01.13 Planning Advice for Soil Protection (Edition 2018)

Overview

Precautionary soil protection aims to protect the efficacy and natural characteristics of soils as well as to prevent adverse effects on the soil. The presentation of the individual soil functions in Maps 01.12.1 through 01.12.5 and the efficacy of soils in Map 01.12.6 (Faensen-Thiebes et al. 2006, SenStadtWohn 2018) lays the technical foundation for the requirements and measures that are relevant from a soil protection perspective for spatially effective planning processes and stipulations (Faensen-Thiebes and Goedecke 2007).

Moreover, notes on how to evaluate differences in the efficacy of soils, and which results to implement in regard to soil protection (Gerstenberg et al. 2007, 2015 and 2017) are useful during the planning process.

The present Map 01.13 combines and weights the information on the individual soil functions. The result shows how vulnerable Berlin soils are to interventions arising from development plans and construction projects. Both the **Map *Planning Advice for Soil Protection*** and the associated **Tool *Catalogue of models and measures for precautionary soil protection in Berlin*** (Leitbild und Maßnahmenkatalog, (Catalogue of models and measures), 2015, only in German) are designed to assist the soil-protection authorities involved in the evaluation of soil interventions in the framework of assessing environmental effects or development planning. It also facilitates an efficient classification and evaluation of the planning process and the derivation of any potential stipulations that may be required to protect the soil. In terms of soil protection, planning decisions and planning processes can thus be improved.

A paper map can no longer adequately display the variety and spatial detail of the respective assessments and suggested measures. The present map is hence built on the digital data display of the FIS Broker. This platform displays detailed information, assessments and suggested measures for the chosen areas, which would be impossible to depict on a paper map.

Statistical Base

The Map is based on the assessment of the soil functions as shown in the Environmental Atlas Maps 01.12.1 through 01.12.5 (Edition 2018). The soil association Map 01.01 (Edition 2018) was also used. Information on the danger of toxic wastes, i.e. from war debris soil associations, sewage farms and railway tracks was extracted from it.

The data (impervious coverage, track gravel is considered impervious) of the Environmental Atlas Map 01.02 (Edition 2017) was used to present the impervious coverage classes.

Methodology

Differentiated Assessment of Soil Functions

In order to solve the two tasks of developing a differentiated assessment of soil functions, and implementing this soil-function assessment to create Planning Advices, the following thought processes and work steps have been implemented in Map 01.13:

First of all, the soil functions (Maps 01.12.1 through 01.12.5) have been weighted differently, according to their significance depending on the specific conditions in Berlin (cf. Gerstenberg et al., 2007 and 2015 for more detail):

- It is deemed extremely important to protect **soils functioning as archives** and soils which constitute **potential sites for rare and near-natural plant communities**, as these soils cannot be restored.
- In general, it is important to protect soils with a high **regulatory function for the water balance** and **buffering and filtration function.** This importance increases further at these locations if both functions occur and are rated as “high”.

It is important to sustain soils with a high **yield function for cultivated plants** in areas that are used for agriculture.

This establishes a prioritization regarding the importance and vulnerability of soil functions.

Moreover, soils with clear potential for material contamination (e.g. sewage farms) with regard to their regulatory, filtration and buffering functions as well as their yield function for cultivated plants are excluded from the assessment, as they are a potential **source of contamination** for the groundwater and the food chain.

To assess soils in terms of their **level of protection**, five protection categories have been established, ranging from the maximum to the lowest protection status. These may be used to derive strategies for action and recommended strategies in the event of soil interventions due to planning and construction projects.

The following soil protection categories are distiniguished to represent the protection level of soils:

- **maximum protection level**,
- **very high protection level**,
- **high protection level**,
- **medium protection level and**
- **low protection level (soils without special requirements)**.

All information and assessments presented here relate to pervious soils, as is the case for all Environmental Atlas maps covering soil as a topic, with the exception of the map on impervious soil coverage. The extent of impervious coverage is of great importance, however. The degree of impervious coverage is therefore not only presented in the factual data display but is also reflected by different colour shades. There are three different colour shades; with decreasing impervious coverage, the colour intensity of the protection category also decreases.

Five % and 30 % were chosen as thresholds to separate the different levels of impervious coverage: areas with a level of impervious coverage of **5 % or less** can be considered completely pervious, interrupted only by scattered buildings, pathways etc. This includes forests, farmland and meadows and pastures. Allotment gardens, single-family homes, park facilities and other open spaces, which may also still have near-natural soils, prevail in the “medium” category with an impervious coverage level of between **more than 5 % and less than 30 %**. Impervious coverage that is **greater than 30 %** occurs primarily in residential and commercial areas, and in traffic areas, where no natural soil associations remain to a large extent.

Maximum protection level

This category is linked to high ratings for the "habitat function for rare and near-natural plant communities" and/or for the "archival function for natural history."

This category is associated with the **maximum protection status** and covers only approx. 5 % of the area evaluated. With respect to possible planning, there are special requirements in regard to considering alternative sites and avoiding interventions. This is the case, as it is virtually impossible to restore the habitat function for rare and near-natural plant species, and definitely impossible to restore the archival function for natural history (Smettan & Litz 2006). Therefore, projects or plans which definitely require interventions in soils with the maximum protection level must be **authorized in collaboration with the soil protection authority** (Leitbild und Maßnahmekatalog (Catalogue of models and measures), 2015, only in German).

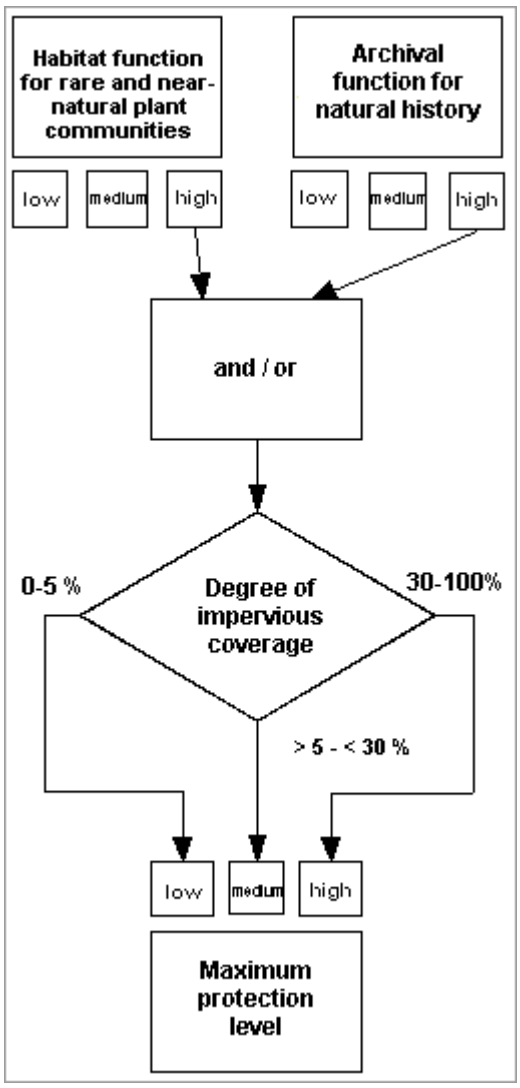

Fig. 1: Diagram to assign the category "maximum protection level"

Very high protection level

The category "Very high protection level" is based on several assessment factors:

1. The "**habitat function for rare and near-natural plant communities**" as well as the "**archival function for natural history**" was assessed as medium, or
2. the "**yield function for cultivated plants**" was assessed as high on areas with agricultural use (farmland, meadows and pastures or tree nursery / horticulture), or
3. the "**regulatory function for the water balance**" as well as the "**buffering and filtration function**" were assessed as high.

