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USING OF THE HYDROTHERMAL COEFFICIENT (HTC) FOR INTERPRETATION OF DISTRIBUTION OF NON-NATIVE TREE SPECIES IN LATVIA ON EXAMPLE OF CULTIVATED SPECIES OF GENUS *TILIA*

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Genus *Tilia* L., which is represented by one wild species and 45 introduced taxa in Latvia, has been chosen as model of non-native cultivated ornamental taxon for clarifying of climatic impact. In description of winter hardiness, HTC may be used along with such often used values as average air temperatures, critical temperatures in the coldest and hottest months of the year e.a. There is clearly marked tendency – the more HTC value in any region differs to one or other side from the optimal value 1,55, the bigger frost damages are to be expected for introduced *Tilia* taxa in the next winter.

Key words: *Tilia* L., Latvia, dendrological plantations, HTC.

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INTRODUCTION

It has been observed that winter hardiness of introduced southern species with different resistance to the northern climate and soil conditions depends more on conditions of growth, the preparation for the winter and the transition to the winter period (Ozols 1962).

During their successive developmental phases, different species of cultivated plants exhibit significant differences with regard to optimal thermal and precipitation conditions which they require (Žmudzka 2004). Furthermore it has been stated that growing and development rhythm as well as winter hardiness varies a lot and depends on meteorological conditions in various years (Ozols 1962). For description of tree growing conditions the sum of vegetation period temperature and precipitation, which can be best characterized by hydrothermal coefficient (HTC) for the period, when the temperature is above 10^{o} C (Rasiņš 1962) and related values (the average temperature of the vegetation period, for the start of the vegetation period, duration of vegetation period).The HTC was introduced by Selyaninov (1928) and was originally used as an agricultural characteristic for various regions of Russia and for various time scale (Mescherskaya, Blaszevich 1985), contemporary this one of the values used even for determination of fire hazard in forests in Russia (Malevsky-Malevich et al. 2008).

Differences in hydrothermal coefficient, which in

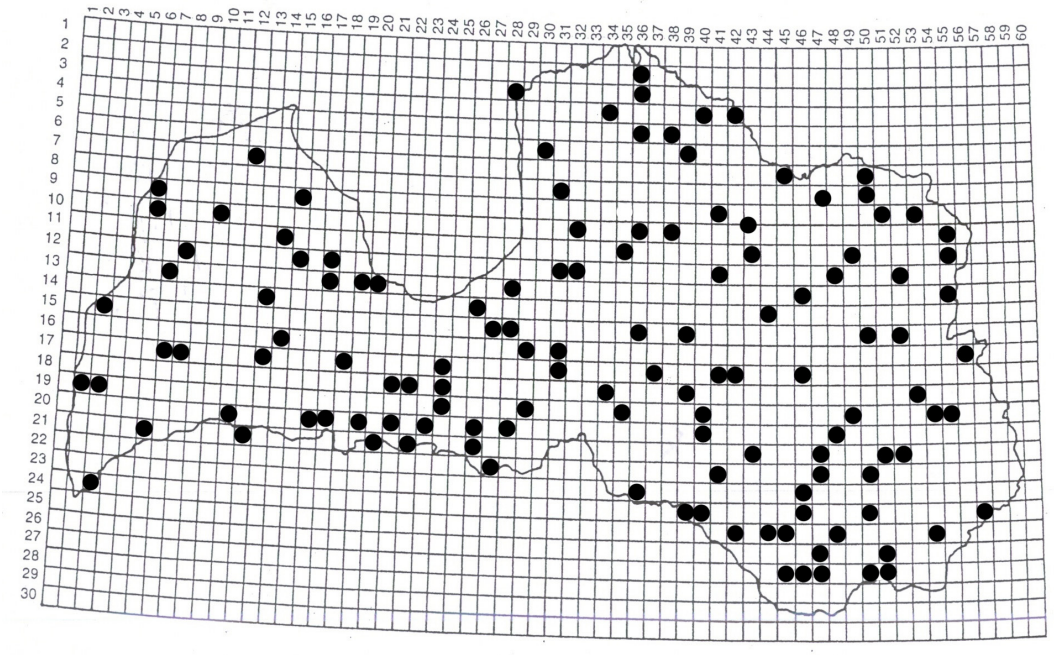

Fig. 1. Map of the territory of Latvia with inspected dendrological objects.

Latvia usually differ from 1,3 to 2, can be used for interpreting winter hardiness of non-native trees and thus potentially also their suitability for greeneries in Latvia. If HTC in some concrete vegetation season has been higher or lower than the average, than this season accordingly has been wetter or drier than the average, however humidity conditions in vegetation season directly impact winter hardiness of trees in general.

