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ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
REVERSE

UIC is seeking solutions and best practice to manage rail lineside in a way that can help **halt and reverse the loss of biodiversity**.

This poster provides information about Theme 1:
"Where companies have had an active role in the development of national strategies for biodiversity."

GERMANY

The Strategy for the exemplary consideration of biodiversity concerns for all federal land is a "Subsidiary Strategy" of the German National Strategy on Biodiversity (NBS). Therefore, the objectives of the NBS were directed at all public sector actors, who should take a pioneering role.

THE SOLUTION

- *Crossing aids in noise barriers – DB builds small-animal passages in noise barriers as crossing aids along railway lines. Such culverts are built wherever it is necessary for the reasons of species protection, for example for reptiles.*
- *Bird protection on overhead contact lines – DB is leading a working group consisting of representatives of environmental associations, the Federal Railway Authority and the BMU as well as DB technicians is working on solutions, to make the overhead contact line systems bird-safe. Measures for both existing and new construction and upgrading are considered.*
- *IT support for compensation obligations – at DB the process chain from planning and implementation to the permanent maintenance of compensation obligations is supported seamlessly by an IT tool ("Fachinformationssystem Naturschutz und Kompensation" - FINK for short). In this way quality in the implementation and maintenance of compensation measures is significantly increased*
- *DB's own protected area documentation contains GIS data on protected areas in accordance with the Federal Nature Conservation Act and the Federal Water Act. In this way, nature conservation issues can be identified at an early stage and taken into account in the planning process.*
- *Guides and information sheets on invasive species have been developed at DB. According to internal regulations, these are generally controlled non-chemically. Methods such as mowing, mulching or staking are described.*
- *Environmental education –The training measures at DB are not only aimed at the company's environmental experts but are also offered to all employees in a target group-specific manner. The aim is to bring the topic of biodiversity to the attention of a broader workforce.*

Outcomes

The Strategy for the exemplary consideration of biodiversity concerns for all federal land (StrÖff) was adopted by the Federal Government (link). The measures fixed within the StrÖff were monitored. Hence a benefit for biodiversity was yielded.

Keywords: National Strategy,

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France

In France, the consideration of watercourses in linear infrastructure projects has long been limited to the study of hydraulic issues and the consideration of flood risks. As a result, their crossing and development have been carried out in such a way as to ensure the sustainability of the projects without really taking into account other issues related to aquatic environments, in particular the biological functions they provide wildlife movement corridors, reproduction preferential, food, shelter or resting places for many terrestrial animal species.

THE SOLUTION

Several laws have enriched this purely hydraulic approach to river crossings and promote the regeneration of ecological continuity within these infrastructures, through the installation of structures adapted to environmental issues and hydraulic risks.

With the help of a specialized consulting firm, we launched a study in three stages on the entire rail network:

- *First stage: A national inventory of engineering structures that may constitute obstacles to the ecological continuity of watercourses.*
- *Second step: Development of a method for prioritizing work according to the type of means to be implemented for compliance work.*
- *And third step: the establishment of a national action plan to steer and organize the work region by region, accompanied by a mapping tool.*

Outcomes

We are currently at the end of the first stage, the second stage should start soon with the definition of the prioritization criteria.

Keywords: Aquatic Environment, River Crossing

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TRAFIKVERKET
SWEDISH TRANSPORT ADMINISTRATION

ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
REVERSE

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SWEDEN

The Assessing Biodiversity in Railway Dry Grassland Patches

THE SOLUTION

In Sweden there are about 200,000 ha managed grasslands along linear infrastructure such as power lines, national road network, airports and railways. We know that over 2,000 species of insects and vascular plants have their habitat in a railway environment. Among these species, about 100 are included in the national red list. In this work we present a method to assess, categorize and handle railway environments on a national basis. The method consists of three steps:

- *remote assessment*
- *field visits*
- *biodiversity action plans.*

The remote orthophoto assessment selects railway environments to be visited in field based on a set of parameters such as visible structures and soil characteristics. The next step, field visits, focuses on recording habitats for vascular plants and insects and includes a survey of plant species. The status of 12 pre-defined habitat structures is targeted and assessed in the field. These pre-defined habitats are each represented by a unique combination of flora and fauna, containing one or more protected species. The Swedish 1,400 railway stations have been surveyed for biodiversity potential. The results include that 230 railway stations contain grassland patches with high biodiversity of plants and animals. In total, more than 2,000 species of insects and vascular plants were found to have their habitat in these dry grasslands. About 100 of these are nationally red-listed species, mainly of bees, beetles, butterflies and vascular plants. The survey has also included a method identifying and ranking sites based on nature conservation values. High-ranked railway grasslands are subject to specific biodiversity action plants.

Outcomes

The field visits conclude an overall classification (1-5) based on the biodiversity parameters. The class 4 (low capacity) and 5 (lack capacity) will not be considered for action plans. The railway environments classified to 1 (very high conservation values), 2 (high conservation values) and 3 (moderate conservation value) are subject to a specific action plan. The purpose of these action plans is to secure and develop the biodiversity along the railway environments. So far, these action plans are not connected to other conservation measures, e.g. green infrastructure strategies. Currently, all Swedish 1,400 railway stations have been surveyed. The results show that 230 railway stations include dry grasslands that are high-ranked (1, 2 or 3). Action plans have been produced for a set of railway stations. In 2021 we anticipate finalizing the action plans for the remaining high-ranked stations. We hope that this methodology will trigger a valuation and ranking of the natural assets of railway environments. We further believe that this national survey will push biodiversity issues to be part of the regular management of railways.

Keywords: Ranking, Monitoring, National Strategy

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ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
REVERSE

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This poster provides information about Theme 2:
Proactive management of habitat for rare or protected species

GERMANY

A pair of peregrine falcons repeatedly tried to breed on the bridge pier of an ICE line belonging to Deutsche Bahn AG

SOLUTION

Due to the exposed location, all attempts were unsuccessful. There was a great willingness of employees on site to support the peregrine falcons, a protected and iconic species, in their efforts to build a nest. The required solution had to fulfil several demands. The technical and operational issues, such as inspection of the bridge pillar at any time of the year, should not conflict with the legal requirements of not disturbing the birds' breeding. During numerous discussions between railway engineers and experts from a nature conservation association, all requirements were weighed up against each other. As a result, the inspection schedules were adjusted so that they were outside the breeding season, and, in the case that a spontaneous inspection would become necessary during the breeding season, this should be feasible in consultation with the experts of the nature conservation association.

Outcomes

A nesting platform was installed on the bridge pillar head and since then the peregrine falcons have bred there successfully several times

Keywords: Falcon, Nesting, Inspection

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Finnish Transport Infrastructure Agency

ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE

REVERSE

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FINLAND

The Ecosystem Hotel

THE SOLUTION

FTIA collects knowledge about ecosystem hotel in practice during ongoing railway project at site. The main target is to save the butterflies and the related plants by removing them to safe to ecosystem hotel.

