nature mixed forest stand development and stands of individual tree species.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Forest ecosystem research and monitoring. By including the site in the intensive forest monitoring program, the set of surveys, the frequency of sampling and measurements and the methods used were fully aligned with the standardized ICP Forests (www.icp-forests.net) manuals. However, the aim was to continue the most detailed ecological research in the framework of several research and scientific-technical projects and to make maximum use of the site for research and education. An important element in terms of quality and reliability of data was the regular successful participation of laboratories that analyze all

types of forest ecosystem samples (water, soil, biological material) in international ring tests.

Location: Central Slovakia, ca 230 km NE from the capital Bratislava, in the east part of territory of Polana Protected Landscape Area

Ecosystems: Deciduous Forest; Mixed Forest

Research topics: biology; biodiversity; species diversity; community ecology; ecosystem ecology; ecosystem function; forest ecology; plant ecology; terrestrial ecology; phenology; physiology; atmospheric chemistry; silviculture; soil physics

Contact(s): Jozef Capuliak, capuliak@nlcsk.org

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | 2WD | T:<10m | Power - Dist | Data: Int | Data: Ext

DEIMS.ID: e4548296-426c-4e08-a517-d177d8ad5239

Slovakia

Tatra National Park

MOUNTAIN SPRUCE FOREST

The Tatra Mountains (Tatra Mts) form the highest part of the Carpathians. Forest forms a large continuous area (400 km^2), spreading from mountain foothills (750 m a.s.l.) up to treeline (1550 m a.s.l.). Remoteness, limited access and low number of inhabitants caused that forests have remained in relatively natural shape.
The Tatra Mts are almost entirely protected as National Park. Forest are naturally dominated by *Picea abies* with admixture of *Larix decidua*, *Abies alba*, *Pinus cembra* and *Pinus mugo*. Some authors classify spruce forest in the Tatra Mts as extrazonal taiga due to similarity with boreal zone (cold and harsh climate, short growing season and conifer tree species dominance).

Norway spruce dominated forests are frequently affected by large scale wind disturbances mostly on south oriented slopes. The 2004 windthrow destroyed 12,000 ha (2.3 million m^3). Following bark beetle outbreaks killed another 7,000 ha. During the last decade, the region lost almost 50% of mature forest when natural disturbances were facilitated by climate change. Norway spruce ecosystems in the Tatra Mts have been intensively studied since 1990s (pollution, weather extremes and bark beetle outbreaks). In recent years more attention has been dedicated to succession changes, energy and material flow in ecosystems. Raising conflict between reduced forest potential for ecosystem services provision and increasing societal demands is one of the key challenges for the management and protection in the Tatra Mts.

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

Four research sites (ca 100 ha each) established in 2005-2008 to study temporal and spatial forest ecosystem response to large-scale disturbances (wind, fire, bark beetle) and post-disturbance management.

REF – reference site unaffected by disturbances

EXT – windthrow site with intensive post-disturbance management (slash harvest, reforestation).

FIR – windthrow site affected by consequent fire, intensive post-disturbance management

NEX – two subplots damaged by windthrow or bark beetle without any subsequent management.

Forest status is classified according to set of standardized parameters describing different components of ecosystem (air, soil, water, flora, etc) measured by automatic instruments (meteorological stations, band dendrometers, soil lysimeters, soil respiration, etc). Flux tower was built at the EXT site in 2018, another at NEX site is under construction.

Location: The site is situated in the Tatra National Park, in northern part of Slovakia, 340 km NE from the capital Bratislava and 15 km from the Poprad city

Ecosystems: Temperate coniferous forests

Research topics: biology; dendrochronology; animal ecology; biodiversity; species diversity; community ecology; community dynamics; successional dynamics; ecosystem ecology; ecosystem function; forest ecology; plant ecology; vegetation dynamics; population ecology; population dynamics; terrestrial ecology; physiology; ecophysiology; air chemistry; atmospheric chemistry; depositions chemistry; environmental science; silviculture; meteorology; climatology; climate change; climate monitoring

Contact(s): Peter Fleischer, p.fleischersr@gmail.com

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | 4WD | T: <10m | Power - Cent | Data: Int

DEIMS.ID: f7b73d7c-068f-4406-b4e8-13e5c6e212b9

Web links

- http://www.lesytanap.sk

Slovakia

Tatras - alpine summits

CARPATHIAN ALPINE SUMMITS

The site was established in 2001 as a part of research initiative GLORIA (Global Observation Research Initiative in Alpine Environments) and as a long-term observation network for the comparative study of climate change impacts on mountain biota respecting the multi-summit sampling design. The main objective is the quantification of the changes of vascular plant biodiversity patterns along the altitudinal gradient. The Site is situated in the Tatra National Park, specifically in Vysoké Tatry Mountains and Liptovské kopy Mountains; and consists of four summits occurring in the alpine belt: Krížna peak (1,918.6 m a.s.l.) represents the higher subalpine level, Veľká kopa peak (2,052.4 m a.s.l.) lies in the lower alpine level, Sedielková kopa peak (2,061.3 m a.s.l.) represents the higher alpine level and Krátka peak (2,374.5 m a.s.l.) can be classified as typical representative of the subnival level. The Tatras – alpine summits is the only site in the GLORIA network established in the Western Carpathians. The re-investigation of the site take place every 7 years, when the data are analysed and compared with other GLORIA research sites within the world-wide network. The first took place in the 5th RTD framework programme of the EU, the second in 2008 and the next in 2015. The comparative data analysis including 2001 and 2008 data produced very interesting results which were published in the SCIENCE journal (Pauli et al., 2012). At present, analyses including the 2015 data are being carried out.

Purpose of site

ONLY OBSERVATION
NO EXPERIMENTATION

The purpose of research initiative GLORIA (Global Observation Research Initiative in Alpine Environments) is to establish a long-term observation network for the comparative study of climate change impacts on mountain biota. A crucial precondition to keep such a large-scale network effective in terms of comparability is a standardized sampling design such as GLORIA's Multi-Summit approach. The main objectives of GLORIA Multi-Summit approach are:

- To quantify the changes of vascular plant biodiversity patterns along the altitudinal gradient and their relation to environmental gradients.
- To assess the potential risks for biodiversity losses due to climate change by comparing the current distribution patterns of species, vegetation, and environmental factors along vertical and horizontal gradients.
- To quantify the changes of biodiversity.

Location: The site is situated in the Tatra National Park, in the northern part of Slovakia, particular summits are 2-7 km distant from mountain villages

Ecosystems: Alpine

Research topics: biology; biodiversity; species diversity; plant ecology; population ecology; taxonomy; meteorology; climatology; climate change; climate monitoring

Contact(s): Robert Kanka, robert.kanka@savba.sk

All parts of site accessible: Yes

Infrastructure:

FOOT | **Data: Ext**

DEIMS.ID: 013642b8-ff75-4abd-a3de-63cc93b4b21f

Web links

- http://www.gloria.ac.at

Slovakia

Kralova hola

ACID ALPINE GRASSLAND EXPERIMENTAL SITE

The research site is located in the natural alpine grasslands at the Mt. Kráľová hoľa (Low Tatra Mountains) at elevation of 1,840 m a.s.l. The grasslands at the research site belong to plant communities on acid substrates and shallow soils of the alliance *Juncion trifidi* Krajina 1933 represented by *Oreochloa disticha*, *Festuca supina*, *Juncus trifidus*, *Carex nigra*, *Campanula alpina*, *Vaccinium vitis-idaea*, *Soldanella hungarica*, *Vaccinium myrtillus*, *Avenella flexuosa*, *Cetraria islandica*, *Cladonia* sp. and *Polytrichum* sp. The mean annual temperature is 2°C and the mean annual precipitation totals is 1,200 mm. In 2009, we established 24 plots with 6 replications of 4 treatments (1: elevated temperature, 2: increased nitrogen, 3: elevated temperature and increased nitrogen, 4: control). The plots were instrumented by air temperature, soil temperature and soil moisture sensors. In 2015, the automatic climate station was installed at the research site. Continual monitoring of microclimate has preliminarily proved suitability of OTC for increasing of soil and air temperature up to 1-3 °C on average. The first research phase was focused to detail study of initial site conditions as for micro-climate, species composition of plant community, aboveground biomass and detritus decomposition.

Purpose of site

PARTLY OBSERVATION
MAINLY EXPERIMENTATION

The main purpose of the site is research on the impact of increased nitrogen and temperature on alpine grassland ecosystems. So far, mainly impact on species composition, litter decomposition and aboveground biomass has been studied. Short-term response of these measurements seem to be quite variable, thus, longer-term measurements need to be done in order to reveal some significant trends. The site is ideal for so called “multisite” experiments in various thematic domains, for example, from 2016 the site has joined the global litter decomposition study using tea bags approach.

Location: Located ca 60 km westwards from Košice (eastern Slovakia, airport) on the main ridge of Low Tatra Mts. – Low Tatra National Park

Ecosystems: Alpine; Montane grasslands and shrublands

Research topics: biology; biodiversity; species diversity; community ecology; community dynamics; ecosystem ecology; ecosystem function; plant ecology; vegetation dynamics; soil solution chemistry; meteorology; climatology; climate monitoring

Contact(s): Matej Mojses, matej.mojses@savba.sk

All parts of site accessible: Yes

Infrastructure:

FOOT | 2WD | Data: Int | Data: Ext

DEIMS.ID: 61c12307-2669-46c1-bf0b-94d40cc6b111

Slovakia

Poloniny National Park LTSER

FOREST-DOMINATED LANDSCAPE AND MOUNTAIN GRASSLANDS

The LTSER platform is located in the northeast corner of Slovakia on the border with Poland and Ukraine, in the Carpathian mountain range. The area has a hilly to upland character, with an altitudinal range of 240–1,221 m. The landscape is dominated by forests, and the agricultural part of the landscape is dominated by grasslands. The great biological diversity of the area was recognised by designation of the Poloniny National Park (NP) in 1997 and its inclusion to the trilateral (PL-SK-UA) East Carpathians Biosphere Reserve by the UNESCO Man and Biosphere program in 1998. From the same year it holds the European diploma for Protected Areas.

The research identified footprints on the landscape and biodiversity after several political and socioeconomic changes in the country and the region after World War II. Traditional forms of individual farming and specific non-forest landscape structure, consisting of a mosaic of meadows, pastures and narrow fields, have been significantly changed, impacting also the biodiversity of agricultural ecosystems, on the contrary area of forests increased.

The biological research is focused on vegetation and some animal groups (spiders, beetles, dragonflies), with accent to grassland ecosystems. Results indicate maintenance of great biodiversity and concluded that financial support for specific farming management is inevitable as for biodiversity maintenance and for integrated landscape protection and sustainable development of this rural and remote region.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The LTSER platform is focused on past and current socio-ecological interactions resulting in landscape and biodiversity changes. Special attention is paid to biodiversity maintenance, promotion of sustainable landscape development and contribution to integrated landscape planning and management of the Poloniny National Park. Research includes 1) study of land cover and land use changes 2) long-term botanical and zoological analysis, 3) identification of past and recent socio-economic drivers of landscape and biodiversity change, 4) analysis of regulatory frameworks linked to biodiversity, ecosystem services and sustainable rural development, 5) participatory approach engaging local/regional/national stakeholders.

Permanent and semi-permanent plots are used for observations, monitoring and manipulative experiments for study of effect of management and abandonment on grassland ecosystems.

Location: The LTSER platform is located in the northeast corner of Slovakia on the border with Poland and the Ukraine, 105-140 km from Košice (airport)

Ecosystems: Agricultural; Deciduous Forest; Montane grasslands and shrublands; Fresh Water rivers

Research topics: biology; conservation; animal ecology; biodiversity; species diversity; community ecology; community dynamics; ecosystem ecology; ecosystem function; ecosystem service; plant ecology; vegetation dynamics; terrestrial ecology; agriculture; silviculture; social sciences; demography; geography

Contact(s): Peter Bezák, peter.bezak@savba.sk

All parts of site accessible: Yes

Infrastructure:

4WD | Power

DEIMS.ID: 4a954f2b-7d18-4992-a860-adb7268f9dc7

Slovakia

Trnava LTSER

INTENSIVELY USED LOWLAND AGRICULTURAL LANDSCAPE

LTSER Trnava is located in the south-west Slovakia, in territory of one city (Trnava) and 22 rural municipalities with total area of 364 km^2. Arable land dominate (75.1 %), followed by forests (13.1 %), water bodies (0.5 %), vineyards, orchards and gardens. The main part of the LTSER (central and southern parts) is located in the Danubian Lowland. Because of the best, most fertile soils and favourable climatic conditions, it is intensively used for agriculture, especially as arable land. In this part of LTSER is located the largest settlement, Trnava. It represents the administrative centre of the county and region with highest population, trade and industry. The hilly northwest part of the LTSER, located in the Little Carpathians Mountrains. belongs to the Protected Landscape Area Malé Karpaty. This is the only large protected area having a vineyard character in Slovakia. Vineyards form a transition belt between lowland arable land and forested hills/mountains. Several types of deciduous forests are developed – oak-hornbeam and beech forests are most common, in steeper sites are developed ravine forests dominated by ash and maple. The LTSER represents intensively used industrial and agricultural area with specific environmental problems (strong degree of contamination of environment, the degradation processes of agricultural land, etc.) and low degree of ecological stability. Use of the most productive soils for construction of industrial parks represents a significant environmental issue.

Purpose of site

MAINLY OBSERVATION
NO EXPERIMENTATION

The LTSER platform was developed over more than 30 years of landscape-ecological and socio-ecological research started in 1985. Initially the research was focused on natural components of the landscape, later extended by evaluation of socio-economic conditions, stakeholder involvement (participatory approach) and finally by sociological research addressing the general public. The main research topics include: 1) Mapping and evaluation of representative geo-ecosystems (REPGES), ecosystem services and green infrastructure, 2) Land use and ecosystem changes, their driving forces and impacts,

3) Sustainable development and integrated landscape planning, 4) Quality of life. Good cooperation with local and regional institutions, communes, schools is important feature of this LTSER. For education we built an environmental laboratory (eco-centre, eco-laboratory and educational path).