Genus *Tilia* L., which is represented by one wild species *Tilia cordata* Mill. and 45 introduced taxa in Latvia, has been chosen as model of non-native cultivated ornamental genus in this research. Genus *Tilia* is appropriate for such researches due to various reasons. First of all, from leastways the end of the 18th century, several other introduced species of *Tilia*, most commonly *Tilia platyphyllos* Scop. and *Tilia* x *vulgaris* Hayne, is being widely used in greeneries in the Baltic region. In the first part of the 19th century American linden species appear in culture as well (Jurševska, Evarts-Bunders 2010, Мауринь 1970). Since introduction of the genus is taking place in Latvia already more than 200 years, *Tilia* taxa can be found not only in botanical gardens and arboretums, but also in city and rural parks. Secondly, species of the genus are distributed in deciduous forests in temperate climate and mountain zone of Northern hemisphere: Europe, North-America, East-Asia. Thirdly, not only species, but also sub-species, hybrids and sorts were planted quite often in the greeneries.

MATERIAL AND METHODS

In 2007 work on interpretation of issues of systematics and species distribution of genus *Tilia* has been commenced. The initial inspection of separate greeneries rich in *Tilia* taxa in time period till 2009 served as model for researches in the whole territory of Latvia.

In the territory of Latvia 134 dendrological objects, approximately five in each former district, have been inspected (Fig. 1). The chosen objects are possibly richest in taxa of

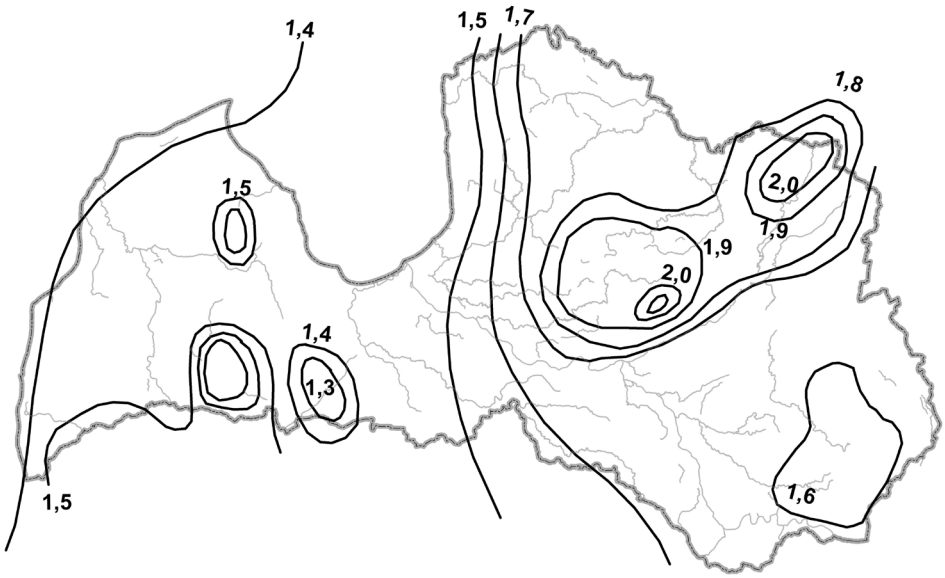

Fig. 2. HTC in the period, when temperature in the territory of Latvia is higher than 10° C.

linden genus. In formation of distribution maps botanical quadrant net map, in which the area of one quadrant in nature is 71 km^2 (7,6 x 9,3 km), was taken as the base (Табака, Клявиня, Плотниекс 1977). The basic level of the net grounds on topographic maps of USSR General Headquarters, zoning of pages of maps is in scale 1: 25 000 (Krampis 2006).

For description of growing conditions of trees hydrothermal coefficient (HTC) has been used, it is correlation between amount of precipitation in the time period, when average day temperature exceeds +10 °C, and sum of temperature in degrees in the very same period. Hydrothermal coefficient has been calculated by applying formula of G.Selyaninov (Selyaninov 1928):

$$HTC = \Sigma x / \Sigma t \times 10;$$

where Σx and Σt –accordingly sum of precipitations and temperatures in the period, when the temperature has not been lower than 10° C.

- HTCfrom 1.0 till 2.0 – humidity is sufficient;
- HTC> 2.0 – immoderately humid;
- HTC< 1.0 – insufficient humidity;
- HTCfrom 1.0 till 0.7 – dry;
- HTCfrom 0.7 till 0.4 – very dry (Čirkovs 1978).

During the research several indicators were analyzed: number of days, when the average temperature is higher than + 10°C; sum of precipitation; average air temperature in vegetation period; sum of average temperature in vegetation period, in period from 2006 till 2010. Hydrothermal coefficient (HTC) has been calculated for the time period from 2006 till 2010 in seven metereological stations: Alūksne, Daugavpils, Dobele, Liepāja, Rīga, Ventspils and Zosēni according to the data of World Metereological Organizationand Latvian Environment, Geology and Meteorology Centre (ftp://ftp.ncdc.noaa.gov/pub/data/gsod, www.meteo.lv). HTC has been calculated for the years, when field researches were done.