An Ecosystem Hotel offers a sanctuary for a small-scale ecosystem during railway project. The long-term objective is to restore the ecosystem back to the original site after the railway project has been completed. FTIA have prepared this in cooperation with Finnish Environment Institute (SYKE) which is a multidisciplinary research and expert institute, and which created the concept of ecosystem hotel.

Keywords: Butterflies, Ecosystem Restoration, Sanctuary

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Iarnród Éireann Irish Rail

ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
REVERSE

UIC

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IRELAND CASE STUDY

Irish Rail (Iarnród Éireann) are partners in the All-Ireland Pollinator Plan. As part of this, they are creating habitats for vulnerable pollinators throughout the entire railway network, across all 145 stations, and in some cases in collaboration with local community groups

THE SOLUTION

- Developing a planting code to ensure pollinator-friendly flowers are planted within stations;
- Where possible, leaving amenity grassland areas uncut to allow wildflowers to flower.
- Reducing the use of herbicides and adopting various chemical-free weed control methods to promote the floral diversity of platforms and stations.

All-Ireland Pollinator Plan
www.pollinators.ie
Implementation coordinated by the National Biodiversity Data Centre

Keywords: Pollinators, Habitat Creation

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RFI RETE FERROVIARIA ITALIANA
GRUPPO FERROVIE DELLO STATO ITALIANE

ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
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This poster provides information about Theme 2:
"Proactive management of habitat for rare or protected species"

ITALY

The case study concerns the theme of the vegetation management and control under two interconnected aspects, in particular:

- The lack of an internal company procedure to standardize the management practices of vegetation in all the departments present on a national scale in full compliance with the prohibitions imposed by current environmental legislation to protect environment and natural ecosystems.
- The experimentation of innovative methods and systems for the containment of vegetation in order to reduce as much as possible the use of conventional chemical products and to evaluate alternative methods to chemical ones.

THE SOLUTION

In February 2021 RFI issued an internal procedure that provides indications on how to control vegetation in presence of vulnerable areas and protected species.
Chemical methods are forbidden in the following types of area in Italy:

- *Vulnerable areas;*
- *Areas for safeguarding surface and groundwater intended for human consumption;*
- *Sites of the Natura 2000 Network;*
- *Protected natural areas;*
- *Soils in which groundwater is located which can come into contact with the percolating waters of the soil;*
- *Areas inside railway yards, adjacent to railway stations accessible to the population, railway embankments adjacent to inhabited areas or normally frequented by the population.*

Moreover, in order to protect the aquatic environment and drinking water, the human health and natural ecosystems, the company procedure establishes safety distances and methods of distribution of chemical herbicides. Some examples: a creation of an untreated buffer zone, 10 meters from the riverbed of the water bodies; the use of mechanical methods at a distance of less than 30 meters from the areas normally frequented by vulnerable groups (children, old people). In areas where chemical methods are permitted, they are strictly controlled. In particular it's necessary to control "Type" of chemical product, Correct dosage by reducing the quantities, Destination in the environment, avoiding all substances subject to bioaccumulation, persistence as well as leaching and percolation phenomena.
Moreover, in the new tenders, the equipping of rolling stock with vegetation localization and recognition systems is also encouraged in order to reduce the quantities of chemical products and two different types of innovative methods field tests will be starting in the 2022: physical methods and methods based on the use of eco-sustainable chemicals

Outcomes
Vegetation management practices have been standardized, giving space to experimentation with new alternative methods to traditional chemical ones and new systems for reducing the dosage of chemicals products only where strictly necessary.

Keywords: Vegetation, Chemical

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ÖBB

ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
REVERSE

UIC

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This poster provides information about Theme 2:
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AUSTRIA CASE STUDY

During the course of building a new high-performance railway line from Vienna to Salzburg, a 13.3 km system beneath the Vienna Woods was constructed. Excavation material from the tunnel was deposited in an old waste landfill site on Taglesberg in the Vienna Woods.

THE SOLUTION

Crossing Originating in the 1980s, this site did not meet environmental regulations and was a contamination threat to the groundwater in that area. Consequently, the site was registered as an area of suspected contamination. The entire clean-up, restoration and landfill activities took place over a seven-year period (between November 2001 and December 2008). In 2007, 1.1 million tonnes of excavation material were deposited at that site, most of it transported in a very environmentally friendly way using a conveyor belt. All the deposited material was profiled in order to fit into the typical landscape of the Vienna Woods, which is an important recreation area for the inhabitants of the city. In 2005, the region was declared a UNESCO Biosphere Reserve. Due to the zoning of the Biosphere Reserve, the dumpsite has become part of the Biosphere Reserve management zone. Hence, the huge landscape pit of the former waste dump has been transformed into a smooth terrain, ready to become part of the forest again. The whole area has been replanted with plants such as red clover and bur clover that grow roots deep into the ground. Thousands of local trees and bushes have been replanted as well. The reforestation took place, in part, in cooperation with local elementary schools, to keep children in touch with nature and to familiarise them with the transport infrastructure project. The reforestation was

planned and coordinated by the Austrian Federal Forests. Whilst the forest authority required a complete reforestation of the dumpsite (8 ha), biological monitoring over the following years revealed that some sub-areas of the landfill site, especially where forest development did not meet expectations, showed highly valuable transition habitats for rare species of plants, insects, reptiles, amphibians and birds. This monitoring work enabled the retention of this valuable, open biodiverse habitat. The Biosphere Reserve management team will take care of the maintenance programme and organise volunteers for conservation activities

Keywords: Contamination, Restoration, Forest

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NetworkRail

ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE

REVERSE

UK Centre for Ecology & Hydrology

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This poster provides information about Theme 2:
"Proactive management of habitat for rare or protected species"

UNITED KINGDOM

Despite over 50 years of effort to halt its decline, the Large Blue butterfly was pronounced extinct in Britain in 1979. Today the butterfly can be found on 33 sites in the south-west of England. This is a tribute to a large-scale conservation programme underpinned by innovative science and implemented by a determined and broad partnership

THE SOLUTION

In the 1970s, the Large Blue Butterfly became extinct in Britain and was the focus of a reintroduction programme, made more complex because of the symbiotic relationship the butterfly has with a grassland ant (Myrmica sabuleti). In the 1990s, a population was discovered to have spread onto a railway embankment owned by Network Rail. A land slide on this site required major engineering work to be undertaken. A plan was devised by the company and the UK Centre for Ecology & Hydrology (UKCEH) to translocate the Large Blue Butterfly colony and its habitat to two new sites on the lineside. The design of one of the sites included slopes with different aspects and soil depths providing a range of micro-habitats for the ant species to compensate for the effects of climate change in the future. One of the Network Rail sites now boasts one of the biggest populations of Large Blues in northern Europe. For this work Network Rail was awarded the prestigious Marsh Award for conservation.

