05.04 Age and Inventory Structure of the Forests (Edition 2015)

Overview

Because of their multiple functions, the Berlin forests and woodlands are exposed to heavy use pressure. The primary function of the forest is recreational, but it also serves the protection and equalization of the water, soil and climate, and as a habitat for animals and plants. In Berlin, the forest plays a subordinate role in terms of its economic significance. Almost 20 % of the Berlin urban area is covered with forest. Thus, Berlin has a very high share of forest in comparison with Hamburg or Munich, which have 5.7 and 5.1 %, respectively.

A forest is a complex system. Depending on the prevailing soil and climatic conditions, a certain herbaceous layer, a richly structured shrub and tree layer, and the corresponding fauna will have formed. In Berlin, there are today no longer any natural forests. The areas are characterized by centuries of forestry management and by the functions which near-urban forests fulfill today. Depending on stocking conditions and the measures taken, they have developed very differently over the course of the past century. While monocultures are still to be found in most areas; there are many places where appropriate management measures have engendered a situation approaching that of near-natural vegetation.

The natural forest associations occurring under existing local conditions are shown in Map 05.02 - Vegetation. On the other hand, the present Economic Forestry Management Map shows the actual situation of the forest.

With passage of the State Forest Law (LWaldG) in 1979, the entire wooded area of then-West Berlin was proclaimed as **protected and recreational forestland**, in which recreation was to receive precedence over wood production. Berlin thus adopted a policy unique in the then-Federal Republic of Germany, a policy which took into account the special situation of a city still surrounded by the wall.

In former East Berlin, the precepts for the economic use of the forest were more strict. But here, too, reduced clear-cut limits and exploitation amounts were used, in contrast to the usual procedure in the rest of the GDR.

Since the consolidation of the two forestry administrations in 1990, the State Forestry Law has applied to the entire city. The goal of near-natural and site-appropriate forestry was concretized in the new Forestry Guidelines of 1992. The express goal of these Forestry Guidelines is to gradually develop the entire area of the Berlin forest to a near-natural forest consisting of site-appropriate tree and shrub species. The policy of sustainable forestry was thus extended to include essential conservationist and species protection aspects, as well as factors supporting naturalness and structural wealth.

State of the Health of the Forests

Since the mid-80s, development processes became apparent that were recognised as a serious threat to the long-term stability of forests. Pollution accumulating in the stock and in the ground, particularly from sulfur dioxide (SO_2) and nitrogen oxides (NO_x), led to soil acidification, damage to needles and large-scale dieback of threatened forest stocks. The complex facts and links attracted global attention under the title “Waldsterben” [forest dieback].

The survey of forest conditions [German only] documents forest health in a procedure that is uniform across the country. In Berlin, the development of forest conditions is being observed since 1991 in a uniform sampling raster. The raster density varied in the different years of acquisition; since 2001 the treetop condition of the forest trees is being recorded in a 2 km x 2 km raster at currently 41 sampling points within the state boundaries of Berlin.

Although the emissions of particularly critical substances such as sulfur oxides have dramatically decreased since then, both the historical and the current pollutant input into the ecosystems still play an important role for the state of the forests. The nitrogen inputs still lie above the critical input rates and continue to exhibit an increasing trend. This further exacerbates the soil acidification, and important

nutrients such as calcium and magnesium are washed out of the soils with the percolation water. This plays an important role on the predominantly base-poor sites of the Berlin forests. Moreover, the nitrogen input leads to a change in the soil flora with an increase in nitrophilous plants.

Climatic changes also have significant influence on the state of the health of the forests. While it is hard to make concrete statements about the reaction of certain tree species e.g. to changing precipitation values and distribution, it is quite safe to assume that the risk of extreme weather conditions rises with climate warming. The concomitantly increasing risks of forestry need to be taken into account by carefully selecting tree species, selecting suitable origins, checking the suitability of sites and maintaining forest stocks to grow vigorous, stress-tolerant forests. Based on this, Berlin forests are still following the concept of developing, as far as possible, near-natural forest stocks rich in structure and species with indigenous forest and shrub species that exhibit a high resilience towards environmental changes. In this context, it is very important in our region to preserve and increase the humus stocks in order to increase the storage capacity of the forest soils both for water and nutrients.

The progress achieved so far in reducing the contaminant load and in climate protection is not sufficient for sustainably stabilising the forest ecosystems in the region.

From a forestry perspective, pollution control should focus on reducing the nitrogen emissions from agricultural sources in Brandenburg and reducing the emissions of precursors of ozone formation, particularly from traffic-related emissions. Here the metropolitan area Berlin bears a particular responsibility.

Development History of the Berlin Forests up to the 2nd World War

Prior to colonization in the 12th century, the area of that is today Berlin was largely covered with forest. Oak and hornbeam forests were the prevailing forest types on the clayey soils of the plateaus (the Teltow, Barnim and Nauen plateaus), and pine and oak forests on the valley and plateau sands of the glacial spillway and the Grunewald Forest. In locations remote from groundwater, the pine-oak forest occurred in the form of durmast oak-pine forests, in locations near groundwater, in the form of English oak-beech forests or English oak-birch forests with a share of pines. This share was generally below 50 % in the original pine-oak forests, however, so that deciduous trees prevailed. In the river valleys and the flood areas, elm alluvial forests and oak-hornbeam forests grew. The woodland was interrupted only by some mires. Before colonization, the oak-hornbeam and the pine-oak forests each accounted for approx. 45 % of the wooded area, of which only 9 % consisted of pure pine stands. The forests of moist to wet locations thus accounted for only 10 % of the wooded area.

The earliest extensive use of the forest was for forest pasturing. The cattle were driven into the forest and fed on foliage, bark and fruit as well as the seedlings of the young trees. This caused a thinning of the forest, i.e. fewer young trees grew to maturity. The consequence was a changed species composition and the formation of stands of the same age. The colonization and cultivation of the countryside and, with it, the clearing of the forest, began on the most fertile soils, which were transformed into farmland. Thus, the oak-hornbeam forests were displaced on the clayey soils first. The heavy settlement development beginning in the 19th century also led to the build-up of fertile areas of arable land. Additional wooded areas were cleared, so that the forest survived only on the poorest soils, the pine and oak sites, strengthening the dominance of these species.

The constant retreat of the forest was not caused only by direct soil utilization. With the rising population, the need for wood as a raw material and energy source also increased. Mismanagement soon resulted in a wood supply shortage, so that as early as around 1700, the first legal regulations were imposed. The oak receded increasingly in favor of the pine in the Berlin forests, since the latter grew better on soil considerably damaged by forest pasturing, and since the oak was no longer favored as a source of feed. Since the beginning of the 19th century, the primary cause for the growing loss of wooded areas has been real estate speculation. Thus, the Berlin Council determined in 1823, despite furious citizens' protests, to clear-cut the Cöllnish Heath. By 1875, the city of Berlin had no more public forest property in its possession. In 1890, the Grunewald Forest consisted almost entirely of pine monoculture. At the turn of the century, the State Forestry Administration began to sell large wooded areas of the Grunewald Forest to real-estate speculators; by 1909, some 1,800 ha had been sold (cf. SenStadtUm 1991).

As part of the property acquisition for the extensive establishment of sewage farms, the city acquired the forestry districts of Buch (1898) and Gorin (1909). In order to guarantee the drinking-water supply for the growing population, the Wuhlheide Heath was added in 1910-'11. In 1911, Berlin and the surrounding communities combined to form the Administrative Association of Greater Berlin. One essential purpose was the acquisition and conservation of large areas which were to be kept free of

development. In 1915, the "Permanent Forest Purchase Agreement" was concluded between the Royal Prussian State and the Administrative Association, under which the latter acquired large parts of the forestry districts of Grunewald, Tegel, Köpenick, Grünau and Potsdam (approx. 10,000 ha) from the State of Prussia, and obligated itself not to build upon or to resell the acquired wooded areas, but to preserve them permanently for the citizens as near-urban recreational areas. In order to provide the inhabitants of the populous industrial borough of Wedding with recreational possibilities to the north, the city bought the Lanke Forest area as well. With the establishment of Greater Berlin in 1920, the municipal forests of Spandau and Köpenick as well as the Wansdorf, Carolinenhöhe and Tasdorf woodlands, which had belonged to sewage farms, became the property of the city. Not until after the inflation of the early '20s could Berlin acquire additional small forest areas in 1928 (e.g. the Düppel Manor and Neu-Kladow). The last large purchase occurred in 1937, with the acquisition of the Stolpe Forest, bordering Tegel. The forest land of the City of Berlin, located both within and outside the city limits, thus covered 25,480 ha at the beginning of World War II (cf. Fig. 1).