At the moment in the territory of Latvia there is less than 30 metereological stations, thus it is

Table 1. Calculated HTC values for some meteorological stations in Latvia

Metereological station	2006	2007	2008	2009	2010	Long-term indicators
Alūksne	1,2	1,3	2,4	2,1	1,7	2,1
Daugavpils	1,6	1,0	0,8	1,8	1,7	1,7
Dobele	1,2	1,6	0,9	1,2	2,0	1,4
Liepāja	0,8	1,8	1,5	1,4	1,8	1,4
Rīga	1,2	1,5	1,5	1,2	1,9	1,5
Ventspils	1,0	2,0	1,7	1,4	1,7	1,4
Zosēni	0,7	1,7	1,8	2,0	2,2	2,0

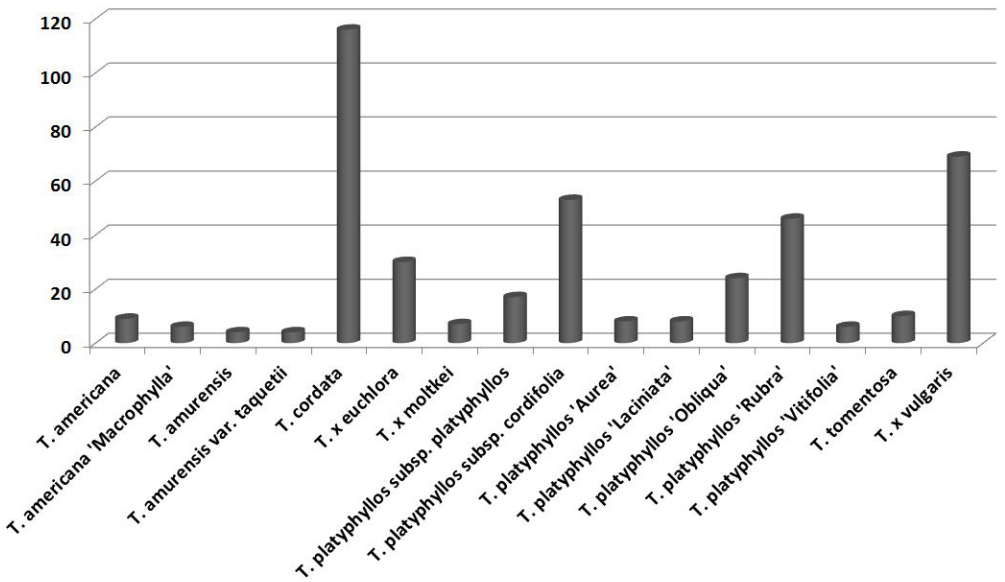

Fig. 3. Occurrence of some *Tilia* taxa in the inspected objects.

impossible to make a precise map with isolines. The data calculated in the research are quite close to long-term indicators (average indicators over last 30 years) taking into account the fact that from time to time both wet and dry summers repeat (Table 1). Therefore it is possible to use previously made isolines' map of hydrothermal coefficients (Rasiņš 1962), where HTC for the territory of Latvia has been given from 1,3 till 2,1 (Fig. 2).

The obtained data were processed with PC–ORD 5 programme, indirect analysis of gradients was done by applying DECORANA (Detrended correspodence analysis) method. The abbreviations used in PC–ORD 5 programme have been transcribed in Appendix 1.

RESULTS AND DISCUSSION

During the research 134 objects were inspected and altogether 46 taxa were found, part of them can be traced in the biggest dendrological

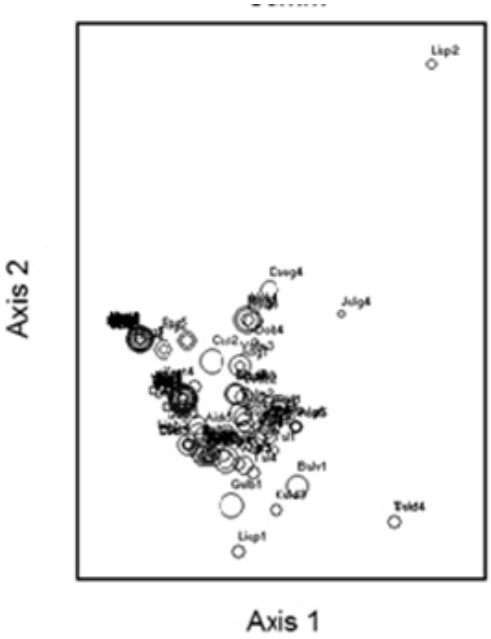

Fig. 4. Ordination of taxa of *Tilia* genus (according to DECORANA). r= - 0,218, n=129. Critical values of correlation coefficient r α, n = 0,175.

greeneries in Latvia (National Botanical Garden, Kalsnava Arboretum etc.). The distribution has been described for those taxa, for which four or more findings were found (Fig. 3).