Location: The LTSER platform is located in the south-western part of Slovakia, about 50 kilometers north-east of the capital city Bratislava

Ecosystems: Agricultural; Deciduous Forest; Grasslands; Fresh Water Lakes; Fresh Water Rivers; Urban

Research topics: natural science; biology; conservation; animal ecology; biodiversity; species diversity; ecosystem ecology; ecosystem function; ecosystem service; land use classification; landscape ecology; plant ecology; terrestrial ecology; urban ecology; agriculture; social sciences; demography; sociology

Contact(s): Milena Moyzeova, milena.moyzeova@savba.sk; Zita Izakovicova

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | 2WD | Power

DEIMS.ID: fabf28c6-8fa1-4a81-aaed-ab985cbc4906

Slovenia

LTER-Slovenia

http://lter.zrc-sazu.si/

Slovenia

Postojna-Planina Cave System

UNDERGROUND (KARST CAVE) ECOSYSTEM

Postojnska jama is a part of the Postojna-Planina cave system (PPCS), the most biologically diverse cave in the world. Postojnska jama is a *locus typicus* of at least 37 animals, among them also cave beetle, *Leptodirus hochenwarti*, the first recognized cave-adapted animal. PPCS, consisting of 17 and 6 km of passages, respectively, connected by 2 km of flooded corridors, has more known species of stygobionts than any other cave or other subterranean site. The sinking river in the main passages is inhabited by a rich assortment of stygobionts, stygophiles, and accidental surface species. Both streams drain a catchment area of over 800 km^2. Above the cave passages is the rich epikarst community. Among the 48 stygobionts is the European cave salamander, *Proteus anguinus anguinus*. Both the snail (8 species) and crustacean (16 species) faunas are rich. The marine origin of some of the stygobiotic species is evident in the hydrozoan, *Velkovrhia enigmatica,* and the cirolanid isopod, *Monolistra racovitzae racovitzae*. Three species of the amphipod genus *Niphargus* as well as populations of *Asellus aquaticus* were isolated in the cave at different times. The Postojna-Planina Cave is one of the best-studied caves in the world, and parts of it have been heavily visited by tourists since 1818. There are currently underground meteorological stations installed, and sites are defined for permanent water and biodiversity monitoring with the respect to human impact.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Research is multidisciplinary. Cave climate observation (with purpose to characterize (micro) meteorologic and climatic patterns) includes setting up and maintenance of cave meteorological stations, data analysis and modelling, as well as measurement of environmental parameters, like air and water temperature, humidity, air pressure, direction and intensity of air flow and CO_2 concentration. Monitoring of stream water and percolation water includes regular measurement and analysis of various biological, ecological and physico-chemical parameters. Anthropogenic impact and tourist use is monitored using air

parameters (e.g., temperature, pressure, CO_2) and surface bioburden indicators. Research on karst hydrogeology characterizes groundwater flow and solute transport in karst aquifers by long-term and event-based analyses. In addition, remote sensing data analyses are used.

Location: 56 km from Ljubljana (Slovenia capital), 1 km from Postojna city centre

Ecosystems: Large rivers

Research topics: natural science; biology; conservation; animal ecology; aquatic ecology; stream ecology; biodiversity; genetic population structure; species diversity; community ecology; community dynamics; ecosystem ecology; ecosystem function; ecosystem service; evolutionary ecology; molecular evolution; microbiology; environmental chemistry; interstitial water chemistry; water chemistry; environmental science; environmental assessment; environmental impact assessment; environmental risk factor; environmental awareness; geology; geomorphology; hydrology; meteorology; climatology; climate; climate change; global climate change; weather; social sciences; geography; remote sensing

Contact(s): Tanja Pipan, pipan@zrc-sazu.si

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | 4WD | SR | Beds | °C | Power - Central | Data: Ext

DEIMS.ID: b5bcf1f8-b905-4190-bb82-12d0d73904d0

Web links

- http://lter.zrc-sazu.si/Introduction/tabid/132/Default.aspx

Slovenia

Cerknica Lake

INTERMITTENT UNIQUE WORLD FAMOUS KARST WETLAND

Lake Cerknica is an intermittent lake appearing at the bottom of a closed depression, Cerkniško polje, with an area of 38 km^2. The karst features are associated with carbonate rock, both with limestone and dolomite. About 80% of inflow consists of karst and only 15% of surface waters. The outflow is completely karstic. In spring and usually late in autumn, the lake reaches a normal level of 550 m a.s.l., covering 26 km^2. Polje is flooded for 9 months and dry for about 2 months, usually in summer. Lake Cerknica is a highly diverse ecosystem that changes in time and space. Vegetation patterns show clear zonal distribution that depends on extent and frequency of flooding. The lake supports a rich fauna with many endangered species, providing temporary shelters and food for protected large carnivores, such as brown bear, wolf, lynx and numerous species of water birds. In recent decades, flood and drought events have become increasingly irregular altering processes and conditions for many species.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Lake Cerknica is an intermittent lake with extreme water level fluctuations and longer aquatic phases in comparison to other wetlands. Increased occurrence of extremes regarding amounts and distribution of precipitation, and consequently changes in the water regimes in different water bodies need a deeper understanding of related processes. Therefore, Lake Cerknica can serve as a model system to study the effects of changing water levels on the associated biocoenoses. This is a basis for effective management practices of aquatic systems in changing environment.

Location: Cerknica city, 50 km from Ljubljana (capital)

Ecosystems: Fresh Water Lakes

Research topics: biology; aquatic ecology; lake ecology; wetland ecology; biodiversity; species diversity; ecosystem ecology; ecosystem function; plant ecology; phenology; physiology; taxonomy; water chemistry; environmental science; hydrology

Contact(s): Tanja Pipan, pipan@zrc-sazu.si; Alenka Gaberščik; Mateja Germ

All parts of site accessible: No

Infrastructure:

All yr | BOAT

DEIMS.ID: 9026e5f2-af78-4610-8e8a-bd73466da65c

Web links

- https://www.notranjski-park.si/en

Slovenia

Gameljne

URBAN RIPARIAL AND FLOODPLAIN FORESTS TRANSECT IN THE CITY OF LJUBLJANA

The urban forest site consists of a riparian pine forest, floodplain hardwood forest and a meadow. It is located in the sub-urban part of Ljubljana, along the Sava river at 300 m above sea level. Bedrock material is glaciofluvial gravel and the soil was classified as Fluvisols (WRB 2007). Each part of this site consists of a 0.25 ha square plot. The urban riparian forest site is positioned on a river terrace, outside of the direct influence of the river water. It is composed of *Pinus sylvestris* L. in the upper canopy layer, and a mixture of deciduous tree species in the mid-story and lower canopy layer, such as *Tilia cordata* Mill., *Quercus petraea* (Mattuschka) Liebl. and *Carpinus betulus* L. The canopy cover is very loose, with a dense understorey. The thickness of the O horizon is 0 to 6 cm and the depth of the M horizon is 0 to 40 cm, with a sandy loam texture. The floodplain hardwood forest is located near the riparian pine forest, approximately 2 m above the Sava River terrace. It is composed of *Acer pseudoplatanus* L., *Alnus incana* (L.) Moench., *Tilia cordata* Mill., etc. Canopy cover is loose, with rather dense shrub and forest floor vegetation. This site is exposed to spontaneous spreading of invasive alien plant species due to frequent flooding. The thickness of the O horizon is 0 to 4 cm and the depth of the M horizon is between 0 and 90 cm, with a clay-loam texture.

Purpose of site

MAINLY OBSERVATION
NO EXPERIMENTATION

The Gameljne urban forest site aims to study the living urban forests, to detect and monitor their changes, to understand and model underlying causes and mechanisms, and to use the knowledge to help preserving the biodiversity and associated ecosystem services. Special attention is given to hydrological cycle of these forests and how changes in their ecology influence their hydrological ecosystem services. Another important topic is the endangered natural regeneration of autochthonous black polar population and intense spontaneous spreading of invasive alien plant species along the riverbed.

Location: 10 km from Ljubljana (Slovenia capital) city centre

Ecosystems: Agricultural; Forest; Grasslands; Rivers

Research topics: environmental science; hydrology; meteorology

Contact(s): Iztok Sinjur, iztok.sinjur@gozdis.si

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD

DEIMS.ID: 6934836e-57af-40f6-bfff-299c12a532a0

Web links

- http://urban.gozdis.si/

Slovenia

Podgorski Kras

CARBON FLUXES IN TWO SUCCESSIONAL STAGES OF VEGETATION IN THE PODGORSKI KRAS

This research site represents karst grassland and different stages of secondary succession, occasionally affected by forest fires. It is located on karst plateau close to Podgorje village in the sub-mediterranean region of south-west Slovenia. The site is equipped with two Eddy Covariance towers which measure carbon fluxes in two successional stages of vegetation. The area has undergone major human influences due to its position at the transition between the Mediterranean and central Europe. In fact agricultural practices, such as overgrazing in the past centuries, led to pronounced destruction of the vegetation cover, causing severe soil erosion and resulting into a stony and bare landscape. However a succession is taking place and different vegetation types, ranging from grasslands to secondary oak forests, are now present. The bedrock is mainly composed of Paleocene and Eocene limestone. Chemical weathering known as karst phenomena led to the formation of Leptosols and Cambisols, which represent insoluble fractions of carbonates. As a result, the soil is superficial, with depths ranging from 0 cm to several decimeters in soil pockets between rocks. Organic matter represents about 12–15% of the topsoil. The climate is referred to as sub-mediterranean, with a mean annual temperature of 10.5 °C, a mean daily temperature of 1.8 °C and 19.9 °C in January and June respectively, and an average annual precipitation around 1370 mm. The growing season ranges from March or April to October.

Purpose of site

PARTLY OBSERVATION
MAINLY EXPERIMENTATION

The purpose of experimental activity in this area is to evaluate the annual and seasonal variability of carbon (C) fluxes over time and to explain the effects of the main environmental drivers on the observed patterns of ecosystem C exchange. Furthermore we want to determine summer drought onset, severity and interactions between drought and other environmental factors and to investigate rain pulse effects and post-drought regeneration of C uptake.

Location: Podgorje, 93 km SW from Ljubljana

Ecosystems: Forest; Grasslands

Research topics: ecology; environmental science; meteorology

Contact(s): Iztok Sinjur, iztok.sinjur@gozdis.si

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | T: >10m | Power | 1-5 kW | Data: Ext

DEIMS.ID: a4822c8a-2cc3-4c44-8456-03e6b0216a0f

Slovenia

Tratice

MIXED NORWAY SPRUCE AND BEECH FOREST ON POHORJE MOUNTAINS, SLOVENIA

The mixed spruce and beech mountain forest is located in the Pohorje mountains, North-East Slovenia. The site is core plot of the ICP Forests - the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests operating under the UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP) – monitoring network. The site located at 1289 m above sea level and consists of a 1 ha plot of mixed *Fagus sylvatica* (L.) and *Picea abies* (Karst) forest. Bedrock material is Dioritoid (Tonalite) and the soil was classified as Dystric Cambisols (WRB 2007).

There are ongoing measurements of crown condition, foliar analysis, soil survey, soil solution analysis, increment measurements, ground vegetation assessment, deposition measurements, meteorological measurements, tree phenological observations,air quality monitoring, etc.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Long-term monitoring of forest ecosystems is of increasing importance as an indicator of global climate change. ICP Forests was launched in 1985 under the Convention on Long-range Transboundary Air Pollution (Air Convention, formerly CLRTAP) of the United Nations Economic Commission for Europe (UNECE) in response to wide public and political concern over extensive forest damage that had been observed in Europe in the beginning of the 1980s.

Location: Pohorje (Rogla), 122 km NE from Ljubljana

Ecosystems: Temperate coniferous forests

Research topics: chemistry; environmental science; hydrology; meteorology

Contact(s): Slovenian Forestry Institute

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD

DEIMS.ID: bbe12f63-af77-4b1a-88dd-a0b156323084

Web links

- http://meteo.gozdis.si/?page_id=42
- http://icp-forests.net/
- http://dx.doi.org/10.20315/SFS.156

Accredited sites

23

Network started

2008

Spain

LTER Spain

http://lter-spain.net

Spain

Aiguestortes / Lleida (ES-SNE)

HIGH MOUNTAIN LAKE AND RIVER DISTRICT

The National Park (14,119 ha) and its Peripheral Protected Area (26,733 ha) is located in the center of the Pyrenean range, in the southern axial chain (42º 34' N, 00º 56' E). It is a high mountain area considered one of the best representations of the Quaternary glacial erosion with typical glacial cirques and "U" shaped valleys. Altitudinal range varies from 1,383 to 3,023 m asl, with a mean altitude of 2,236 m asl. The Aigüestortes National Park has, as a particular identity, a wide variety of aquatic ecosystems with more than 200 lakes which make the Park the most important alpine lacustrine area of Europe. Some of these lakes have been naturally replenished causing the development of peatlands and wet meadows where the stream meanders, locally called "aigüestortes" (literally, "twisted waters"). Climate is of mountain Atlantic type with precipitation abundant all year round (range 1,200 to 1,300 mm) and monthly average usually higher than 100 mm. Temperatures are low with yearly average of 5.2ºC and thermal amplitude 16ºC. The vegetation is a typically alpine landscape of great phytogeographic interest with extensive meadows, scree and snow bed endemic communities. In the montane and subalpine belts there are beech, mixed deciduous, fir, and pine forests, diverse scrubs, and a number of wetlands and peatlands which are the main feature of this space. There are at least eight vulnerable or threatened iconic species of animals living in the Park.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The Aigüestortes and Estany de Sant Maurici eLTER Site promotes and supports research oriented towards a better understanding of the high mountain ecosystems functioning to design indicators and define methodology for monitoring Climate and Global Change effects with particular emphasis on freshwaters (i.e. lakes and streams). The site aims to provide fine resolution and extensive meteorologic, limnological, biodiversity and atmospheric gas exchange data, and to introduce new parameters, to develop basic and applied

research and to help provide answers and solutions to the society in this changing world. The remoteness of the area makes it an ideal early warning site for global change (atmospheric deposition of pollutants, shift in temperatures and radiation) and meets the conditions to hold experimental catchments such as Sant Nicolau valley.