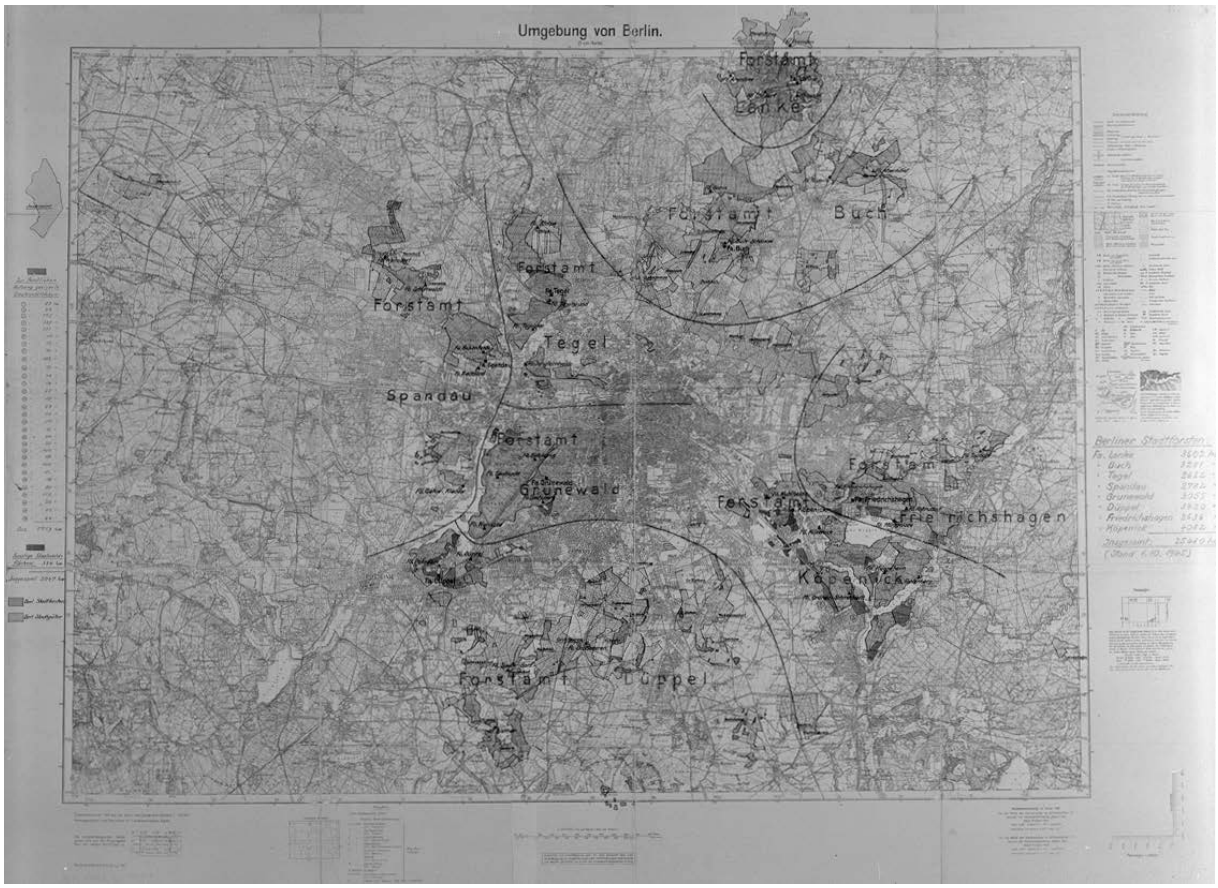

Fig. 1: Survey of the City Forests in the Area Surrounding Berlin in 1945

The Berlin forests suffered severe damage during the course of World War II. Between 1937 and 1944, more than twice as much wood was cut "to strengthen raw material supply" in Berlin than would have been sustainable from the point of view of forestry planning - 150,000 solid cubic meters per year (fm/a) instead of 71,000 fm/a. At the same time, the planting of new trees was neglected, and thus the principle of sustainability abandoned (cf. SenStadtUm 1995a). This systematic depletion increased still more during the last two years of the war: For the defense against the advancing Allies, a large number of trees were indiscriminately felled by the Wehrmacht, leaving behind extensive desolation. However, there was also large-scale theft of firewood, both by the *Wehrmacht* and by the population, which did great damage to the forest (570,000 fm during 1945-'46).

With the end of the Second World War, a period of separate development of the forests began in the eastern and western parts of the city, as well as in the districts located outside the city.

West Berlin after the 2nd World War

In **West Berlin**, after the war's end and the ensuing blockade (1948-'49), approx. 45 % of the original wooded areas had been cleared and/or greatly thinned. For lack of other plant material, mainly pines

were used for the extensive reforestation of the barren areas. This is the reason for the relatively excessive proportion of 50 to 70 year-old pine monocultures existing today.

Since the beginning of the '50s, the West Berlin forestry assessments have been using the opportunity to transform the forest and taking a step towards a mixed forest by deciduous undergrowth seeding and planting in clearings in open stands of old trees. The goal has been forestry on the basis of a selection forest, and the development of a permanent forest. At the same time, however, such florally foreign tree species as the larch, the Douglas fir, the Weymouth pine and the red oak were also introduced into the inventory by hurst and cluster. The 1979 State Forest Law and the 1982 Basic Forestry Plan for the Berlin Forests were oriented toward naturally compatible management of the Berlin forests. The most important goals of these operational guidelines were:

- an increase in the deciduous share from 40 % to 60 %;
- the promotion of a richly-structured mixed forest;
- the improvement of the conservation and landscape care;
- a 1-ha limit on clear-cutting;
- the adoption of natural rejuvenation;
- and abandonment of the use of herbicides and melioration measures.

East Berlin after the 2nd World War

The forest lands in **East Berlin** developed differently. The destruction of the old growth had not been as extensive as in the western part of the city. Those trees which, by the end of the war, had surpassed pole-timber age, but not yet reached felling maturity, were not subjected to harvesting during the '50s to the same extent as in West Berlin. This affects many areas in the districts south of the Müggel Lake. Thus, the old-growth proportion (stocks over 80 years old) was able to grow to 53 % by 1975. In addition, the rotation age has been raised for pines from 100 to 120 since 1975. The result was a deficit in wood production, which was tolerated out of consideration for the recreational function of the Berlin forests. Thus, the Berlin forests assumed a special place in East Germany. They received a recreational function, in addition to their primary role of raw material production. Due to the staged clear-cutting of the pines, wooded areas were characterized predominantly by the structures typical of an age-class forest.

Forestry in East Germany was greatly centralized. This was further intensified during the '70s. The goals were maximum increase in domestic wood production and the transition to industrial production methods. In the Berlin forests, the following measures were to be carried out:

- removal of all low-production stocks;
- no toleration of afforestation delays;
- fertilization and melioration measures; and
- restoration of a normal age structure (i.e., removal of the high old-growth proportion).

Because of the goal of multiple use of the Berlin forests, these guidelines could be somewhat diluted. The forest was broken down into classes of recreational functions. Maximum allowable clear-cut areas were established. For instance clear-cutting was forbidden at key recreational areas, while in recreational park forests, clear-cutting of up to 3 ha was allowed, compared with the up to 10 ha allowed in normal economic-use forests. In the areas of the former city forests outside the city limits, however, work was carried out according to the guidelines of optimal economic use under the direction of the respective locally responsible state-owned forestry operations.

As early as the '60s, smoke-damage investigations were carried out in the East Berlin forests, and damage to the trees was ascertained. As a result, a smoke-damage area amounting to 36 % of the total area was certified in 1974 (by 1975, it was already 43 %). For "revitalization," damaged pine forests were fertilized with nitrates. Between 1977 and the cessation of fertilization in 1985, 100 to 800 kg of nitrogen/ha were spread in the Fahlenberg and Müggelheim Districts.

A major problem in the East Berlin forest is the wide dissemination of chee-reed grass (*Calamagrostis epigeios*), which complicates natural rejuvenation. Its center of dissemination is found particularly in the relatively clear, single-layer pine stands which are devoid of a shrub layer and are of medium age. The

spread was encouraged by the former practice the clear-cutting and complete re-plowing, and the fertilization of the forests.

In the northeast of the city, large former sewage-farm areas were transferred to the Berlin Forestry Operation in 1985 and afforested in connection with the 750-year anniversary festival of the founding of Berlin (1987). This was carried out under heavy deadline pressure and without sufficient preliminary examinations, with the goal of the creation a recreational forest. After grading, the sewage farms were planted predominantly mechanically with over 50 different tree and shrub species, such as poplar, mountain ash, birch, alder, European beech, pine and spruce. The site problems, including heavy-metal pollution, the disturbed soil surface and ground-water conditions, and difficulty in the selection and procurement of suitable seed stock (including decorative trees and shrubs) resulted in unsatisfactory growth results and poor stock vitality (cf. SenStadtUm 1995a).

Current Situation

In 1992, the Berlin Forests published the Forestry Guidelines for Greater Berlin, which brings together the interests of forestry, conservation, recreational use and landscape esthetics to form a uniform concept for action. The orientation is toward careful, sustainable and naturally appropriate forestry. To preserve the climatic, hydrological, hydrochemical and public-health effects of forest areas, extensive measures for the protection and development of near-natural forest structures with rich animal and plant life are carried out in the entire wooded area.

The abundant dissemination of the black cherry, which was introduced about 100 years ago from North America, presents a considerable Berlin-wide problem, since it suppresses natural rejuvenation of florally appropriate tree species and the development of a herbaceous layer. In former West Berlin, it has been increasingly cleared since 1985. For financial reasons, removal measures are currently possible only on limited plots, and they need to be supplemented by the establishment of indigenous tree species through natural rejuvenation or plantation, so that areas once cleared cannot be recolonised.

Wood production, still an important function of modern forestry, in view of Germany's commitment to measures aimed at binding CO2 and the policy of increased use of renewable raw materials, is currently subordinated to the State of Berlin's cultural and social priorities. Nevertheless, the use fulfills not only the function of the provision of wood, but also provides an important large-scale effective method for the attainment of Berlin's forestry goals with regard for the creation of a mixed deciduous and coniferous woodland with a variegated structure and a large number of species.