Most commonly wild species *T. cordata* (here and further number of findings is given 116). However from cultivated taxa - *T.* x *vulgaris* (69) and *T. platyphyllos* subsp. *cordifolia* (43), most frequently cultivated species is *T. platyphyllos* 'Rubra' (46).

Together with field researches a number of climatic data and parameters, which are important for successful introduction and acclimatization of trees, were analysed as well. PC-ORD 5 programme was applied in analysis of climatic data and seeking for relation with distribution of *Tilia* taxa in Latvia. According to analysis of ordination of taxa of *Tilia* genus it can be seen that ordination is negative. On Axis 1, direction to the right HTC is getting lower, thus dryer places with smaller HTC coefficient are separated. In Fig. 4 places with higher HTC coefficient are located on the left side from the centre. In Fig. 4 the visible vector marks three dendrological greeneries, where few taxa are found – American lindens: I. Graudiņš' Botanical garden (Liep2); Ambeļi park (Daug4) and Nākotne greenery (Jelg4). However in the lower part of Fig. 4 objects, in which only *T. platyphyllos* taxa are found, are displayed, e.g., Balvi Elementary School (Balv1), Rožkalni dendrological greeneries (Sald4), fragments of Dižgramzda park (Liep1), Park of Gulbene castle (Gulb1).

Since isolines' map, made in 1960-ies in Latvia, was used in calculus, there could arise

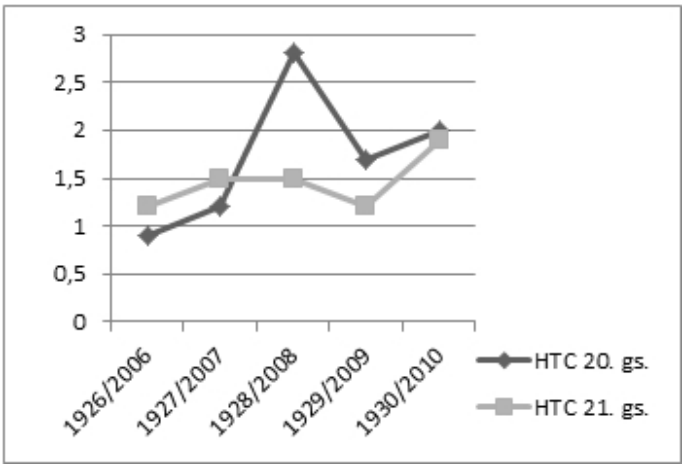

Fig. 5. Comparison of HTC in Riga in the end of 1920-ies and beginning of the 21st century.

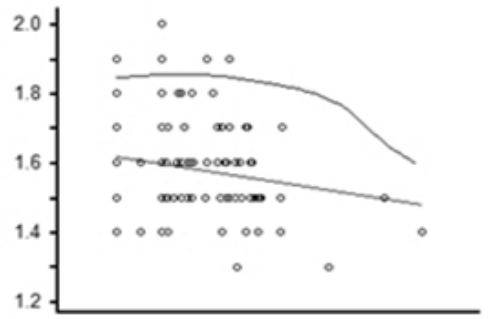

Fig. 6. Disposition of findings of *Tilia* genus according to the value of HTC. The findings being richest in Tilia taxa are within 1,5-1,6.

grounded discussion concerning topicality of so old data due to climate changes. Therefore with the researches a thorough analysis of HTC in seven biggest meteorological stations was done regarding last five years (Appendix 2), the obtained data compared with long-term HTC in Table 1. The seven chosen cities are deliberately taken from various state regions, where sharpest varieties of climate have been observed, so that HTC values would be most diverse. Though more than 50 years have passed the obtained data were close to isolines' map developed by Rasiņš. HTC for Riga in periods of time from 1926-1930 and from 2006-2010, when 80 years have passed, was compared. In the chart it can be seen that over the last five years HTC is more stable and there have not been so extremely wet summers as in 1928 (Fig 5). The average HTC 1,5 of last five years conforms to long-term HTC observed in Riga.

The area of the territory of Latvia 65 598 km^2 is comparatively small, however climate-related indicators vary significantly. Length of vegetation period, when average day temperature is above 10^{o}C in Central Upland of Vidzeme and Northern Kurzeme, makes up till 125 days, in southern regions even till 145 days (Zirnītis 1968). For example, in 2007 vegetation period in Western and Middle Latvia was even 30 days longer than in Eastern Latvia and reached 148 days in Dobele (see Appendix 1). Along with climate warming in the territory of Latvia vegetation period over last 50 years has become on average 5 days longer (Jansons 2011). However length of vegetation season does not directly affect HTC, therefore these changes have not made any significant corrections in long-term HTC in the territory of Latvia.