Outcomes

As In the UK, the partnership is keen to replicate the landscape-scale metapopulations of the butterfly which occupy parts of Somerset. Work is now underway in the Cotswolds, Dartmoor, South Devon, as well as the North Atlantic coasts of Devon and Cornwall. The success of this project led to a major, European-funded research programme, MacMan. It used the approach pioneered by the Large Blue project to understand and then conserve four other species of Large Blue, which exist outside of Britain, across Europe.

Since CEH began work on the project in the 1970s, it has monitored the effect that managing a site for Large Blue habitat has had on other species. It quickly became apparent that other rare species of plants, insects and birds had suffered from the same changes in agricultural practices, and also benefited from scrub management and grazing. Several species listed as endangered have increased dramatically on Large Blue sites, contrary to their national trends. Conserving Large Blues has become a paradigm for insect community conservation.

Keywords: Large Blue Butterfly, Translocation, Habitat

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ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
REVERSE

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This poster provides information about Theme 3:
"Mitigation for impacts of operation on species (collision, electrocution, etc.)."

AUSTRIA

Vehicle wildlife collisions (WVC) on railroads and roads. In railway networks and high-speed roads, current systems still are not applicable. The main limitations are the missing functionality during daytime and higher speed operation capability for road and rail traffic.

THE SOLUTION

Crossing a R&D project call has been launched in 2017 by ÖBB-Infrastruktur AG as the manager of the major part of the Austrian railway network, together with ASFINAG as the manager of the national highway-network. The research platform used has been provided by the Austrian Research Promotion Agency in the course of the so-called transport-infrastructure research facility.

The call was awarded to a consortium made up by a company developing wildlife deterring devices (iPTE Traffic solutions), the Austrian Institute of Technology (AIT), responsible for the laboratory testing of light and sound effects of the devices and WWN-Forstner, an acknowledged expert for wildlife and biosphere projects, in charge of the field work and monitoring.

WiConNET brought together all the relevant stakeholders (government, road, rail and highway operators, wildlife experts, industry and research) to tackle the subject. Additionally, an international board of experts. R&D project started in 2018 and should have been finalized in 2021.

The WiConNET project is basically a WVC research and development project, but also includes a test and certification laboratory for WVC equipment and finally deploys 16 large test sites all across Austria. Five of these test sites are located at the railway network at different types of lines from regional lines with a maximum speed of less than 100 km/h to so called high-performance lines with a maximum speed of 230 km/h.

The main goal of the WiConNET Project is to improve the efficiency of today's WVC systems by implementing a wireless communication and networking capability and to extend the applicability WVCA systems towards railways and highways. The system should also be cost efficient to enable a large-scale deployment. Wildlife monitoring was planned to be performed by physical observations, by monitoring with IR-illuminated wildlife cameras, by thermo cam and, as an option, with a special wildlife tracking collar.

Outcomes

Due to delayed installations of the devices and the complicated circumstances of the C19 pandemia, the project progress did not develop as has been planned. Only at the end of 2022 all the 16 test-sites have been equipped with the wildlife deterring devices WDD. Therefor the consortium offered to prolong the project period and will continue their survey until the end of 2022.

Keywords: Collision, Mitigation

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SBB

ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
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This poster provides information about Theme 3
Mitigation for impacts of operation on species (collision, electrocution, others?)

SWITZERLAND CASE STUDY

Enhancing the crossing for amphibians and monitoring the impact

THE SOLUTION

- *Deepening the ballast between each 11th and 12th sleeper (or even more frequent) and Installing amphibian plats at the inside and outside of the rail at two sides: a) Canton Waadt between Yverdon and Yvonand, section of about 1.5 km with one rail (deepening ballast since 2017, installing plats early 2021), b) Canton Aargau closed to Oberrüti early 2021, section of 900 m with two rails.*
- *The installation was done by SBB*
- *The manufacturing of this plats has been developed by the cantonal department of nature protection of Aargau (further information here, video of installation)*




- *The 2-year monitoring whether the amphibian cross better the rails has been funded and mandated by the national department of environment (BAFU) to the national coordination platform for amphibian and reptils karch. The monitoring was then conducted by WLS GmbH.*
- *The national department of transport authorised this system (no adverse impact on rail topography)*

Outcomes

- *Faster and more directed crossing of amphibians*
- *No observation that amphibians died due to the air pressure of the train*
- *The final report should be available at the end of 2021 and acknowledged by BAFU.*

Keywords: Amphibians, Crossing, Monitoring

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This poster provides information about Theme 3:
Mitigation for impacts of operation on species (collision, electrocution, etc.)

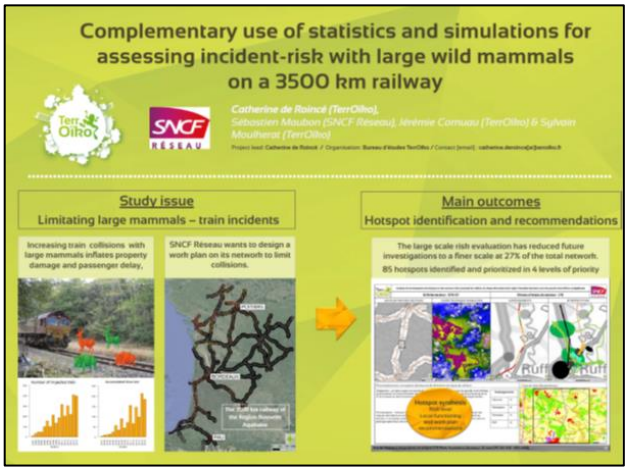
FRANCE

The SNCF Réseau is the French company managing the national railway network. Since about 5 years, the group has declared that the reduction of wildlife collisions with trains will be one of its first priority for actions.

THE SOLUTION

To achieve both these objectives the territorial production units have worked on global strategies to identify and prioritize actions to reduce their collision hot-spots. In the New Aquitaine region (southwestern part of France), Incidents (collisions and wanderings) with large mammals (roe deer, wild boars, and deer) account for 30% of train incidents with animals. For security reasons, each collision necessitates the immobilization of the train for inspection, and therefore delays for the passengers and repairs and compensation costs for SNCF Réseau. Over the 2005-2016 period, the number of incidents increased by 235% (30 to 101 incidents), resulting in a 700% time-lapse increase (from 30 hours to 200 hours). This trend is likely to continue due to the increased populations of large mammals reported in France (e.g., +300% deer in 20 years).

Manager of 3500 km of railway in this region, SNCF Réseau seeks to design a development programme of these lines to limit the number of incidents.



For this, SNCF Réseau commissioned TerrOïko a large-scale mapping of the risk of collision on its network. The study aims to target hotspots with high potential for incidents to reduce the scope of investigations at a smaller scale and to define the nature of the work to be done. To this aim, TerrOïko has developed an analysis method consisting of crossing data on the location of the incidents reported by the drivers and demographic and displacement data of large mammals in order to map the hotspots and to prioritize them. The collision data were analysed by the statistical method of Generalized Additive Model (GAM) and the displacement data were obtained by the SimOïko simulator.