The forests emerging in the future should contain a web of all stages of development, from the rejuvenation through the aged phase. Important structural elements, like standing deadwood or glades, should exist in sufficient quantity and quality and be distributed throughout the entire wooded area, and/or should emerge anew. The essential criteria for natural management of the Berlin forest are:

- Gradual reduction of the florally foreign tree species;
- Promotion of site-appropriate and florally appropriate tree species;
- Stock renewal through promotion of natural rejuvenation;
- Promotion of mixed stands with rich structural and species diversity;
- Abandonment of fixed rotation times while preserving and creating permanent forest structures;
- Selective, tree-by-tree wood harvesting;
- Abandonment of clear-cutting;
- Protection of hollows and nest-trees;
- An increase in the proportion of deadwood;
- No complete replowing of areas; and
- Renunciation of fertilizer and pesticides (cf. SenStadtUm 1992).

The Berlin Forests in 1990 applied to the Trust Agency (which managed former East German government property) for the restoration of approx. 13,000 ha of former Berlin city forest land in Brandenburg. The restoration of this area to the ownership of the state Berlin has now been almost completely concluded. The forest areas adjacent to Berlin to the south, in the Ludwigsfelde/ Grossbeeren/ Königs Wusterhausen area, were managed by the Berlin City Properties through January

1st 2002, and were then taken over by the Berlin Forestry Management. Of the total of approx. 29,000 hectares presently managed by the Berlin Forestry Management, approx. 16,500 hectares are within the State of Berlin, and the other approx. 12,500 hectares in the State of Brandenburg. Besides forested areas, the total area includes approx. 3,000 ha open spaces of diverse quality. They comprise water bodies, wet and dry open country areas, power line routes and many other habitats.

Since June 2002, the Berlin forests have been certified according to the criteria of FSC and Naturland. Thus the preservation of strict forestry standards is annually monitored and confirmed by independent third parties.

Present Structure of the Berlin Forestry Agencies

Since 2004 the Berlin forests have consisted of the four Forestry Agencies Grunewald, Tegel, Pankow and Köpenick with a total of 28 forestry districts. Leaving Kyritz aside, they are spread throughout an area extending over 65 km from north to south and 70 km from east to west.

The average size of the areas is approx. 980 hectares.

Statistical Base

Between 2001 and 2004, all Berlin forests (owned by the State of Berlin and managed by the Berlin Forestry Management) were for the first time investigated according to a uniform method in a forest assessment. The most important investigation parameters are the forest address (Forestry Agency, Forestry District, Section, Sub-Section, Plot), species of tree, age-classes, inventory layers, stocking levels (measure for the density of the inventory) and various other parameters relevant for planning. The method has also been carried out in the same manner on areas protected under conservation law; the protected areas (forest areas in state ownership) are also for the most part directly managed by the Berlin Forestry Management.

The operational maps in the scale of 1: 10,000 served as the map basis, with representation of the main tree-species group per plot/subsection, as well as the symbols for mixed tree species of the main stock and the symbols for the tree species of the other inventory layers.

The forest data are updated about every 10 years. The data stock of the forest assessment was checked and adapted in 2010-2011. Annual updates occur based on the available implementation data for individual areas.

The maps and the following evaluations are current as of October 1st, 2014. They include the areas of the Berlin forests that lie in the surrounding area.

Methodology

An important structural instrument for forest assessment data is the structure of forest lands in layers. Certainly, the progressing development of an age-mixed near-natural forest makes adherence to the mapping methods of inventory layers developed under forestry-management aspects increasingly difficult, since the clearly recognizable stratification is broken down - as is the intention. Still, the yet-prevailing inventory conditions at present make a layer-based description of the forest appropriate.

The five inventory layers certified for the Berlin forests are explained more precisely below, since e.g. the distribution of tree species among the various layers can lead to important conclusions for the further development of the inventory.

In the age-class forest, that layer of the forest is considered the **Main Stock** which is the most important and most characteristic for the stock from a forestry-management point of view. All forestry measures are concentrated on the main stock, until the target strength is achieved. The age of the main stock can vary strongly. After the reforestation of a clear cut, the one-year-old plants already constitute the main stock, while old, self-contained stocks may be 140 years old, or older. The tree species dominating the respective layer is the main tree species; other species of trees are described as mixed-tree species.

Reserve Trees are usually individual trees which are of greater age than the main tree layer. There is no clear line separating this category from that of **Residual Stocks**; ultimately, the number of still existing trees is the determining factor. Trees in these two layers are the points of departure for the natural rejuvenation of the forest.

The layer of the trees which are young and not yet stock-forming is described as **Undergrowth** or **Secondary Growth**. The assignment to undergrowth or to secondary growth, respectively, is carried out on the one hand on the basis of tree species (over the long run, secondary growth is to constitute the main stock, therefore undesirable species such as the black cherry cannot be classed as secondary growth); and on the other on the basis of the vitality and quality of the trees (misshapen, weak trees and those of undesirable species are classed as undergrowth). In a near-natural forest, undergrowth and secondary growth occur as natural rejuvenation (e.g. by natural seeding from reserve trees).

A comparison of tree species composition of the main stock with that of the undergrowth and secondary growth shows a clear shift from pine to deciduous trees. This is an important indicator that the Berlin forests are on the right path in management with the goal of moving the Berlin forest in a more near-natural direction (see graphics in the chapter Data Evaluations).

Unlike the 1995 Environmental Atlas, the separate representation of florally exotic species of trees has not been undertaken in the present version. These tree species are still recorded in detail through the forestry assessment, and can also be evaluated. However, the experiences collected over the past decades indicates that maximum success in the fight against such neophytes is not necessarily assured by maximum expense. The natural aging and dying of undesirable tree species due to competition with desired tree species may in many cases lead to the goal just as surely, and much more economically. A separate representation therefore seems no longer required. The present forest assessment data stock is based on the following assignments tree species to tree-species groups:

Name of Tree-Species Group	Tree Species
Pine	Scots pine, Austrian black pine, Weymouth pine, other pines
Other conifers	All other conifers
Oak	Common and black oak, red oak, other oaks
Beech	Common beech, other beeches
Other deciduous trees with high rotation times (Alh)	Hornbeam, ash, species of maple, elm etc.
Other deciduous trees with low rotation times (Aln)	Birch, alder, willow, poplar, black cherry etc.

Tab. 1: Assignments of Tree Species to Tree-Species Groups

For the representation of the age distribution in the map, the following age classes were combined into three age classes:

Age class :	I	0 - 20 years,
Age class:	II	21 - 40 years,
Age class:	III	41 - 60 years,
Age class :	IV	61 - 80 years,
Age class:	V	81 - 100 years,
Age class:	X	> 180 years.

The current Edition 2015 makes extensive data per stand address available for the first time. Thus, not only the main tree species is specified, but up to five tree species per tree layer as well as the corresponding mixture proportion (%), diameter at breast height (cm) and tree height (cm). Information on the location and the responsible forest authority is also provided.

Map Description

Tree Species Distribution, Total Area of the Berlin Forests

The distribution of tree species groups in the main stock of the Berlin forests shows the pine with 64.5 % and the oak with 13.8 %, while 10.7 % of the areas are stocked with birch and 4.1 % with beech.

Hornbeam, maple, elm and other deciduous hardwoods account for 3.3 %, while fir, Douglas fir, larch and other conifers make up 3.5 % of the total area. Figure 2 and the corresponding Table show an overview of the distribution of tree species in the Berlin forests and the differences between the Forestry Agencies.

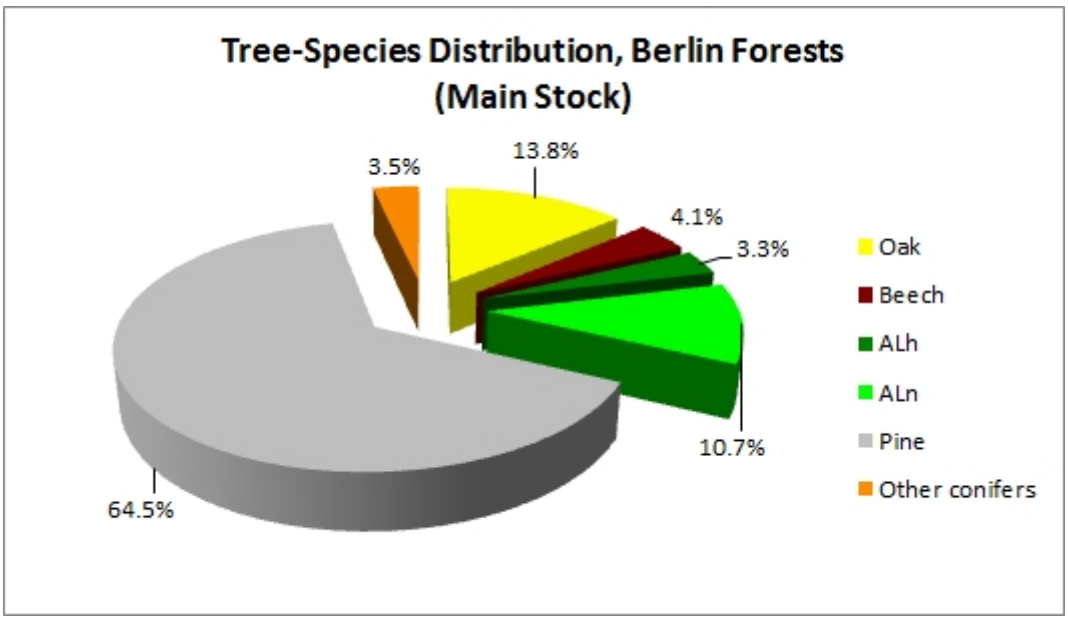

Fig. 2: Tree Species Distribution in the Berlin Forests (Main Stock)

Tree-Species Group	Area in hectares
ALh	842
ALn	2,703.6
Beech	1,020.8
Oak	3,488.1
Pine	16,265.4
Other Conifers	881.7
Total	**25,201.6**

In the inventory layers Undergrowth and Secondary Growth, the distribution of tree species is completely different. Here, the area shares shift away from Pine (only 2.2 %) and Other Coniferous (1.5 %) to Deciduous Hardwoods (47 %), Oak (19.8 %), Beech (16.5 %) and Deciduous Softwoods (13 %). The major share of the latter is accounted for by the black cherry, the common birch and the mountain ash. Among the Deciduous Hardwoods, the Norway maple and the sycamore dominate.