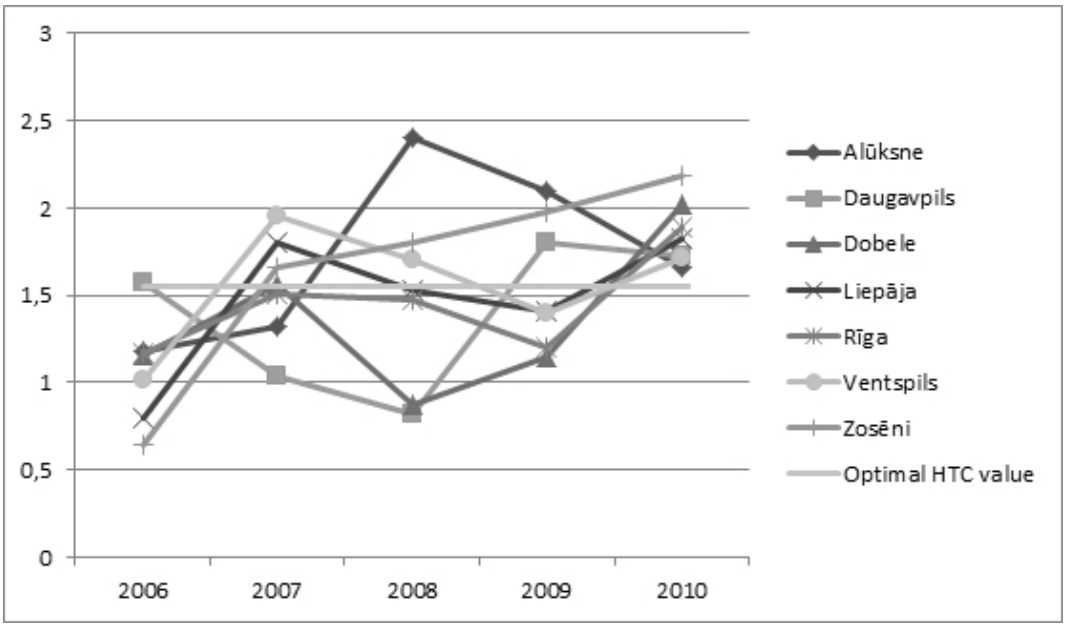

Fig 7. HTC values in seven meteorological station from 2006-2010.

Wintering of trees is negatively impacted by too dry summers, when HTC is lower than 1 and too wet – when it exceeds 2 (Čirkovs 1978). In NE part of Latvia long-term HTC is 2, here summer are wetter and colder and comparatively severe winters are observed. Analysis of dislocation of the inspected greeneries, richest in *Tilia* taxa, according to their HTC (Fig. 6) it can be seen that findings with *Tilia* taxa are mainly within HTC 1,5-1,6. During inspection of dendrological objects in NE part of the country smaller variety of taxa was stated, mainly *T. cordata* un *T.* x *vulgaris*, more rarely some of *T. platyphyllos* taxa. In bigger separate collections, e.g. Endzele park, *T. americana* and *T.* x *euchlora* were found as well, in winter 2009/2010 freezing was observed (Evarte-Bundere, Evarts-Bunders 2011). It should be marked that HTC in summer 2009 in Alūksne (NE Latvia) was 2,1 and average air temperature in vegetation period 15,1° C. in vegetation season 2006 there were very small precipitations and thus low HTC values can be observed, e.g. in Zosēni 0,65, where long-term HTC – 2 (Fig. 7). From inspection of the chosen objects in Latvia and their comparison with data of previous reviews (review done in 1970-ies) it can be concluded that directly in the places, where most sudden HTC values were observed, the taxa, which were damaged or even died, were the ones of American linden: *T. caroliniana*; *T. americana* 'Spectabilis' as well as rarely planted Far East *Tilia* taxa – *T. amurensis, T. japonica, T. sibirica, T. insularis*.

Winter hardiness of introduce trees and thus their distribution in greeneries are much impacted by very versatile abiotic ecological conditions, however climate is one of the most important limitative factors of this kind. In description of winter hardiness HTC may be used along with such often used values as average air temperatures, critical temperatures in the coldest and hottest months of the year e.a. there is clearly marked tendency – the more HTC value in any region differs to one or other side from the optimal value 1,55, the bigger frost damages are to be expected for introduced *Tilia* taxa in the next winter. In the regions, where sudden HTC fluctuations can be observed, the most sensitive foreign taxa (American, Far Eastern and South-European) vanish in long run – they are not found any more though they were traced in the previous reviews.