The majority of the areas in this protection category have been assigned to it due to their habitat and archival functions, a slightly smaller share due to their regulatory or buffering and filtration functions, with only a few areas having been assigned to it because of their yield function for cultivated plants.

The area category "Very high protection level" means that, for reasons of soil protection, avoiding planned interventions should be prioritized, or suitable alternative sites should be sought in keeping with other requirements. Moreover, net loss of pervious soil and soil functions are not permissible.

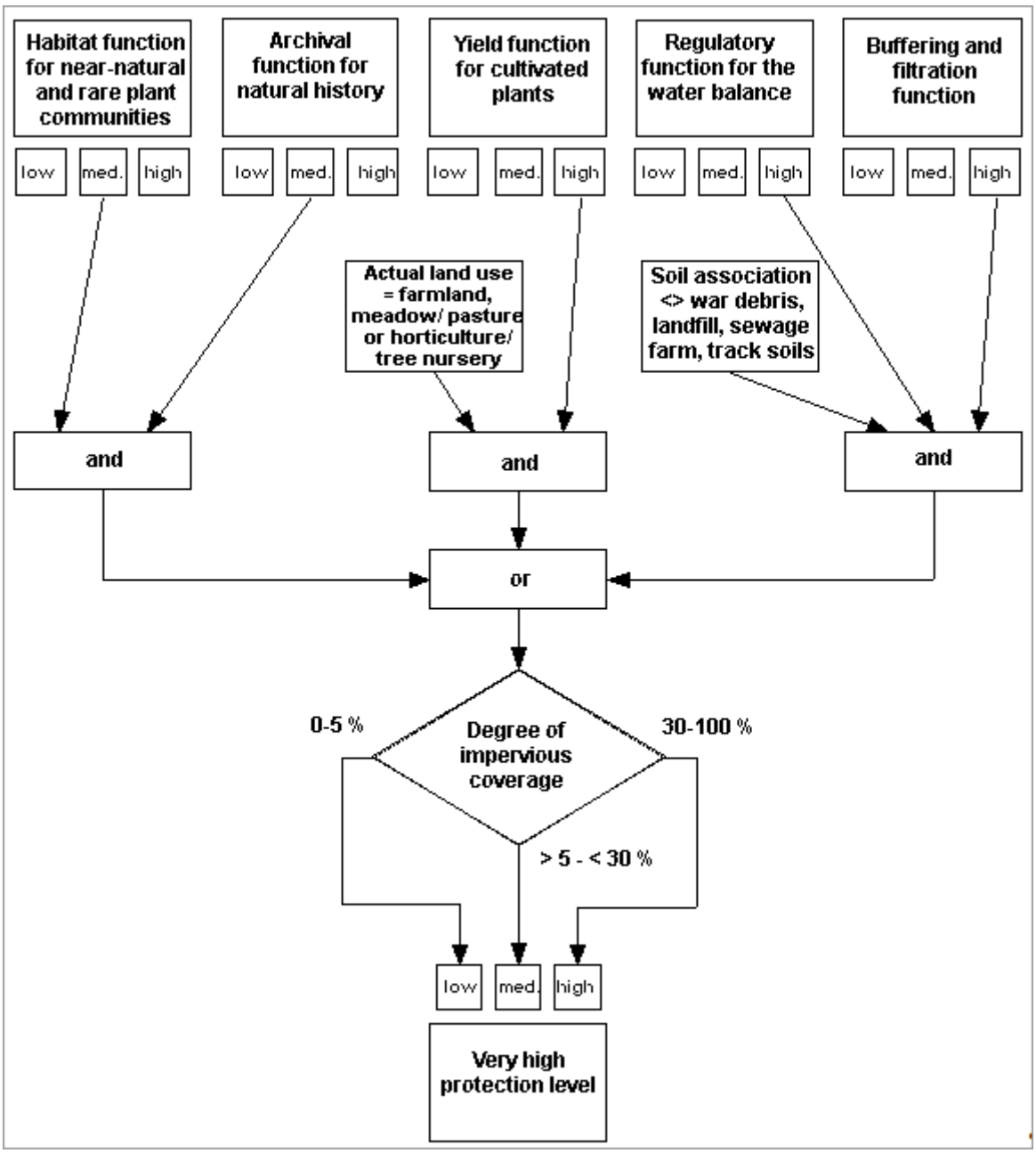

Fig. 2: Diagram to assign the category "very high protection level"

High protection level

The category "High protection level" is linked to a high rating for the "**regulatory function for the water balance**" or for the "**buffering and filtration function**."

The protection status is lower here, as compared with the "Very high protection level", due to the clear drop in the number of soil functions involved. It is sufficient that **only one criterion** (either the regulatory function for the water balance or the buffering and filtration function) is rated as high. Despite the lower protection level, an effort should also be made here to avoid or compensate for a net loss of land and soil functions, in collaboration with the soil protection authority (Leitbild und Maßnahmekatalog (Catalogue of models and measures), 2015, only in German).

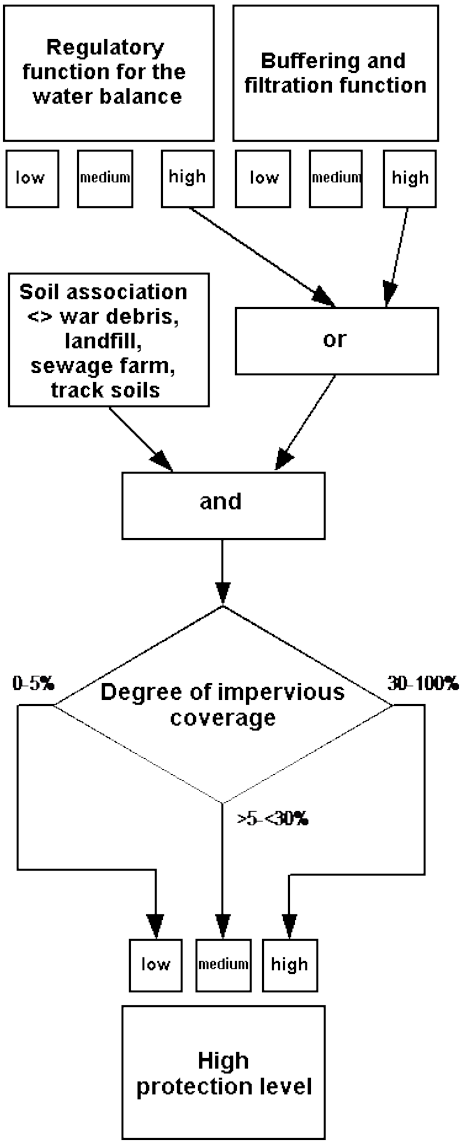

Fig. 3: Diagram to assign the category "high protection level"

Medium protection level

The category "Medium protection level" is linked to medium ratings both for the "**regulatory function for the water balance**" and the "**buffering and filtration function**."