Location: Parc Nacional d'Aiguestortes i Estany de Sant Maurici is about 160 Km from Lleida and 280 km NW from Barcelona

Ecosystems: Alpine; Deciduous Forest; Evergreen Forest;Temperate grasslands, savannas, and shrublands; Flooded grasslands and savannas; Montane grasslands and shrublands; Fresh Water Lakes; Small rivers; Large river headwaters

Research topics: biology; conservation; ecology; chemistry; environmental science; geology; glaciology; hydrology; limnology; meteorology; geography

Contact(s): Esperança Gacia, gacia@ceab.csic.es

All parts of site accessible: No

Infrastructure:

4WD | 4WD | Beds | T: <10m

DEIMS.ID: cf8247a0-e3d7-499f-84a9-3b2d1215fe06

Web links

- http://www.lter-spain.net/content/aig%C3%BCestortes

Spain

Doñana Long-Term Socio-ecological Research Platform

MEDITERRANEAN WETLANDS AND TERRESTRIAL ECOSYSTEMS

Protected in 1968, Doñana National Park (537 km^2) is a UNESCO Biosphere Reserve, a Ramsar Site and a Natural World Heritage Site. It contains the largest wetland in Western Europe, a intricate matrix of marshlands (270 km^2), phreatic lagoons, a 25 km-long dune ecosystem with its respective shoreline and representative Mediterranean terrestrial plant communities. Doñana is both a critical stopover site for Palearctic birds migrating to Africa and an important overwintering site for waterfowl.

Doñana LTSER Platform comprises both the protected area and the surrounding territories (2736 km^2) where a complex landscape matrix composed by rice fields, fisheries, irrigated crops, berry greenhouses, vineyards, olives and pine afforestations hold the tributary streams that pour their water to the fluvial marshland, the main figure of Doñana. Doñana's surroundings hold over 180000 permanent inhabitants. Inside the protected land, the three main ecosystems sustain more than 1550 species of vascular plants, 900 species of arthropods, up to 400 breeding and migratory bird species, 38 mammal species, 72 species of fishes, 40 reptile and amphibian species.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The many different management plans for Doñana LTSER Platform require the implementation of methodological protocols to yield continuous long term information on biodiversity status, natural processes trends, human activities and public land use in order to increase the knowledge on ecosystem dynamics, disturbances, fluctuations and overall tendencies. The monitoring programme of natural processes and resources in Doñana Protected Area collects systematically since 2002 the indicators on the status of the monitored 87 processes, structured under thematic areas: Landscape, Vegetation, Threatened Flora, Limnology, Mammals, Birds, Amphibians and Reptiles, approached in a transversal way through geophysical, biological and management processes.

Location: 118 km from Seville International Airport

Ecosystems: Mediterranean forests, woodlands, and scrub

Research topics: biology; conservation; animal ecology; aquatic ecology; wetland ecology; biodiversity; genetic diversity; species diversity; community ecology; trophic dynamics; ecosystem ecology; ecosystem function; ecosystem service; evolutionary ecology; plant ecology; vegetation dynamics; population ecology; plants population changes over time; population changes over time; population dynamics; terrestrial ecology; genetics; phenology; physiology; ecophysiology; taxonomy; water chemistry; hydrology; limnology; agriculture; aquaculture; geography; biogeography; history; land use history

Contact(s): Ricardo Diaz-Delgado, rdiaz@ebd.csic.es; Luis E. Santamaria Galdon

All parts of site accessible: No

Infrastructure:

All yr | 4WD | 2WD | 4WD | SR | Beds | T: >10m | Power - Dist | <1 kW | Data: Int | Data: Ext

DEIMS.ID: bcbc866c-3f4f-47a8-bbbc-0a93df6de7b2

Web links

- http://www.ebd.csic.es/icts-donana, http://www.ebd.csic.es/equipo-de-seguimiento

Spain

Illas Atlanticas / Pontevedra (ES-SNE)

ATLANTIC COASTAL AND MARINE ECOSYSTEMS

The Atlantic Islands of Galicia were declared a national park in 2002 in order to protect one of the best examples of Atlantic Ocean-associated ecosystems. Although on land there are highly valuable and exceptional ecosystems relating to cliffs, dunes and scrub, it is the marine setting that hosts the greatest biodiversity.

Situated off the Rías Baixas (Lower Estuaries), the archipelagos Cíes, Ons, Sálvora and Cortegada, create a natural barrier to the ocean, thereby accentuating the rías' estuary influence. The terrain features dune systems, cliffs with gorse and heather scrub, while the marine environment hosts a rocky seabed with large communities of brown algae (*Sacorhiza polyschides* and *Laminaria* spp), which are home to a great variety of living things. The marine currents deposit sand in the most sheltered parts, and together with the important Mäerl beds consisting of the remains of calcareous algae, create a shifting substrate to which living things must adapt.

Purpose of site

MAINLY OBSERVATION
NO EXPERIMENTATION

The National Park's aim is not only to protect the integrity of ecosystems linked to coastal zones and the continental shelf of the Eurosiberian region, but also to ensure the recovery, promotion and dissemination of their environmental values and its natural heritage by regulating in a manner consistent with the conservation both research and educational activities and visitors access.

Location: Northwestern Spain, Atlantic Coast

Ecosystems: Coastal; Temperate grasslands, savannas, and shrublands; Marine; Temperate upwelling

Research topics: biology; biodiversity; population ecology; animal ecology; aquatic ecology; marine ecology

Contact(s): Jose Antonio Fernandez Bouzas, jose.antonio.fernandez.bouzas@xunta.es

All parts of site accessible: No

Infrastructure:

All yr | BOAT | 4WD | BOAT | Aqua | SR | Beds | Power - Central

DEIMS.ID: 4240428e-0c36-47b7-bf49-666b99a4a183

Web links

- http://www.iatlanticas.es/

Spain

Las Tablas de Daimiel National Park

A THREATENED AND FLUCTUATING SEMI-ARID WETLAND

Las Tablas de Daimiel National Park (TDNP) is a floodplain wetland located at Central Spain in the core of La Mancha Húmeda Biosphere Reserve. Until the 1970s, wetland inundation was due to natural flooding of both the Gigüela and the Guadiana Rivers, and to the aquifer discharge (Llanura Manchega Occidental aquifer) as the groundwater table was close to the surface. Historically, the wetland's inundation was also promoted by small water-mill dams which helped to increase the water-level. TDNP is the typical example of wetland degradation in the Mediterranean Europe, including dessication, agriculture conversion, groundwater overexplotitation and water quality impairing. Most importantly, aquifer overexploitation resulting from excessive agricultural irrigation strongly changed the ecosystem hydrology from a semi-permanent wetland to a highly fluctuating ecosystem with long periods (several years) of almost complete dryness. From the 1870s until the 1950s, the area was a private hunting park. It then became a National Hunting Reserve and later, in 1973, a National Park. It was included in the Ramsar convention in 1982. Its main environmental values are the large waterfowl populations, the European cut-sedge and the reed, and the plasticity of the ecosystem to absorb different threats.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Las Tablas de Daimiel is a unique ecosystem that has evolved historically through the convergence of many ecological, social and economic factors. From the early 1980s scientific research has been conducted within the ecosystem, most of them hydrological, ecological and avifauna, with data records extending from the 1950s to the present. There are active monitoring programs on different ecological processes including temporal dynamics of nutrients, plankton and macrophytes, evapotranspiration and photosynthesis, exchange of CO_2 and CH_4 emissions and monitoring of fish and birds. Since 2012, there is also a FACE (free-air CO_2 enrichment) facility to expose *Phragmites australis* to 580 ppm.

Location: Las Tablas de Daimiel, 180 km south of Madrid

Ecosystems: Fresh Water Lakes; Fresh Water Rivers

Research topics: biology; aquatic ecology; wetland ecology; biodiversity; species diversity; ecosystem ecology; plant ecology; taxonomy; sediment chemistry; water chemistry; environmental science; hydrology; meteorology; climatology; climate monitoring

Contact(s): Salvador Sánchez-Carrillo, sanchez.carrillo@mncn.csic.es

All parts of site accessible: Yes

Infrastructure:

All yr | BOAT | 4WD | BOAT | SR | Beds | Power - Dist | Data: Int | Data: Ext

DEIMS.ID: 3f485cdb-fd8c-433a-910b-7f8c73c1d882

Web links

- http://www.magrama.gob.es/es/red-parques-nacionales/nuestros-parques/daimiel/

Spain

Ordesa y Monte Perdido / Huesca ES

HIGH MOUNTAIN NATIONAL PARK

The site is monitored from very diverse points of view: habitats of community interest, plants (dynamics of more than 50 populations of threatened and endemic species), animals (mammals, birds, raptors, butterflies, etc.), land use (traditional management of cattle in alpine grasslands), one of the southermost glaciers in Europe in clear retrogression, ice caves, physico-chemical parameters in alpines lakes, and climate, with mini loggers across 70 locations. Monitoring is carried out both by remote sensing (georadar, terrestrial laser scanner and interferometry radar), small instrumentation, precipitation and cattle exclusions, and traditional in situ sampling methods (observations).

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The main purpose of the site is to track current changes in biodiversity (species and habitats), abiotic components of the ecosystems (snow, water), and traditional use. A paleoecological perspective serves to frame current changes detected.

Location: Central Pyrenees, in the border between Spain and France

Ecosystems: Alpine; Forest; Grasslands; Lakes; Rivers; Tundra

Research topics: biology; conservation; ecology; geology; limnology; meteorology; geography

Contact(s): Maria Begona Garcia, mariab@ipe.csic.es

All parts of site accessible: No

Infrastructure:

2WD | Power

DEIMS.ID: 829a2bcc-79d6-462f-ae2c-13653124359d

Web links

- http://www.mapama.gob.es/es/red-parques-nacionales/nuestros-parques/ordesa/

Spain

Sierra Nevada / Granada (ES-SNE)

MEDITERRANEAN HIGH-MOUNTAIN ECOSYSTEM

Sierra Nevada (Andalusia, SE Spain), is a mountainous region with an altitudinal range between 860 m and 3482 m a.s.l. covering more than 2000 km^2. The climate is Mediterranean, characterized by cold winters and hot summers, with pronounced summer drought (July-August). The annual average temperature decreases in altitude from 12-16ºC below 1500 m to 0ºC above 3000 m a.s.l., and the annual average precipitation is about 600 mm. Additionally, the complex orography of the mountains causes strong climatic contrasts between the sunny, dry south-facing slopes and the shaded, wetter north-facing slopes. Annual precipitation ranges from less than 250 mm in the lowest parts of the mountain range to more than 700 mm in the summit areas. Winter precipitation is mainly in the form of snow above 2000 m of altitude. The Sierra Nevada mountain range hosts a high number of endemic plant species (c. 80; Lorite et al. 2007) for a total of 2,100 species of vascular plants (25% and 20% of Spanish and European flora, respectively), being considered one of the most important biodiversity hotspots in the Mediterranean region.

This mountain range has several legal protections: Biosphere Reserve MAB Committee UNESCO; Special Protection Area and Site of Community Importance (Natura 2000 network); and National Park. The area includes 61 municipalities with more than 90,000 inhabitants. The main economic activities are agriculture, tourism, cattle raising, beekeeping, mining, and skiing.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Gathering information relevant for creating scientific knowledge and promoting informed decision making processes.

Location: Southern Spain, 30 km ESE of Granada

Ecosystems: Agricultural; Alpine; Chaparral; Deciduous Forest; Evergreen Forest; Mediterranean forests, woodlands, and scrub; Flooded grasslands and savannas; Montane grasslands and shrublands; Fresh Water Lakes; Fresh Water Rivers

Research topics: conservation; demography; dendrochronology; ecology; aquatic ecology; biodiversity; genetic diversity; species diversity; community ecology; ecosystem service; forest ecology; landscape ecology; long term ecological research; microbial ecology; paleoecology; plant ecology; population dynamics; restoration ecology; spatial ecology; terrestrial ecology; phenology; ecophysiology; pollen analysis; population biology; atmospheric physics; soil science; social sciences; biogeography; remote sensing; land use history; atmospheric chemistry; biogeochemistry; water chemistry; environmental science; epidemiology; glaciology; global change; hydrology; limnology; silviculture; climate change

Contact(s): Regino J. Zamora Rodríguez, rzamora@ugr.es; Antonio Jesus Pérez-Luque

All parts of site accessible: No

Infrastructure:

4WD | SC | 4WD | SR | Beds | T: <10m | T: >10m | Power - Dist

DEIMS.ID: e51cee43-dc12-4545-8e5b-dad35431e3f7

Web links

- http://obsnev.es/

Spain

The Arid Iberian South East LTSER Platform

SEMI-ARID SHRUBLANDS AND HUMANIZED LANDSCAPES

The Arid Iberian South East LTSER Platform encompasses a wide range of human-modified and semi natural landscapes which make up interesting socio-ecosystems. These singular environments represent both natural processes of aridification as traditional land uses, forcing an effective management of the scarce and irregular water resources. Further, agricultural land abandonment linked to the land cover and land use changes is driving to a biodiversity loss and alteration of the ecosystem functioning. All these features provide excellent natural laboratories for studying 'in real live' scenarios predicted for other Mediterranean regions and for testing adaptive management models to improve the ecosystem resilience.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The Arid Iberian South East LTSER Platform aims to seek multidisciplinary solutions to the environmental problems occurring in the socio-ecological systems of Anthropocene. With this aim, we monitor a set of indicators and parameters related to ecosystems health and social perceptions regarding their ecosystem services provision. The knowledge acquired is transferred from scientists to decision makers (science & policy) to achieve knowledge transfer & adaptive management experiences.

Location: The Arid Iberian Platform is located in southeast Spain and has an extension of 1,426446 ha covering partially Almeria and Granada provinces

Ecosystems: Agricultural; Coastal; Deserts and xeric shrublands; Mediterranean forests, woodlands, and scrub; Temperate grasslands, savannas, and shrublands

Research topics: biology; conservation; ecology; chemistry; environmental science; hydrology; social sciences

Contact(s): Javier Cabello Piñar, jcabello@ual.es

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | 4WD | T: <10m | Data: Int

DEIMS.ID: 889b159a-8b58-4685-9418-73ee70388799

Web links

- http://www.caescg.org/

Accredited sites

21

Network started

2010

Sweden

LTER Sweden

www.slu.se/lter

Sweden

Aneboda, IM-site SE14

NATURE RESERVE IN A CONIFEROUS BILBERRY FOREST

The Aneboda IM site is located in central part of southern Sweden in a coniferous forest landscape with mires and lakes. The site forms a catchment and a small stream starts in the headwater area to discharge out in the low-lying downslope location. It is part of a morainic landscape with a coarse till soil with frequent existing stones and boulders. Vegetation is characterized by bilberry and wet spruce forests. The forest is mainly over one hundred years old but thinnings have occurred. In 2005, a heavy storm struck the area and currently most old spruce trees are dead and many have fallen to the ground. The basic purpose of investigations is to follow air pollution and climate changes impacts on the soil-water-vegetation system by carrying out simultaneous determinations in most compartments of the ecosystem. The results provide reference data for experiments and consequences of land management, especially forestry. It is long-term monitoring establishing coherent time series to follow water balances and chemical budgets to contribute in understanding future changes in the natural environment. Monitoring includes measurements of air quality, deposition, soil and soil water conditions, decomposition, catchment runoff and vegetation. Data is freely available on the internet or by personal contact. Data may be found on the web; https://www.slu.se/institutioner/vatten-miljo/miljoanalys/integrerad-monitoring-im/

Purpose of site

MAINLY OBSERVATION
NO EXPERIMENTATION

The monitoring program includes ecosystem studies at catchment level with determinations of hydrological and chemical budgets as well as effects on biota, primarily the vegetation and studies of soil processes. The aims are to collect relevant background data from reference areas that can be used to separate anthropogenic disturbance of the ecosystem by air pollution from natural variation. Model simulations for prognoses of future environmental status are an important part of the program. IM also furnish possibilities to test models. The IM sites are located in protected areas where there has been little forestry activity for many decades.

