

# Autecology of the **SMALL-LEAVED LIME**

*Tilia cordata* Mill.

Fr. : Tilleul à petites feuilles  
Sp. : Tilo norteño; Cat.: Tiller de fulla petita

Ger. : Winterlinde  
It. : Tiglio selvatico

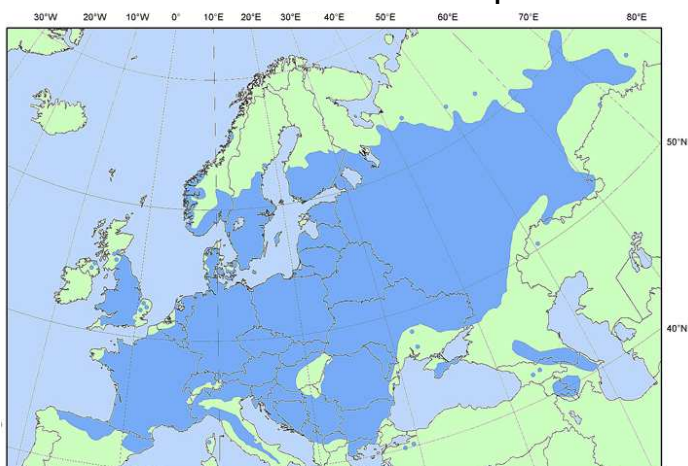


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## Geographical distribution

- Eurasian and **mid-European** species [13].
- **Common in eastern France** and in the **Pyrenees**; **less common in the west**; rare in the **Mediterranean region** [13].
- Very often mixed with oak and beech in eastern France [14].

**Natural range  
of the Small-leaved lime in Europe**



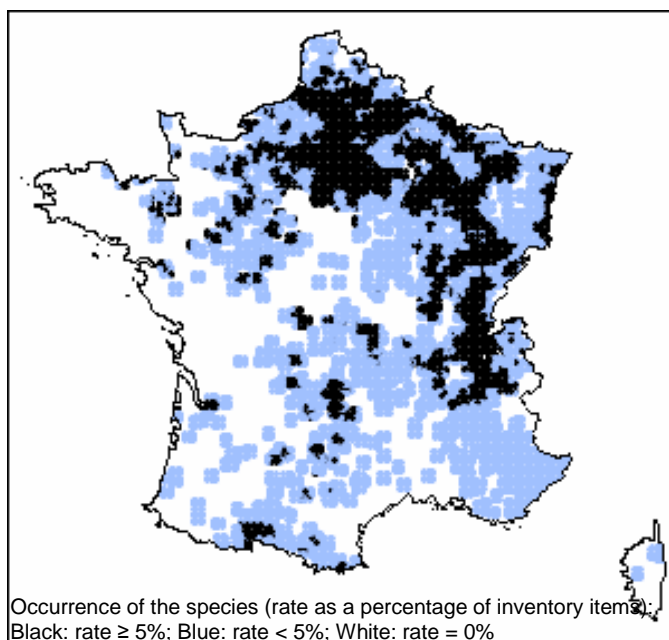
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**Distribution of  
the Small-leaved lime  
in Spain**



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**Distribution of the Small-leaved lime in France**



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## **Climate and temperament**

### **Bioclimatic conditions**

- Continental or slightly oceanic temperament: **not sensitive to cold** [1, 6]. **Grows moderately well with atmospheric moisture** [6, 7].
- **Needs substantial rainfall** [1].
- **Requires warmth**, growing best in temperate climates. Grows well on sites that are warm in summer and sheltered from cold winds. **Less demanding of warmth and humidity than the Large-leaved lime** [1].
- **Tolerates drought** [8, 1].
- **Sensitive to late frost** [14], but less so than the **Large-leaved lime**, which buds earlier [1].

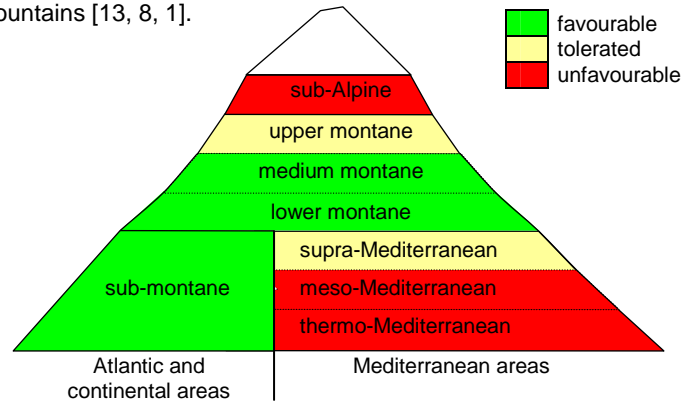
**Summary of bioclimatic requirements and sensitivity of the Small-leaved lime**

Warmth requirements	Sensitivity					
	cold	late frost	early frost	sticky snow	wind	drought
Moderate	Very low	Moderate	Low	Low	Low	Moderate

## Vegetation stages

- This species occurs in the sub-montane and **montane stages** [13], rarely above 1000 m although it can grow up to 1,500 m in the Central Alps and 1,100 m in the Jura Mountains [13, 8, 1].