If the functions in question occur as described, they can potentially be improved with technical measures, such as the retention of precipitation water or the use of soil coverage pervious to water and air. The focus here is thus on **avoiding a net loss of soil functions and keeping the net loss of land as low as possible in collaboration with the soil protection authority** (Leitbild und Maßnahmekatalog (Catalogue of models and measures), 2015, only in German).

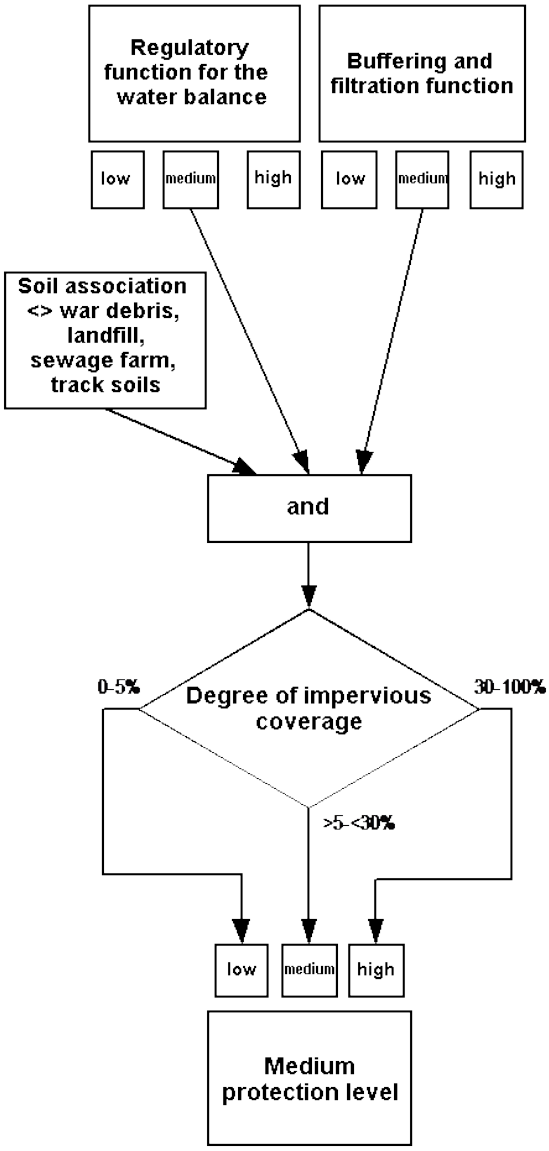

Fig. 4: Diagram to assign the category "medium protection level"

Low protection level (soils without special requirements)

The remaining soils are assigned to the category "Low protection level."

Here, the **general legal soil protection requirements** (Federal Soil Protection Law 1998, Federal Soil Protection and Residual Waste Ordinance 1999, Berlin Soil Protection Law 2004, Building Code 2017, Leitbild und Maßnahmekatalog (Catalogue of models and measures), 2015, only in German) apply.

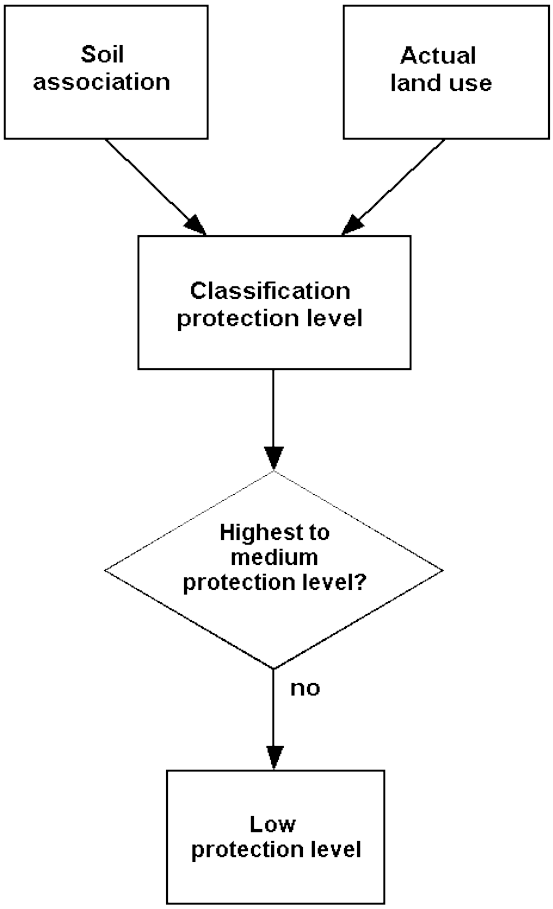

Fig. 5: Diagram to assign the category "low protection level"