Atmospheric deposition of pollutants and anthropogenically induced climate change are the only human disturbances within the IM sites.

Location: The Aneboda site is located close to Lammhult municipality, c. 500 km south of Stockholm and 30 km north of Växjö airport

Ecosystems: Mixed Forest

Research topics: biology; biodiversity; species diversity; community ecology; community dynamics; successional dynamics; ecosystem ecology; ecosystem function; ecosystem service; forest ecology; plant ecology; vegetation dynamics; terrestrial ecology; taxonomy; air chemistry; atmospheric chemistry; biogeochemistry; depositions chemistry; interstitial water chemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; geology; hydrography; meteorology; climatology; climate monitoring

Contact(s): Pernilla Rönnback, pernilla.ronnback@slu.se

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | 2WD | SR | Beds | Power - Central | Data: Int | Data: Ext

DEIMS.ID: 9dd45aa6-ed7a-49d2-bea4-7750351c55d0

Web links

- https://www.slu.se/institutioner/vatten-miljo/miljoanalys/integrerad-monitoring-im/aneboda/

Sweden

Asa Field-research Infrastructure (LTER)

NEMO-BOREAL FOREST, STREAM AND LAKE RESEARCH

The Asa LTER Site consists of 5 subsites; the Asa Experimental Forest, the Asa Experimental Production Forest, the FutMon-sites Sandbäcken and Ängavägen, and the IM site Aneboda.

The Asa LTER Site is situated in the nemo-boreal forest in south-central Sweden. It consists of five areas, integrated both geographically and thematically. The Asa Research Station has on-site permanent staff responsible for research and monitoring activities. Field laboratories and modern equipment are available as well as offices, lecture/meeting rooms, working rooms and lodging nearby.

Purpose of site

PARTLY OBSERVATION
MAINLY EXPERIMENTATION

The purpose of the site is to be a platform for ecological and forestry research and monitoring. It provides an infrastructure that facilitates the research and monitoring activities and also provides background information, eg. forest description, weather data, soil and bedrock characteristics and historic land use.

Location: Research station and experimental forests are located in the village Asa, 37 km North of Växjö. Aneboda catchment is located about 20 km West of Asa

Ecosystems: Boreal forests/taiga; Deciduous Forest; Mixed Forest; Fresh Water Lakes; Small rivers

Research topics: biology; aquatic ecology; lake ecology; ecosystem ecology; ecosystem service; forest ecology; plant ecology; vegetation dynamics; terrestrial ecology; phenology; soil solution chemistry; water chemistry; silviculture; meteorology; climatology; climate change; climate monitoring

Contact(s): Ola Langvall, ola.langvall@slu.se

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | 2WD | 4WD | BOAT | SR | Beds | Aqua | T: <10m | Power - Central | Data: Int | Data: Ext

DEIMS.ID: 13b28889-ed32-495a-9bb6-a0886099e6d9

Web links

- http://www.slu.se/esf-lter-eng, http://www.slu.se/asa-eng

Sweden

Bergslagen (LTSER platform)

URBAN TO RURAL, AND TEMPERATE TO BOREAL FOREST

Bergslagen is an informal region in south-central Sweden (ca. 59–61° N latitude, 13–15° E longitude). The history of industrial natural resource use began with production of metals more than 2000 years ago. The name Bergslagen comes from the words mine (*berg* in Swedish) and law or team (*lag* in Swedish). The landscapes of Bergslagen form a gradient between urban areas in Mälardalen with temperate forest remnants in agricultural settings, and rural remote boreal forest regions. Bergslagen includes parts of nine counties, and all municipalities and communities in its core has a peripheral location in relation to regional centres of economic growth. Read more:

Angelstam, P., K. Andersson, M. Isacson, D.V. Gavrilov, R. Axelsson, M. Bäckström, E. Degerman, M. Elbakidze, E. Yu. Kazakova-Apkarimova, L. Sartz, S. Sädbom, J. Törnblom. 2013. Learning about the history of landscape use for the future: consequences for ecological and social systems in Swedish Bergslagen. AMBIO 42(2): 150–163.

Naumov, V., Manton, M., Elbakidze, M., Rendenieks, Z., Priedniek, J., Uglyanets, S., Yamelynets, T., Zhivotov, A., Angelstam, P. 2018. How to reconcile wood production and biodiversity conservation? The Pan-European boreal forest history gradient as an "experiment". Journal of Environmental Management 218:1-13.

Purpose of site

ONLY OBSERVATION
NO EXPERIMENTATION

By establishing the Bergslagen region in Sweden as a LTSER Platform, the ambition is to fill the gap between local and regional governance levels by focusing on providing land owners, stakeholders and municipalities, who are responsible for local comprehensive planning processes, with transparent information and integrated assessment about state and trends of different sustainability criteria. The area of the Bergslagen LTSER Platform includes several local LTER Sites, which constitute natural science research sites in areas within various land cover and land-use.

Location: Accessible from Stockholm's airports by public transport, and an excellent road network via several access points such as Örebro, Västerås and Ludvika

Ecosystems: Agricultural; Boreal forests/taiga; Deciduous Forest; Taiga; Temperate broadleaf and mixed forests; Fresh Water Lakes; Fresh Water Rivers; Urban

Research topics: conservation; aquatic ecology; biodiversity; species diversity; community ecology; ecosystem ecology; population ecology; terrestrial ecology; fishery; silviculture; social sciences; geography; biogeography; history; land use history; political science; sociology

Contact(s): Per Angelstam, Per.Angelstam@slu.se; Johan Törnblom

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | 2WD | BOAT | SR | Beds | Power - Dist | Data: Int | Data: Ext

DEIMS.ID: 0a60111e-c8d6-4850-9805-dc5283f9d691

Web links

- http://www.imfn.net

Sweden

Erken Laboratory (LTER)

FRESHWATER LAKE AND RESEARCH FACILITY

The Erken station and lake is located in the Uppland area in east-central Sweden surrounded by a hemi-boreal landscape. The bedrock consists mainly of gneiss and granites overlayed by glacial and postglacial clay deposits. The extensive environmental monitoring program for Lake Erken includes both manual and high-frequency automatic measurements. The program includes one of the longest available measurements series of water temperature and water chemistry as well as plankton community analyses, including sampling stations in the lake as well as all in- and outlets. More recently, greenhouse gas flux measurements also became part of the monitoring programme. The field station was founded 1946 and belongs to Uppsala University. It is running all year round with a staff of about ten people. The station is also part of the Swedish Infrastructure for Ecosystem Science (SITES).

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

The main purpose of the station is to provide an infrastructure for field research in the areas of limnology, biogeochemistry, hydrology, ecology, and related areas. The Erken station maintains a long-term monitoring programme of water quality in Lake Erken which includes manual sampling and measurements (water chemistry, plankton composition) at weekly to monthly intervals and bi-weekly to monthly measurements at the in- and outflows. The monitoring programme of the lake includes automated high-frequency measurements (e.g. temperature, oxygen and fluorescene profiles). Data from the monitoring programme is freely available for researchers. In addition, the station also has infrastructure for mesocosms experiments and can support work in other surrounding lakes as well.

Location: 70 km northeast of Stockholm

Ecosystems: Lakes; Rivers

Research topics: biology; ecology; chemistry; environmental science; hydrology; limnology; meteorology

Contact(s): Silke Langenheder, silke.langenheder@ebc.uu.se

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | 2WD | BOAT | SR | Beds | Power - Central | Power - Dist | 1-5 kW | Data: Int | Data: Ext

DEIMS.ID: 2c560a19-85bb-4e3b-b41f-9f1d06c6e0d6

Web links

- http://www.ieg.uu.se/erken-laboratory/

Sweden

Gammtratten, IM-site SE16

NATURE RESERVE IN A CONIFEROUS BILBERRY FOREST

The Gammtratten IM site is located in central part of northern Sweden in a coniferous forest landscape with mires. The site forms a catchment and a small stream starts in the headwater area to discharge out in the low-lying downslope location. It is located between two high hills. In higher elevations thin till soils cover the bedrock and forest vegetation is dominated by pine while in the low valley inbetween spruce is major tree specie. Ground vegetation is characterized by bilberry and wet spruce forests. The forest is up to two hundred years old with very limited harvesting. The basic purpose of investigations is to follow air pollution and climate changes impacts on the soil-water-vegetation system by carrying out simultaneous determinations in most compartments of the ecosystem. The results provide reference data for experiments and consequences of land management, especially forestry. It is long-term monitoring establishing coherent time series to follow water balances and chemical budgets to contribute in understanding future changes in the natural environment. Monitoring includes measurements of air quality, deposition, soil and soil water conditions, decomposition, catchment runoff and vegetation. Data is freely available on internet or by personal contacts. Data may be found on the web; https://www.slu.se/institutioner/vatten-miljo/miljoanalys/integrerad-monitoring-im/

Purpose of site

MAINLY OBSERVATION
NO EXPERIMENTATION

The monitoring program includes ecosystem studies at catchment level with determinations of hydrological and chemical budgets as well as effects on biota, primarily the vegetation and studies of soil processes. The aims are to collect relevant background data from reference areas that can be used to separate anthropogenic disturbance of the ecosystem by air pollution from natural variation. Model simulations for prognoses of future environmental status are an important part of the program. IM also furnish possibilities to test models. The IM sites are located in protected areas where there has been little forestry activity for many decades. Atmospheric deposition of pollutants and

anthropogenically induced climate change are the only human disturbances within the IM sites.

Location: The Gammtratten site is located 650 km north of Stockholm, 80 km north of the city Örnsköldsvik and 100 km west of Umeå airport

Ecosystems: Boreal forests/taiga

Research topics: biology; biodiversity; species diversity; community ecology; community dynamics; successional dynamics; ecosystem ecology; ecosystem function; forest ecology; plant ecology; vegetation dynamics; terrestrial ecology; air chemistry; atmospheric chemistry; biogeochemistry; depositions chemistry; interstitial water chemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; geology; meteorology; climatology; climate monitoring; soil physics

Contact(s): Pernilla Rönnback, pernilla.ronnback@slu.se

All parts of site accessible: No

Infrastructure:

2WD | 2WD | SM | SR | Beds | °C | Power | <1 kW | Data: Int | Data: Ext

DEIMS.ID: 27415652-8de8-40e7-92c1-f82526116a2d

Web links

- https://www.slu.se/institutioner/vatten-miljo/miljoanalys/integrerad-monitoring-im/gammtratten/

Sweden

Gårdsjön, IM-site SE04

NATURE RESERVE IN A CONIFEROUS BILBERRY FOREST

The Gårdsjön IM site is located in the southwest part of Sweden not far from the sea. The site is a small (3.7 ha) headwater catchment to the lake Gårdsjön. It forms a small valley between somewhat higher bedrock sides where thin till soils cover the bedrock. Forest trees in the downslope part is old spruce, partly storm-felled but still with a fairly closed canopy. Ground vegetation is characterized by bilberry and wet spruce forests and along the stream wet sphagnum mosses dominate. In the lower parts old spruce exists while the upper part of the catchment hosts younger (50 years) pine forest occurs, being thinned four years ago.. The basic purpose of investigations is to follow air pollution and climate changes impacts on the soil-water-vegetation system by carrying out simultaneous determinations in most compartments of the ecosystem. The results provide reference data for experiments and consequences of land management, especially forestry. It is long-term monitoring establishing coherent time series to follow water balances and chemical budgets to contribute in understanding future changes in the natural environment. Monitoring includes measurements of air quality, deposition, soil and soil water conditions, decomposition, catchment runoff and vegetation. Data is freely available on internet or by personal contacts. Data may be found on the web; https://www.slu.se/institutioner/vatten-miljo/miljoanalys/integrerad-monitoring-im/

Purpose of site

MAINLY OBSERVATION
NO EXPERIMENTATION

The monitoring program includes ecosystem studies at catchment level with determinations of hydrological and chemical budgets as well as effects on biota, primarily the vegetation and studies of soil processes. The aims are to collect relevant background data from reference areas that can be used to separate anthropogenic disturbance of the ecosystem by air pollution from natural variation. Model simulations for prognoses of future environmental status are an important part of the program. IM also furnish possibilities to test models. The IM sites are located in protected areas where there has been little forestry activity for many decades.

Atmospheric deposition of pollutants and anthropogenically induced climate change are the only human disturbances within the IM sites.

Location: The Gårdsjön IM site is located in the southwest of Sweden 50 km north of Göteborg city and about 50 km from the sea coast

Ecosystems: Evergreen Forest

Research topics: biology; biodiversity; species diversity; community ecology; successional dynamics; ecosystem ecology; ecosystem function; forest ecology; plant ecology; vegetation dynamics; population ecology; plants population changes over time; population changes over time; population dynamics; terrestrial ecology; air chemistry; atmospheric chemistry; biogeochemistry; depositions chemistry; interstitial water chemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; geology; hydrology; meteorology; climatology; climate monitoring

Contact(s): Pernilla Rönnback, pernilla.ronnback@slu.se

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | 2WD | SR | Beds | Power - Central | Data: Int | Data: Ext

DEIMS.ID: c7f490fb-76a4-4d6c-ba3e-2fd2f33822ec

Web links

- https://www.slu.se/institutioner/vatten-miljo/miljoanalys/integrerad-monitoring-im/gardsjon/

Sweden

Kindla, IM-site SE15

NATURE RESERVE IN A CONIFEROUS BILBERRY FOREST.