## Distribution of the Small-leaved lime by vegetation stages



## Temperament

- **Semi-shade species** [6, 13, 14], considered as tolerant to shade, but also **reacts very favourably to light** [12].
- Seedlings tolerate shade very well [1, 12] and must be protected from strong sunlight [14], even though a minimum of light is required for regeneration and to ensure good growth [12].

Young adult



Adult



Sensitivity to competition for light	Phototropic tendency
Moderate to high	Moderate

## Climatic limits

- In the north, the boundary coincides with the Northern European distribution range, with an annual average temperature of +2°C [12].
- In the south, limited by severe summer droughts in the Mediterranean region [12].

## Soils

### Water and drainage

#### Water supply:

- **Mesophilic species preferring thick soils** [13, 8, 1] with a **favourable water balance** [13], hence its occurrence on heavy, clay soils with a good supply of water [6]. **Moderately water-demanding in dry climatic conditions (Mediterranean)** [13, 12]. However, it can grow on drier sites where it competes with species such as beech with similar site requirements [1].

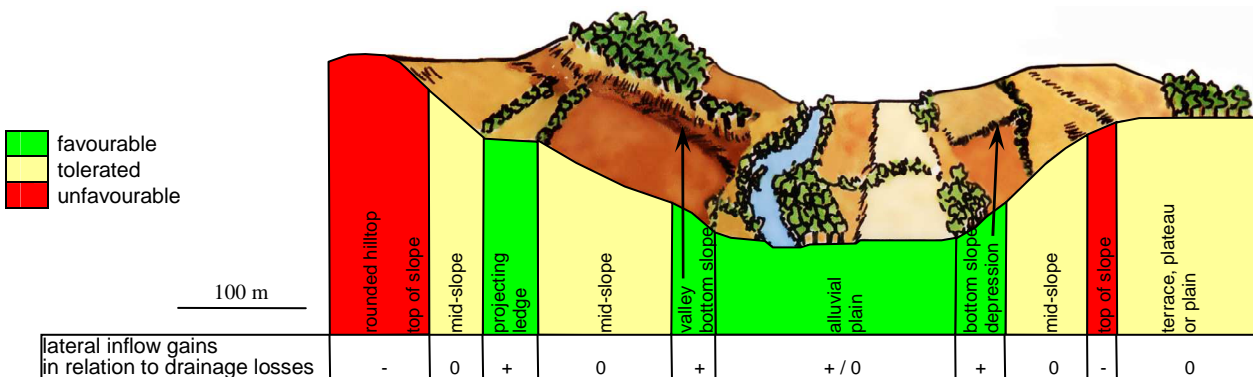
#### Waterlogging:

#### Drainage and excess water

			a	b	c	d	h	i	e	f	g	
Natural drainage			excessive	good	moderate	imperfect	poor	very poor	partial	virtually non-existent	non-existent	
water table	temporary	redox horizon with rust patches	no water table	absent or > 90cm	60-125cm	40-80cm	20-50cm	0-30cm	20-50cm	0-30cm		
	permanent	reductive waterlogged horizon		-	-	-	-	-	> 80cm	40-80cm	< 40cm	

(from the Species Ecology file, Ministry of the Walloon Region, 1991, amended)

### Topographic situations favourable to the Small-leaved lime in terms of water supply (involved in the morpho-pedological compensations, to be modulated according to the other site characteristics)



## Texture and materials

- Occurs most frequently on clay, loam and loess [6, 13], This species is **not very demanding** and is also found on compact clay soils, sand or limestone screes [ 11,14, 12].

### Textures favouring growth of the Small-leaved lime

(involved in the morpho-pedological compensations, to be modulated according to the climate and soil)

very sandy S	coarse SA, LS, SL	loamy LmS, Lm, LI, LIS	intermediary LAS, LSA, LA, AL	clayey A, AS	very clayey Alo	favourable	tolerated	unfavourable
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## Nutrients

### Nutritive elements:

- Species present over a **wide pH range**, basic to acidic [13].
- **Prefers mineral-rich soils**, though it can be found on poor soils [1].