Outcomes

At the end of this work, 85 hotspots were identified and prioritized in 4 levels of priority. This pre-diagnosis reduces future investigations to a finer scale at 941 km or 27% of the total network. In each sector, the finer analysis of the simulated movements makes it possible to define the nature of the actions to be considered in order to reduce the passage of animals: fences, landscaping, passage to wildlife, etc.

Keywords: Collision, Mitigation

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ProRail

ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
REVERSE

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This poster provides information about Theme 3:
Mitigation for impacts of operation on species (collision, electrocution, others?)

NETHERLANDS

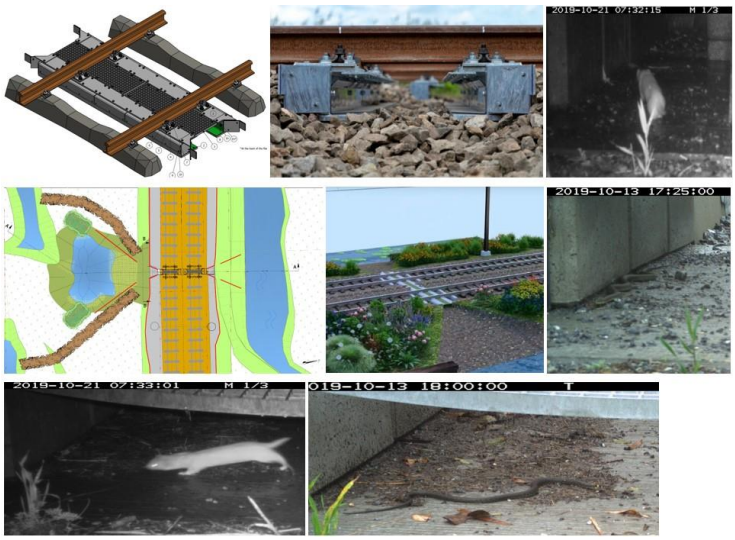
ProRail researches new ideas for fauna facilities, so animals can cross our railways easier and safer. This year we are finishing a test with what we call the principle of "Fauna Track Passage", in the form of de "Dwarsligger FaunaPassage" (Sleeper FaunaPassage).

THE SOLUTION

This field test is a collaboration between ProRail, engineering firm Movares and the province of "Noord-Holland". The passage consists of modified sleepers with a plastic grid between them and a lowered path of fine fraction of ballast, which enables small animals such as frogs, snakes and toads to safely cross the network below the tracks. If more small animals can cross the tracks safely, more habitats are connected and more genes are mixed. Which in turn keeps populations bigger and stronger and thus nature will stay and/or become more divers.

The project is related to our assets of railway embankment, trackbed and railway tracks.

1. *The "Dwarsligger FaunaPassage" (DFP) starts on/in the railway embankment with conductive devices such as vegetation and screens for animal guidance to the DFP.*
2. *Then the DFP crosses the trackbed and the safety path besides it by sort of a little tunnel consisting of concrete walls topped with a plastic grid.*
3. *This little tunnel runs out into an empty space between to steel, H-shaped sleepers (also topped with a plastic grid to ensure sufficient light enters the construction).*
4. *The other end of the tracks is then a mirror image of points 1 and 2 above.*



Outcomes

The test is to be ended in September 2021, but within a month from the start in August 2019 the intended animals (and more) started to actively and successfully use the "Dwarsligger FaunaPassage". They have done so ever since. Monitoring is done with wildlife cameras on site, and the animals on the collected images are identified by an ecologist

Keywords: Passage, Fauna, Amphibians

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ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
REVERSE

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This poster provides information about Theme 4:
"Management for control of invasive non-native species

AUSTRIA

Railway embankments and other infrastructure properties often act as corridors for invasive alien species. In some cases, such as Japanese knotweed, conventional vegetation management using machinery can worsen the problem by transferring seeds and roots from one site to another

THE SOLUTION

In 2014, ÖBB-Infrastruktur AG initiated a pilot project to control Japanese knotweed by grazing with goats and sheep. Following double fencing to prevent the livestock escaping, the railway embankment was grazed as additional pastureland for a local organic farmer. The grazing keeps the Japanese knotweed from spreading and saves the money that would otherwise have been needed for disposal of the cut material.

Outcomes

This has benefitted biodiversity, generated local income for the farmer through regional products, and provided positive media stories.

Keywords: Invasive species, grazing

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ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
REVERSE

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This poster provides information about Theme 5:
Robust, cost-effective and safe methods for collecting data (to establish a baseline)

GERMANY CASE STUDY

In order to assess the traffic safety of vegetation along railway lines, DB Netz AG - Group subsidiary DB Fahrwegdienste has arranged for a Geographical Information System to be set up to record and manage the flora

THE SOLUTION

This system, "Digitales Management von Geodaten aus den Sparten UPM und Vegetation durch das Fahrwegdienste Fachinformationssystem" (FaFIS)[1] also records invasive alien species.
During regular inspections of the vegetation in the immediate neighbourhood of railway lines, the inspectors collect data on a tablet device. The following species have been recorded: Japanese knotweed (Fallopia japonica), giant hogweed (Heracleum mantegazzianum), ragweed (Ambrosia artemisiifolia), Himalayan balsam (Impatiens glandulifera), tree of heaven (Ailanthus altissima) and ragwort (Senecio jacobaea).

A timestamp is automatically set when the process is started. Other information collected includes spatial information, such as route kilometres and regional jurisdiction within Deutsche Bahn.
In addition to the identified species, there is further information on the spatial extent and size of the plants found, which in some cases is supplemented by photos. Furthermore, information on the accessibility of the site for machinery as well as information on legal obligations is provided. These may result from both operational and traffic safety. Finally, in addition to advice on safety measures, suggestions are made on vegetation control measures to be taken.

Outcomes

In order to assess the traffic safety of vegetation along railway lines, DB Netz AG - Group subsidiary DB Fahrwegdienste has arranged for a Geographical Information System to be set up to record and manage. This system (Fahrwegdienste Fachinformationssystem, short FaFIS) also records invasive alien species.

