

02.03 Biological Water Quality (Trophics) (Edition 2004)

Overview

All major Berlin streams are **dammed and extremely slow-flowing**, with the lake-like expansions of the Spree and Havel in which showing very great detention times.

Body of water	Area [sq.m]	Max. depth [m]	Volume [cu.m.]	Max. length [m]	Max. width [m]	Detention time
Great Glienicke Lake	667,072	11.25	4,530,633	1,512	504	> 7 years
Tegel Lake	3,957,621	15.93	26,122,984	3,211	1,697	183 days
Great Wannsee Lake	2,819,202	9.79	15,417,210	2,810	1,570	11 days
Great Müggel Lake	7,668,803	8.92	36,521,941	4,336	2,607	59 days
Dämeritz Lake	1,028,924	5.73	2,736,526	1,766	918	2 days
Seddin Lake	2,806,202	7.46	11,044,671	3,426	1,020	12 days
Zeuthen Lake	2,326,180	4.75	5,835,246	3,187	851	9 days

Tab.1: Key quanta of the lake-like expansions of the Spree and Havel

Unlike natural streams, dammed stream segments, like country lakes, are sensitive to nutrient immission. Due to the **high nutrient presence** in the Spree-Havel area, the water quality of the Berlin stream segments is characterized by the results of **Eutrophication**, and to a lesser extent by external immission of easily degradable organic substances. Therefore, a water-quality classification according to the saprobic system is not practicable for Berlin.

Statistical Base

A [quality measurement network](#) is operated to monitor Berlin's surface bodies of water. It concentrates as a matter of priority on ascertaining the effects of the numerous single-point and diffuse water pollution sources into the watercourse. The measurement network contains a total of **63 measurement points**, of which 39 are on the Dahme, Spree, Havel and the canals, and 24 are on the streams and country lakes.

As a rule, **physical chemical, bacteriological and biological parameters** are ascertained from **monthly sample tests**. For the continuous supervision of oxygen conditions, water temperature, pH value and conductivity, nine **water-quality measurement stations** are in addition operated along the major streams.

As a rule, 11 to 17 measurements per year are carried out on the average at the test points **in the sample measurement stations**. Normally, the 90th percentile (minimum sample size n= 11) is taken for the determination of the quality classes in the assessment; for temperature, the maximum values are used, and for oxygen, the minimum values.

At the continuously measurement stations, **fifteen-minute values** are ascertained and compiled to statistical key values. The assessment of the temperature is based on the 95th percentile, and of the oxygen content on the 10th percentile of the day values. These values are naturally of greater significance than the sample tests.

Methodology

The assignment of the Berlin watercourse segments to quality classes was carried out on the basis of the LAWA proposal on **Quality Classification of Dammed Plankton-Dominated Streams** (LAWA 1996), on the basis of the mean chlorophyll-a content (biomass equivalent) for the testing period May

through October of the years 1993 to 1995, 1995 to 1997, 1997 to 1999, 1999 to 2001 and 2001 to 2003. The canals north and southern of the Spree were excluded from the assessment.

Class	Chlorophyll-a mean average value $\mu\text{g/l}$	Overall phosphorus mean average value mg/l	View depth mean average value m
I	1-4	-	4.6 -- 6.0
I, II	3 –8	0.006 -- 0.018	3.5 -- 5.0
II (target)	7 –30	0.016 -- 0.082	1.5 -- 3.7
II -- III	25 –50	0.067 -- 0.150	1.0 -- 1.7
III	50 –100	0.150 -- 0.320	0.5 -- 1.0
III -- IV	> 100	> 0.320	< 0.5
IV	not defined	-	-

Tab. 2: Quality classification based on chlorophyll-a contents and expected overall phosphorus concentrations and view depths

The measured maximum, minimum and mean average values of the respective examination time periods with the curve lines for **chlorophyll-a values**, **overall phosphorus**, **view depths**, and **algae proportions** shown in the pie charts can be obtained by clicking on the respective measurement points in a separate window (mark the function "Show Data" in the menu below the map, and click on the map).

There is no data attainable through the colored strips for the quality classes.

Map Description

The dammed Berlin stream segments in some cases showed significant differences in quality class over the course of time of the investigation:

Quality Class II: Tegel Lake, Müggel-Spree 1993-1995; since then only Tegel Lake

Quality Class II-III: Müggel-Spree, Great Müggel Lake, Seddin Lake, Teltow Canal

Quality Class III: Dahme, Stadtspre, Havel, Zeuthen Lake after 1997

Quality Class III-IV: Zeuthen Lake 1993 – 1997

The **Zeuthen Lake** shows a considerably higher P burden than other bodies of water in the southeastern Berlin area, such as **Seddin Lake** and **Great Müggel Lake**. This is primarily to be explained by the immissions from the Notte Canal (immissions from the former sewage-farm processes) and by high Pre-dissolution rates during the investigation periods.

The measured chlorophyll-a concentrations with view depths of in some cases less than 0.5 m can be explained largely by particular algae-physiological and morphological conditions. In terms of its trophics, Zeuthen Lake is the **most strongly polluted river lake** of the other Berlin stream segments.

The fact that under this classification proposal, which judges water quality exclusively on the basis of chlorophyll-a content, the **Teltow Canal** must be assigned to Quality Class II-III also shows that in some cases, supplemental water-quality descriptions depending of local conditions are required.

The Teltow Canal has a special position within the water system, since it is subjected to immissions from sewage-treatment plants (Wassmannsdorf, Marienfelde to 1998, resting life and Stahnsdorf) with a share of 30% of mean drainage. The **high phosphorus concentrations** (Quality Class III) (cf. Map 02.01) ascertained for the Teltow Canal, by contrast with the **rather moderate chlorophyll-a concentrations** (Quality Class II-III), indicate that in the Teltow Canal, the **eutrophication potential is not nearly as well utilized as in the other parts of the Berlin water system**. Investigations in the Teltow Canal indicate increased heterotrophic decomposition processes, because of the great heat and sewage load, so that saprobiological processes become more significant.

The **oxygen curve** in the Teltow Canal/Teltow Wharf Measurement Station shows considerably lower values in dry weather than the Spree/ Sophienwerder Measurement Station.

The temperature conditions in the Teltow Canal, which are relatively constant throughout the year due to the high specific heat immissions from the power stations, affect the algae composition. Moreover, phytotoxic effects of the sewage plant processes may impede algae growth.

Tegel Lake was the only bodies of water in the investigation time period to show Water-Quality Class II. The inflow to Tegel Lake from the northeast (Nordgraben, Tegel Creek) has since 1985 been passed through the Tegel Surface Water Treatment Facility (phosphate elimination), which has relieved the lake from high nutrient immissions.

Literature

[1] **LAWA 1996:**

Klassifikation "Planktondominierter Fließgewässer" (Phosphor) [Classification of plankton-dominated streams (phosphorus)], 1996

[2] **LAWA 1998:**

LAWA-Verfahren zur "Chemischen Gewässerklassifikation" [LAWA procedure for "chemical classification of bodies of water"], 1998

Laws

[3] **Laws of Water:**

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