With a total of 16,000 hectares of undergrowth and secondary growth, as well as the staged character of the main stock which has been achieved to some extent, 50 % of the area of the Berlin forests now has a two or multi-layered inventory.

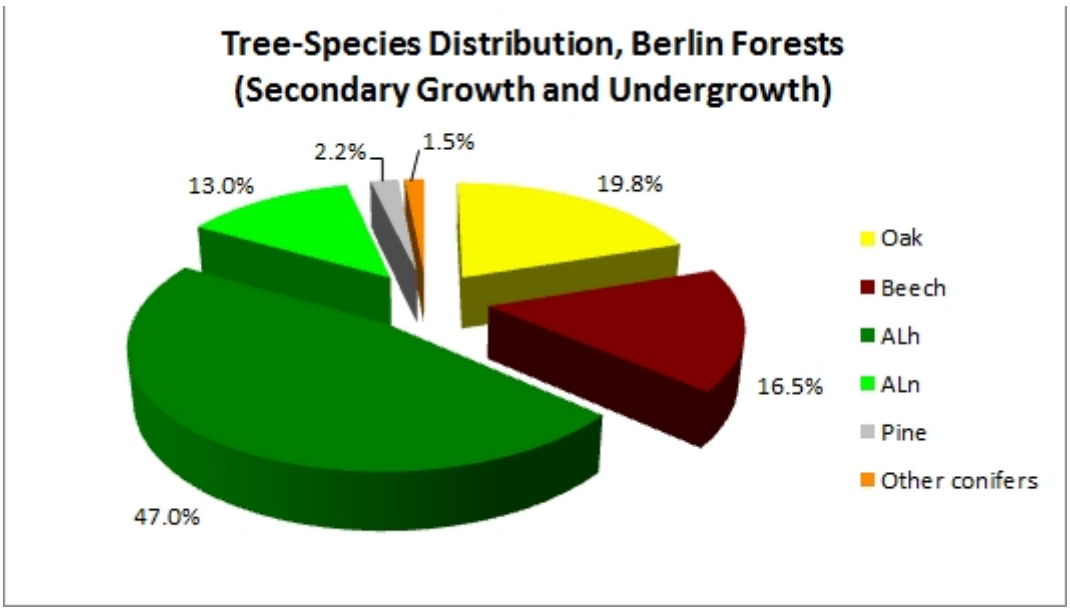

Fig. 3: Tree Species Distribution Berlin Forests (Secondary Growth and Undergrowth)

Tree-Species Group	Secondary Growth (area in hectares)	Undergrowth (area in hectares)	Total (area in hectares)
ALh	245.5	7,290.4	7,535.9
ALn	886	1,195.9	2,081.9
Beech	1,829.7	822.2	2,651.9
Oak	1,678	1,503	3,181
Pine	208.4	136.5	344.9
Other Conifers	111.8	130.2	242
Total	**4,959.4**	**11,078.2**	**16,037.6**

Age-Class Distribution, Total Area of the Berlin Forests

The age-class distribution shows a picture characteristic for the North German Plain. There is a clear excess of the third and fourth age-classes, which is due to over-exploitation during and after World War II. Except for these two age-classes, the age-class structure of the Berlin forests is quite well-balanced.

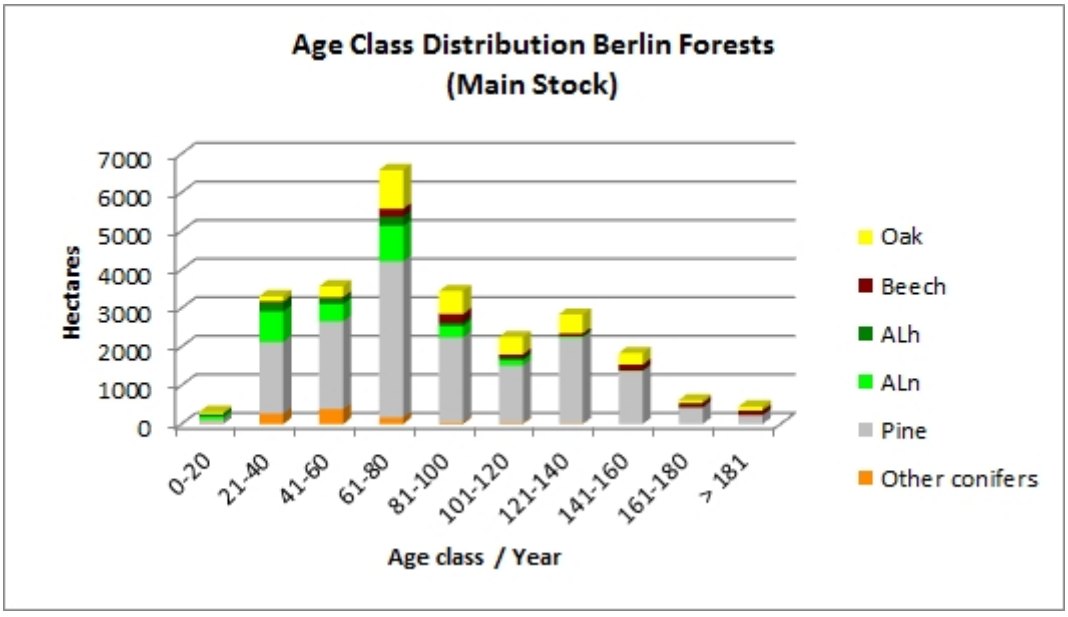

Fig. 4: Age-Class Distribution Berlin Forests (Main Stock)

Clearly, the pine is the dominant tree species in all age-classes. Fortunately, there is also a share of oak in almost every age class.

An evaluation included all inventory layers in an age-class confirms the impression already obtained from the tree-species distribution that an extensive transformation in the inventory, involving a shift of considerable proportion away from pine monoculture and toward a mixed inventory with a major share of deciduous species, is occurring. In particular, the high proportion of oak and beech should be noted here. Less heartening is the large area share occupied by the Aln category (Other Deciduous with Low Rotation Times), since this essentially involves the black cherry.

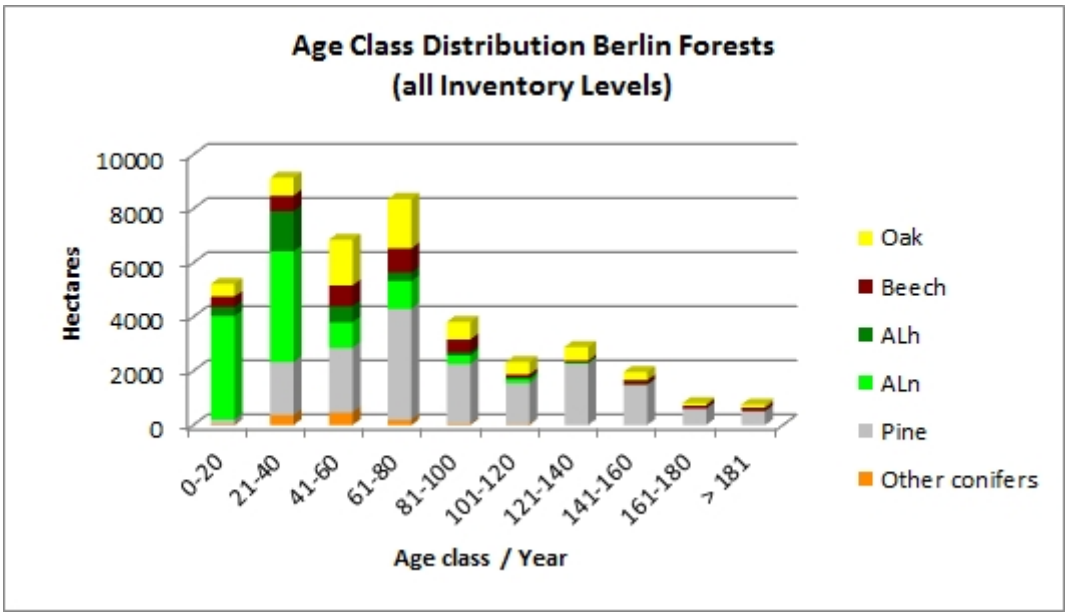

Fig. 5: Age-Class Distribution Berlin Forests (all Inventory Levels)

Tree Species and Age-Class Distribution in the Individual Forestry Agencies

The inventory of tree species differs due to location and historical conditions in the individual Forestry Agencies.