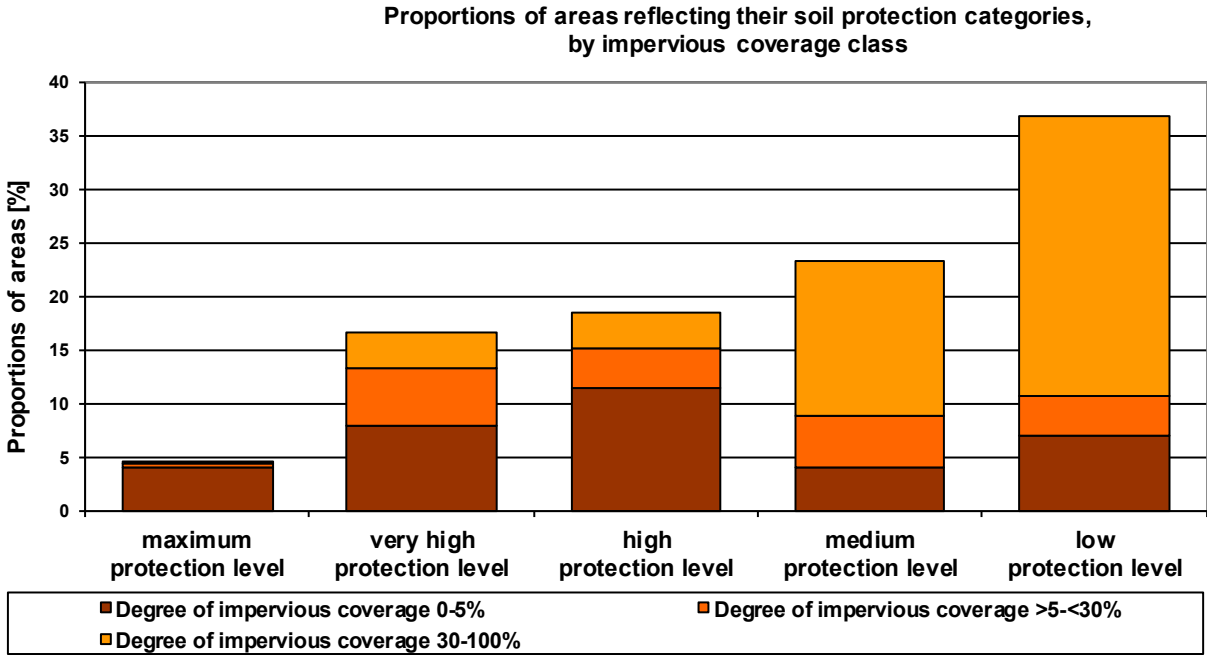

Fig. 6: Proportions of areas reflecting their soil protection categories, by degree of impervious coverage (excl. streets and bodies of water)

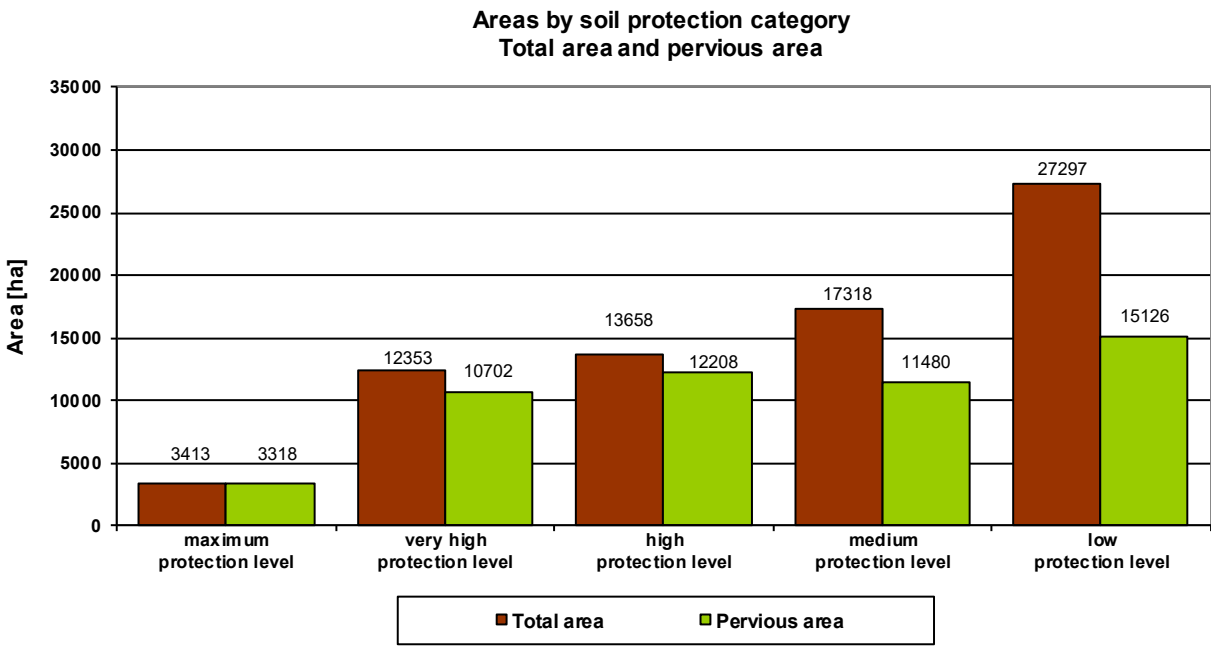

Fig. 7: Total area and pervious area by soil protection category

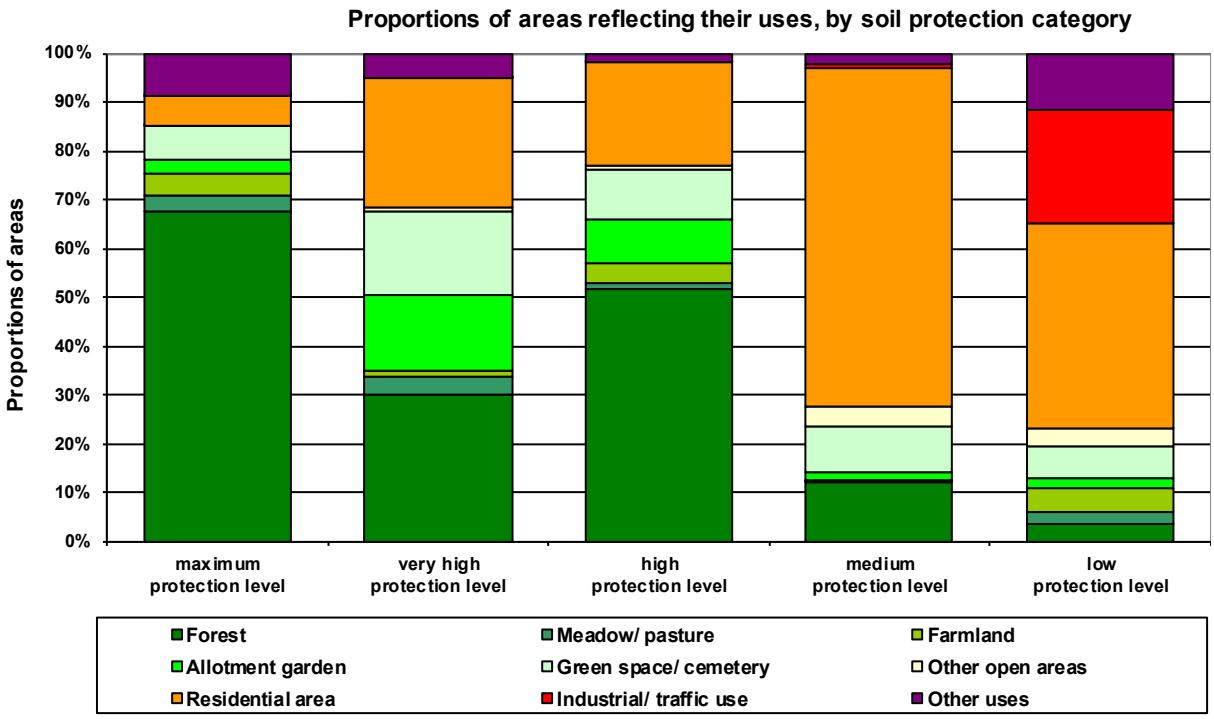

Fig. 8: Proportions of areas and their uses by soil protection category

Soil protection category	Area		Of which pervious		Impervious coverage class					
					0 - 5 %		> 5 - < 30 %		30 - 100 %	
	[ha]	[%]	[ha]	[%]	[ha]	[%]	[ha]	[%]	[ha]	[%]
Maximum protection level	3,413	5	3,318	97	3,004	88	295	9	114	3
Very high protection level	12,353	17	10,702	87	5,879	48	4,031	33	2,442	20