The Kindla IM site is located in the south central part of Sweden in a coniferous low-hill forest landscape. The site forms a catchment and a small stream starts upslope and discharges in the low-lying downslope location. The area located on fairly steep slopes from highest elevation at 415 m down to 312 m at the stream outlet. In higher elevations thin till soils cover the bedrock and forest vegetation is of mixed coniferous type while over a hundred year old spruce forests cover the slopes. Ground vegetation is mainly characterized by bilberry and wet spruce forests. The forest spruce forest starts to die and the number of fallen trees increases. The basic purpose of investigations is to follow air pollution and climate changes impacts on the soil-water-vegetation system by carrying out simultaneous determinations in most compartments of the ecosystem. The results provide reference data for experiments and consequences of land management, especially forestry. It is long-term monitoring establishing coherent time series to follow water balances and chemical budgets to contribute in understanding future changes in the natural environment. Monitoring includes measurements of air quality, deposition, soil and soil water conditions, decomposition, catchment runoff and vegetation. Data is freely available on internet or by personal contacts. Data may be found on the web: https://www.slu.se/institutioner/vatten-miljo/miljoanalys/integrerad-monitoring-im/

Purpose of site

MAINLY OBSERVATION
NO EXPERIMENTATION

The site is included in the UN ECE CLRTAP Integrated monitoring (IM) network. The monitoring program includes ecosystem studies at catchment level with determinations of hydrological and chemical budgets as well as effects on biota, primarily the vegetation and studies of soil processes. The aims are to collect relevant background data from reference areas that can be used to separate anthropogenic disturbance of the ecosystem by air pollution from natural variation. Model simulations for prognoses of future environmental status are an important part of the program. IM also furnish possibilities to test models. The IM sites

are located in protected areas where there has been little forestry activity for many decades. Atmospheric deposition of pollutants and anthropogenically induced climate change are the only human disturbances within the IM sites.

Location: The Kindla site is located in the Kindla Natura 2000 area about 250 km west of Stockholm in the Bergslagen region.

Ecosystems: Forest; Taiga

Research topics: biology; biodiversity; species diversity; community ecology; community dynamics; successional dynamics; ecosystem ecology; ecosystem function; forest ecology; plant ecology; vegetation dynamics; population ecology; plants population changes over time; population changes over time; population dynamics; terrestrial ecology; air chemistry; atmospheric chemistry; biogeochemistry; depositions chemistry; interstitial water chemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; geology; hydrology; meteorology; climatology; climate monitoring

Contact(s): Pernilla Rönnback, pernilla.ronnback@slu.se

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | SC | SR | Beds | °C | Power | <1 kW | Data: Int | Data: Ext

DEIMS.ID: 9aa88bb6-b4a9-4569-8520-3d26643e6de9

Web links

- https://www.slu.se/institutioner/vatten-miljo/miljoanalys/integrerad-monitoring-im/kindla/

Sweden

Svartberget Field-research Infrastructure (LTER)

BOREAL FOREST AND MIRE LANDSCAPE RESEARCH

The Svartberget Field-research Infrastructure hosts several unique long-term field research programs, starting in the early 1920's when the Experimental Forests were established here. Present research includes studies of the effect of different forest practices, climate change, long-range transport of air pollutants on water quality, full carbon budget of boreal mires and forests and long-term soil-tree interactions with nutrient optimization. These research activities has for decades provided excellent opportunities for international researchers to study natural and human induced impacts on the structure and function of the boreal landscape. To date, more than 1000 scientific publications and 100 PhD-theses have contributions from research performed at Svartberget. A main objective of the ongoing research is to assess the role of external drivers, such as land-use, climate change and nutrient supply on soils and waters in the boreal terrestrial landscape. The main strategy has been to increase the interaction between process-based research, environmental monitoring and improved modelling. The plan for the future is to continue to:

1. Generate long-term monitoring data of high quality
2. Provide a long-term climatic context for the experimental and hypothesis-driven research
3. Contribute towards scientifically based guidelines and models for policy and decisions makers.

Purpose of site

PARTLY OBSERVATION
PARTLY EXPERIMENTATION

- Landscape assessment of the environmental and societal consequences of enhanced forest production on carbon sequestration, biodiversity and water quality
- Integrated catchment research and monitoring that contribute to the development of new water management models and guidelines.
- Investigations of long-term soil-tree interactions under the impact of different external drivers

- Long-term monitoring of the full carbon balance from an oligotrophic boreal mire, including carbon uptake, methane emissions, and runoff export carbon loss.

Location: The Svartberget LTER site is located 63 km NV of Umeå, the capital city of the county Västerbotten, 7.5 km from the municipality center Vindeln

Ecosystems: Agricultural; Forest; Lakes; Fresh Water Rivers

Research topics: biology; dendrochronology; aquatic ecology; stream ecology; biodiversity; species diversity; forest ecology; fungal ecology; plant ecology; vegetation dynamics; terrestrial ecology; phenology; biogeochemistry; isotopic chemistry; soil chemistry; water chemistry; environmental science; geology; hydrology; limnology; silviculture; meteorology; climatology; climate change; climate monitoring

Contact(s): Charlotta Erefur, charlotta.erefur@slu.se

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SC | 2WD | 4WD | BOAT | SM | SR | °C | Aqua | T: <10m | T: >10m | Power - Central | Data: Int

DEIMS.ID: c0705d0f-92c1-4964-a345-38c0be3113e1

Web links

- https://www.slu.se/svartberget

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At **events**: Our website will indicate which events we will attend.

Accredited sites

61

Network started

1992

United Kingdom

Environmental Change Network + CEH sites

www.ecn.ac.uk

United Kingdom

Alice Holt

MULTIPURPOSE, LOWLAND MIXED WOODLAND

UK ECN site. Alice Holt forest lies in the Weald between the North and South Downs in southern England. Alice Holt Forest Park covers 851 hectares of mainly Corsican pine but approximately 140 ha. of original 1820 oak still remain. The ancient forest is now a truly multi-purpose woodland where research, conservation, timber production and recreation co-exist. The target sampling square is located in 90 hectares of 80 year old semi-natural oak woodland.

Gault clay dominates the underlying geology. For the past 25 years intensive monitoring has been carried out under a variety of programs at this highly instrumented site. The site is part of a network of such highly monitored forests across both the UK and Europe. The Alice Holt site is owned by the Forestry Commission and is run by Forest Research under the Integrated forest monitoring programme. Collaboration with other research programs is actively encouraged.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Sustainable forest management requires an understanding of the effects of management on ecosystem function, biodiversity and the wider environment. The Long term Intensive monitoring within the research forest, including an Eddy co-variance system, allows us to understand management and climate effects on ecosystem function. The research aims to (i) provide integration and analysis of environmental data to improve our understanding of the drivers and responses of environmental change; (ii) identify natural and human induced change and understand their causes, (iii) provide comparable long-term data sets for modelling and research purposes.

Location: South East England, 72 km South West of London, 48 km from London Heathrow, 80 km from London Gatwick

Ecosystems: Temperate broadleaf and mixed forests; Temperate coniferous forests

Research topics: biology; conservation; dendrochronology; animal ecology; biodiversity; ecosystem ecology; ecosystem service; forest ecology; plant ecology; vegetation dynamics; terrestrial ecology; phenology; taxonomy; air chemistry; atmospheric chemistry; biogeochemistry; depositions chemistry; isotopic chemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; geology; silviculture; meteorology; climatology; climate change; climate monitoring; soil physics; social sciences; geography; history; land use history; sociology

Contact(s): Sue Benham, sue.benham@forestresearch.gov.uk

All parts of site accessible: No

Infrastructure:

All yr | 2WD | SR | T: can | T: <10m | Power - Central | >100 kW

DEIMS.ID: d47ec839-5d20-4315-9f88-1e9edbab22e8

Web links

- http://data.ecn.ac.uk/sites/ecnsites.asp?site=T09
- https://www.forestresearch.gov.uk/research/integrated-forest-monitoring
- http://data.ecn.ac.uk/

United Kingdom

Cairngorms (ECN site)

NATURALLY REGENERATING UPLAND MOOR AND MOUNTAIN

UK ECN site. The Cairngorms site is located high in the Cairngorms, near Aviemore in Speyside, Scotland. The site lies on the North-Western flank of the Cairngorms encompassing the catchment of the Allt a' Mharcaidh (a site in the ECN freshwater network). It is part of the Invereshie and Inshriach National Nature Reserve, within the Cairngorms National Park, and covers some 10 km^2.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

As part of the UK ECN we collect, analyse and interpret a wide range of long-term biological, chemical and physical data from an upland catchment, with the aim of better understanding the ecosystem drivers and pressures, how these might change over time, and the impacts of change.

Our existing knowledge and historical data mean the site is ideally placed for research across a range of environmental, ecological and socio-ecological themes. Recent research has looked to address topics including ecosystem resilience, forest regeneration, environmental change impacts, litter decomposition, human perceptions of wild landscapes and ecosystem service delivery, among others.

Location: Feshiebridge, Cairngorms National Park, Scotland. Approximately 8 km south of Aviemore and 135 km north of Edinburgh

Ecosystems: Alpine; Temperate broadleaf and mixed forests; Temperate coniferous forests

Research topics: biology; animal ecology; aquatic ecology; stream ecology; biodiversity; species diversity; ecosystem ecology; ecosystem function; ecosystem service; forest ecology; plant ecology; vegetation dynamics; terrestrial ecology; atmospheric chemistry; biogeochemistry; depositions chemistry; soil chemistry; water chemistry; environmental science; geology; hydrology; meteorology; climatology; climate change; climate monitoring; geography

Contact(s): Chris Andrews, chan@ceh.ac.uk

All parts of site accessible: No

Infrastructure:

All yr | 4WD

DEIMS.ID: 5a04fee1-42aa-47e9-abfc-043a3eda12ac

Web links

- http://data.ecn.ac.uk/sites/ecnsites.asp?site=T12

United Kingdom

Cairngorms National Park LTSER

A LONG-TERM STUDY SITE OF THE COUPLED SOCIO-ECOLOGICAL SYSTEM

The Cairngorms National Park is one of 15 National Parks in the UK (one of two in Scotland) and is Britain's largest National Park. It is the location for some of the most spectacular landscapes in Britain and is home to an incredible diversity of wildlife and plants. Cairngorms National Park's seven broad habitats are: enclosed farmlands, woodlands, open waters (rivers, lochs, wetlands and floodplains), mountains, moorland, semi-natural grasslands and urban. Facts and figures:

- Population of c17,500
- 25.8% of population over 60 (higher than Scottish average)
- Average health index in top 25% of Scotland (based on deprivation indices)
- Extensive core paths network
- 55 Munros, including 5 summits over 4000 ft (1219 m)
- 3 ski centres
- National Cycle Network Route 7
- 1 Long Distance Route (Speyside Way)
- Relatively low atmospheric pollution
- Annual precipitation over 2250 mm on summits and under 900 mm in straths
- Average annual snow cover 200 days on summits and 50 days on low-ground
- Prevailing winds from south-west.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The Cairngorm National Park has four aims which are:

- To conserve and enhance the natural and cultural heritage of the area;
- To promote sustainable use of the natural resources of the area;
- To promote understanding and enjoyment (including enjoyment in the form of recreation) of the special qualities of the area by the public;
- To promote sustainable economic and social development of the area's communities.

In order to fulfil this purpose It is neccessary to obtain high quality data and knowledge about the socio-ecology of the park and as many research efforts are concentrated in the Park, we view the LTSER platform as practical vehicle with which to focus our activities.

Location: North East Scotland. Lying some 210 km north of Edinburgh and 144 km west of Aberdeen

Ecosystems: Agricultural; Alpine; Temperate broadleaf and mixed forests; Temperate coniferous forests; Temperate grasslands, savannas, and shrublands; Montane grasslands and shrublands; Large lakes; Small lakes; Small rivers; Large river headwaters; Large rivers; Urban

Research topics: social sciences; anthropology; archeology; demography; economy; ethics; environmental ethics; geography; biogeography; remote sensing; history; land use history; natural history; vegetation history; intermediate disturbance hypothesis; political science; sociology; theory; life history theory

Contact(s): Jan Dick, jand@ceh.ac.uk

All parts of site accessible: No

Infrastructure:

All yr | 4WD | SC | 2WD | 4WD | BOAT | SM | SR | Beds | Power

DEIMS.ID: 1b94503d-285c-4028-a3db-bc78e31dea07

Web links

- http://cairngorms.co.uk/

United Kingdom

Conwy

A SOURCE TO SEA CATCHMENT RESEARCH PLATFORM

The Conwy catchment research platform in North Wales, UK, is a long-term, large-scale platform for catchment scale research, modelling and environmental trend detection. The catchment has a wide range of landscapes, facilitating comparative survey and experimental work. The main Conwy river drains an area of 380 km^2 to the tidal limit, with a further 200 km^2 of land draining directly to the 20 km long estuary. There is a strong climatic gradient across the catchment with annual precipitation varying between 500 mm in the north-east to more than 3500 mm falling in the mountains of Snowdonia to the west, which rose to 1064 m. The lower and drier east of the catchment is more agriculturally productive, with livestock rearing and scattered native woodland. The higher Snowdonia mountains support limited grazing, plantation forestry and are of high amenity value. The catchment has a range of important habitats: blanket bog; montane and moorland habitats; conifer plantations and woodlands; extensive and intensive grassland; lakes and drinking reservoirs; flood plains and salt marshes. Its uniqueness arises from this wide range of habitats which are a result of a complex mix of geology, soils and historic land use. There is a broad range of engaged stakeholders in the catchment including: water industries (drinking and hydropower); shell fisheries; farmers; foresters; tourist industries; conservation groups and local communities.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The Conwy catchment provides a linked terrestrial, freshwater and marine study system at a practical, policy relevant scale, with a wide range of ongoing experimental research, long-term monitoring and modelling activities. The diversity of habitat types and broad range of economic activities provides an ideal platform on which to undertake research into a range of environmental issues including: flooding; water quality; soil health; climate change mitigation; improving biodiversity; development of more resilient land and water-based industries such as farming, forestry and tourism and exploring how these interact at a landscape. Ecological, biogeochemical and hydrological

processes from the gene to landscape scale are studied with an emphasis on developing a holistic understanding of how pressures influence our natural resources and the many benefits which we receive from them.

