

CITY BIODIVERSITY REPORT: URBAN NATURE IN BONN

SUMMARY

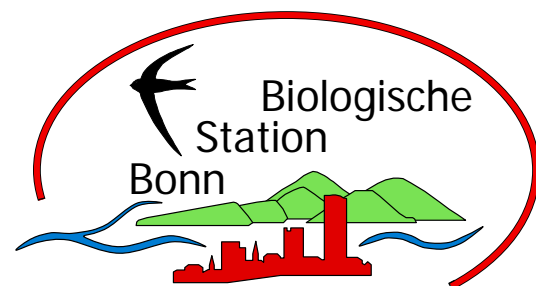
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The UN-City

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Preliminary remark

The first comprehensive biodiversity report for the city of Bonn has now been prepared, within the context of the run-up to the 9th Conference of the Parties to the Convention on Biological Diversity (CBD), which is to be held in May 2008 in Bonn.

In addition to describing the biological diversity found within the Bonn city area, the report outlines the city's strategies for preserving biodiversity – as well as the city's efforts to protect biodiversity at the local, national and international levels, activities that involve far more than simply direct protection of local biotopes.

In the coming years, this report will serve as a basis for developing additional aims relative to scientific study of the city's local flora and fauna, to protection of the city's local biodiversity and to the city's informational and educational efforts.

The present summary provides an overview of the biodiversity report. The long version of the report, which was prepared under the technical direction of the Bonn Biological Station, presents a wealth of additional information, along with pertinent tables and figures and a list of sources and literature.

Short description

In the area that is now Bonn, one finds an extremely wide range of different landscape elements in very close proximity to one another. This landscape basis supports a considerable diversity of habitats and, thus, relatively high biodiversity.

The biodiversity map for Bonn shows how areas of high, medium and low importance with regard to urban biodiversity are spread throughout the city. Areas of high importance for species and habitat diversity are found in riparian meadows and along banks of watercourses, in semi-natural forests, in peripheral grasslands of such forests and in small sections of agricultural lands. Within the city's urban space, species diversity generally decreases as one moves from the city's periphery towards its centre. This pattern has been specifically confirmed for Bonn with regard to plant-eating insects and mites.

The city has Botanical Gardens, which the University of Bonn uses for scientific research, and a range of cemeteries and parks that serve cultural needs. These areas exhibit high levels of – highly anthropogenic – biodiversity. Local biodiversity centres, such as the Rodderberg volcano and the historic Ennert quarries, are now protected geological monuments, with biodiversity being one of the reasons for their protection.

Water pollution that persisted into the 1970s reduced aquatic faunal diversity to a great extent, and aquatic floral diversity to a lesser extent. This situation has been markedly improved through better environmental protection, however. Environmental protection measures have restored much of the diversity lost among fish, bivalves and aquatic snails, dragonflies (species requiring flowing waters) and other insects. As to birds, bans on use of DDT insecticide and other chemicals have proven of decisive importance for a number of birds of prey, while prohibitions against hunting have helped herons, various duck species and raptors.

Last not least, Bonn is rich in protected areas covering a total of 51 % of the city area! Landscape-protection areas cover 39.89 km² or 28 %, nature conservation areas cover 31 km², or 23 % - and 22 % are also FFH areas.

Basic factors pertaining to climate, natural areas and culture

The city of Bonn is located in the southern Lower Rhine Bight. It thus lies within the transition zone between the Subatlantic – i.e. cooler and rainier – climate of north-western central Europe and the Submediterranean to continentally influenced – i.e. warmer and drier – middle Rhine climate. Its annual rainfall amounts to 600–700 mm, with a summer maximum. As a result of its relatively low and protected location, as well as of the buildings and structures it now contains, the Rhine valley is has a milder climate than the surrounding uplands. Its average temperature, at 9.5–10°C, is some 2°C higher than that of neighbouring upland areas.

Situated on the boundary between Germany's central uplands and the Lower Rhine Bight, the Bonn city area naturally harbours a wide range of different landscape elements: the Rhine and Sieg river valleys; the large Kottenforst forest areas; the Waldville and Ennert areas, which are part of the Siebengebirge mountains; a number of small, scattered special biotopes (including wetlands, an extinct volcano and an inland dune).