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Appendix 1. Description of abbreviations of inspected objects

Abbreviation of the object	Finding, year of inspection	Abbreviation of the object	Finding, year of inspection
Aizk1	Aizkraukle county, Daudzesa-rural municipality, Kuprēni greenery (2007)	Liep1	Priekule county, Gramzda rural municipality, Dižgramzda park Fragm. (2011)
Aizk2	Neretacounty, Nereta Secondary school (2011)	Liep2	Grobiņa county, I. Graudiņš dendrological greenery (2011)
Aizk3	Pļaviņas county, greenery in Pļaviņas center (1974, 2011)	Liep3	Aizpute county, Kazdanga rural municipality, Kazdanga park (1993; 2008)
Aizk4	Aizkraukle district, Skrīveri arboretum (2007; 2010)	Liep4	Saka county, Saka rural municipality, Saka greenery (1977)
Aizk5	Koknese county, Bebrirural municipality, Vecbebri park (1991, 2011)	Liep5	Liepaja, Jūrmala park (2011)

Abbreviation of the object	**Finding, year of inspection**	**Abbreviation of the object**	**Finding, year of inspection**
Aluk1	Alūksne district, park near Aūksne castle (2010)	Liep6	Rucava county, Rucava rural municipality, dendrological greenery
Aluk2	Ape county, Gaujiena rural municipality, baron cemetery in Gaujiena (2012)	Limb1	Limbaži, Limbaži 2nd Secondary School (1973)
Aluk3	Alūksne county, Liepna rural municipality, Liepna greenery (1975)	Limb2	Saladzgrīva county, Ainaži, Baltāmuiža greenery (1973)
Aluk4	Alūksne county, Maliena rural municipality, Dārznieki (2010)	Limb3	Aloja county, Braslava rural municipality, park (1973)
Aluk5	Alūksne county, Veclaicene rural municipality, Veclaicene vicarage (1973)	Limb4	Krimulda county, Lēdurga arboretum (2010)
Balv1	Balvi, Balvi Elementary School (2011)	Limb5	Limbaži county, Viļķene rural municipality, Viļķene school (2008)
Balv2	Balvicounty, Berzpils rural municipality, Domopole greenery (1975)	Ludz1	Ludza city park (2011)
Balv3	Viļaka county, Šķilbēni rural municipality, Šķilbēni park and cemetery(1973)	Ludz2	Ludza county, Cirma rural municipality, Gomeļmuiža (2012)
Balv4	Balvi county, Tilža rural municipality, Tilža church and vicarage (1975)	Ludz3	Kārsava county, Malnava rural municipality, Malnava park (2011)
Balv5	Viļaka county, Viļaka, Viļaka Secondary School, greenery and park (1973)	Mad1	Cesvaine county, Cesvaine rural area, Cesvaine park (2008)
Balv6	Žīguri (2011)	Mad2	Ērgļi county, Ērgļi hospital (2011)
Baus1	Bauska county, Gailīši rural municipality, Uzvara (2008)	Mad3	Madona county, Kalsnava arboretum (2007)
Baus2	Bauska county, Mežotne rural municipality, Mežotne park (2008)	Mad4	Madona county, Barkava rural municipality, greenery in Barkava center (2011)
Baus3	Rundāle county, Rundāle rural municipality,Ziedoņi park (2008)	Mad5	Madona county, Ļaudona rural municipality, Sāviena park (1986)

Abbreviation of the object	Finding, year of inspection	Abbreviation of the object	Finding, year of inspection
Baus4	Vecumnieki county, Stelpe rural municipality, Stelpe's Tmuki (1975, 2011)	Ogr1	Ikšķile county, Ikšķile, Ozoliņi park (1974)
Baus5	Bauska county, Vecsaule rural municipality, Vecsaule park (1978, 2011)	Ogr2	Ķegums county, greenery in Ķegums centre (2010)
Ces1	Rauna county, Rauna, Rauna park (2011)	Ogr3	Ogre county, Taurupe rural municipality, Taurupe park (2011)
Ces2	Cēsis, Maija and Castle park (2011)	Ogr4	Ķegums county, Ķegums rural area, Tome recreation centre (2010)
Ces3	Priekuļi county, Priekuļi, Priekuļi Agricultural Vocational School (2011)	Ogr5	Ogre county, dendrological park 'Lazdukalni' (2005, 2011)
Ces4	Jaunpiebalga county, Zosēni rural municipality, greenery in Zosēni centre (1973)	Pre1	Preiļi, Preiļi park (2007)
Ces5	Amata county, Drabeši rural municipality, greenery in Kārļi ciems (2011)	Pre2	Riebiņi county, Galēni rural municipality, Galēni park (2008)
Daug1	Ilūkste county, Bebrene rural municipality, Bebrene park (2008, 2012)	Pre3	Preiļi county, Sausna rural municipality, Jezufinova park (2011)
Daug2	Daugavpils county, Naujene rural municipality, Juzefovas park	Pre4	Vārkava county, Upmala rural municipality, Vecvarkava park (2011)
Daug3	Daugavpils county, Naujene rural municipality, Krauja park (2011)	Pre5	Līvāni county, Līvāni, greenery of Roman Catholic Church(2011)
Daug4	Daugavpils county, Ambeļi rural municipality, Ambeļi park (2011)	Rez1	Rēzekne county, Bērzaune rural municipality, Marientāle (1974)
Daug5	Daugavpils county, Vabole rural municipality, Vabole park (2010)	Rez2	Rēzekne county, Feimaņi rural municipality, Feimaņi school (1998)
Daug6	Daugavpils county, Višķi park (2007, 2011)	Rez3	Rēzekne county, Lūznava rural municipality, Lūznava park (2011)
Daug7	Daugavpils county, Višķi rural municipality, 'Vītoli' dendrological greenery (2011)	Rez4	Rēzekne county, Malta rural municipality, Malta Secondary School (2011)