High protection level	13,658	18	12,208	89	8,553	63	2,748	20	2,357	17
Medium protection level	17,318	23	11,480	66	2,974	17	3,581	21	10,763	62
Low protection level	27,297	37	15,126	55	5,161	19	2,744	10	19,392	71
Total	**74,039**	**100**	**52,833**	**71**	**25,571**	**35**	**13,400**	**18**	**35,067**	**47**

Tab. 1: Area balance of the soil protection categories (excl. streets and bodies of water)

Advice for Implementation in Planning Practice

The planning advice for soil protection comprises requirements and stipulations relevant for each soil protection category. Although they are intended for **development planning**, their meaning can be transferred and applied to other types of spatial projects and planning. For methodological reasons, the advice is represented in the map legend in very general form only. Detailed information, available in tabular form for each area, can be accessed using the factual data display of the FIS Broker. The terms used here, such as "avoidance" and "compensation" are not legal terms but represent technical measures of soil protection. To reiterate in this context, the soil functions assessed refer only to **pervious block segments**.

The factual data display includes the soil protection category, the soil association and land use relevant for the assessment, the ratings for each of the five soil functions (from Maps 01.12.01 through 01.12.05) as well as the degree of impervious coverage. The planning requirements table, which can be displayed separately for each area, is of particular interest, however.

Structure and contents of the planning requirements table:

- Line 1 states the **soil protection category**.
- Line 2 states the general soil protection **goal**.
- Line 3 describes the **reasons for the classification** (cf. "Methodology Item 1") in short form. The statements in the additional lines are based on these characteristic soil functions.
- Line 4 details **avoidance and reduction measures** that should generally be pursued. No distinction has been made between avoidance and reduction, since the assignment depends on the context and the point of view of the parties involved. What matters here is that soils are protected from intervention, if they are deemed worthy of protection. Terminology is secondary only.
- Line 5 presents suggestions for **compensatory measures**, **focusing on function** as far as possible. First, those requirements are named which can be determined conditionally in accordance with the provisions of the Building Code.
- Line 6 contains additional **measures** in some cases, which are useful to compensate for considerable impairments of soil functions under the aspect of soil protection.
- Line 7 contains **other notes** and explanations.

Very high soil protection level	
Protection goal and planning assessment	Prioritize avoiding interventions. Prioritize alternative locations or optimize planning. Prioritize avoiding net loss of pervious areas and functions.
Evaluation Criteria (relevant soil functions)	**Yield function for cultivated plants = high** **AND** **area use farmland (121) or grassland (122) or tree nursery / horticulture (200)**
Measures for avoidance and reduction	o Searching for an alternative location, using agricultural land of lower value o Identifying construction windows o Excluding parking spaces and garages in accordance with Sect.12 of the Building Usage Ordinance (BauNVO) outside the property areas to be developed. o Excluding ancillary facilities within the meaning of Sect.14 BauNVO outside the property areas to be developed.
Compensatory measures related to functions (defined in the development plan or elsewhere - not onsite)	o Expanding use through use change o Increasing the humus content o Enriching the landscape with landscape-structuring elements such as hedges or rows of trees
Measures (usually not defined according to the Federal Building Code, potentially regulated in the context of urban development contracts)	o Liming, if applicable according to conditions (depending on pH value) o Resting of soil by growing perennial crops without mechanical tilling o Reducing the use of operating resources
Other notes	Coordination with relevant soil protection authority. The use of the comprehensive assessment and balancing procedure for interventions is generally considered appropriate from the soil protection viewpoint if soils of this protection category are affected.

Table 2: Example of a planning requirements table

Map Description

The map shows the areas differentiated into five soil-protection categories. In addition, the individual protection categories are divided into three impervious coverage categories, i.e. 0 - 5 %, > 5 - < 30 % and 30 - 100 % with different colour intensities. In the following description, the numbers of the soil associations are listed. An explanation of these numbers can be found in Table 7 of Map 01.01.

Maximum protection level

The areas of the maximum protection category are concentrated primarily in **near-natural areas** with rare plant communities or exceptional remnants of the ice age in the **outer areas** of the city.

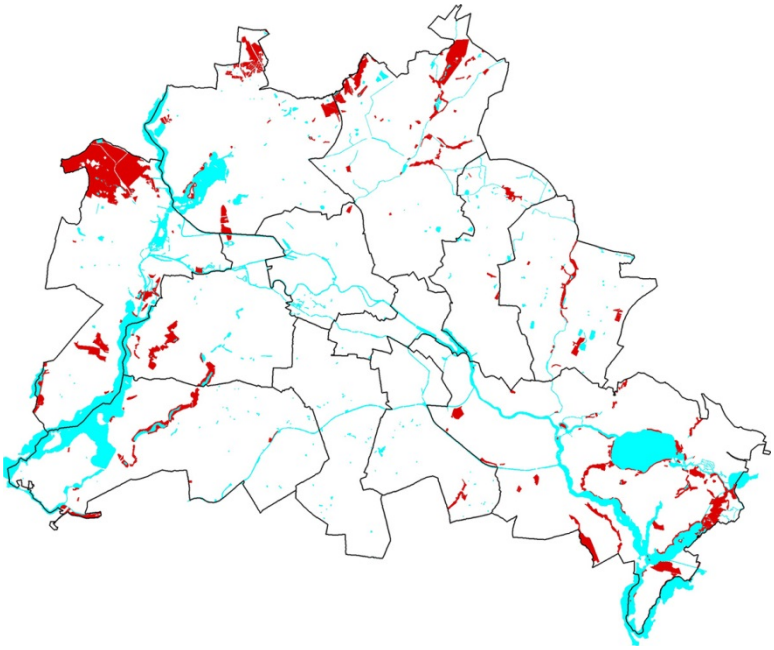

Fig. 9: Areas assigned to the category "maximum protection level"

Major contiguous areas of this protection category are located in the Spandauer Forst on valley sand with mesotrophic/ eutrophic histosols (1250, 1240) and oligotrophic transitional histosols (1200). These **groundwater locations** are associated with calcaro-gleyic cambisols, gleysols, eutro-gleyic dystric

cambisols and calcaric gleysols (1150, 1231, 1210, 1220). The soil association covering the largest area share in this category (1200) also occurs in Schmöckwitzwerder (Schwarze Berge) in southeast Berlin.