Located in the Rhine River valley, Bonn and its surroundings have a very long settlement history and are now extremely densely populated. Bonn has a sizeable population, 314,000, corresponding to a density of 2,223 inhabitants per km². Continual population growth in recent decades has led to intensive land use for construction and traffic infrastructure, as well as to intensive pressures on the city's open recreation areas. The Bonn area no longer has any untouched natural areas. At the same time, the city's original natural areas have been supplanted by numerous cultural landscape elements that in some cases are – or used to be – more species-rich than were the natural areas they replaced. That is why this species-rich cultural landscape, which attained a diversity zenith in the 19th century, became an ideal for nature conservation in central Europe. In spite of its dense development, the Bonn city area – especially when its small size is taken into account – still exhibits a high level of species and habitat diversity by central European standards.

Most – but not all – of the Bonn city area is built-up or has a sealed land surface. Considerable open spaces have remained between the city's rows of houses and roads: structures take up only about one-third (46.6 km²) of the city's area. Sealed-land areas, reserved for roads, pathways, squares and other public / traffic infrastructure, take up 16.8 km². Between these developed areas are found some 1,200 green areas, large and small (parks, cemeteries, playgrounds, peripheral strips), that total more than 7 km² – and that complement some 23.6 km² of agriculturally or horticulturally used areas.

All in all, therefore, somewhat less than half of the city's area (45 %) is developed. The remaining city areas consist of about 50 % forest and about 30 % open land. The remaining areas in this perspective consist of parks and green areas (10 %) and other types of areas. In the city's managed forest areas, deciduous forests predominate (55 %), followed by coniferous forests (23 %) and mixed forests (22 %). An additional 7 % of the city's non-sealed areas are taken up by various bodies of water, with the Rhine and Sieg rivers accounting for the great majority of this category of area.

Protected areas and protected habitats

The natural areas within and near cities are subject to strong usage pressures, pressures which can be controlled solely via special area planning and structuring. This is especially true for the city of Bonn, which is surrounded by highly valuable natural areas that, as in the case of the Rheinland and Siebengebirge nature parks, extend into the city area proper. In order to protect such forest areas and habitats from uncontrolled uses, including construction, recreational use, traffic, etc., a total of 71.69 km², or 51 % of the city's area, have been placed under protection. Some areas have been placed within several different protection categories.

Landscape-protection areas: These areas serve the purpose of conserving and developing nature. In such areas, any impairments of natural systems are to be eliminated, and the systems' proper capacities and function are to be restored as necessary. All activities are prohibited that could change the areas' character or counter their special protection purpose. A total of 39.89 km², or 28 %, of Bonn's city area have been set aside as landscape-protection areas.

Nature conservation areas: These areas' purpose is to provide special protection for nature and landscapes. They are set aside with the aims of conserving, developing or restoring biotopes or communities of certain wild animal and plant species. In these areas, priority is given to protection of native plants and animals and their natural habitats. At present, 31 km², or 23 % of the city's area, have been set aside as nature conservation areas; a total of 22 % of the city's area are also FFH areas (see below).

Inner-city biodiversity

To this day, Bonn remains a "green city", with large parks, cemeteries, many tree-lined avenues, countless gardens and generously planted schoolyards and courtyards. An important aspect of the centre of Bonn is that that area's shopping districts, with their tightly sealed ground surfaces, border on green areas and rows of houses backed by quiet courtyards. Apart from the many trees found in private gardens, the city has some 80,000 trees on its municipal land, and over 30,000 of these are in the city centre. In addition, the city harbours a wildly diverse mosaic of small structures, found along roads and railways, in untended gardens, in open plots between structures, on embankments, on old walls and in open drainage ditches. The smallest inner-city habitat structures consist of tree stumps and slices, joints in pavement, cracks in walls, fringes of pathways, facade vegetation and rooftop vegetation. The common features shared by all such habitats are that they are strongly dependent on human impacts, tend to be isolated, tend to appear only in small patches, often survive for only short periods of time and are subject to numerous impairments. The city also harbours a number of animal species that have adapted to such urban habitats. Because of the city centre's mild climate by comparison to the city's environs, warmth-loving plants and animals, including both native species and non-native species, are typical elements of Bonn's inner-city biodiversity.