### Nitrogen and phosphorus:

- **Moderately demanding** species, occurring on humus forms ranging from **eumull to moder**, but grows best **on mull** [13].

### Lime in fine soil:

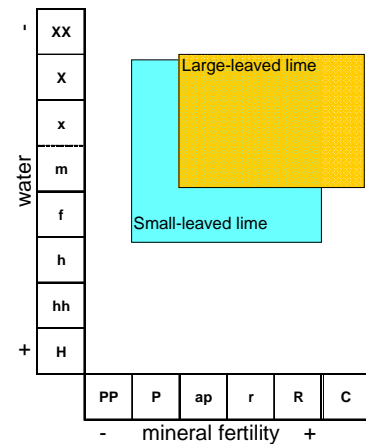
- Occurs on **lime** and prefers calcium-rich soils [12].

### Summary of water and nutrient requirements and sensitivity of the Small-leaved lime

Water requirements	Moderate
Sensitivity to temporary waterlogging	Low to moderate
Nutrient requirements (Ca, Mg, K)	Moderate
Nitrogen (and phosphorus) requirements	Moderate
Sensitivity to lime in fine soils	Low

### Ecogram for Lime species

Favourable situations for timber production (according to Rameau *and al.*, 1989, amended)



## DYNAMIC BEHAVIOUR AND CHARACTERISTICS

- Nomadic post-pioneer species [13], capable of **colonising screes** [1].
- Basal shoot growth and suckering [13].
- **Slow growth in height in the first years, then rapid growth** up to 70 years followed by very slow growth after 150-180 years. Small-leaved limes can grow to 30 m in height, less than Large-leaved limes [1].
- **Long-lived** (500 to 1000 years) [1, 13].
- Occurs scattered or in stands that are often small as the species is light-demanding; sensitive to competition, particularly from beech.
- Occurs in forest gullies (Lime-maple [1313community]), but also in beech-oak woodlands and on river banks [13].

## MAIN FACTORS LIMITING THE PRODUCTION OF GOOD QUALITY TIMBER

- Competition for light after the establishment phase.
- Waterlogged soils near the surface over a long period
- Broad ecological range, but chemically fertile sites with a good water supply are preferable.

# Autecology of the **LARGE-LEAVED LIME**

*Tilia platyphyllos Scop.*

Fr. : Tilleul à grand feuilles  
Sp. : Tilo hoja ancha; Cat.: Tell de fulla gran

Ger. : Sommerlinde  
It. : Tiglio nostrano

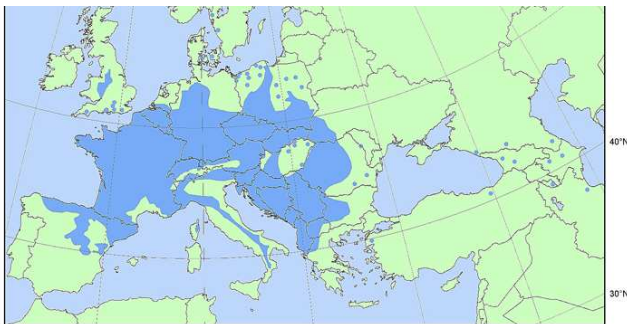


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## Geographical distribution

- Eurasian, **sub-Atlantic and sub-Mediterranean species** [13].
- In France, fairly common in the **east, the Pyrenees and the southern foothills of the Alps**, uncommon in the west and on the **Mediterranean coast** [13].

**Natural range  
of the Large-leaved lime in Europe**



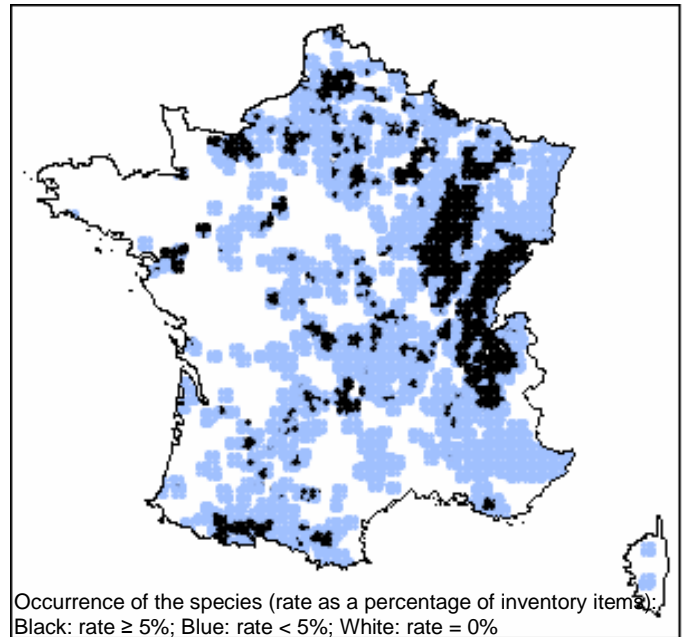
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**Distribution of the  
Large-leaved lime  
in Spain**