Keywords: GIS, Flora, inspection

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HS2

ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
REVERSE

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This poster provides information about Theme 5:
"Robust, cost-effective and safe methods for collecting data (to establish a baseline)"

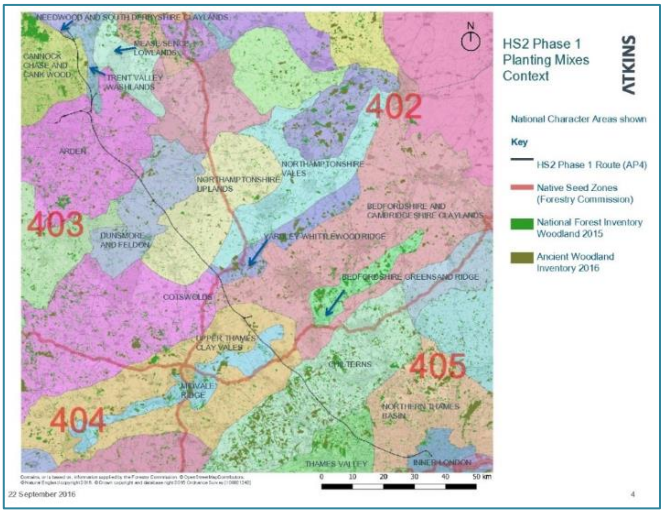
UNITED KINGDOM

How HS2 uses integrated asset information management in a BIM environment.

THE SOLUTION

In January 2018 HS2 Ltd. took an important first step with the planting of 23,000 of up to 7 million trees along the first stage of the project in the West Midlands. By the end of the 2019/20 planting season this figure had risen to over 500,000 trees and shrubs. Before it comes into operation, Phase 01 of the HS2 Project intends to create around 650 ha of new woodlands, to provide new habitats, screen communities and blend the new line into the landscape. This huge task is fully integrated with the construction programme, utilising integrated Asset Information Management to efficiently collect and manage information throughout the build and operation of HS2.

Using BIM to achieve HS2 aims is enabled through integrated design, which, in turn, improves supply and construction coordination, and informs management and maintenance of assets throughout the Project's lifecycle. During Scheme Design, the efficient management of data within a Common Data Environment has helped reduce potential impacts arising from construction by, for example, recording baseline information to minimise the loss of existing trees and hedgerows and validate the design decisions. Such benefits extend through the Detailed Design and Construction stages.



The quality of data capture and the use of a Common Data Environment to integrate datasets from across the environmental and engineering disciplines. This has improved early design decision making that influences land management. Cost efficiencies are delivered by enabling HS2 Ltd. to plan, construct and manage soils, landscape, and woodland assets throughout the lifetime of the project.

Outcomes

This baseline information enables efficient and stable transfer of design data between contractor's design teams. This data has been used to work with stakeholders to develop the Green Corridor strategy and of habitats, access and recreational opportunities that is delivering benefits to communities along the route which link up with those delivered by HS2.

Keywords: BIM, data collection

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Iarnród Éireann Irish Rail

ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE

REVERSE

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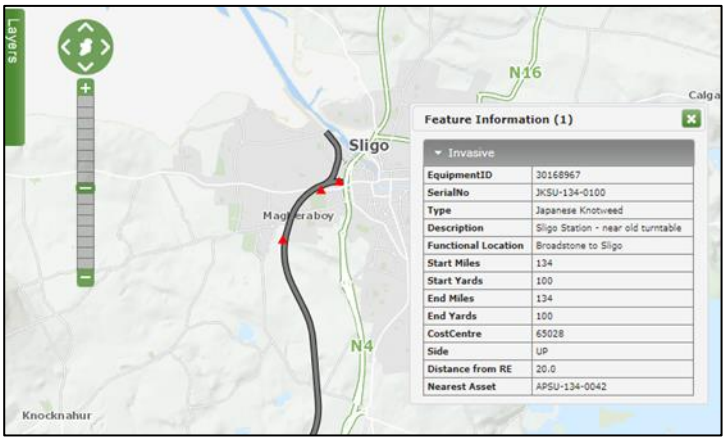
This poster provides information about Theme 5:
Robust, cost-effective and safe methods for collecting data (to establish a baseline)

IRELAND CASE STUDY

Irish Rail (Iarnród Éireann) carry out regular surveys of their lineside environmental assets to identify any signs of infestation by invasive alien species.

THE SOLUTION

A standard recording sheet is used to describe the infestation, including species, location, mileage and if there is any potential damage to nearby assets or third party property. The information is added to the internal GIS system (IAMS) where it can be combined with other spatial data layers, viewed by engineers prior to projects and highlights treatment planned or previously carried out. In this way it is possible to efficiently plan management action and track their effectiveness over time.



Keywords: survey, infestation, GIS

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ProRail

ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
REVERSE

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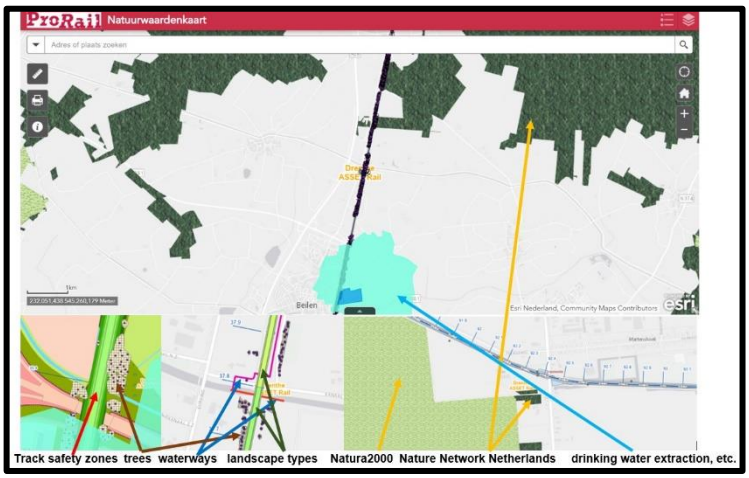
This poster provides information about Theme 5:
"Robust, cost-effective, and safe methods for collecting data (to establish a baseline)"

NETHERLANDS

Every 5 years, ProRail instruct ecological survey companies to conduct a "Nature value research" (field research) of the entire Dutch Railway network and our surrounding properties. The research is done on plants, animals, a selection of invasive species and fauna facilities and the result of this research is used for a broad variety of projects and registrations.

THE SOLUTION

- *We upload the results to our "national database flora and fauna" (NDFF), so all users of this database in the Netherlands can see and use this data*
- *The results are used as input for building projects and maintenance actions*
- *The results are input for our program "Meer Natuur in de Berm" or MNiB in short (which stands for: "More Nature on the Verge").*



THE PRINCIPLES

1. *Vegetation > where and how much of which 'green assets' do we have to manage;*
2. *Biodiversity > what do and/or can contribute these 'green assets' to biodiversity (and following that question: which maintenance requirements do we need to contract for these 'green assets' to promote biodiversity.*

Outcomes

As more and more information on our 'green assets' is becoming available and get combined into better maps, we are able to make better and more specific plans on where and how to manage our 'green assets' in ways better suitable for promoting biodiversity.

Keywords:: Research, vegetation, Biodiversity

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UNITED KINGDOM

Network Rail in the UK are working in collaboration with the UK Centre for Ecology & Hydrology to develop a fully autonomous biodiversity monitoring station for deployment on the lineside.