A number of inner-city parks and cemeteries harbour semi-natural – and, thus, species-rich – habitats with greater structural diversity, larger numbers of older trees and overall greater vegetation density by comparison with surrounding city areas. The Botanical Gardens of the University of Bonn are an outstanding example of an area with high biodiversity located right in the city. In the gardens, which have a total area of 0.065 km² and are surrounded, and isolated, by densely built-up areas and heavily travelled roads, nearly 1,000 beetle species have been found, along with 83 moss species, 74 wild-bee species and about 25 species of breeding birds. The Botanical Gardens, like many centrally located open areas of cities, are also home to a number of new "citizens", including species that have been released and species that have arrived spontaneously. In the past 20 years, the number of lichen species in the area has increased from four to ten.

The list of 219 documented birds lists 108 as breeding birds. Nine other species are considered to be potential breeders in the area. As a result, some 60 % of North Rhine – Westphalia's breeding birds occur in Bonn, and nearly 40 % of Germany's breeding birds occur in the city.

A total of 56 wild mammal species have been documented in the Bonn city area. Of these, two are considered extinct or critically endangered in North Rhine – Westphalia, four are considered endangered, seven are considered vulnerable and two are naturally rare. The city of Bonn's mammalian fauna can be roughly assigned to four habitat types – urban areas, forests, riparian meadows and open land. The various relevant species communities in these habitats are then characterised in terms of typical representative species.

It must be admitted that relatively little is known about fish within Bonn's city limits. The lower sections of streams that empty directly into the Rhine are presumably affected strongly by Rhine fish fauna, in spite of their often poor connections (i.e. for fish) to the Rhine and the extensive straightening and channelling they have undergone. Lakes and ponds are often used by anglers, and thus their fish populations tend to be strongly influenced by stocking. In all likelihood, a total of 57 fish and lamprey species occur (or have occurred) in the city of Bonn. Of these, 46 are considered to be native species.

In Germany, amphibians are among the animal groups with the largest proportions of endangered and rare species. The Bonn area is among Europe's most species-rich regions. Bonn's amphibian fauna currently comprise 13 species. Amphibians with broad ecological amplitude are normally distributed throughout the entire area, in keeping with water-body availability, and thus tend not to be endangered.

With regard to insects in Bonn, the available studies have tended to consider only individual sites, and thus overviews of insect-species diversity in Bonn are lacking for most insect groups. Locusts in central Europe have been relatively well-studied. Since the 1990s, a total of 32 locust species have been documented in the Bonn city area. The actual numbers of species in question, along with their distributions and frequencies, are known only sketchily, however.

The quality of the data on dragonflies in Bonn is much lower than that of the data on dragonflies in Germany as a whole. All in all, a total of 38 dragonfly species have been

documented here in the past 50 years. That figure corresponds to about 47 % of all dragonfly species occurring in Germany. Three species are now considered to be extinct or to have disappeared.

The groups wild bees, cuckoo wasps and sphecid wasps have been intensively studied in only a few areas of the city of Bonn; no study oriented to the city's entire area has been carried out to date.

With its favourable climate, Rhine-valley location in the transition area between the central Rhine valley and the Lower Rhine Bight and well-differentiated land forms with a diverse range of soils, the Bonn city area is capable of supporting an extremely wide range of flora. The area's indigenous flora have been undergoing changes for over 2,000 years, as a result of a wide range of agricultural uses, and of commerce, which has brought new species into the area – accidentally, in most instances. And even if many elements of the original vegetation have been lost, and if many of the species that migrated into the area or were unintentionally introduced to it were able to become established only as a result of over-use, the area's floral diversity continued to increase until about the mid-19th century, leading to the biological diversity we see today.

The Bonn region may be considered one of the best-studied of all regions in North Rhine – Westphalia. A total of 1,296 plant communities have been documented. The largest numbers of ferns and flowering plants are found in various types of forest, in species-rich dry and wet meadows, on croplands and in inner-city areas.