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**Distribution of the Large-leaved lime in France**



Occurrence of the species (rate as a percentage of inventory items):  
Black: rate ≥ 5%; Blue: rate < 5%; White: rate = 0%

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## Climate and temperament

### **Bioclimatic conditions**

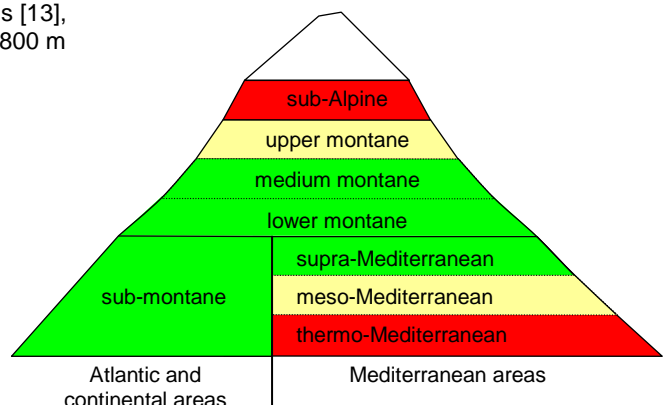
- Prefers **sub-Atlantic to sub-Mediterranean** climates, requires more **warmth than the Small-leaved lime** [1].
- **Withstands winter cold** [1, 6]. **More sensitive to late frost than the Small leaved lime**, which buds later [1].
- Needs more **air humidity than the Small-leaved lime**, hence its occurrence on northern slopes or in forest gullies [1].

Warmth requirement	Sensitivity					
	cold	late frost	early frost	sticky snow	wind	drought
Moderate	Very low	High	Low	Low	Low	Moderate

### **Vegetation stages**

- Occurs at **supra-Mediterranean, sub-montane and montane** levels [13], where it may grow at altitudes above 1000m; will grow up to 1700-1800 m in the central Alps [13, 1, 12].

**Distribution of the Large-leaved lime  
by vegetation stages**



## Temperament

- **Shade or partial-shade** species [13], tolerant to shading in its early stages [1]. **Becomes more light-demanding than the Small-leaved lime as it grows**, including in unfavourable climatic or soil conditions [1].
- The Large-leaved lime therefore cannot compete with shade-tolerant species such as beech, although it occurs in beech-lime woodlands on shaded north-facing slopes or confined valley bottoms [1, 3].



Sensitivity to competition for light	Phototropic tendency
High	Moderate

## Soils

### Water and drainage

#### Water supply:

- **grows in dry to moderately humid conditions**, occurring on soils with a broad range of water supply conditions [13], including dry sites (top slopes to coarse screes and warm exposure) [3]. However, the Large-leaved lime is often found in **more humid conditions than** the Small-leaved Lime, with a good water balance, for example in shade and moisture-loving lime habitats [1, 3].

#### Water logging:

- **Does not occur on poorly aerated soil** [1].