Other sites near groundwater associated with the maximum protection level are located at Tegeler Fließ, with rare dystric gleysols, calcaro-dystric histosols, and eutrophic fluvi-eutric histosols (1180, 1280), in the Bucher Forst with stagno-gleyed cambisols - gleysols - dried eutric histosols on valley sand (1164); and in Müggelheim in the Gosener and Müggelheimer Wiesen with dried eutric histosols in a valley sand lowland (1260). In the southwest of Berlin, in Kladow; dried eutric-histosols with fossil gleysols and dystric cambisols in meltwater channels in the area around the Groß Glienicker See have been assigned this high protection status (1290). Other areas located at the edge of the Grunewald chain of lakes, at the Pechsee and the Teufelssee (Grunewald) consist of dried eutric transitional histosols, stagnic gleysols, fossil gleysols and dystric cambisols (1290, 1300), and in the Tegel Airport and in the Jungfernheide area, with fluvic soils (1320). A special phenomenon constitute the drained fluvisols with thick lime mud of Teerofen (1310).

Smaller areas with eutric histosols and gleyic soils are located at the edges of water bodies such as the Krumme Lake in Grünau und Schmöckwitz, the Neuer Wiesengraben in Köpenick, the Krumme Laake in Müggelheim, the Fredersdorfert Mühlenfließ in the Rahnsdorfer Forst, the Lietzengraben and Seegraben in Buch (all 1231) and the Wuhle in Marzahn-Hellersdorf (1270). The groundwater-characterized soil associations in the Havel lowlands in Tiefwerder (1320), in the Königsheide in Johannisthal, and the fluvisols in Heiligensee, also deserve to be mentioned.

Examples of areas with the maximum protection category and with main emphasis on the **archival function** are primarily the ice-age-characterized arenic dystric cambisols associated with the podzoluvisols of the Frohnauer Forst (1080), and the arenic dystric cambisols associated with luvisols in Gatow (1130), which are used as farmland.

The total area of this protection category amounts to 3,413 ha. Of these, 3,004 ha (88 %) are up to 5 % impervious, 295 ha (9 %) are between more than 5 and less than 30 % impervious and 114 ha (3 %) are 30 % and more impervious.

As expected, impervious coverage of less than 5 % dominates this protection category. The proportion of areas with more than 5 % of impervious coverage is small and amounts to 12 % (cf. Fig. 6 and Tab. 1). In total, 3,318 ha are pervious in this category (cf. Fig. 7).

For the most part, these areas are **forests.** Other uses include **parks and open spaces, mixtures of meadows, bushes and trees, residential areas** and **areas used for agriculture** (cf. Fig. 8). Most areas are already protected in other legal contexts. The maximum protection is provided by conservation law, with the definition of official protected areas.

Very high protection level

All areas that are **rated as high** with respect to their **yield function,** their **regulatory function for the water balance** or their **buffering and filtration function**, or are rated as medium as a site for rare plants or in regard to their **archival function** are assigned to this protection category.

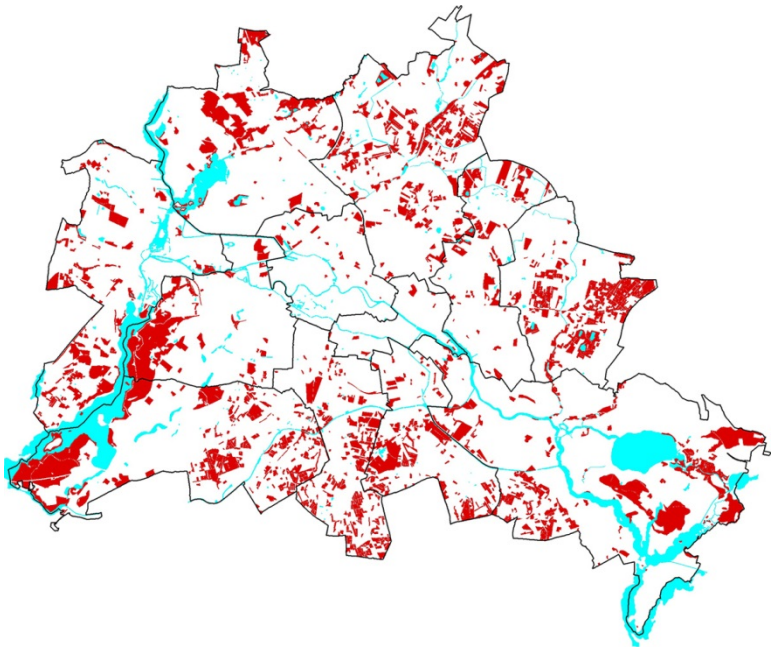

Fig. 10: Areas assigned to the category "very high protection level"

Major contiguous areas in this category, either pervious or minimally impervious, are located at the end moraines or push moraines, with a soil association of dystric cambisol - regosolic cambisol - colluvial cambisol (1040) in Grunewald, on the Schäferberg and the Seddinberg, on the Müggelberge and in the Gatower Heide. The slopes of these moraines, the Havel, the Griebnitzsee and the Müggelberge are characterized by the soil association dystric cambisol - regosol - colluvial cambisol / gleysol (1060).

The fluvioglacial meltwater channels winding through Grunewald are associated with the soil association dystric cambisol - chromic cambisol - colluvial cambisol (1050). Two typical soil associations with soils that are deemed particularly deserving of protection are the soil associations of dune-sand with spodo-dystric cambisol - podzol/ dystric cambisol - colluvial dystric cambisol (1090, 1100) in the Tegeler Forst, Rahnsdorf, Frohnau, Düppel and Müggelheim. At the latter location, these soils are partially mixed with the associations described for the end and push moraines.

Other areas are located in the Tegeler Fließ, with eutrophic fluvi-eutric-histosol - fluvic histo-humic gleysol - eutro-gleyic dystric cambisol (1280) and with dried fluvi-eutric histosol (1260) in the Gosener Wiesen. Small scattered areas can be found on the Barnim Plateau with sandy sink fills, e.g. in Malchow and Wartenberg. The soil associations which occur here are dystric cambisol - colluvial cambisol (1072) and dystric cambisol - luvisol - dried eutric-histosol (1022). Other occurring soil associations that deserve protection are located in the borough of Spandau (1030).

Areas with this assessment and a medium degree of impervious coverage of more than 5 and less than 30 %, are concentrated on the Barnim and Teltow plateaus, with boulder clay or boulder marl. These certified locations are generally smaller segments located in loosely built-up single-family home areas on the outskirts of the city, or in parks and allotment gardens such as in Lichterfelde, Britz, Rudow, Bohnsdorf, Mahlsdorf and Kaulsdorf. The soil association with luvisol - arenic cambisol (1010) represents 50 % of this share.