- **Tegel Forestry Agency**

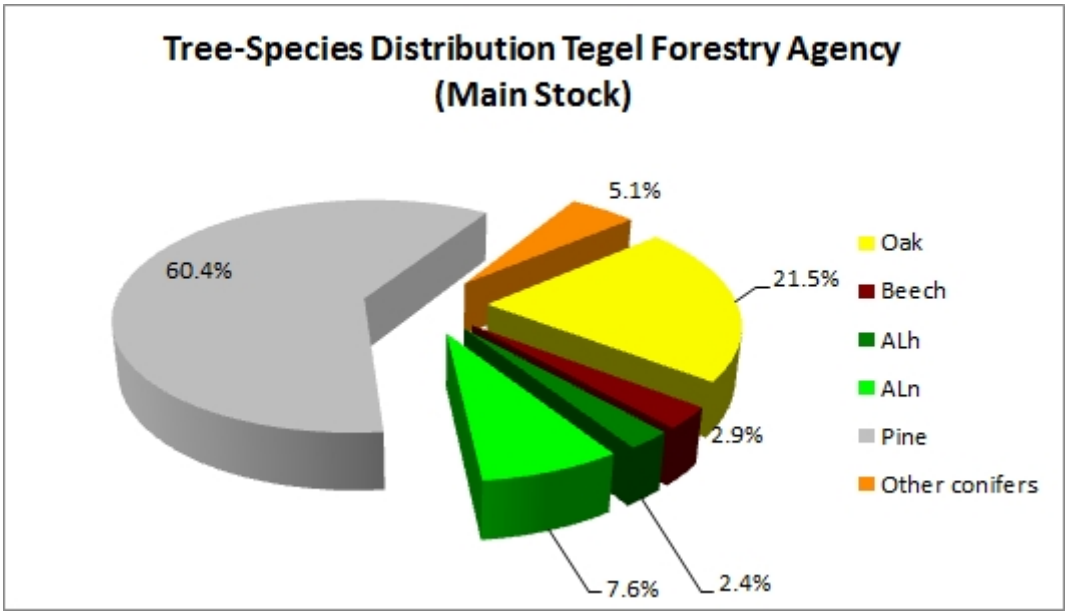

Fig. 6: Tree Species Distribution, Tegel Forestry Agency (Main Stock)

Tree-Species Group	Area in hectares
ALh	130.2
ALn	403
Beech	155.9
Oak	1,149.5
Pine	3,224.8
Other Conifers	271.4
Total	**5,334.8**

In the Tegel Forestry Agency, the pine is still the characteristic species of tree, although the overall tree-species structure is distorted in favor of the pine by the very high pine share in the Wansdorf and Stolpe forestry districts. The oak has a relatively high share, with 21.5 %, particularly in the inner-city forest areas. The beech is often the characteristic tree species in these inner-city areas; however, it accounts for only a small share of overall tree-species distribution.

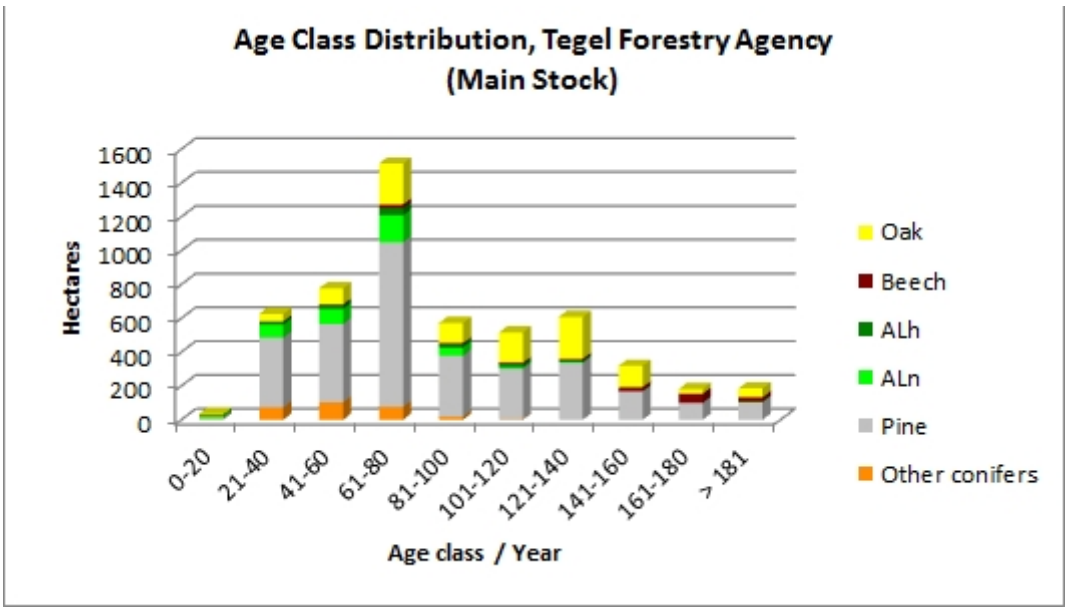

Fig. 7: Age-Class Distribution, Tegel Forestry Agency (Main Stock)

The age-class distribution in the Tegel Forestry Agency also shows a typical peak in the third and fourth age classes. At the same time, however, there is also a considerable share of older stock of oak. The amount of older beech is not particularly large, contrary to the visual impression in the inner-city forest areas.

- **Grunewald Forestry Agency**

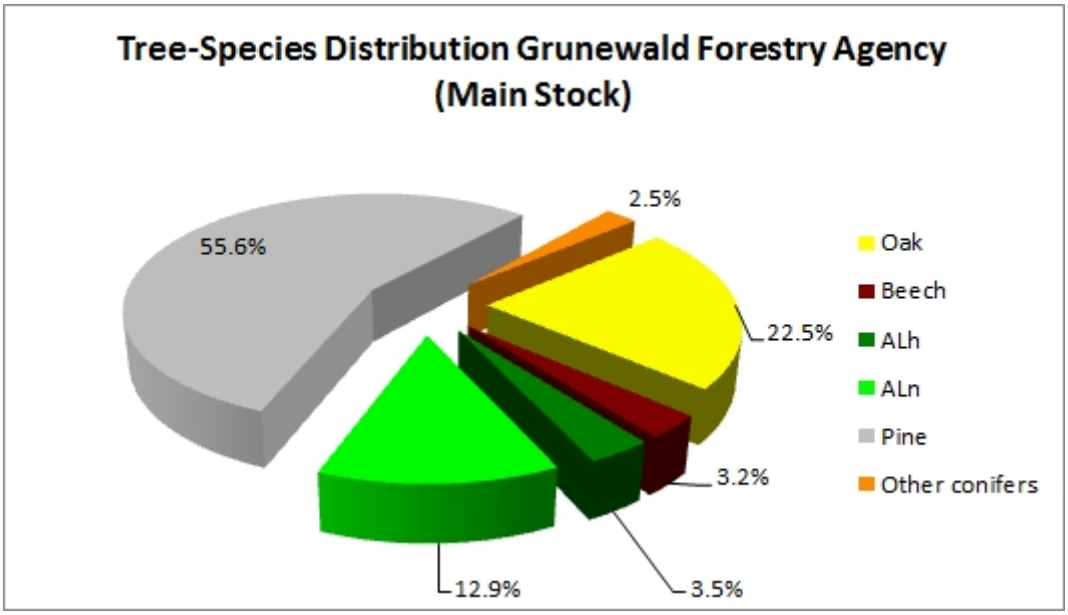

Fig. 8: Tree Species Distribution, Grunewald Forestry Agency (Main Stock)

Tree-Species Group	Area in hectares
ALh	188.7
ALn	701.1
Beech	172.5
Oak	1,223.4
Pine	3,027

Other Conifers	134.9
Total	**5,447.6**

The share of oak is even more considerable in the Grunewald Forestry Agency, largely due to the lack of large pure-pine districts. The share of beech is roughly comparable to that of the Tegel Forestry Agency.

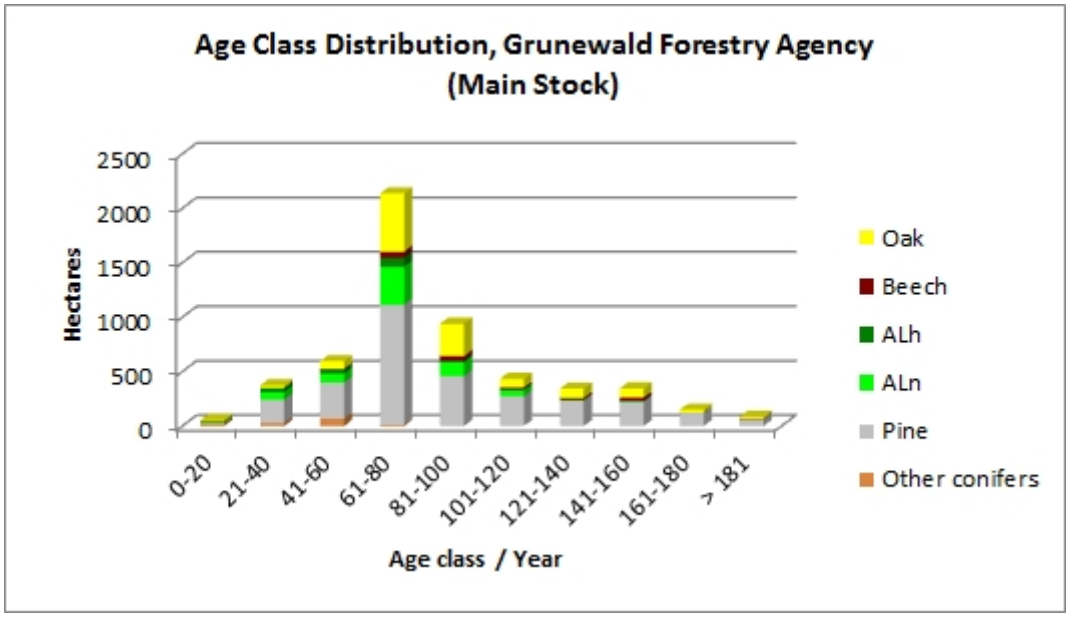

Fig. 9: Age-Class Distribution, Grunewald Forestry Agency (Main Stock)

A not atypical distribution for Berlin forests, though the high share of oak in the fourth age-class is conspicuous. The oaks here are predominantly present as mixed-tree species in pine stocks. The very low area share of the youngest age-class in the main stock is also conspicuous. The reason for that is that in recent decades, large-area uses were not carried out. Secondary growth does however exist in sufficient quantity in the areas of the Grunewald Forestry Agency.