#### Drainage and excess water

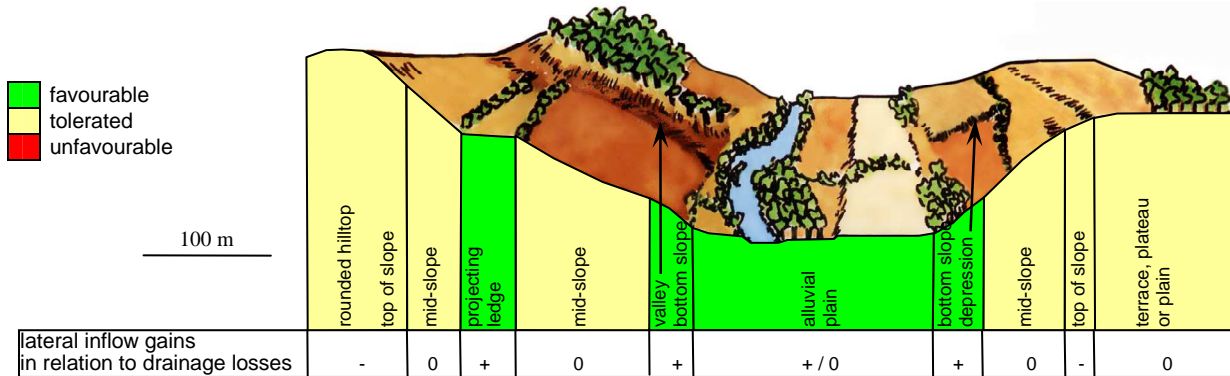
		a	b	c	d	h	i	e	f	g	
drainage		excessive	good	moderate	imperfect	poor	very poor	partial	virtually non-existent	non-existent	
water table	temporary	redox horizon with rust patches	absent or > 90cm	60-125cm	40-80cm	60-125cm	0 - 30cm	60-125cm	0 - 30cm		
	permanent	reductive waterlogged horizon	-	-	-	-	-	> 80cm	40-80cm	< 40cm	

■ favourable  
■ tolerated  
■ unfavourable

(from the Species Ecology file, Ministry of the Walloon Region, 1991, amended )

### Topographic situations favouring growth of the Large-leaved lime in relation to the water supply

(involved in the morpho-pedological compensations, to be modulated according to the other site characteristics)



## Texture and materials

- Carbonates, coarse screes on gneiss or limestone, decarbonizing clays [13, 3].
- Due to its adaptability and nomadic behaviour, this species occurs on steep scree slopes and on filtering and aerated soils, often cool and humid [6], or on thin plateau soils [8].

### Textures favouring growth of the Large-leaved lime

(involved in the morpho-pedological compensations, to be modulated according to the climate and soil)

very sandy S	coarse SA, LS, SL	loamy LmS, Lm, LI, LIS	intermediary LAS, LSA, LA, AL	clayey A, AS	very clayey Alo	<span style="color: green;">■</span> favourable <span style="color: yellow;">■</span> tolerated <span style="color: red;">■</span> unfavourable
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## Nutrients

### Nutritive elements:

- Occurs on base-rich, slightly acidic to basic soils. **More vulnerable to mineral deficiency than the Small-leaved lime** [13].

### Nitrogen and phosphorus:

- Form of humus: **eumull**, even carbonated [13], but **can grow on soils poor in organic matter** such as screes with an adequate nitrogen supply [3].

### Lime in fine soil:

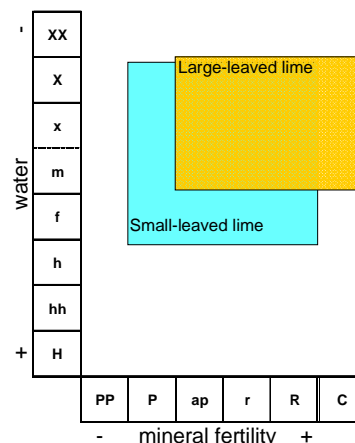
- Occurs on carbonate soils [2, 1].

### Summary of water and nutrient requirements and sensitivity of the Large-leaved lime

Water requirements	Moderate
Sensitivity to temporary waterlogging	High
Nutrient requirements (Ca, Mg, K)	Moderate
Nitrogen (and phosphorus) requirements	Moderate
Sensitivity to lime in fine soil	Zero to very low

### Ecogram for Lime species

Favourable situations for timber production (according to Rameau *and al.*, 1989, amended)



## DYNAMIC BEHAVIOUR AND CHARACTERISTICS

- Nomadic post-pioneer species [13], able to colonise screes, even on warm slopes [1].
- Growth of basal shoots from the stump [13].
- Slow growth in height in **the first years, followed by fast** growth up to 70 years and very slow growth after 150-180 years; Large-leaved lime can grow up to 40 m, higher than the maximum for Small-leaved lime [1].
- Very long-lived (1000 years), slightly more than the Small-leaved lime [1, 13].
- Mature species in forest gullies (maple woods on screes [6], ash woods on slopes [1], lime-maple communities [4]), also occurring in beech woods and dry beech-oak woods [13] or mixed with young oak woods in southern foothills and moderately high mountains [8].

## MAIN FACTORS LIMITING THE PRODUCTION OF GOOD QUALITY TIMBER

- Competition for light, especially in the early years.
- Waterlogged soil near the surface for a long period
- Mineral deficiency and slow-recycling humus (moder)



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