THE SOLUTION

As shown in figure 1, the station is solar powered and comprises acoustic sensors for birds, bats and crickets. It also operates a light trap to monitor moths and camera traps for small mammals and large mammals. The data is automatically analysed using image and sound recognition algorithms. The station also collects detailed weather data which are of interest to both ecologists and rail infrastructure managers. The data is continuously transmitted to the data server using the 4G mobile phone network.

(Figure 1: Autonomous biodiversity monitoring station on the lineside (left), Small mammal camera trap (right), © Network Rail)

Keywords: Collision, Mitigation

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ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
REVERSE

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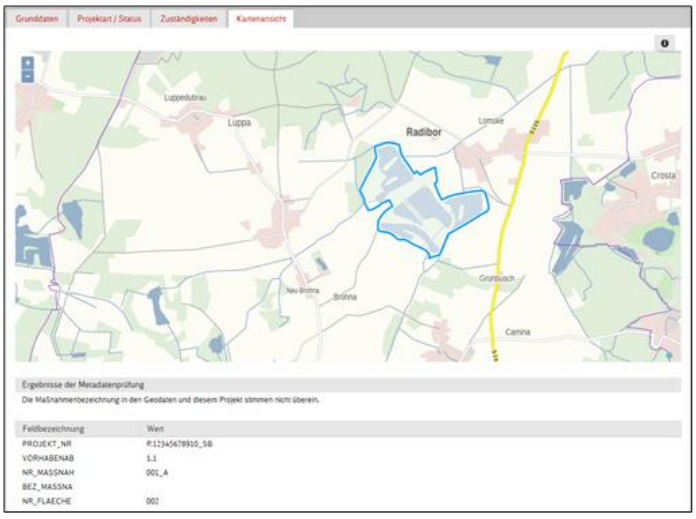
This poster provides information about Theme 6:
"Organisational KPIs, and ideally where these have evidence of biodiversity gain"

GERMANY

Within the scope of construction measures, Deutsche Bahn must provide compensation measures. These are planned/implemented in the construction project and must be maintained and cared for in regular operation over several decades. In the planning, implementation and maintenance of nature conservation compensation measures, there are many parties involved in the DB Group and frequent changes in personnel and responsibilities. It must be ensured that all information is available to those involved. In addition, Deutsche Bahn must make the information on the compensation measures available to the approval authorities.

THE SOLUTION

All data on nature conservation compensation measures are recorded in the Group-wide IT tool "Fachinformationssystem Naturschutz und Kompensation" (FINK). The measures are documented and accompanied in the application throughout the entire process, i.e. from planning to implementation and maintenance.



Outcomes

Our employees as well as external environmental planning offices can call up the current status of a compensation measure at any time.

The system standardises the entire environmental planning process and makes high-quality management of compensation areas possible. At the same time, FINK is used to create documents for authorities.

Keywords: Conservation, Measures, indicators

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NetworkRail

ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE

REVERSE

UIC

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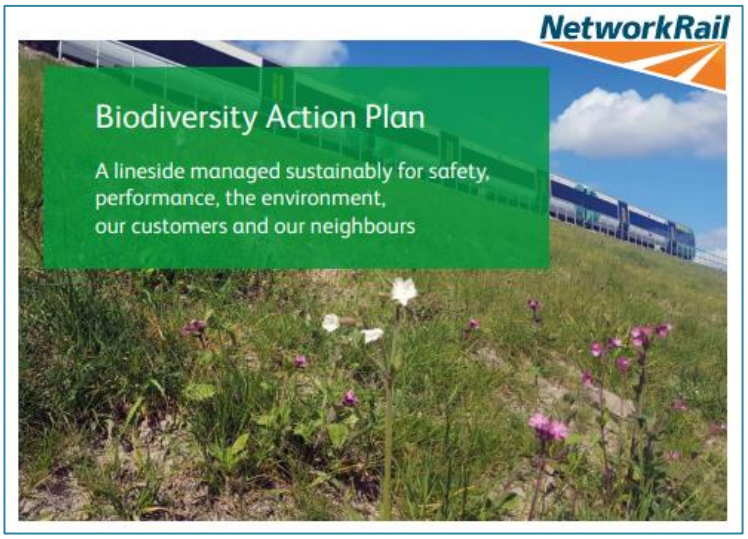
"Organisational KPIs, and ideally where these have evidence of biodiversity gain"

UNITED KINGDOM

In 2020 Network Rail in the UK published their Biodiversity Action Plan. This committed the company to a series of time-bound, meaningful and measurable biodiversity targets:

SOLUTION

- *2021: Publish new biodiversity standard to help us better care for plants and other wildlife.*
- *2024: Collect baseline information about our diverse railway habitats so that we can manage them effectively. + Run a reliable railway and look after all existing plants and wildlife on our land in a way that causes no net loss of biodiversity.*
- *2035: Increase levels of biodiversity near the railway by creating new habitats or managing invasive weeds. + Lead the way in land management, advising others on how to manage and increase biodiversity.*



Keywords: Conservation, Measures, indicators

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ÖBB

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ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
REVERSE

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This poster provides information about Theme 6:
"Organisational KPIs, and ideally where these have evidence of biodiversity gain"

AUSTRIA CASE STUDY

During the course of building a new high-performance railway line from Vienna to Salzburg, a 13.3 km system beneath the Vienna Woods was constructed. Excavation material from the tunnel was deposited in an old waste landfill site on Taglesberg in the Vienna Woods

THE SOLUTION

Crossing Originating in the 1980s, this site did not meet environmental regulations and was a contamination threat to the groundwater in that area. Consequently, the site was registered as an area of suspected contamination. The entire clean-up, restoration and landfill activities took place over a seven-year period (between November 2001 and December 2008). In 2007, 1.1 million tonnes of excavation material were deposited at that site, most of it transported in a very environmentally friendly way using a conveyor belt. All the deposited material was profiled in order to fit into the typical landscape of the Vienna Woods, which is an important recreation area for the inhabitants of the city. In 2005, the region was declared a UNESCO Biosphere Reserve. Due to the zoning of the Biosphere Reserve, the dumpsite has become part of the Biosphere Reserve management zone. Hence, the huge landscape pit of the former waste dump has been transformed into a smooth terrain, ready to become part of the forest again. The whole area has been replanted with plants such as red clover and bur clover that grow roots deep into the ground. Thousands of local trees and bushes have been replanted as well. The reforestation took place, in part, in cooperation with local elementary schools, to keep children in touch with nature and to familiarise them with the transport infrastructure project. The reforestation was

planned and coordinated by the Austrian Federal Forests. Whilst the forest authority required a complete reforestation of the dumpsite (8 ha), biological monitoring over the following years revealed that some sub-areas of the landfill site, especially where forest development did not meet expectations, showed highly valuable transition habitats for rare species of plants, insects, reptiles, amphibians and birds. This monitoring work enabled the retention of this valuable, open biodiverse habitat. The Biosphere Reserve management team will take care of the maintenance programme and organise volunteers for conservation activities

Keywords: Re-forestation, reserve

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This poster provides information about Theme 7:
Stakeholder engagement and how this has resulted in biodiversity gain

AUSTRIA CASE STUDY

The federal state government of Upper Austria approached ÖBB-Infrastruktur AG with the suggestion that the nature protection authority takes over the landscape management of specific railway sites that are home to rare species of plants and animals

THE SOLUTION

The authority agreed to fund landscape management measures in order to protect and enhance valuable habitats. The nature protection authority subcontracted the practical work to landscape management companies, whose staff had to undergo the necessary safety training.