A large group of the species in question – a total of 265 (23.5 %) – are listed on the Red List for North Rhine – Westphalia and, thus, the Red Lists for the two relevant major natural areas, Lower Rhine Bight and Eifel/Siebengebirge. In addition, 99 species are considered endangered in other natural areas of North Rhine – Westphalia. All 28 species on the watch list also occur in Bonn.

Populations of 223 species known to have occurred in Bonn have disappeared. Nearly 85 % (192) of these are species that are now included on the Red List for North Rhine – Westphalia. The last documented period, that between 1945 and 1980, brought the largest losses for the city's area in terms of numbers. The disappearance of 164 species has been documented, including 128 species on North Rhine – Westphalia's current Red List.

As a result of major human impacts in the Bonn area, in combination with the area's mild climate, neozoans (animals that have arrived through human agency) account for a not inconsiderable share of Bonn's fauna. Animal species of southern origin have been especially successful in establishing themselves in the city and its peripheral areas. Many aquatic neozoans have found their way into the area's two largest rivers, the Rhine and the Sieg, and the ongoing presence of such new arrivals is due primarily to increased water temperatures. On the whole, however, the problems created by neozoans – displacement of native animal species, damage to native plants and negative impacts on habitats – are only minor here in light of the relevant global situation. According to current findings, no species in central Europe have become extinct as a result of competition from neozoans, although native central European

species have been locally displaced or have suffered changes in their abundance levels.

Bonn's flora include a sizeable share of plants that have arrived in the area via human agency (neophytes). Currently, a total of 188 neophytic species are known to occur in the Bonn city area. That figure represents nearly 17 % of all vascular plant species occurring in Bonn. While such plants play only a minor role in forests, especially large numbers of neophytes are found in disturbed habitats, such as areas along roads and paths, and railway embankments. Many are also found on banks of rivers and streams, which by nature are highly dynamic habitats. Along Bonn's Rhine-River banks, neophytes are common, and many different species of them occur. In some cases, such species are the most prominent types of vegetation seen in such areas.

The overall threat posed by such species for indigenous plant and animal species, like that from neozoans (see above), may be considered relatively minor, even though some invasive plants tend to dominate habitats and can displace native plants. In Bonn, such problems are seen only on relatively small areas. In terms of strict nature conservation, such species present problems over larger areas only in the area of the mouth of the Sieg River.

Bonn's biodiversity: changes and threats

The species that have benefited the most from climate change, which has brought warmer summers and milder winters, have been warmth-loving species of Mediterranean or even sub-tropical origin.

Many of the factors threatening biodiversity have to do with usage conflicts between urban interests and efforts to protect the remaining open areas in the Rhine valley's conurbation. These trends especially affect open lots in inner-city areas, lands that often harbour especially high biodiversity.

In addition, agricultural lands in the Bonn city area have decreased in the past ten years – by a total of 2 km² – as a result of structural change in the agricultural sector. The shrinkage of agricultural land is especially problematic in the city's village-like peripheral areas, since those areas, with their rural cultural landscapes, often have higher species diversity.

Although most persons now respect rules designed to protect nature in conservation areas, strong recreational pressures generate numerous use-related threats to biodiversity.

In the past, one of the most important factors in biodiversity losses has been habitat eutrophication, especially that occurring via nitrogen compounds and phosphates. Thanks to improved air quality and water-body protection, that factor has lost much of its significance.

A number of plant and animal species whose overall global populations are endangered, and which have been a special focus of local nature conservationists, have been stabilised in the Bonn city area via protection measures. In addition, Bonn has accepted a special responsibility to protect Red List species that are highly endangered

or vulnerable on a national level. The Kottenforst and Siebengebirge areas are among the region's largest deciduous-forest areas, and the mouth of the Sieg River is one of the very last remaining semi-natural Rhine tributaries. As a result, efforts to protect and develop (in a conservation sense) these landscapes and habitats are of supra-regional relevance.

Biodiversity goals

The city of Bonn is aiming to fully fulfil and implement the European Union's requirements relative to the FFH and Wild Birds directives and the Water Framework Directive. It conforms to the Convention on the Conservation of Migratory Species of Wild Animals (CMS; Bonn Convention) and to the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention), the latter of which is being implemented in the European Union primarily via the Wild Birds Directive and the FFH Directive. In keeping with provisions of the "Agenda 2010", the city of Bonn wishes to protect its biodiversity and use it sustainably.