- **Köpenick Forestry Agency**

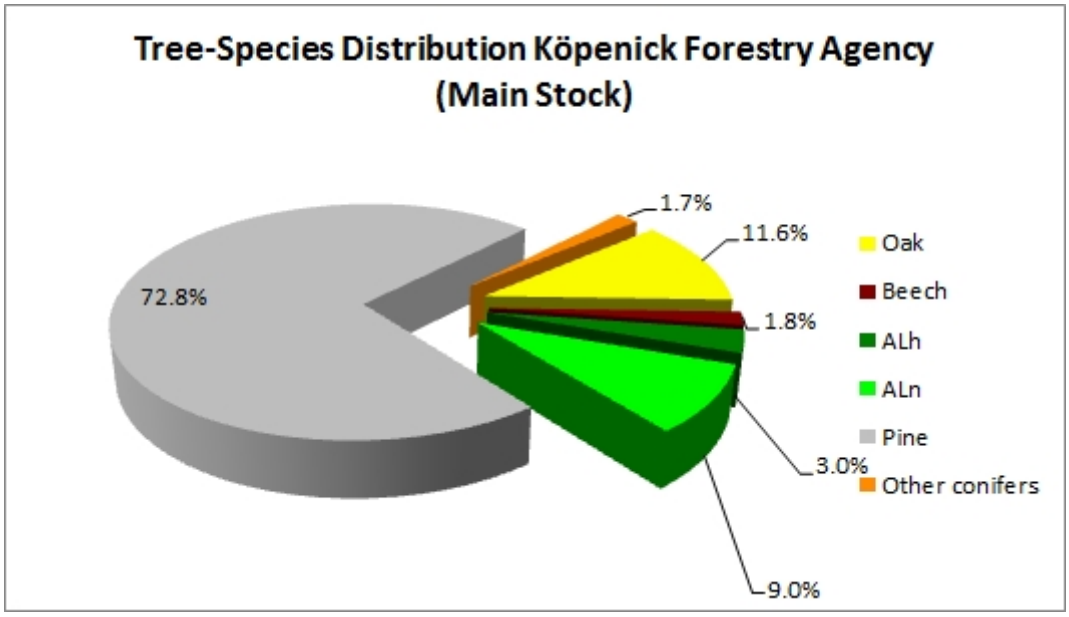

Fig. 10: Tree Species Distribution, Köpenick Forestry Agency (Main Stock)

Tree-Species Group	Area in hectares
ALh	232.3
ALn	688
Beech	135.7
Oak	884.5
Pine	5,550.2
Other Conifers	131.7
Total	**7,622.4**

Two thirds of the forest areas of the Köpenick Forestry Agency are pine areas, mainly single-layered pure stock covering large areas. Forestry management measures during the coming decade are to bring about an extensive change of tree species by means of a change of the light-exposure conditions. The oak stock is to a large extent very near-natural. The large share of deciduous softwoods (Aln) involves largely alder stocks in major wetlands as well as along the numerous lakes, as well as the birch stands, which can be found everywhere. The beech share is low due to climatic and site conditions.

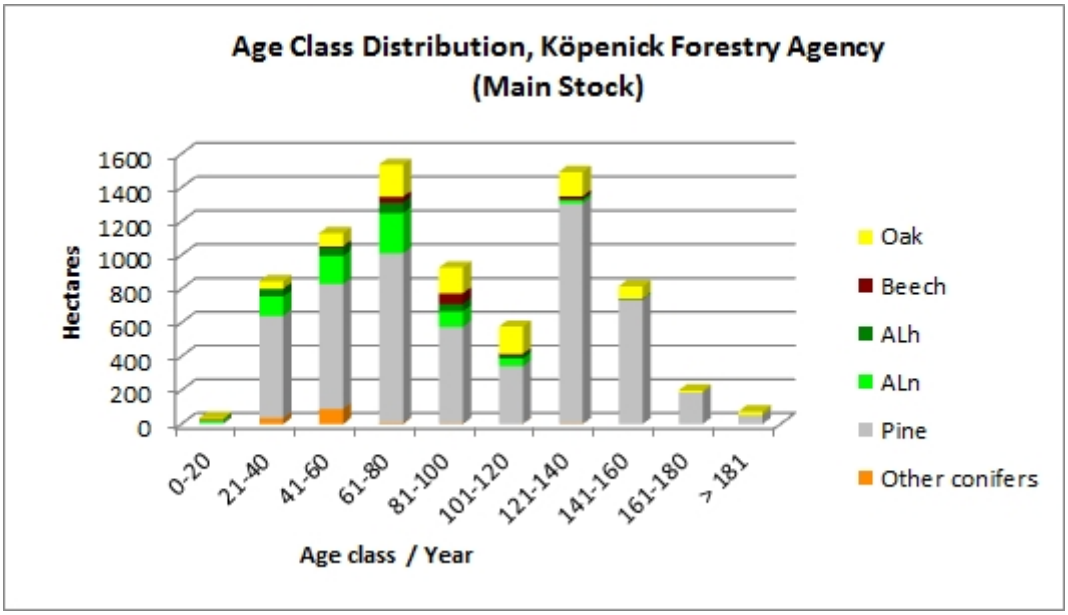

Fig. 11: Age-Class Distribution, Köpenick Forestry Agency (Main Stock)

Köpenick differs markedly from the two previous Forestry Agencies. The very balanced distribution, with a high share of older stock is notable. Historically, this is due to the relatively low amount of reparations logging after the war, and to restrained use because of the special significance of this area for recreation.

- **Pankow Forestry Agency**

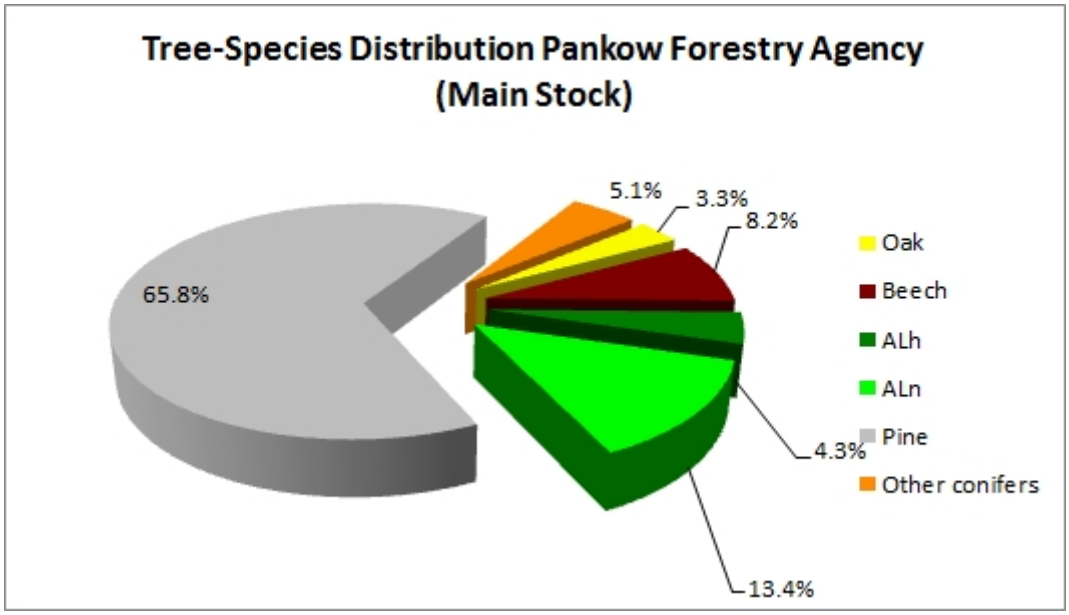

Fig. 12: Tree Species Distribution, Pankow Forestry Agency (Main Stock)

Tree-Species Group	Area in hectares
ALh	287.9
ALn	906.8
Beech	553.8
Oak	220
Pine	4,454.4
Other Conifers	344.4
Total	**6,767.3**

The tree species distribution in the Pankow Forestry Agency is also strongly characterized by the pine. However, due to site and climatic conditions, there is a higher share of Aln-category trees, as well as of beech. North of the Berlin city limits runs the boundary between two climatically delimited zones, the dry lowlands climate to the south of the city limits, and the temperate humid lowlands climate to the north. North of the Berlin city limits, a characteristic beech area thus begins, of which the Pankow forest areas constitute a considerable share. The largest coherent old beech complexes in the Berlin forests are located here. They have considerable significance for conservation as well as favorable conditions for the gradual development of a richly structured, near-natural inventory.