Outcomes

The To date, 33 sites with a total area of 4.5 ha in Upper Austria have been selected to be managed in this way.

Keywords: Nature Protection Engagement

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This poster provides information about Theme 7:
"Stakeholder engagement and how this has resulted in biodiversity gain"

France

Since September 2021, SNCF Réseau has been involved in standardization processes in France and internationally.

THE SOLUTION

In France, we participate in groups of experts on biodiversity within the framework of 2 standards currently being developed:

- *"Biodiversity and ecological engineering - Methodology for carrying out a project*
- *"Biodiversity and ecological engineering - Project management methodology*

In 2022, we will also participate in the construction of international standards - ISO TC 331 Biodiversity, within ad hoc group number 2 "Measurement, data, monitoring and evaluation"

Keywords: Standardisation

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ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
REVERSE

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WWF & UIC

In 2020 UIC signed a memorandum of understanding (MoU) with WWF Central-Eastern Europe to promote environmentally conscious rail transport in Central and Eastern Europe by enhancing cooperation between stakeholders.

THE SOLUTION

Crossing In particular, this MoU aims strengthen partnership working in the region of Central and South-East Europe, known as the Green Heart of Europe, and act as a catalyst to promote this approach globally. The partnership between UIC members and WWF-CEE has established a dialogue and knowledge sharing in domains of common interest, including management of landscapes for ecological connectivity and corridors. The REVERSE project meetings also provided a forum for members of the UIC-CEE partnership to share the latest outcomes of research and monitoring , including European projects, such as TransGreen and BISON. As such, this partnership has helped to identify and promote some of the many practical solutions urgently needed to secure a living planet for people and nature. For more information, consult the website: link

"Travel by train is one of the more environmentally friendly modes of travel in terms of energy efficiency and emissions - anywhere between ten to 20 times less polluting than air travel."

Andreas Beckmann, CEO of WWF-CEE

"A holistic approach is necessary if the railway is to be the champion of transport."

François Davenne, General Director of UIC

Keywords: Engagement, Collaboration

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ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
REVERSE

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This poster provides information about Theme 8:
"Good practice in the management, accessibility, and use of Data"

France

In 2021, SNCF wrote a guide for the installation of fences, intended for field agents. The primary objective of this guide is to facilitate the implementation of fences with regard to various criteria in order to improve rail operations by integrating all the issues:

- Safety and security issues (risk of collision, intrusion, etc.)
- Landscape integration (heritage, noise, co-visibility)
- Ecological continuity
- Administrative and regulatory constraints
- Maintenance of green borders and opportunities to optimize it
- The configuration of the infrastructure and the technical limits of the fence

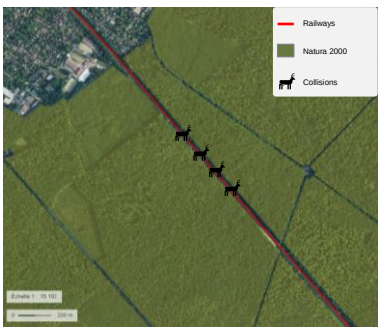
THE SOLUTION

SNCF aims to provide:

- *a simple and rapid analysis of the sites at risk in their surrounding context in order to identify priority areas for development.*
- *a choice of simple measures adapted to each situation and each site, and as far as possible at a lower cost*

This guide is currently being tested on a section through the forest of Fontainebleau, near Paris. This field is interesting because it presents many problems:

- *due to the high number of collisions recorded on this section*
- *because it is identified as a reservoir of biodiversity on a regional scale. It is also classified Natura 2000 area and biosphere reserve.*



The region is also of significant landscape and cultural interest, as the railway section is one of the first French railway lines. It was used to bring the nobility of the 19th century to observe the landscape painters of Barbizon. Thus, the forest of Fontainebleau is at the origin of the first measure of protection of nature and landscapes in France: in 1861, the first "artistic series" are created by Imperial Decree, under the pressure of writers like Victor Hugo and painters of the Barbizon school.

Outcomes

These multiple issues are taken into account by the "Guide to fences" and condition the location and type of fences that will be installed, as well as the wildlife facilities that are planned, such as the improvement of the two road bridges and bridges railways that border this railway section.

Keywords: Fences, Landscape, Safety

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TRAFIKVERKET
SWEDISH TRANSPORT ADMINISTRATION

ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
REVERSE

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This poster provides information about Theme 8:
"Good practice in the management, accessibility, and use of data"

SWEDEN

The Swedish Transport Administration has developed a methodology for classifying and identifying stations with high biological diversity.

THE SOLUTION

There are about 1,400 railway stations or designated stops on the Swedish rail network. The Swedish Transport Administration has developed a methodology for classifying and identifying stations with high biological diversity. There are 237 railway stations that are classified as having high biological diversity, some of which are being managed according to the template that has been developed.

The Swedish Transport Administration has also looked at all the bridges and pipes associated with water courses based on knowledge from county administrative boards, and surveyed for medium-sized mammals, such as otters, foxes and badgers.

655 bridges and pipes that may act as barriers to the movement of these species were identified. Of these, 85 have been mitigated and the bridge and pipe has been adapted so that the animals can cross the railway without risk of collision. In addition, an inventory of some pilot areas concluded that 110 of the pipes that are placed in watercourses are barriers for aquatic organisms. Of these 27 have been adapted to date.

Outcomes

The field visits conclude an overall classification (1-5) based on the biodiversity parameters. The class 4 (low capacity) and 5 (lack capacity) will not be considered for action plans. The railway environments classified to 1 (very high conservation values), 2 (high conservation values) and 3 (moderate conservation value) are subject to a specific action plan.

The purpose of these action plans is to secure and develop the biodiversity along the railway environments. So far, these action plans are not connected to other conservation measures. Currently, all Swedish 1,400 railway stations have been surveyed. The results show that 230 railway stations include dry grasslands that are high-ranked (1, 2 or 3). Action plans have been produced for a set of railway stations. In 2021 we anticipate finalizing the action plans for the remaining high-ranked stations. We hope that this methodology will trigger a valuation and ranking of the natural assets of railway environments. We further believe that this national survey will push biodiversity issues to be part of the regular management of railways.