Abbreviation of the object	**Finding, year of inspection**	**Abbreviation of the object**	**Finding, year of inspection**
Daug8	Daugavpils county, Kalupe rural municipality, Kalupe park (2008)	Rez5	Viļāni county, Viļāni (2011)
Daug9	Ilūkste county, Dviete rural municipality, Dviete park (2008)	Rig1	Rīga, UL Botanical Garden (2011)
Daug10	Daugavpils, Fortress (2007)	Rig2	Ādaži county, greenery in Ādaži center (2011)
Daug11	Daugavpils, Dubrovina park	Rig3	Inčukalns county, "Līgotnes", Artists' Garden (2010)
Dob1	Auce county, Auce rural area, Vecauce park (2011)	Rig4	Ķekava county, Ķekava rural municipality, Katlakalns' pines, Garlības Merķelis arboretum (2011)
Dob2	Tērvete county, Augstkalne rural municipality, Augstskalne Secondary School (1976, 2011)	Rig5	Salaspils county, Salaspils, National Botanical Garden (2007; 2010)
Dob3	Dobele county, Penkule rural municipality, Alave park (1976, 2011)	Rig6	Sigulda county, Sigulda square and parknear Railway Station (2011)
Dob4	Tērvete county, Tērvete rural municipality, Sprīdīši arboretum (1975, 2011)	Sald1	Saldus county, Ezere rural municipality, Lielezere park (2011)
Dob5	Auce county, Vītiņirural municipality, Ķevele park (2008)	Sald2	Brocēni county, Gaiķi rural municipality, Lielsatiķi park (2011)
Gulb1	Gulbene, Castle parks (2011)	Sald3	Saldus county, Lutriņi rural municipality, Lutriņi park (1991)
Gulb2	Gulbene county, Jaungulbene rural municipality, Jaungulbene Rural Professional Secondary School (2011)	Sald4	Saldus county, Nīgrande rural municipality, Kalni, "Rožkalni" dendrological greenery (2011, 2012)
Gulb3	Gulbene county, Ranka rural municipality, Ranka Vocational School greenery. (2011)	Tal1	Talsi, Talsi dendrological park (2011)
Gulb4	Gulbene county, Stāmeriena rural municipality, Stāmeriena park (2010)	Tal2	Dundaga county, Dundaga, Dundagas park (2008)
Jelg1	Ozolnieki county, Sidrabe rural municipality, 'Lībieši' dendrological greenery (2006)	Tal3	Talsi county, Strazde rural municipality, Strazde parks (2011)

Abbreviation of the object	Finding, year of inspection	Abbreviation of the object	Finding, year of inspection
Jelg2	Ozolnieki county, Ozolnieki, centre greenery	Tal4	Talsi county, Valdemārpils "Priednieki" dendrological greenery (2011)
Jelg3	Jelgava county, Eleja rural municipality, Eleja park (2008)	Tal5	Talsi county, Valdemārpils rural area, Nogale park (1993, 2011)
Jelg4	Jelgava county, Glūda rural municipality, Nākotne (2006)	Tuk1	Engure county, Engure rural municipality, Lāčupe arboretum (2009)
Jelg5	Jelgava county, Vircava rural municipality, Vircava park (2006)	Tuk2	Jaunpils county, Jaunpils rural municipality, Strutele (2011)
Jelg6	Jelgava county, Mežciems, Sila 3 (2006)	Tuk3	Tukums county, Pūre rural municipality, Pūre park (2011)
Jelg7	Jelgava county, Zaļenieki rural municipality, Zaļenieki estate park (2006)	Tuk4	Tukums county, Vāgners arboretum (2008)
Jelg8	Jelgava county, Vilce rural municipality, Vilce parks (2006, 2008, 2010)	Tuk5	Tukums county, Zentene rural municipality, Zentene Elementary School (2007)
Jek1	Aknīste county, Aknīste, Sēļipark (2011)	Valk1	Valka, Lugažisquare (2009)
Jek2	Jēkabpils, Ethnographic Museum 'Sēļu sēta' (2011)	Valk2	Valka county, Ērģeme rural municipality, Ērģeme park (1975)
Jek3	Aknīste county, Gārsene rural municipality, Gārsene castle park (2011)	Valk3	Burtnieki county, Ēvele rural municipality, Ēvele park (1994)
Jek4	Sala county, Sala rural municipality, Greenery in Sala centre (2011)	Valk4	Smiltene county, Silva, Silva arboretum (2010)
Jek5	Jēkabpils county, Zasa rural municipality, Zasa park (2009)	Valm1	Strenči county, Jercēni rural municipality, greenery in Strenči centre (1975)
Kras1	Krāslava park (2007)	Valm2	Rūjiena county, Jerirural municipality, Endzele (2010)
Kras2	Dagda county, Dagda, Dagda centre (2011)	Valm3	Burtnieki county, Burtnieki rural municipality, Burtnieki park (2006)