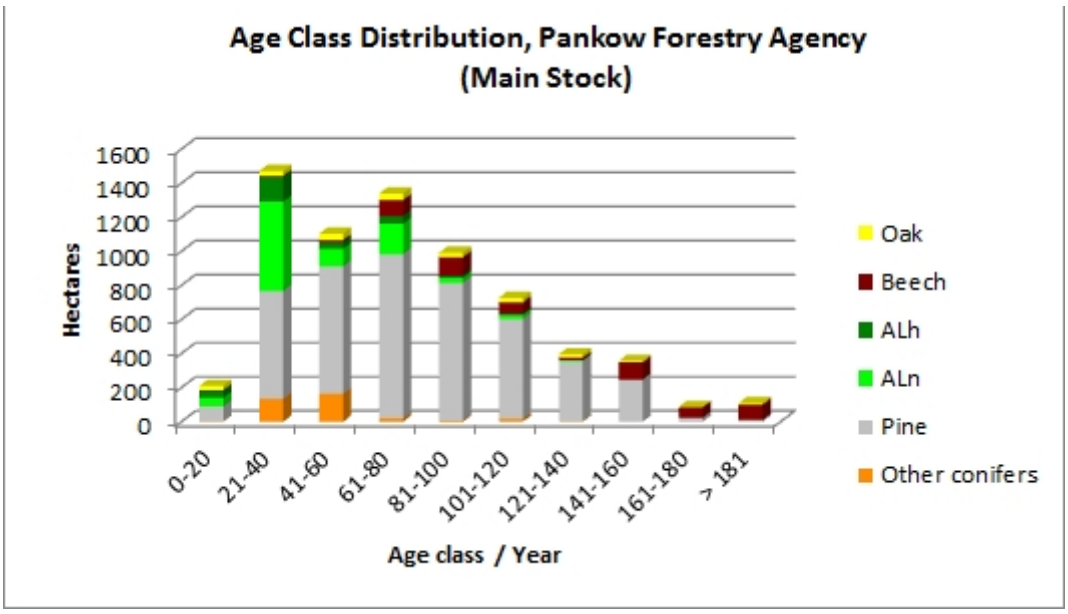

Fig. 13: Age-Class Distribution, Pankow Forestry Agency (Main Stock)

The distribution of the Pankow Forestry Agency shows clearly that oak species are considerably less frequently represented, with the beech taking its place. The high share of Aln-category trees is dominated by species from the former sewage farms, with the poplar occupying the largest areas. Another significant species of this category is the alder, which occurs along the numerous ditches, creeks, lakes and wetlands.

Glossary

Age-class forest (clear-cut-managed timber forest)**:** The management mode dominant in Central Europe, with age classes, and with use and rejuvenation by spatially separate stands**.** It is characterized by the distinction of areas by age class (young growth, thicket growth, pole woods, timber woods, old woods), and clear breaks due to area-based rejuvenation management. Because of the different biotopic qualities of the individual age classes in an age-class forest, plants and animals find favorable conditions of life only in that age phase which meets their respective needs. Because of the age identity prevailing within these age classes, pests enjoy optimal living conditions, which makes such forests susceptible to them. Its opposite is the → Sustainable forest.

Appropriate forestry: The term “appropriate forestry” describes the criteria of minimum requirements for multifunctional forestry arising from the sum of all societal claims on the forest. This means, in addition to conservationist requirements, requirements to ensure recreation functions, resource-economic requirements, or requirements for forest protection etc. (Winkel 2006).

Black cherry (*Prunus serotina*) **:** Tree species native to North America. First introduced to Germany in 1685 as a decorative tree in the gardens and parks, it arrived in Berlin/ Brandenburg only in the latter half of the 18th century. From 1900 to approx. 1950, it was also planted in a planned manner for site improvement. Since 1986, it has been removed from stands of trees in Berlin for ecological and forest-structural reasons, to permit the indigenous forest to develop.

Certification: Verification system for an ecologically-oriented labeling system for wood products from sustainable forestry management, which will be accepted by consumers. It is based on the UNCED Conference in Rio de Janeiro (1992) and the subsequent conferences. The participating countries have affirmed the goal of establishing uniform criteria and indicators for the sustainable management of the forests. The “General Guidelines for the Sustainable Management of Forests in Europe” was adopted in Helsinki in 1993 by all the Western European industrial nations, and the “General Guidelines for the Conservation of Biodiversity of Forests in Europe” followed in Lisbon in 1998. Sustainability, from the point of view of wood production, of forest biodiversity, and of forest utilization for economic and social purposes, was observed. Since June 2002, the Berlin forests have been certified according to the criteria of FSC (Forest Stewardship Council) and Naturland.

Deadwood: Standing or fallen trees or parts of trees which have died. Deadwood occurs in over-mature natural forests, but is also caused by disease (e.g. attacks by insects or fungi), wind and snow breakage, and by fire. Decomposing wood provides a habitat for mushrooms, including many endangered large mushrooms, beetles, (wood is the basic habitat for more than half of all species), wood wasps, wild bees, ants, and many other species of animal. Deadwood contributes decisively to the preservation of species diversity in a forest.

Degree of cover, degree of shading: Expression for the degree of covering of the forest soil by the crowns of all stock elements of a stand**.**

Forest assessment: A recording of the condition of the forest and a check of the success of measures carried out periodically (every ten years). The medium-term operational planning for the next assessment period is carried out in the context of this process.

Forest Biotope Mapping: Mapping of biotopes, such as stands with rare indigenous animal and plant species, associations, former sheep-walks, residual natural forest stands, unusual natural features and natural monuments, and also swamp, ravine, bogside and dry woods, and succession areas**.** The goal of forest biotope mapping is the natural-area-related recording and assessment of ecological condition and the conservation assets of biotopes in woodlands, in order to create the basis for coordination between the ecological conditions of the forests and the various goals of sustainable forestry. Two types of the forest biotope mapping can be distinguished: (1) full-scale mapping; and (2) selective mapping.

Forest Stewardship Council (FSC): This was set up in as a result of the Environmental Summit in Rio. The FSC is a non-profit NGO which supports the ecological and socially responsible use of the forests. The organization is supported worldwide by environmental organizations, labor unions, representative of indigenous peoples, and numerous companies from the timber and wood industries. Its goal is to contribute towards improving forest management worldwide. It drafts standards and develops mechanisms for marketing appropriately produced wood products. The most important feature of the FSC is that it works out a balance between the claims upon the forest of environmental, social and economic interests. Minimum ecological standards are defined which guarantee that in the long run, the basic ecological functions of the forest ecosystem can be ensured; see also → *Naturland*

Forms of forest structure: The structure of the forest takes different forms, depending on the type of management. Coppice forests are of the same age, single-layered and mixed. The coppice-with-standards forests are uneven-aged, multi-layered and mixed singly or in groups. The clear-cut-managed timber forest is even or uneven-aged, single or multi-layered and structured in stages, either monocultural or mixed singly or in groups. The selection forest is uneven-aged, multi-layered and structured in stages, and mixed singly or in groups.

Future-crop-tree, Selection tree: An individually selected tree, with good growth which promises a good mass and value performance in terms of growth, stability, appearance and health, i.e. which largely meets the goals set by forest management**.** A future-crop-tree can be supported by the removal of competing trees which restrict its growth

Melioration: Soil melioration is the general term for soil improvement measures**.** In the area of the former sewage farms, this is done by working marly clay into the soil for pH-value stabilization and to bind heavy metals.

Natural forest associations: When left free of anthropogenic influence, various forest sites have given rise to various forest associations of species, i.e. forest typologies are adapted to the specific climatic and soil conditions. Due to their very similar combinations of characteristic species, these various forest associations are defined. Under certain local conditions, only one certain combination of plant associations can establish itself and take hold. In the Berlin, oak-hornbeam, acidic-soil oak, oak-pine, and warm-site pine forests predominate.

Naturally appropriate forest management: As an alternative to clear-cut management, naturally appropriate forest management calls for maintaining a natural forest consisting of a mixture of site-appropriate species for the best possible usage and simultaneous care of the site**.** Major elements include: permanent stocking with mixed deciduous and coniferous site-appropriate trees, and wood production with high added value and reduced labor intensity. The goal of stability and full permanent utilization of production capacities, while maintaining the internal climate of the forest, has priority. These goals are to serve the modification of stand-based management toward a more uneven-aged and staged forest structure, and a utilization policy of the entire area oriented toward the value development of the individual tree, elimination of clear-cutting, and a shift from the time sequence of harvest and planting toward a simultaneity. Rejuvenation is shifted under the shelter of the old trees; the concept of a mixed

deciduous and coniferous woodland is pursued; and the continuity of forest care is ensured by a more frequent schedule of care intervention. Under naturally appropriate forest management, the forest ensures the protection of its own site, its flora and fauna exhibits a large number of species, and it is thus altogether more resistant to damage. Small-scale diversity and an uneven-age structure make individual-tree utilization, care, and rejuvenation possible at the same time. Naturally appropriate forest management ensures a continuity of the ecosystem of the forest, including the circulation of substances in a very small area. The functions of the forest are sustainably provided, and natural rejuvenation and the preservation of the forest gene resources ensured. The Association for Natural Forest Management (ANW) has for 50 years been working nationwide for a stable and healthy forest woods. Pro Silva has been founded as a Europe-wide association.

***Naturland*:** In 1996, the association *Naturland,* together with large conservation organizations such as Greenpeace, BUND and Robin Wood, developed guidelines for ecological forest use. Several German cities, such as the Lübeck, Göttingen and Hanover, decided to accept the supplementary requirements of the *Naturland* certificate for their city forests, in addition to the stringent → FSC guidelines . The state of Berlin has also committed itself to compliance with these guidelines.