Location: North Wales coast, UK, draining from the mountains of Snowdonia to the Irish Sea

Ecosystems: Agricultural; Forest; Grasslands

Research topics: biology; aquatic ecology; wetland ecology; community ecology; community dynamics; ecosystem ecology; ecosystem function; ecosystem service; land use classification; microbial ecology; plant ecology; vegetation dynamics; restoration ecology; terrestrial ecology; biogeochemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; hydrology; limnology; agriculture; aquaculture; soil science; soil physics; soil chemistry; remote sensing

Contact(s): Chris Evans, cev@ceh.ac.uk

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD

DEIMS.ID: 2eac4a5e-c339-47cf-9371-8f2b0cd8f175

Web links

- https://www.ceh.ac.uk/our-science/monitoring-site/conwy-source-sea-catchment-research-platform

United Kingdom

Esthwaite Water

EUTROPHIC FRESHWATER LAKE

UK ECN site. Esthwaite Water is a natural lake situated in a glacial valley and is generally agreed to be the most productive or eutrophic lake in the English Lake District. It lies approximately 65 m above sea level and has an area of 1 km^2 and a maximum depth of 15.5 m. The average retention time is 90 days. The catchment area is 17.1 km^2 and the hills are composed geologically of Bannisdale slates and grits. The surrounding land is used chiefly for agricultural purposes and forestry. The lake is a grade 1 Site of Special Scientific Interest and has been a designated "Ramsar" site since November 1991. Artificial enrichment of the lake occurs by input from the Hawkshead Sewage Treatment Works (which has operated a continuous programme of phosphate stripping since 1989) and originally from effluents from the fish farm which used to be situated towards the south of the lake. The lake undergoes summer stratification with oxygen depletion regularly below 7 m and sometimes as shallow as 5 m. The phytoplankton tends to be dominated by diatoms in spring and by cyanobacteria for much of the summer.

Purpose of site

MAINLY OBSERVATION

PARTLY EXPERIMENTATION

Research on Esthwaite Water began with W H Pearsall's studies of the English Lake District before WWI. A national facility for freshwater biological research was set up in 1929 with a base established on the shores of Windermere in 1931 and research began in earnest. In 1950 the laboratory was moved to Ferry House and then the main laboratory was relocated to buildings on the Lancaster University site in 2003. Before 1970, research was primarily of a fundamental nature as progress was made to understand some of the key processes controlling freshwater ecosystems. Later, more applied work was done whilst continuing with a core element of fundamental research including eg, water temperatures, dissolved oxygen levels, nutrients, flora and fauna information. The long-term data are used to reveal long-term trends of ecosystem functions and services provided as affected by climate change.

Location: In the English Lake District, North West England approximately 10 km from Windermere Railway Station via car ferry.

Ecosystems: Fresh Water Lakes

Research topics: biology; aquatic ecology; lake ecology; water chemistry; limnology; meteorology; climatology; climate; climate change; weather

Contact(s): Heidrun Feuchtmayr

All parts of site accessible: Yes

Infrastructure:

All yr | BOAT | Beds | Aqua | Power - Central

DEIMS.ID: 892c8613-4a21-40b5-a2e9-1036c63ca31f

Web links

- http://data.ecn.ac.uk/sites/ecnsites.asp?site=L05

United Kingdom

Glensaugh

UPLAND SEMI NATURAL AGRICULTURAL GRASSLAND

UK ECN site. Glensaugh is one of two terrestrial ECN sites currently managed by the James Hutton Institute.

Glensaugh Research station is 35 miles south west of Aberdeen, NE Scotland (NGR NO 671783), on the edge of the Grampian hills and covers over 1100 hectares. The dominant cover is semi-natural vegetation, and there is a small amount of woodland (5ha) and some short term and permanent grassland (150ha). Much of the ECN monitoring is carried out towards the northern boundary of the research station in the small upland catchment of the Birnie Burn. Winters can be severe and snow may lie in patches until late March.

The target sampling site is located at an altitude of 300m on heather dominated (*Calluna vulgaris*) moorland interspersed with patches of blaeberry (*Vaccinium myrtillus*). It has a westerly aspect and straight slopes of up to 20 degrees. The soil is predominantly freely draining humus iron podzol of the Strichen Series. The water chemistry sampling point, flume and in-stream measurements are made on the Birnie Burn at an altitude of 240m. The catchment area above the sampling point is around 100ha. Precipitation and atmospheric chemistry samples are collected adjacent to the stream at a similar altitude.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Upland research and monitoring is carried out on a working farm. The main enterprises are sheep, beef cattle and deer with some shooting and fishing opportunities. The types of land use and management carried out at Glensaugh are representative of those undertaken across large areas of upland Scotland. Monitoring of environmental variables such as climatic conditions, soil, flora and fauna over a long time frame (decadal) enable cause and effect relationships to be investigated and help to gather evidence with which to test predictive models of, for example acid deposition, climate change impacts and biodiversity change.

Location: Glensaugh is 56 km south west of Aberdeen, NE Scotland (NGR NO 671783)

Ecosystems: Agricultural; Temperate grasslands, savannas, and shrublands; Small lakes; Small rivers; Fresh Water Rivers

Research topics: biology; animal ecology; aquatic ecology; stream ecology; biodiversity; ecosystem ecology; ecosystem service; plant ecology; vegetation dynamics; terrestrial ecology; atmospheric chemistry; biogeochemistry; depositions chemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; geology; hydrology; meteorology; climatology; climate change; climate monitoring; geography

Contact(s): Helen Watson, helen.watson@hutton.ac.uk

All parts of site accessible: No

Infrastructure:

All yr | 4WD | 2WD | 4WD | SR | Beds | Power - Central | 5-10 kW | Data: Int | Data: Ext

DEIMS.ID: 1c4d454d-0c00-49f9-a7fe-3a3e596c3648

Web links

- http://data.ecn.ac.uk/sites/ecnsites.asp?site=T02

United Kingdom

Hillsborough

HILLSBOROUGH FOREST, 150 ACRES OF MIXED WOODLAND.

UK ECN site. A lowland grassland site situated at the Agri-Food and Biosciences Institute, Co. Down, Northern Ireland and representative of grassland in much of the north-western United Kingdom. There are several long-term field experiments ongoing on the site. A large part of the site is estate woodland (Hillsborough Forest) consisting of mature mixed woodland and conifer plantation. Many of the vegetation plots are located within this forested area, as are sections of the butterfly, carabid beetle, spider and bird transects.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The site owes it origins to a memo presented by the executive committee of the Ulster Farmer's Union to the Prime Minister of N.I. in 1925 stating that 75% of agri income of N.I. farmers is from livestock and stock products. All previous & experimental work in Ireland had mainly concerned crops and if attention to the animal side was progressed similar achievements could be made. After negotiations between UFU and Government, 500 acres of land at Large Park Hillsborough was allocated for this purpose. The aim of the new Institute was to investigate problems of economic importance to N.I. farmers and find solutions which are capable of application by all farms small or large. Currently the site carries out Agricultural and livestock research and long-term environmental monitoring. The farm, which is 440 acres, (20 acres used for renewable), is mainly grass for grazing or silage production. It supports 1200 livestock.

Location: Hillsborough is a village in County Down, Northern Ireland, situated 19 km from the city of Belfast and 10km from the city of Lisburn

Ecosystems: Grasslands

Research topics: biology; animal ecology; biodiversity; ecosystem ecology; ecosystem service; plant ecology; vegetation dynamics; terrestrial ecology; atmospheric chemistry; biogeochemistry; depositions chemistry; soil chemistry; water chemistry; environmental science; geology; hydrology; meteorology; climatology; climate change; climate monitoring; geography

Contact(s): Colm McKenna, colm.mckenna@afbini.gov.uk

All parts of site accessible: No

Infrastructure:

All yr | 2WD | 2WD | 4WD | SR | Power - Dist

DEIMS.ID: 371c5259-6f38-4aa7-9517-c56f608c62cc

Web links

- http://data.ecn.ac.uk/sites/ecnsites.asp?site=T03
- https://www.afbini.gov.uk/

United Kingdom

Loch Leven

LARGE SHALLOW SCOTTISH FRESHWATER LAKE

UK ECN site. Loch Leven is the largest, shallow, relatively nutrient-rich, lowland loch (lake) in Scotland. It lies at an altitude of 107 m. It has a surface area of 13.3 km^2 and has a mean depth of 3.9 m. The Loch Leven catchment covers 145 km^2, consisting mainly of arable crops and improved pasture. Loch Leven is particularly renowned for its large numbers of migratory, breeding and overwintering waterfowl and its world famous brown trout fishery. Although the overall quality of the site is good, the loch has suffered from periodic cyanobacterial ('blue-green algal') blooms for many years. These have occurred, largely, as a result of substantial amounts of phosphorus entering the loch, combined with a relatively low flushing rate and a favourable light-climate.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Lake monitoring and research. Since the mid-1960s Loch Leven has been the focus of a long-term monitoring programme. Current research is focused primarily on whether Loch Leven is showing signs of ecological recovery from eutrophication pressures following reductions in external loadings of phosphorus, the main limiting nutrient. Recent evidence suggests that although there have been encouraging signs of improvement in the ecology of the loch, a sustained recovery has yet to occur. The site has also been a focus site for the EU funded OpenNESS project that aimed to link water quality to ecosystem service delivery, and for the EU funded MARS project that investigated the impacts of multiple drivers (nutrients, flushing rate and temperature) on water quality.

Location: Central Scotland, 35 km north of Edinburgh, immediately to the east of the town of Kinross in the Perth and Kinross Council area

Ecosystems: Fresh Water Lakes

Research topics: biology; conservation; aquatic ecology; lake ecology; biodiversity; species diversity; community ecology; community dynamics; successional dynamics; trophic dynamics; ecosystem ecology; ecosystem function; ecosystem service; paleoecology; phenology; sediment chemistry; water chemistry; environmental science; hydrology; limnology; fishery; meteorology; climatology; climate change

Contact(s): Linda May, lmay@ceh.ac.uk

All parts of site accessible: Yes

Infrastructure:

All yr | BOAT

DEIMS.ID: fa7f524d-a414-4f91-8e18-16d57192fc0c

Web links

- http://data.ecn.ac.uk/sites/ecnsites.asp?site=L06

United Kingdom

Lough Neagh

LARGE ENRICHED FRESHWATER LAKE

UK ECN site. Lough Neagh covers 383 km^2 and is by far the largest area of freshwater in the British Isles. Situated in the north-east of the island, it has a drainage basin of 4,453 km^2, which is shared between Northern Ireland (91%) and the Republic of Ireland (9%). The average water retention time is 15 months. Although large in area, the lake is relatively shallow with a mean depth of 8.9 m (max. 25 m). This, combined with its great size and a mild and windy oceanic climate, ensures that the water column is generally well mixed. The lake supports commercial fisheries for European eel, pollan, perch and trout. The eel fishery is the most significant, with an annual catch in the region of 600 t. Lough Neagh is hypertrophic with a mean annual total phosphorus (P) concentration of 140 mg P l^{-1} (2017). Levels of phosphorus and nitrogen in the lough support large phytoplankton populations with annual chlorophyll a concentrations typically in excess of 45 mg l^{-1}. The dominant alga is the cyanophyte *Planktothrix agardhii* and the phytoplankton is now less diverse than in the late 1960s when regular monitoring began. Since then there has been regular monitoring of the plankton, lake and river nutrient concentrations, which have been used to produce nutrient budgets for the lake.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Lake ecological monitoring and research. There has been continued monitoring of Lough Neagh since the early 1970s. When the monitoring programme commenced, the focus was on relieving point source pollution. However, attempts to lower P concentrations in the lough by curtailing point sources of P have been unsuccessful due to increasing inputs from diffuse sources and continued internal loading.

Location: Central Northern Ireland

Ecosystems: Fresh Water Lakes

Research topics: biology; biodiversity; aquatic ecology; lake ecology; community ecology; trophic dynamics; water chemistry; limnology

Contact(s): Yvonne McElarney, yvonne.mcelarney@afbini.gov.uk

All parts of site accessible: Yes

Infrastructure:

All yr | BOAT | BOAT

DEIMS.ID: a7f8c0f4-e90f-4fa1-bbba-2daadeaf7a8c

Web links

- http://data.ecn.ac.uk/sites/ecnsites.asp?site=L16

United Kingdom

Lower Lough Erne

LARGE FRESHWATER LAKE

UK ECN site. The shallower regions of Lower Lough Erne (109.5 km^2), present an example of a flooded drumlin landscape which has created an intricate mosaic of land and water. As a consequence of differences in depth and area, the water retention time of the Lower Lough is four months. The phytoplankton abundance in the deep open water of the Lower Lough is more typical of a mesotrophic water body despite comparatively high phosphorus concentrations (58 mg P l^{-1}, 2017). The paucity of phytoplankton in this region is attributed to a high back-ground light attenuation from the peat-stained water and the greater depth of the mixed water zone (>35 m). The lake supports a fish population dominated by the introduced roach, as well as pike, perch, bream, trout and pollan. The zebra mussel is a relatively recent introduction (1996) which has impacted significantly on the lake ecology. Water monitoring is undertaken at the deepest portion of Lower Lough Erne.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Freshwater lake water quality monitoring and research. Roach was already well established when the long term monitoring on Lough Erne commenced in the early 1990s. Since then the lake has undergone considerable change. Zebra mussels, and most recently bloody red shrimp, have invaded the lake and continue to alter the lake's ecology.

Location: Western Northern Ireland

Ecosystems: Fresh Water Lakes

Research topics: biology; biodiversity; aquatic ecology; lake ecology; invasion ecology; water chemistry; limnology

Contact(s): Yvonne McElarney, yvonne.mcelarney@afbini.gov.uk

All parts of site accessible: Yes

Infrastructure:

All yr | BOAT | BOAT

DEIMS.ID: 177075bb-c0bb-40f2-81f7-b0a25bf029bd

Web links

- http://data.ecn.ac.uk/sites/ecnsites.asp?site=L17

United Kingdom

Moor House - Upper Teesdale

UPLAND GRASSLAND AND BLANKET BOG

UK ECN site. Moor House - Upper Teesdale is an upland site in the north of England that is dominated by moorland and grassland vegetation. It is England's highest and largest terrestrial National Nature Reserve (NNR), a UNESCO Global Geopark and a European Special Protection Area. Habitats include exposed summits, blanket peatlands, upland grasslands, pastures, hay meadows and deciduous woodland. The site is grazed by sheep and comprises of two areas.

The Moor House area extends from the upper edge of the Eden Valley, over the Great Dun Fell (848 m), Little Dun Fell and Knock Fell to the River Tees. The geology comprises alternating strata of limestone, sandstone and shale into which the dolerite of the Great Whin Sill intrudes. The gently sloping eastern side of the area is overlain by poorly-drained glacial till, which has led to the development of blanket bog with peat 1-3 m deep. The vegetation is dominated by Eriophorum, Calluna vulgaris and Sphagnum moss. The soils and vegetation on the western side are more variable.