Abbreviation of the object	**Finding, year of inspection**	**Abbreviation of the object**	**Finding, year of inspection**
Kras3	Krāslava county, Kaplava rural municipality, Vecborne park (2011)	Valm4	Naukšēni county, Ķoņi rural municipality, Ķoņi Elementary School park (2010)
Kras4	Krāslava county, Kombuļi rural municipality, Kombuļi centre (2011)	Vent1	Ventspils county, Tārgale rural municipality, Tārgale park (1993)
Kras5	Dagda county, Landskorona (now Šķaune) (1975)	Vent2	Ventspils county, Ugāle rural municipality, greenery in Ugāle centre (1977)
Kuld1	Kuldīga county, Ēdole rural municipality, Ēdole park (2011)	Vent3	Ventspils county, Vārve rural municipality, Lēči park (2011)
Kuld2	Kuldīga county, Kabile rural municipality, Kabile park (2011)	Vent4	Ventspils county, Zlēkas rural municipality Zlēkas park (2011)
Kuld3	Kuldīga county, Laidas rural municipality, 'Jaunbrēdiķi' (2008)	Vent5	Ventspils, Vasarnīcu street 38 and Children's Town (2011)

Appendix 2. Description of metereological conditions of vegetation period

Observation places	Beginning of vegetation period	End of vegetation period	Number of days when mean T higher than+10 °C	Sum of precipitation, mm	Mean air temperature in period of vegetation, °C	Sum of temperatures above 10 °C	Hydrothermal coefficient
2010							
Alūksne	28.05.	01.09.	97	291	18,1	1754	1,66
Daugavpils	27.05.	01.09.	96	312	18,8	1800	1,73
Dobele	11.05.	03.09.	115	408	17,6	2019	2,02
Liepāja	27.05.	27.09.	124	378	16,7	2072	1,82
Rīga	26.05.	27.09.	125	405	17,1	2139	1,89
Ventspils	28.05.	28.09.	124	357	16,9	2091	1,71
Zosēni	27.05.	29.08.	94	366	17,9	1679	2,18

2009							
Alūksne	08.06.	24.09.	109	345	15,1	1641	2,10
Daugavpils	08.06.	28.09.	113	312	15,3	1734	1,80
Dobele	08.06.	28.09.	113	211	16,3	1837	1,15
Liepāja	08.06.	30.09.	115	262	16,2	1863	1,41
Rīga	07.06.	28.09.	114	220	16,1	1833	1,20
Ventspils	07.06.	30.09.	116	266	16,4	1902	1,40
Zosēni	08.06.	28.09.	113	329	14,7	1660	1,98
2008							
Alūksne	20.05.	30.08.	98	359	15,2	1493	2,40
Daugavpils	17.05.	31.08.	106	140	16,2	1713	0,82
Dobele	21.05.	11.09.	114	161	16,2	1850	0,87
Liepāja	21.05.	11.09.	114	280	16,2	1835	1,53
Rīga	21.05.	11.09.	114	269	16,1	1834	1,47
Ventspils	22.05.	15.09.	116	310	15,7	1824	1,70
Zosēni	22.05.	30.08.	101	269	14,9	1503	1,80
2007							
Alūksne	14.05.	29.08.	107	239	17,0	1816	1,32
Daugavpils	10.05.	31.08.	113	204	17,3	1955	1,04
Dobele	13.05.	07.10.	148	366	16,0	2352	1,56
Liepāja	17.05.	10.10.	146	418	15,9	2322	1,80
Rīga	18.05.	06.10.	141	348	16,3	2301	1,51
Ventspils	17.05.	10.10.	147	453	15,8	2321	1,95
Zosēni	14.05.	28.08.	107	288	16,2	1733	1,66
2006							
Alūksne	09.06.	15.09.	99	180	17,1	1520	1,18
Daugavpils	01.06.	15.09.	100	269	17,1	1709	1,57
Dobele	27.05.	09.10.	136	265	16.8	2282	1,16
Liepāja	02.06.	15.10.	136	177	16,5	2245	0,80
Rīga	02.06.	11.10.	124	250	17,2	2132	1,17
Ventspils	02.06.	15.10.	136	229	16,4	2236	1,02
Zosēni	09.06.	14.09.	98	107	16,9	1658	0,65

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