THE ROLE OF INTRODUCED ULMUS SPECIES IN THE NATURE OF UZBEKISTAN

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Abstract. *Elm (Ulmus) trees play an important role in environmental protection and the creation of sustainable ecosystems. This article studies and analyzes the scientific and local names of species in the Ulmus genus, including Siberian elm (Ulmus pumila L.), Wych elm (Ulmus glabra Huds.), European white elm (Ulmus laevis Pall.), and Chinese elm (Ulmus parvifolia Jacq.), based on scientific sources regarding their importance in nature and areas of use. The ecological role of Ulmus species introduced to Uzbekistan in natural ecosystems was examined. The beneficial properties of elms, such as improving soil structure, reducing wind and water erosion, and supporting biodiversity, were analyzed. It was also shown that these species are essential for creating green zones in urban and rural areas, restoring ecological balance, and enhancing adaptability to climate change. This article aims to highlight the ecological services of introduced Ulmus species in Uzbekistan and explore possibilities for their effective use.*

Keywords: *Ulmus, elm, Ulmus pumila L., Ulmus glabra Huds., Ulmus laevis Pall., Ulmus parvifolia Jacq., ecology, flora of Uzbekistan.*

Аннотация*. Деревья вяза (Ulmus) играют важную роль в охране окружающей среды и создании устойчивых экосистем. В данной статье изучены и проанализированы научные и местные названия видов рода Ulmus, включая сибирский вяз (Ulmus pumila L.), шотландский вяз (Ulmus glabra Huds.), европейский белый вяз (Ulmus laevis Pall.) и китайский вяз (Ulmus parvifolia Jacq.), на основе научных источников об их значении в природе и областях применения. Изучена экологическая роль видов Ulmus, интродуцированных в Узбекистан, в природных экосистемах. Проанализированы полезные свойства вязов, такие как улучшение структуры почвы, снижение ветровой и водной эрозии, поддержка биоразнообразия. Также показано, что эти виды важны для создания зелёных зон в городских и сельских районах, восстановления экологического равновесия и повышения адаптивности к изменениям климата. Цель статьи - подчеркнуть экологические услуги интродуцированных видов Ulmus в Узбекистане и изучить возможности их эффективного использования.*

Ключевые слова*: Ulmus, вяз, Ulmus pumila L., Ulmus glabra Huds., Ulmus laevis Pall., Ulmus parvifolia Jacq., экология, флора Узбекистана.*

***Ulmus* L.** First published in Species Plantarum (1753) by Carl Linnaeus.*Ulmus* is the classical Latin name for an elm tree. It originated from the Akkadian *u'ulum.* to bind, or from Proto-Indo-European *el*, brown. Among elm tree species, prevalently concentrated in the temperate regions of the northern hemisphere and Elms are deciduous medium-sized trees, characterised by pollination and seed dispersal driven by the wind. These trees and shrubs have watery sap and alternate and opposite leaves that are arranged in a plane along the stem (distichous). Stipules grow in pairs on either side of the petioles, and leaf blades are simple,

strongly serrate and basally asymmetrical. The flowers are green or brown, the perianth spirally arranged with four to eight fused or free tepals. Fruits are tiattened nuts. drupes or samarasi. They all are components of mixed broadleaved cool forests, distributed principally near rivers and floodplains. Elms have always played an important cultural role, being part of the traditional rural landscape as a tree of multiple purposes, such as working and firewood, fodder supplier, living grapevine support and more recently as an ornamental and roadside tree.

Research Object and Methods. The study focuses on representatives of the elm genus (*Ulmus*), belonging to the Ulmaceae family.

During the analysis of scientific research dedicated to representatives of the elm genus (*Ulmus*), databases such as Google Scholar, ResearchGate, and Web of Science were mainly used, along with websites like POWO, WFO, and WCVF.

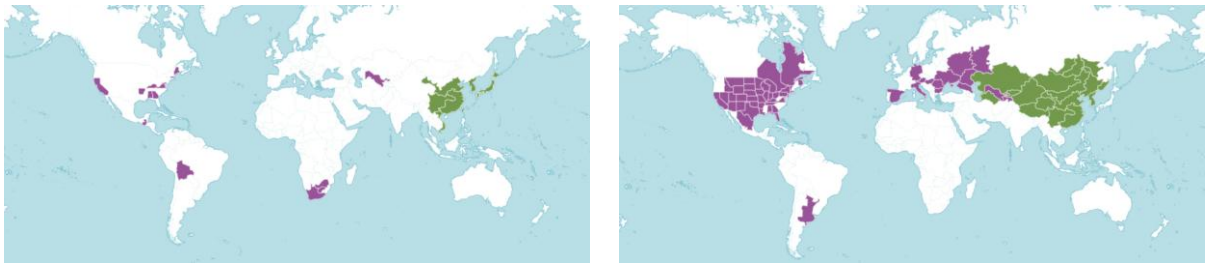
Results Obtained and Their Analysis. The species belonging to the genus can be divided into native and introduced areas based on their distribution range. They are as follows:

-***Ulmus pumila*** **L-** The tree is native to Central Asia, eastern Siberia, the Russian Far East, Mongolia, Tibet, northern China, India (northern Kashmir), Turkmenistan, Kazakhstan, Kirgizstan, and Korea. It is the last tree species encountered in the semi-desert regions of Central Asia. Introduced into: Austria, Baleares, Bulgaria, California, Georgia, Germany, Hungary,Italy, Romania, Ukraine, Uzbekistan, Spain.