The Upper Teesdale area protects unique communities of arctic-alpine plants and other flora and fauna. From Cow Green Reservoir it extends southwards to the summit of Mickle Fell (788 m) and eastward, down the Tees, to High Force waterfall. The geology, soils and vegetation of much of the area are similar to Moor House, but 'sugar limestone' soils, along with damp river-side soils, support many of the rarer plant species.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Moor House-Upper Teesdale is one of a series of terrestrial sites in the UK Environmental Change Network (ECN). The monitoring includes a wide range of physical, chemical and biotic parameters and is of high frequency. The data is used to detect environmental change in upland environments. In addition the site is used for a wide range of both short term and long term experimental work.

Location: The North Pennine hills 45 km east of Penrith (nearest railway station)

Ecosystems: Montane grasslands and shrublands

Research topics: biology; animal ecology; aquatic ecology; stream ecology; biodiversity; ecosystem ecology; ecosystem service; plant ecology; vegetation dynamics; terrestrial ecology; atmospheric chemistry; biogeochemistry; depositions chemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; geology; hydrology; meteorology; climatology; climate change; climate monitoring; geography

Contact(s): Rob Rose, rjr@ceh.ac.uk

All parts of site accessible: No

Infrastructure:

All yr | 4WD | 4WD

DEIMS.ID: bf78c96f-0763-4b31-b1a6-6eccef19edd1

Web links

- http://data.ecn.ac.uk/sites/ecnsites.asp?site=T04

United Kingdom

North Wyke

LOWLAND GRASSLAND RESEARCH FARM

UK ECN site. North Wyke (latitude 3° 54' W; longitude 50° 46'N) lies in undulating countryside 7 km to the north of Dartmoor National Park, midway between the villages of South and North Tawton. The site covers 250 ha, of which 200 ha are grassland and 50 ha are deciduous woodland at an altitude of 120 m to 180 m. A lowland grassland site typical of conditions in wetter, western Britain, with predominately impermeable clays of the Culm Measures. ECN is funded through the Rothamsted Long-Term Experiments National Capability (LTE- NCG). Details available at http://www.rothamsted.ac.uk/long-term-experiments-national-capability.

North Wyke was an experimental farm from 1955-1981, belonging to Fisons Fertilisers, before the Grassland Research Institute acquired the site in September 1981 to study the efficiency of grassland production on heavy soils under high rainfall in SW England. A period of restructuring of research institutes resulted in the formation in the Institute of Grassland and Environmental research (IGER) in 1990. In March 2008 IGER ceased to exist and North Wyke was temporarily known as North Wyke Research before becoming part of Rothamsted Research in August 2009.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Lowland grassland agricultural ecosystem research site. North Wyke established itself nationally and internationally as a research centre for pastoral livestock systems. The research emphasis shifting from predominately agricultural production to one of more multi-functional land use taking account of the environmental implications of grassland farming. Current research at North Wyke is helping to address some of agriculture's most pressing challenges, for example mitigating and adapting to climate change, protecting natural resources and sustaining the rural economy in grassland dominated regions. The North Wyke Farm Platform (https://www.rothamsted.ac.uk/north-wyke-farm-platform) is a unique national and global research facility that is linked to real-world farming to study and improve grassland livestock systems.

Location: Rothamsted Research North Wyke, 7 km north of Dartmoor National Park, 30 km west of Exeter

Ecosystems: Agricultural; Grasslands

Research topics: biology; animal ecology; biodiversity; ecosystem ecology; ecosystem service; plant ecology; vegetation dynamics; terrestrial ecology; atmospheric chemistry; biogeochemistry; depositions chemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; geology; hydrology; agriculture; meteorology; climatology; climate change; climate monitoring; geography

Contact(s): Deborah Beaumont, deborah.beaumont@rothamsted.ac.uk

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD

DEIMS.ID: 4fbe4bf9-e342-4412-8f0c-c75aff08a8ca

Web links

- http://data.ecn.ac.uk/sites/ecnsites.asp?site=T05

United Kingdom

Plynlimon

UPLAND HYDROLOGY, GEOCHEMISTRY AND LAND USE

The Plynlimon research catchments are two adjacent uplands catchments, one used for grazing sheep and the other under plantation conifer forestry. Intensive and long-term monitoring within the catchments underpins a wealth of hydrological and hydro-chemical research. Datasets include river flow, rainfall, cloud and stream hydro-chemistry, meteorology and detailed spatial datasets representing the topography, soils and rivers of the catchments. The catchments cover a combined area of 19.25 km^2 at 300-700 m above sea level. The site features a wide range of state-of-the-art equipment including flumes, met towers, met stations, soil profiles and soil sampling equipment, boreholes, experimental plots or sub-catchments comprising different management histories, river flow monitors, and infra-red gas analysers for CO_2 flux work. Data from the site have been used to report on the hydrochemical responses of upland catchments to declining acid deposition, forest harvesting, agricultural management and climate change. More recently, high temporal resolution sampling has been used to develop new mathematical and statistical methods for the interpretation of short and long-term chemical trends. The site hosts one of CEH's national network of COSMOS soil moisture sensors providing near-real time soil moisture data for use in a variety of applications including farming, water resources, flood forecasting and land-surface modelling.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Research at Plynlimon started in 1968 to compare water yields from plantation forestry and grassland catchments. The site now has more than 40 years of high temporal resolution river flow and meteorological data, supplemented by process studies on flow pathways, forest interception and evaporation. Hydrochemical measurements comprise a 30-year uninterrupted record of weekly to monthly measurements of wet deposition and stream water chemistry for a wide range of constituents. At various times, "routine" monitoring has been supplemented by more detailed plot and small catchment-scale studies of flow generation, weathering and element cycling in grassland and forest systems, biogeochemical responses to forest harvesting, acid rain and atmospheric nitrogen deposition.

Location: The Plynlimon catchments in the UK form the headwaters of the Rivers Severn and Wye approximately 20 km inland of Aberystwyth on the mid-Wales coast

Ecosystems: Forest; Grasslands; Rivers

Research topics: natural science; biology; disturbance ecology; ecosystem ecology; ecosystem service; landscape ecology; long term ecological research; atmospheric chemistry; biogeochemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; environmental impact; hydrology; forest hydrology; hydrography; limnology; soil science

Contact(s): Jack Cosby, jaccos@ceh.ac.uk

All parts of site accessible: No

Infrastructure:

4WD | 2WD | 4WD

DEIMS.ID: 6d47f4ca-8621-49a4-8240-3021429d1db5

Web links

- https://www.ceh.ac.uk/our-science/monitoring-site/plynlimon-critical-zone-observatory
- https://catalogue.ceh.ac.uk/documents/91961a0f-3158-4d00-984d-91eb1e03e8bd#section-metadataQuality
- https://www.ceh.ac.uk/our-science/projects/plynlimon-experimental-catchments

United Kingdom

Porton Down

MILITARY RESEARCH AREA AND UNIQUE CHALK GRASSLAND

UK ECN site. Porton Down is located in Southern England on the Wiltshire/Hampshire border. It is owned by Defence Science and Technology Laboratory (Dstl) and is a military research area. It has been closed to the public for over 100 years, resulting in it missing out on the agricultural revolution which affected the rest of the country. This is why it constitutes the largest uninterrupted tract of semi-natural chalk grassland in Britain, a habitat which has declined by more than 80% in the last 50 years. Over 1500 hectares is designated as a Site of Special Scientific Interest (SSSI), a Special Area of Conservation (SAC) and a Special Protection Area (SPA). In addition to the grassland the site supports large areas of mixed scrub, including juniper, and broadleaved, mixed and coniferous woodland. These habitats contain many rare and characteristic plants. Porton Down also contains 20% of the Southern England juniper population as well as 15 species of invertebrates endemic to Juniper. It is also one of the best butterfly sites in the UK with 44 species being recorded.

The ECN monitoring takes place at the heart of the site on the chalk downland and takes in some of the sites special features. The ECN protocols that are undertaken on Porton Down include Atmospheric chemistry, Precipitation chemistry and Weather data. Ecological data includes Rabbits, Birds, Butterflies, Moths, Ground Predators and Spiders.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The area is used for military research by Defence Science and Technology Laboratory. The land is closed to the public and no livestock is allowed on the site. The only grazing is undertaken by the extremely high rabbit population. Its protected area, the largest uninterrupted tract of semi-natural chalk grassland in Britain, is where the UK Environmental Change Network programme monitoring takes place. An in-house team manage the up-keep of the area and undertakes other ecological research and monitoring of the sites Stone-curlew population, which has been part of a LIFE Project.

Location: Located 12 km from Salisbury which has rail links to London. The nearest airport is Southampton (47 km), though London Heathrow is only 110 km

Ecosystems: Grasslands

Research topics: biology; conservation; animal ecology; biodiversity; ecosystem ecology; ecosystem service; plant ecology; vegetation dynamics; terrestrial ecology; atmospheric chemistry; biogeochemistry; depositions chemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; geology; hydrology; meteorology; climatology; climate change; climate monitoring; geography

Contact(s): Sarah Atkinson, seatkinson@dstl.gov.uk

All parts of site accessible: No

Infrastructure:

All yr | 4WD | 4WD | SR | Power - Central | 1-5 kW

DEIMS.ID: 0f05a86f-0f7a-4b81-8268-6818a6064428

Web links

- http://data.ecn.ac.uk/sites/ecnsites.asp?site=T10

United Kingdom

Rothamsted

AGRO-ECOLOGICAL RESEARCH

UK ECN site (T06 ROT) is funded through the Rothamsted Long-Term Experiments National Capability (LTE-NCG). Rothamsted is located about 35 km North of London, UK (51° 48′ 34.44″ N, 0° 21′ 22.76″ W) in the county of Hertfordshire. It covers about 330 ha, all of which is included within the Rothamsted ECN site. The estate contains several ecosystems, including managed arable and grassland fields, naturally regenerated and ancient woodland, the river Ver and more recently energy crops e.g. short rotation coppice willow and miscanthus grass. It is a rural area within an urban landscape, surrounded by the town of Harpenden to three sides and the village of Redbourn on the south-west side. The larger conurbations of Luton, St. Albans and Hemel Hempstead, together with the M1 motorway and London Luton Airport, are within an eight mile radius. The Park Grass Hay Experiment (est. 1856) is the principal target sample site (TSS) for the majority of the ECN protocols at Rothamsted. This experiment is widely acknowledged to be the oldest continuing agro-ecological experiment in the world; it is recognised internationally as an important site for long-term studies on biodiversity and ecology. The experimental plot on Park Grass of most interest to the ECN, in relation to physical and atmospheric inputs is Plot 3, Section d (Plot 3d). This plot receives no inorganic or organic inputs apart from atmospheric deposition.

Purpose of site

PARTLY OBSERVATION
MAINLY EXPERIMENTATION

Rothamsted Research was founded as a centre for agricultural research in 1843, to investigate the effects of mineral fertilisers and organic manures on crop production and soil fertility. Initial experiments on cereals (Broadbalk Continuous Wheat Experiment, est. 1843) and grassland (Park Grass Hay Experiment, est. 1856) continue today, albeit in modified forms to ensure they remain relevant to current agricultural and environmental issues. These and several other long-term experiments, including ECN Rothamsted (est. 1992) and archived samples and data, comprise the Rothamsted Long-Term Experiments National Capability (LTE-NC). Agro-ecological research at Rothamsted continues today in the form of

experimentation and observation to provide the knowledge and tools to enhance agricultural sustainability and minimise its environmental impact.

Location: Harpenden, Hertfordshire: 35 km North of London by road, 11.7 km from London Luton Airport, 30 mins by rail from London St. Pancras Int'l

Ecosystems: Agricultural; Temperate broadleaf and mixed forests; Temperate grasslands, savannas, and shrublands

Research topics: biology; animal ecology; biodiversity; species diversity; ecosystem ecology; ecosystem service; plant ecology; vegetation dynamics; terrestrial ecology; atmospheric chemistry; biogeochemistry; depositions chemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; geology; hydrology; agriculture; meteorology; climatology; climate change; climate monitoring; geography; history; land use history

Contact(s): Tony Scott, tony.scott@rothamsted.ac.uk

All parts of site accessible: Yes

Infrastructure:

All yr | 2WD | SR | °C | Data: Int | Data: Ext

DEIMS.ID: cb340d4c-e6e5-465a-b0cb-d6c613fa5541

Web links

- http://data.ecn.ac.uk/sites/ecnsites.asp?site=T06
- http://www.rothamsted.ac.uk/long-term-experiments-national-capability
- http://www.rothamsted.ac.uk/era
- http://www.rothamsted.ac.uk/environmental-change-network

United Kingdom

Sourhope

UPLAND GRASSLAND ON WORKING SHEEP FARM

UK ECN site. The ECN site at Sourhope is managed by the James Hutton Institute with consent and support from Roxburghe Estate. Sourhope research station lies 15 miles south-east of Kelso near the head of the Bowmont valley on the western slopes of the Cheviot. The station covers an area of approximately 1100 hectares.

The target sampling site (TSS) is located on the broad, smooth southerly to south-westerly shoulder of the Schil (summit 605 m) at an altitude of between 460-510 m. The soils are predominantly peaty gleyed podzols of the Cowie series and Sourhope association. The organic surface horizons are underlain by a mineral horizon. The vegetation at the TSS is representative of that across both the farm and many parts of the uplands in southern Scotland consisting of coarse grassland dominated by White bent (*Nardus stricta*) and Flying bent (*Molinia caerulea*). The mean annual rainfall is over 1100 mm on the hilltops. The site is relatively exposed and access can be difficult due to prolonged snow cover during the winter months.

The meteorological conditions are recorded by a weather station that is located on Fassett Hill. Generally the streams flow south to form the Sourhope burn which becomes the Bowmont Water at the boundary of the station. Historically two tributaries were sampled. From 2017 sampling effort was focussed on the Rowantree Burn. The precipitation chemistry and atmospheric chemistry samples are collected adjacent to the sampling point on the Rowantree Burn. The flume and gauging station are also located at this point.

Purpose of site

ONLY OBSERVATION
NO EXPERIMENTATION

Sourhope is a working upland farm that was previously used for research purposes. Although experimental research at the site has ceased the long term monitoring of environmental variables still continues.There is a wealth of historic experimental data with emphasis on soil health, fine fibre production and animal (particularly sheep) breeding. For many years there was a large and much studied cashmere goat herd.

Currently scientific work is limited to continuing the long term monitoring protocols that ensure the site remains within the Environmental Change Network.