Keywords: Biological Diversity Classification

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ÖBB

ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE
REVERSE

UIC

UIC is seeking solutions and best practice to manage rail lineside in a way that can help **halt and reverse the loss of biodiversity**.

This poster provides information about Theme 9:
Training of staff in biodiversity relevant skills or knowledge

AUSTRIA CASE STUDY

Biodiversity has not been touched as a topic in the original environmental training courses that have been offered to the staff before 2010. Traditionally environmental training was primarily focussing on waste management, contaminated sites or energy management.

THE SOLUTION

In 2010 a new internal training format, called "railway ecology" has been started. It´s a 3 days seminar, 2 days indoor 1 day outdoor, that touches many environmental and sustainable development related topics, in the context of railway planning, building, maintenance and operation. Biodiversity and the understanding of the value of nature and ecosystem services are one important focus of the seminar. Specificly the outdoor day, which is dedicated to landscape management in order to foster biodiversity of the sites deemed to be very valuable to transport the idea of nature protection and the crucial role of biodiversity.

Outcomes

The More than 200 participants from almost all different departments and fields of the company. Excellent feedback from the participants (grade 1,4 – 5 been the worst), Network of colleagues all over Austria, that have ambitions to integrate sustainability issues and biodiversity into their daily business.
The training course "railway ecology" was awarded with the UNESCO certificate during the UN decade of education for sustainable development, in 2014

UN DECADE OF EDUCATION FOR SUSTAINABLE DEVELOPMENT
DÉCENNIE DES N.U. POUR L'ÉDUCATION EN VUE DU DÉVELOPPEMENT DURABLE
2005-2014

Ausgezeichnet von der
Österreichischen UNESCO-Kommission

Keywords: Training, Biodiversity, Railway Ecology

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This poster provides information about Theme 10:
"Examples of companies undertaking or commissioning biodiversity research"

AUSTRIA

Twelve tunnels along the Tauernbahn railway line in Carinthia, Austria were abandoned due to the relocation of the main tracks.

SOLUTION

As part of the ÖBB initiative "Green Points", a project was launched to investigate the function of the tunnels as habitat for bats. Furthermore, measures for improving the surrounding habitat quality for bats were planned and put into action.

To obtain information about temperature and humidity conditions, data loggers were placed in the tunnels. Because different bat species have different temperature requirements for their hibernation, a detailed knowledge of temperature range and fluctuations is of great importance. The existing use of the tunnels by hibernating bats was checked visually during the winter months. During summer, automated recording devices for recording bat calls were used, as well as mist netting in front of the tunnels.

So far, six bat species have been recorded in the tunnels:

- *Lesser horseshoe bat,*
- *Natterers' bat,*
- *Mouse-eared bat,*
- *Common pipistrelle,*
- *Barbastelle, and*
- *a species of the genus Plecotus.*

Based on these first results, we initiated work to ensure that:

- *the tunnel entrances enabled access for bats and supported the microclimatic conditions aimed for in the different tunnels;*
- *human disturbances in the tunnels were minimised; and*
- *hollow concrete blocks were placed in the tunnels to increase the number of available crevices for bats.*

The effectiveness of these measures and the population trends of the bats will be monitored in the coming years.

Outcomes

The results will provide important guidelines for the improvement of abandoned tunnels as habitat for bats.

Keywords: Tunnel, habitat, bats

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France

Since 2016, SNCF Réseau has launched a "post-glyphosate" program to implement various experiments related to the reduction and discontinuation of several plant protection products. On the edges of the tracks, the vegetation is already maintained by mechanical means. Only the tracks and tracks are still treated by weeding trains, which carry out chemical treatments once or twice a year depending on the vegetation present. Treatment with glyphosate, as a total herbicide, is still today the most used method because it is the most effective for the company.

THE SOLUTION

In this context, SNCF Réseau has joined forces with an agronomic engineering laboratory to finance a test thesis on "seeding selection", in particular on the most problematic roads for vegetation, i.e., service areas used for freight or for parking trains. On these poorly maintained tracks, the ballast has almost disappeared, and the sandy substrate allows the development of pioneer plant species.

In order to prevent the development of these plants, the selected seeding could allow an effective competition of the plants. The species chosen for sowing meet several criteria:

- *the soil and climatic conditions (nature and composition of the soil, resistance to drought, cold, sunshine, etc.)*
- *the constraints of the company (low height, resistance to trampling, low maintenance, etc.)*
- *the industrialization of the process (possibility of sowing, availability of seed suppliers, cost of seeds, etc.)*

The trial protocol consisted of 2 trial sites on which 4 different species mixtures were tested, each on 3 plots corresponding to 3 seeding rates (4 - 8 - 12 g/m²).

Outcomes

- *Initial results show that neither seeding rates nor rail disturbances have an impact on cover rates or vegetation heights.*
- *Moreover, at the 2nd site, the majority of seed mixtures increased gradually, suggesting competition with the undesirable species initially present.*
- *Further tests should confirm these initial results.*

Keywords: research, vegetation

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UK Centre for Ecology & Hydrology

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Examples of companies undertaking or commissioning biodiversity research

UNITED KINGDOM

As part of the rEvERsE project, staff at the UK Centre for Ecology & Hydrology used the Global Biodiversity Information Facility (GBIF) to assess the number of Red List species occurring within 1 km either side of the European rail network

THE SOLUTION

In order to value biodiversity and natural assets, it is important for rail companies to understand where species and habitats occur in relation to their land holdings.

As part of the rEvERsE project, staff at the UK Centre for Ecology & Hydrology used the Global Biodiversity Information Facility (GBIF) to assess the number of Red List species occurring within 1 km either side of the European rail network. GBIF is a publicly accessible database of species occurrences across the world and the 1 km buffer was chosen because rail companies' activities are likely to have some kind of benefit or impact within this zone, especially on species that have been Red Listed because they are rare or declining.

Species group	Number of rare species within 1 km either side of the European rail network
PLANTS	
Ferns and their relatives	63
Flowering plants and conifers	391
Medicinal plants	270
INSECTS	
Bees	255
Beetles that live in dead wood	127
Butterflies	206
Dragonflies	89
Grasshoppers, locusts and crickets	139
MOLLUSCS	
Freshwater snails and shellfish	62
Land-living snails and slugs	62
VERTEBRATES	
Amphibians and reptiles	50
Fish (marine)	85
Mammals	87
Total number of species[2]	**2,302**

2 *Data downloaded from the GBIF database in July 2021 (www.gbif.org) for the rail network across the whole of Europe.*

(Table 1, *Data downloaded from the GBIF database in July 2021 (www.gbif.org) for the rail network across the whole of Europe.)*

Outcomes

As shown in the Table above, the lives of more than 2,300 rare species could potentially be affected by European rail companies.

Keywords: Assessment Red List Species

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