Activities incompatible with ecological forest use include in particular:

- Clear-cutting
- Planting of monocultures
- Introduction of non-indigenous or genetically modified tree species
- Use of poisons, mineral fertilizers, liquid manure, sewage
- Plowing or compacting of the soil
- Large-scale clearing, or burning of biomass
- Drainage of wetlands
- Disturbing operations during ecologically sensitive seasons
- Feeding of wild animals.

Moreover, the so-called reference areas, where forest use is terminated and the forest is left to its natural development, are an essential component of certification. Conclusions for the most appropriate manner of management in the rest of the forest can in turn be drawn from this.

In the Berlin forests, the stated stipulations have for the most part been carried out for many years.

Neophytes: Purposely or accidentally introduced plants from remote areas or other continents which are not part of the natural species composition. Neophytes such as the → black cherry (*Prunus serotina*) (q.v.) or the snowberry (*Symphoricarpos albus*) can crowd out native plants. In Brandenburg, the locust tree is a particular problem. It invades low-nutrient meadows and changes their habitat populations by shading and nitrogen enrichment.

Old woods: Usually old woodland, in which the trees have achieved the target size, and can be used.

Permanent Forest Contract (*Dauerwaldvertrag*): A sales contract concluded in 1915 between the Association of Municipalities of Greater Berlin and the State of Prussia, concerning the former domain forests in the immediate surroundings of Berlin. In 1920, the Association was transformed into the united municipality of Greater Berlin. Berlin thus obtained possession of extensive forest lands. The term "*Dauerwald*" in the German name of the contract did not refer to the naturally-appropriate management form supported by MÖLLER (1922), which used the same German term, and which is referred to in English as the "Sustainable Forest" concept (q.v.). Rather, it referred to the permanent contractual obligation upon the Association, or upon the city of Berlin as its successor, not to sell the forest land for construction purposes; hence the different terminology in English.

Provenances: An autochthonous or non-autochthonous population of trees which grow at a certain fenced off place and have certain characteristic and genetically established qualities**.** The provenance is assigned the name of that place, e.g. West German Hill Country and Upper Rhine Trench.

Reference areas: Reference areas which are not economically used are certified for recurring comparison with utilized areas; they are to represent the most important stand types of the forest. The goal is to preserve local and site-specific information about the natural forest development and for ecological forest utilization.

Rejuvenation: Planting of a new forest stock by natural or artificial rejuvenation**.** In nature rejuvenation, the stock itself ensures seeding in the vicinity of mother trees, or by vegetative reproduction. This saves work and expense. In artificial rejuvenation, the desired species of trees are raised by seeding or plantation in a certain area.

Reparations lumbering: After both World Wars, the Allies engaged in lumbering in the German forests, particularly in the state-owned forests, to collect reparations payments**.** The principles of sustainability were not taken into account. After 1945, this obvious overexploitation, together with lumbering by the United Nations Reconstruction and Rehabilitation Administration carried out to provide firewood and other necessities for the over one million displaced persons and other needy groups of people in Germany, led to citizens' protests and finally to the foundation of the German Forest Protection Association.

Rotation time: Rotation time is the forester's term for the average duration between the planting and the harvesting of a forest. It varies according to tree species and location.

Sheep-walks: From the Middle Ages until early modern times, forests containing broad old oaks and beeches with large crowns, and a groundcover of grass, heather or blueberries. Among other things, the sheep-walks served for forest pasturing and pannage. The owners of the forest had to permit holders of sheep-walk rights to pasture their animals. However, intensive forest pasturing robbed the forest pastures of their natural regenerability, so that no natural rejuvenation could occur. Thus, these forests became increasingly impoverished. They still occupied a considerable area in the 18th century.

Site Mapping: Method by which all natural and ecological conditions important to forest growth are recorded as a basis for site-appropriate, effective forestry management**.** It forms the basis for a description and cartographic representation of site types or site units. These are basic forest-ecological units with roughly the same forest-structural possibilities and risks, and with roughly similar yield capacities. Site mapping primarily serves as a basis for selection of tree species and the determination of stand structure.

Sustainable forest: A forest structure in which a coherent stand is permanently maintained despite forest use. Gaps in the high growth caused by cutting of single trees are immediately closed again by growth of medium and lower growth (selection forestry management). In Brandenburg, the concept of the sustainable forest (*Dauerwald*) attained great importance for the first time during the twenties, when A. MÖLLER (1922) argued in favor of naturally appropriate selection forestry, in reaction to the management system based on clear-cutting of pine. The sustainable forest concept was implemented at that time in the Fläming district of Bärenthoren.

Target-size utilization: Minimum diameter at which utilization of different tree species may begin in near-natural management. In Berlin, this regulation has replaced the rotation age system, which applied there until 1992.

Vetting: Forestry care measure in young woods to reduce the number of trees, regulate the competitive situation, and achieve a mixture of tree species. No marketable wood is yet obtained.

Wood production: This important branch of production since ancient times now uses approx. 31 million sq.m. of wood (rough timber) annually (down from 39.3 million sq.m. in 1995) in Germany, whereas the growth is several million higher. The German woods provide a sustainably utilizable potential of approx. 57 million sq.m. per year.

Names of Existing Tree Species

Contraction	Scientific	German	English
AHS	*Acer*	Ahorn	Maple
AS	*Populus tremula*	Aspe	Common Aspen
BPA	*Populus balsamifera*	Balsampappel	Balsam Poplar
SBW	*Salix*	Baumweiden	Willow
BAH	*Acer pseudoplatanus*	Bergahorn	Sycamore Maple
BRU	*Ulmus glabra*	Bergrüster	Wych Elm
BIS	*Betula*	Birke	Birch
Blö		Blöße	bareness
BWE	*Salix fragilis*	Bruchweide	Crack Willow

BUS	*Fagus*	Buche	Beech
DGS	*Pseudotsuga menziesii*	Douglasie	Douglas Fir
EB	*Sorbus aucuparia*	Eberesche	Rowan
EIB	*Taxus baccata*	Eibe	Yew
Ei	*Quercus x*	Eiche	Oak
ELS	*Sorbus torminalis*	Elsbeere	Wild Service Tree
ESS	*Fraxinus*	Esche	Ash
EAH	*Acer negundo*	Eschenblättriger Ahorn	Ashleaf Maple
EK	*Castanea sativa*	Eßkastanie	Sweet Chestnut
ELA	*Larix decidua*	Europäische Lärche	European Larch
SPA	*Populus nigra*	Europäische Schwarzpappel	Black Poplar
FAH	*Acer campestre*	Feldahorn	Field Maple
FRU	*Ulmus minor*	Feldrüster	Field Elm
WRU	*Ulmus laevis*	Flatterrüster	European White Elm
GBI	*Betula pendula*	Gemeine Birke	Silver Birch
GES	*Fraxinus excelsior*	Gemeine Esche	Common Ash
GFI	*Picea abies*	Gemeine Fichte	Norway Spruce
GKI	*Pinus sylvestris*	Gemeine Kiefer	Scots Pine
GSB	*Symphoricarpos albus*	Gemeine Schneebeere	Common Snowberry
GTK	*Prunus padus*	Gewöhnliche Traubenkirsche	Bird Cherry
WER	*Alnus incana*	Grauerle	Grey Alder
GPA	*Populus canescens*	Graupappel	Grey Poplar
HBU	*Carpinus betulus*	Hainbuche	Common Hornbeam
HAS	*Corylus*	Hasel	Hazel
JLA	*Larix kaempferi*	Japanische Lärche	Japanese Larch
KTA	*Abies grandis*	Küstentanne	Grand Fir
MEH	*Sorbus*	Mehlbeere	Whitebeam
MBI	*Betula pubescens*	Moorbirke	Moor Birch
PAS	*Populus*	Pappel	Poplar
RO	*Robinia pseudoacacia*	Robinie	Black Locust
RKA	*Aesculus hippocastanum*	Roßkastanie	Horse-chestnut
RBU	*Fagus sylvatica*	Rotbuche	European Beech
REI	*Quercus rubra*	Roteiche	Northern Red Oak
RER	*Alnus glutinosa*	Roterle	Common Alder
RUS	*Ulmus*	Rüster	Elm
SKI	*Pinus nigra*	Schwarzkiefer	Black Pine
WWE	*Salix alba*	Silberweide	White Willow
SLI	*Tilia platyphyllos*	Sommerlinde	Large-leaved Lime
EIS	*Quercus*	sonstige Eichen	other Oaks
FIS	*Picea*	sonstige Fichten	other Spruces
HLS		Sonstige Hartlaubbaumarten	other Sclerophyll
KIS	*Pinus*	sonstige Kiefern	other Pines
NHS		Sonstige Nadelbaumarten	other Conifers
TAS	*Abies*	Sonstige Tanne	other Firs
WLS		Sonstige Weichlaubbaumarten	other Softwoods
STK	*Prunus serotina*	Spätblühende Traubenkirsche	Black Cherry
SPE	*Sorbus domestica*	Speierling	Service Tree
SAH	*Acer platanoides*	Spitzahorn	Norway Maple
SEI	*Quercus robur*	Stieleiche	English Oak
TEI	*Quercus petraea*	Traubeneiche	Sessile Oak
VKB	*Prunus avium*	Vogelkirsche (-baum)	Wild Cherry
WTA	*Abies alba*	Weißtanne	European Silver Fir
WKI	*Pinus strobus*	Weymouthskiefer	Eastern White Pine

WLI	*Tilia cordata*	Winterlinde	Small-leaved Lime

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Maps

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