The priority aims of nature conservation and species protection in Bonn include protecting and optimising remaining habitats and protecting all plant and animal species present in the city's area. Efforts to protect a broad spectrum of Bonn's native plants and animals and habitats are being made via set-aside, care and management of national and international conservation areas. Greater use of plants and seeds of regional origin, for the city's green areas and in the framework of compensation and substitution measures, is helping to protect local plant communities and, thus, intra-species genetic diversity.

Regulations call for forests located within the city are to be completely protected, and kept ecologically intact, and for diverse and semi-natural forest areas to be especially promoted.

Concepts, resolution and programmes

To achieve such aims, the city of Bonn has prepared a number of concepts, adopted resolutions and developed relevant programmes.

Several examples:

- A concept for ecological care and establishment of green areas (1998)
- Meadows programme (1993)
- Stream-development plan (1988)
- Management of the Stadtwald municipal forest in keeping with criteria for semi-natural forest management (1999)
- Providing lasting protection for trees within Bonn (1977)
- Promoting the city's Biological Station (2001)

- Environmental education ("Haus der Natur" since 1989, "Öketermine" ("eco-dates") since 2002, promotion of relevant external organisations, via eco-sponsoring, since 1994)
- Rejection of genetic engineering, and promotion of organic farming (2006)
- Use and promotion of regional products (2007)

Biodiversity in city management

On the basis of the applicable legal framework, the city of Bonn has a binding land-use plan in place that describes Bonn's planned urban development. The aims expressed in the plan including protecting valuable zones, enlarging open areas where possible, conserving large local recreational areas and using strips of vegetation to structure the landscape.

The city of Bonn has developed and implemented many programmes and projects in the interest of preserving and enhancing its urban biodiversity. The basis for biodiversity programmes and projects has always been intensive analysis of landscape areas, on a solid scientific basis.

Such programmes and projects are implemented with the help of nature conservation association and initiatives, local volunteers and various administrative departments. Numerous nature conservation associations, along with organisations and private initiatives, are active in Bonn, at the regional, national and international levels, and it is safe to say that all deal with biodiversity issues. In co-operation with the city's administration – and, in some cases, working with the administration's direct support – such organisations are carrying out a number of practical projects in the city for promoting biodiversity. In the process, contributions are being made to relevant international projects and the relevant global discussion.

Education to promote awareness about biodiversity

In light of the global dimension of biodiversity, the interconnections between climate protection and biodiversity and the political significance of biodiversity with regard to economic uses, current and future generations have a great responsibility to protect biodiversity. In order to help fulfil its responsibility in this area, and to do justice to the complexity of this issue, Bonn places great priority on educating children, adolescents and adults about biodiversity. And its education / awareness measures in this regard are explicitly not confined to regional topics; they take a broad perspective and present biodiversity in its full global context.

From action to interaction

Internationally, the city of Bonn is a member of various networks and associations of cities, including the Eurocities network of major European cities, the Council of European Municipalities and Regions (CEMR), the International Council for Local Environmental Initiatives (ICLEI) and the Climate Alliance. Since 2005, Bonn's Lord Mayor has served as chair of the World Mayors Council on Climate Change (WMCCC). In addition, the city is involved in theme-oriented project partnerships with other cities.

Bonn has taken the pending Conference of the Parties (COP) to the Convention on Biological Diversity (CBD) as an occasion to consolidate the biodiversity-oriented efforts it has been making throughout its various departments and structures. The biodiversity report that has been prepared will serve as a basis for continuing and refining relevant measures and programmes, and it will enter into international exchanges with other municipalities throughout the world, especially in the framework of the ICLEI's Local Action for Biodiversity programme.

At the same time, Bonn has launched a biodiversity information and education campaign, a campaign that is profiting from the energy surrounding the COP and that is designed to have a lasting effect long after the conference is over. Bonn considers the role of municipalities to be a particularly important one with regard to biodiversity. Bonn is part of a group of "catalyst cities", along with Johannesburg, Montreal, Curitiba and Nagoya, that is working to enhance cities' efforts in striving toward biological diversity and to harness those efforts for the pertinent global debate.