Location: Sourhope lies at the head of the Bowmont valley 24 km SE of Kelso in the Scottish Borders (National Grid Reference NT 846202)

Ecosystems: Agricultural; Temperate coniferous forests; Temperate grasslands, savannas, and shrublands; Small rivers

Research topics: biology; animal ecology; biodiversity; ecosystem ecology; ecosystem service; plant ecology; vegetation dynamics; terrestrial ecology; atmospheric chemistry; biogeochemistry; depositions chemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; geology; hydrology; meteorology; climatology; climate change; climate monitoring; geography

Contact(s): Helen Watson, helen.watson@hutton.ac.uk

All parts of site accessible: No

Infrastructure:

All yr | 4WD

DEIMS.ID: 125d4667-0fae-418d-88ff-7d9930809d12

Web links

- http://data.ecn.ac.uk/sites/ecnsites.asp?site=T07

United Kingdom

Whim bog

LONG-TERM NITROGEN EXPERIMENT

Whim bog offers a globally unique comparison of how the main N forms affect semi-natural vegetation, with meteorological data and treatment history since 2002.

A quantified ammonia concentration / deposition gradient, is provided, plus a wet deposition system, comparing oxidized ($NaNO_3$) and reduced N (NH_4Cl), where treatments are meteorology dependent. ie. wind direction and rainfall frequency define the treatment exposure(~120 events y^{-1}). Wet plots are large (13m²) and there are 4 replicates per treatment.

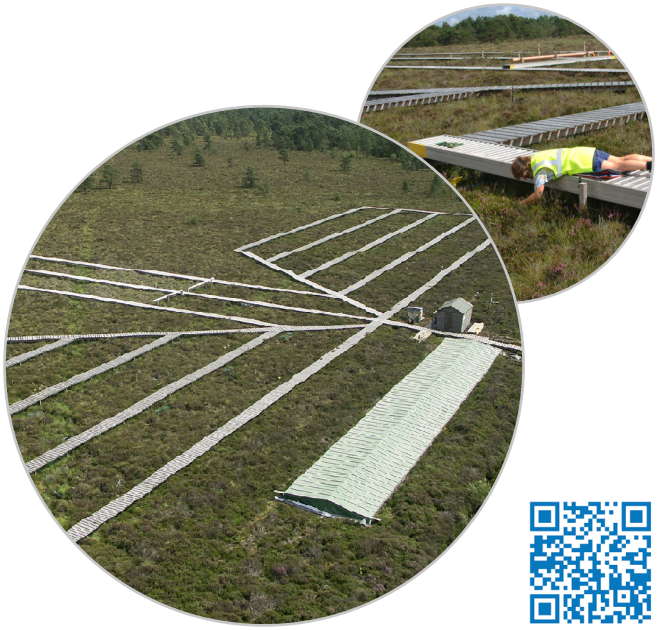
Opportunities exist to evaluate a whole range of ecosystem services from conservation to carbon sequestration, GHG emissions and water chemistry in addition to understanding how changes in vegetation affect the delivery of these services.

Purpose of site

PARTLY OBSERVATION
MAINLY EXPERIMENTATION

The Whim experimental bog is a globally unique study of how peatland ecosystems respond to different levels and forms of nitrogen (N) deposition. In operation since 2002, the field manipulation experiment provides a quantified ammonia (NH_3) concentration/deposition gradient to an ombrotrophic bog, plus separate wet treatments comparing different levels of oxidized ($NaNO_3$) and reduced (NH_4Cl) N deposition. The site also includes treatments with phosphorus and potassium (K_2HPO_4) at two N doses to compare N effects with and without limitations of other nutrients.

In 2017 an ozone (O_3) fumigation system was added to the site to study the combined effects of nitrogen and ozone.



Location: Whim Bog is located in the Scottish borders, approximately 30 km south of Edinburgh

Ecosystems: Tundra

Research topics: biology; ecology; chemistry; environmental science

Contact(s): Netty van Dijk, nvd@ceh.ac.uk

All parts of site accessible: Yes

Infrastructure:

All yr | 4WD | 2WD | SR | Power - Central | Data: Ext

DEIMS.ID: c80eaaac-411f-4e8f-a2c8-5ee7797576db

Web links

- https://www.ceh.ac.uk/our-science/monitoring-site/whim-bog-long-term-nitrogen-experiments
- http://www.whimbog.ceh.ac.uk/

United Kingdom

Windermere

MESOTROPHIC FRESHWATER LAKE

UK ECN site. Windermere is in NW England in the English Lake District. The dominant geological structure of the Lake District is a dome of Paleozoic rocks formed by uplift in the Tertiary producing a radial drainage pattern later enhanced in the Pleistocene glaciation, with major lakes within bedrock basins in steep-sided, flat-floored valleys. England's largest natural lake with a surface area of 14.8 km^2 and altitude of 40 m and is divided by a shallow sill; North Basin (NB) (surface area c. 8 km^2, max. depth 64 m) and South Basin (SB) (surface area c. 6.7 km^2, max. depth 42 m). Windermere (ECN site (2°58'W 54°23'N)) has a catchment of 180 km^2 draining into the lake via two main rivers, several small tarns and streams. The catchment is mainly uplands, grazed by sheep all year but also used for recreational purposes. The villages are major tourist destinations with consequent increases in sewage input to the lake. Over the past 50 years levels of SRP in the lake have more than doubled, peaking in the 1980s. The effluent discharged into SB is now P-stripped to reduce nutrient loading to the lake. The lake is a Site of Special Scientific Interest (SSSI), a source of potable water and a major recreational facility. The Freshwater Biological Association and latterly the Centre for Ecology & Hydrology have had a laboratory on the shore of Windermere for over 50 years resulting in a large body of scientific literature based on Lake District lakes.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

Research on Windermere began with W H Pearsall's studies of the English Lake District before WWI. A national facility for freshwater biological research was set up in 1929 with a base established on the shores of Windermere in 1931 when research began in earnest. In 1950 the laboratory moved to Ferry House and in 2003 the main laboratory was relocated to buildings on the Lancaster University site. Before 1970, research was primarily of a fundamental nature as progress was made to understand some of the key processes controlling freshwater ecosystems. Later there was a shift towards more applied work whilst continuing with a core element of

fundamental research e.g. water temperatures, dissolved oxygen levels, nutrients, flora and fauna information. The long-term data are used to reveal long-term trends of ecosystem functions and services they provide, as affected by climate change.

Location: In the English Lake District, North West England approximately 5 km from Windermere Railway Station to eastern ferry landing

Ecosystems: Fresh Water Lakes

Research topics: biology; aquatic ecology; lake ecology; water chemistry; limnology; meteorology; climatology; climate change; climate monitoring

Contact(s): Heidrun Feuchtmayr

All parts of site accessible: Yes

Infrastructure:

All yr | BOAT | Beds | Aqua

DEIMS.ID: 2b4ed6fa-ce83-4a75-af65-2cfa497ff5ba

Web links

- http://data.ecn.ac.uk/sites/ecnsites.asp?site=L04

United Kingdom

Wytham

DECIDUOUS WOODLAND AND FARMLAND

Wytham is 5 km north west of Oxford and consists of mixed woodland, mainly deciduous, and organic mixed farmland. Roughly a third of the wooded area is ancient woodland which, to our knowledge, has never been cleared and there has been continuity of tree cover since the prehistoric 'wild wood'. It has however had a long history of management, which for many hundreds of years took the form of coppicing. Within the woodland there are patches of semi-natural grassland, of both ancient and recent origin, and scrub.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The UK ECN site at Wytham was established in 1992 with the aim of studying the impacts of climate change on ecological systems and to compare the findings with those from other sites around the UK. Our research slots into 75 years of scientific research and long term monitoring projects set up since the woods were gifted to Oxford University in 1942. Notable events include the start of the tit population monitoring project in 1947, small mammal monitoring in 1962, grassland restoration project in 1984 and long term badger monitoring in1987. In 2006 the canopy flux tower was established, facilitating studies on canopy interactions.

Location: 5 km north west of Oxford. Nearest airport is Heathrow

Ecosystems: Agricultural; Deciduous Forest

Research topics: biology; animal ecology; biodiversity; ecosystem ecology; ecosystem service; plant ecology; vegetation dynamics; terrestrial ecology; atmospheric chemistry; biogeochemistry; depositions chemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; geology; meteorology; climatology; climate change; climate monitoring; geography

Contact(s): Denise Pallett; Steffi Schäfer
wytham_ecn@ceh.ac.uk

All parts of site accessible: No

Infrastructure:

All yr | 4WD

DEIMS.ID: 16dcd0c3-a114-412c-9f01-8c1af292ba69

Web links

- http://data.ecn.ac.uk/sites/ecnsites.asp?site=T08

United Kingdom

Yr Wyddfa/Snowdon

MONTANE RESEARCH SITE WITH ARCTIC-ALPINE FLORA AND LAKES IN A PROTECTED AREA

Yr Wyddfa/Snowdon is an upland ECN site incorporating the summit of Yr Wyddfa or Snowdon, the highest mountain in England and Wales, 19km south-east of Bangor in North Wales. It is co-located with the Nant Teyrn freshwater site. The altitude ranges from 298-1085 m and includes three additional summits over 800 m. The bedrock is a mixture of Ordovician acidic and basic volcanic rocks, with localised igneous intrusions. Evidence of glaciation is widespread, with prominent corrie moraines. There are 5 lakes within the site, three of which form a 'staircase'. The soils are varied and include brown podzolic soil, gleys, organic peat soils and humic rankers. The dominant vegetation is acidic grassland with *Festuca ovina* (sheep's fescue) and *Agrostis* sp (bent grass) in the drier areas and *Nardus stricta* (mat grass) in the wetter areas.

Purpose of site

MAINLY OBSERVATION
PARTLY EXPERIMENTATION

The site is part of the Yr Wyddfa/Snowdon National Nature Reserve, managed by Natural Resources Wales under agreement with the owner. The land is unenclosed and grazed by sheep and a small herd of feral goats. It is a popular area for tourists (hill walkers, climbers,etc.) and is the location of long-term Environmental Change Network long-term monitoring and some upland research.

Location: In the Snowdonia mountain range (N. Wales) 21 km from Caernarfon (nearest mainline rail station). Snowdon summit accessible via tourist railway

Ecosystems: Alpine

Research topics: animal ecology; aquatic ecology; stream ecology; biodiversity; ecosystem ecology; ecosystem service; plant ecology; vegetation dynamics; terrestrial ecology; atmospheric chemistry; biogeochemistry; depositions chemistry; soil chemistry; soil solution chemistry; water chemistry; environmental science; geology; hydrology; meteorology; climatology; climate change; climate monitoring; geography

Contact(s): Victoria Bowmaker
victoria.Bowmaker@cyfoethnaturiolcymru.gov.uk

All parts of site accessible: No

Infrastructure:

4WD

DEIMS.ID: 8b5da977-eed8-459f-b663-f3835aa0b356

Web links

- http://data.ecn.ac.uk/sites/ecnsites.asp?site=T11

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Disclaimer

Site information in this catalogue was sourced from DEIMS-SDR (https://deims.org/) and has been used with only minor editing. The site information on DEIMS is the responsibility of the site operating organisations, not the catalogue's editors.

Acknowledgements

We are extremely grateful to the many site contacts (unfortunately, too many to list individually) who helped in the production of this catalogue by editing their site records on DEIMS-SDR and by providing feedback on draft pages. We also thank: Christoph Wohner (EAA) for adapting DEIMS-SDR to enable the production of the catalogue; Alessandro Oggioni for producing the map on page 2 and the QR codes throughout the catalogue, and Marjut Kaukolehto for providing feedback on an earlier draft version.

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Key to infrastructure symbols

For full details of site facilities, we recommend checking DEIMS or, better still, contacting the site personnel

Access to site	
All yr	Site accessible all year
2WD	All or most of the site can be reached by regular two wheel drive vehicle
4WD	A four wheel drive / off-road vehicle is needed to access all or most of the site
BOAT	A boat is needed to access all or most of the site
CABLE	Site only accessible by cable car
FOOT	Site only accessible by foot
SC	Snow is cleared from site (or snow clearing equipment is available)

Transport provided at site	
2WD	Two wheel drive vehicle available
4WD	Four wheel drive/off road vehicle available
BOAT	Boat available
SM	Snow mobile available
HELI	Helicopter available

Accommodation facilities at site	
Beds	Lodging available
SR	Staff room at site

Where accommodation is not listed as available at the site, there may be local hotels or B&Bs. Refer to DEIMS for details

Research and monitoring infrastructure at site	
°C	Temperature-controlled container
Aqua	Aquatic monitoring buoy or marine platform
T: can	Measuring tower in canopy
T: <10m	Measuring tower less than 10 m above canopy
T: >10m	Measuring tower more than 10 m above canopy

Electrical power at site	
Power	Permanent power - no details
Power - Dist	Permanent power - distributed across site
Power - Central	Permant power - available at a central location

For some sites, additional symbols indicate the quantity of power available (kW)

Data transmission at site	
Data: Int	Data transmission within the site
Data: Ext	Data transmission from the site

Before visiting a site

Whilst many eLTER sites welcome visiting researchers, please always contact site staff first to arrange your visit.

eLTER Site Catalogue

Long-Term Ecosystem Research (LTER) is an essential component of world-wide efforts to better understand ecosystems and the environment we belong to and depend on. Through research and long-term observation of representative sites in Europe and around the globe, LTER enhances our understanding of the structure and functions of ecosystems, which are indispensible for people's life and well-being.

This catalogue presents 150 European eLTER Sites (foci for long-term ecosystem observation and research) and eLTSER Platforms (large areas facilitating socio-ecological research), forming about a third of the total European sites.

Each site is described in one page, providing a description of the site, the main ecosystems represented, the site's research purpose(s), its location, research topics and the facilities available to support research. The catalogue is illustrated throughout with photographs from the sites.

The eLTER Sites and eLTSER Platforms featured in the catalogue are distributed across 22 European countries and were included in the Horizon 2020 eLTER project (Integrated European Long-Term Ecosystem and Socio-Ecological Research Infrastructure, 2015-2019), a collaboration between LTER-Europe and the European Critical Zone Observatories.

The aim of this catalogue is to showcase the wide range of eLTER Sites and eLTSER Platforms in Europe, and to attract prospective researchers to use the sites for research, either in-person or by accessing the many environmental datasets available.

The eLTER Site Catalogue is based on, and links with, the extensive metadata on global LTER sites available via the Dynamic Ecological Information Management System Site and Dataset Registry (DEIMS-SDR), https://deims.org/.