The total area of this protection category amounts to 12,353 ha. Of these, 5,879 ha (48 %) are less than 5 % impervious, 4,0314 ha (33 %) are more than 5 and less than 30 % impervious and 2,442 ha (20 %) are more than 30 % impervious.

This category contains 17 % of the area evaluated of which 10,702 ha (87 %) are pervious (cf. Fig. 7). The relatively high share of areas with less than 5 % of impervious coverage and with more than 5 and less than 30 % of impervious coverage are characteristic here (cf. Fig. 6 and Tab. 1).

The predominant uses in this protection category are **forest, residential areas, allotment gardens, parks/ green spaces** (cf. Fig. 8).

High protection level

This category of soils with a high protection level is based on the **high capacity** of the soils to fulfil their function for the **water balance**, or for their **filtration and buffering capacity**.

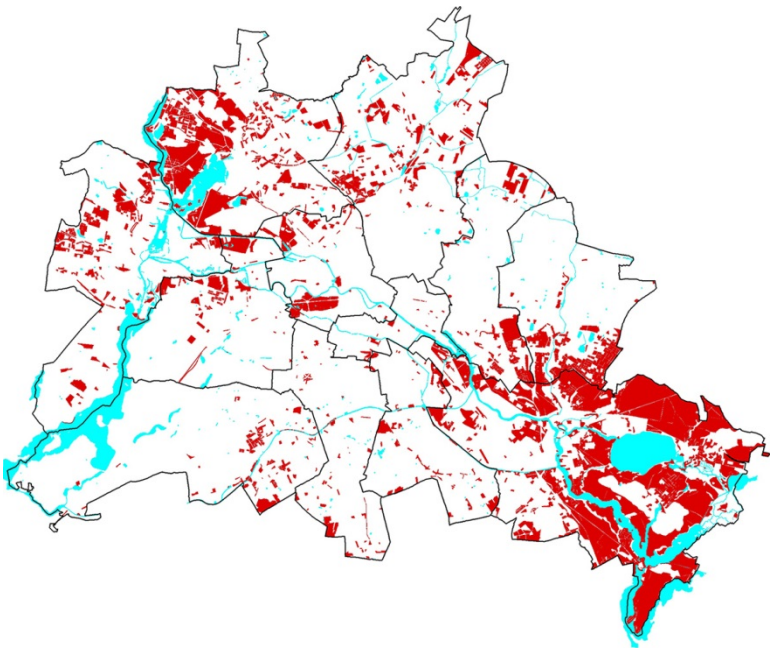

Fig. 11: Areas assigned to the category "high protection level"

One large pervious complex along Müggelsee, Dahme, Seddinsee and Crossinsee is particularly striking, where the entire forest area on valley sand with dystric cambisol - stagno-gleyed cambisol - gleyic cambisol (1160) meets these criteria. In addition, there are smaller areas belonging to an acidic soil association of drift sand with spodo-dystric cambisol - stagno-gleyic dystric cambisol (1190). These dune-sand and valley-sand soil associations, which very much deserve to be protected, can also be found in the Tegeler Forst and at Jungfernheide. Smaller pervious areas are located primarily in the north, south and west of Berlin, on the Teltow and Barnim plateaus. The typical soil association here is luvisol - arenic cambisol of boulder marl (1010).

The moderately impervious areas in this category with a degree of impervious coverage of up to 30 % are mostly small and scattered. The medium and fine sand soils of dystric cambisol - stagno-gleyed cambisol - eutro-gleyic cambisol (1160), which run through the glacial spillway dominate with an area share of approx. 70 %. Soils of glacial sands on moraine areas with dystric cambisol - colluvial cambisol (1170) located in Charlottenburg that are used as allotment gardens also fulfil these criteria. Further soil associations include drift sands of spodo-dystric cambisol - stagno-gleyed dystric cambisol (1190) in Schmöckwitzwerde, in Wedding and in Heiligensee and ground moraines with luvisol - arenic cambisol of boulder marl (1010) in Bohnsdorf, Britz and Hermsdorf.

Soils that deserve protection with a high degree of impervious coverage of 30 - 100 % are limited to a small areas, predominantly in residential areas, allotment gardens and weekend cottages. These are primarily aggraded soils with soil types regosol + calcaric regosol + hortisol (2483, 2485, 2486, 2484). Certified areas include for example the Zoologischer Garten, allotment gardens in Britz and Französisch Buchholz and residential areas in Hermsdorf, Heiligensee, Biesdorf and Mahlsdorf.

The total area of this protection category amounts to 13,658 ha. Of these, 8,553 ha (63 %) are up to 5 % impervious, 2,748 (20 %) are more than 5 and less than 30 % impervious and 2,357 ha (17 %) are 30 % and more impervious.

This category accounts for approx. 18 % of the area evaluated, similar to the category "Very high protection level" (cf. Fig. 6). The pervious area of 12,208 ha (89 %), is also similar in size to that of the category "Very high protection level" (cf. Fig. 7). The largest proportion comprises areas with less than 5 % of impervious coverage (cf. Fig. 6 and Tab. 1).

Soils with **forest use** account for the majority of areas in this protection category, followed by **residential area, farmland and allotment garden** (cf. Fig. 8).

Medium protection level

The category of the soils deserving protection is based on their **medium capacity to** fulfil their **function** for the **water balance** and their **filtration and buffering function**.

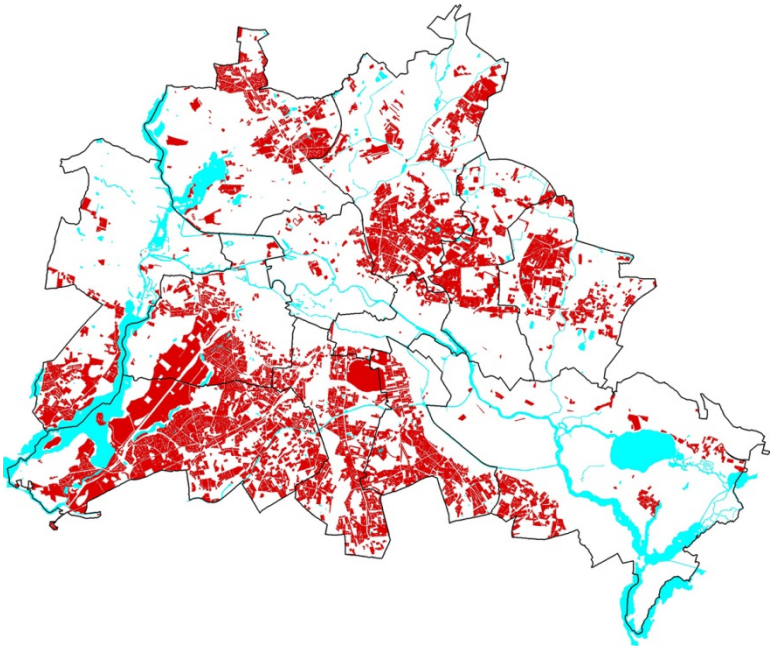

Fig. 12: Areas assigned to the category "medium protection level"

The pervious or slightly impervious proportion (0 - 5 %) of this category is a large, predominantly contiguous area, covering Grunewald Forst, Forst Düppel and the Pfaueninsel. Here, the dominant soil associations are acidic dystric cambisols with colluvial cambisols of glacial sands very pervious to water (1070). Scattered areas of glacial sands, layered over marl, however, are also located in these forests and the Gatower Heide, characterized by dystric cambisol - luvisol - colluvial cambisol (1020). The soils of the former Tempelhof airport on boulder marl with calcaric regosol + loose lithosols + regosol (2489) also belong to this protection category.

The proportion with a medium level of impervious coverage (> 5 - < 30 %) consists predominantly of small areas. In the area that winds like a ribbon from Wannsee, via Nikolassee, Zehlendorf to Westend, the predominant soil association is that of dystric cambisol - colluvial dystric cambisol (1070). This soil association also occurs in the Hasenheide, Viktoriapark and the Landschaftspark Rudow-Altglienicke. Loosely built-up areas of Kladow and Gatow are characterized by dystric cambisol - luvisol - colluvial cambisol (1020), with dystic cambisol - colluvial cambisol (1030) prevailing in Dahlem. A large proportion of this category reflects residential areas on the Teltow and Barnim plateaus, which are partially aggraded, with soils of regosol + calcaric regosol + hortisol (2483 - 2486) and calcaric regosol + loose lithosols + regosol (2487 - 2489, 7777).

The highly impervious sections (30 - 100 %) account for the majority of this protection category. They are concentrated on the Barnim and Teltow plateaus, in the south and north of the city. These can be found mainly in densely built-up areas such as Steglitz, Gropiusstadt in Neukölln, Prenzlauer Berg, Marzahn, Pankow, Lichtenberg or the Märkisches Viertel in Reinickendorf. The soil associations are shaped by humans, and the soil has often developed from sandy aggradations. The dominant soil types are therefore slightly developed A - C soils, such as loose lithosols, regosols, calcaric regosols and humic regosols (2490, 2483 - 2489, 7777).

The total area of this protection category amounts to 17,318 ha. Of these, 2,974 ha (17 %) are less than 5 % impervious, 3,5814 ha (21 %) are between more than 5 and less than 30 % impervious and 10,763 ha (62 %) are 30 % and more impervious.

With 23 %, this category accounts for the second largest area among the protection categories. Of the total area, 11,480 ha (66 %) are pervious (cf. Fig. 7). While the aforementioned categories were dominated by areas with a degree of impervious coverage of below 30 %, this category is mainly characterized by areas with a high degree of impervious coverage of between 30 and 100 %. These are largely located in the residential areas on the plateaus, some lie even within the City Rail Circle Line. Areas with a low degree of impervious coverage of below 5 % are negligible (cf. Fig. 6 and Tab. 1).

The areas of this protection category are found predominantly in **residential areas**, but also in **forests** (cf. Fig. 8).

Low protection level (soils without special requirements)

According to this evaluation system, most soils and soil associations in Berlin are subject only to the **general soil protection requirements**.

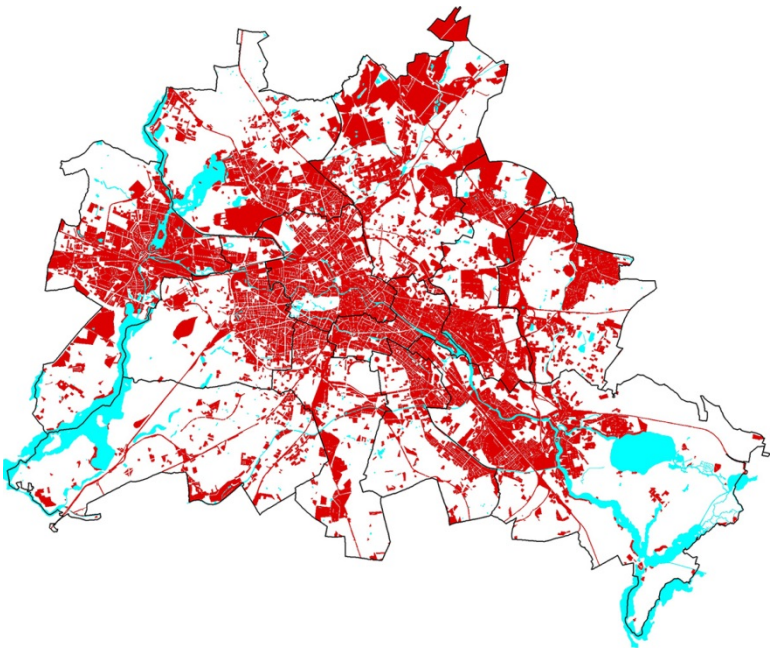

Abb. 13: Areas assigned to the category "low protection level"

These soils frequently constitute large contiguous complexes. These are primarily densely built-up areas with a high degree of impervious coverage (2482 - 2489, 7777), especially in the city centre (2540). These also include industrial sites along the Spree in Treptow and along the Spree and Havel in Spandau as well as in Lichtenberg, Neukölln, Tempelhof and Reinickendorf (2500). The soil associations in these areas are largely influenced by humans, and have developed mostly from sandy aggradations. Their common characteristic is a short development time with slightly developed A - C horizons. They primarily consist of loose lithosols, regosols and calcaric regosols.

Slightly impervious areas of this category are mostly former sewage farms consisting of regosols, luvic regosols, dystric-eutric regosols and gleyic regosols (2560, 2580, 2590) in the northeast of Berlin, while a very few are located in Gatow. The same applies to war debris hills (2510), landfills (2530), former industrial areas (2540) and railway tracks (2470). These areas did not receive a protection status, due to their potential or actual pollution.

The total area of this protection category amounts to 27,297 ha. Of these, 5,161 ha (19 %) are less than 5 % impervious, 2,744 ha (10 %) are between 5 and below 30 % impervious and 19,392 ha (71 %) are 30 % and more impervious.

These soils can be found on 37 % of the assessed areas. Only 15,126 ha (55 %) of the soils of this category are pervious (cf. Fig. 7 and Tab. 1).

Soils with a low protection level are largely located in **residential and industrial areas, as well as fallow areas and areas with public service and other special uses**. The high proportion of **farmland** (approx. 50 %) received a low rating based on its former sewage-farm use. Due to the existing pollution, these areas are excluded from moving up to a higher protection category.

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