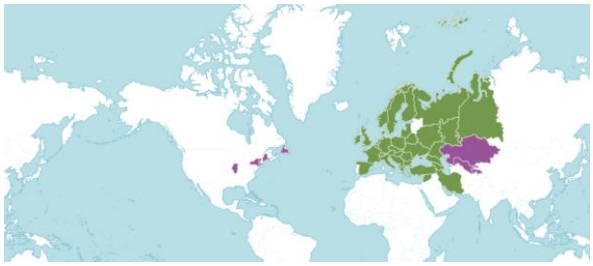
-***Ulmus glabra*** **Huds**.- The tree is native to Albania, Austria, Baltic States, Belarus, Belgium, Bulgaria, Finland, France, Germany, Great Britain, East European Russia, North European Russia, Turkey , Ukraine. Introduced to Amsterdam-St.Paul Is., Connecticut, Illinois, Kazakhstan, Maine, Massachusetts, New York, Newfoundland, Rhode I., Tadzhikistan, Uzbekistan, Vermont.

-***Ulmus Laevis*** **Pall.** The tree is native to Albania, Austria, Baltic States, Belarus, Belgium, Bulgaria, Central European Russia, Finland, France, Germany, Greece, Hungary, Italy, Kazakhstan,. Introduced into Great Britain, Switzerland, Tadzhikistan, Uzbekistan

-***Ulmus Parvifolia*** **Jacq**. - A tree native to China North-Central, China South-Central, China Southeast, Japan, Korea, Nansei-shoto, Taiwan, Vietnam, introduced into Alabama, Arkansas, Bolivia, California, Cape Provinces, District of Columbia, Free State, Georgia, Guatemala, Kentucky, Maine, Maryland, Massachusetts, Northern Provinces, Uzbekistan, Virginia. (1- photo).



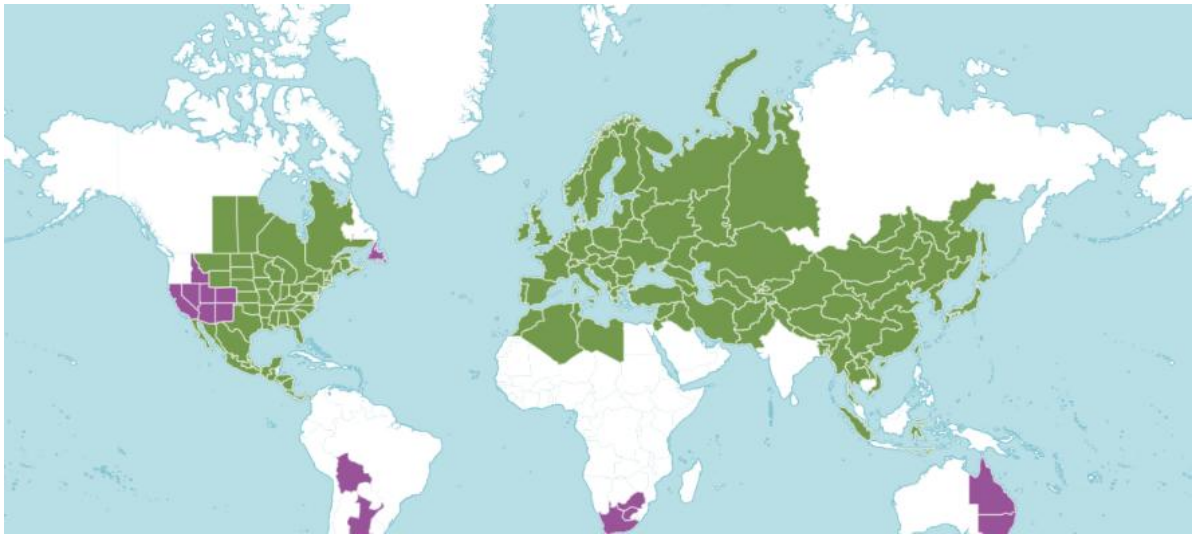
a **b**



c



d



e

1-photo. a- The Distribution of *Ulmus parvifolia* Jacq, b-The Distribution of *Ulmus glabra* Huds, c-The Distribution of *Ulmus pumila*, d-The Distribution of *Ulmus Laevis* Pall, e- The Distribution of *Ulmus* species

1-Table

The morphology of the leaf, flower, and seed of the elm tree.

Leaves		simple, alternate, placed on the branchlet in two ranks, stalked, simply or doubly serrate, penninerved, asymmetrical at the base,' the inner half of the blade being the larger. Stipules lateral, entire, free or connate at the base, usually early deciduous.
Flowers		minute, perfect, appearing either in early spring before the leaves in the axils of the leaf-scars of the previous year, or in autumn in the axils of the leaves of the current year; in stalked or sub-sessile fascicles or cymes; articulated on slender two-bracteolate pedicels: calyx, campanulate or funnel-shaped, with four to nine short or deeply divided lobes: stamens three to eight, inserted under the ovary, with thread-like filaments, and two-celled dorsifixed extrorse anthers, which dehisce by two longitudinal openings; ovary usually one-celled by abortion, sessile or stalked; style with two spreading lobes, stigmatic on the inner surface; ovule solitary, suspended from the apex of the cell.
Fruit		a samara, ripening in two or three months after flowering, surrounded at the base by the remains of the calyx, notched at the apex, the notch open or closed by the incurved persistent stigmas and ciliate within; seed-cavity in the centre or above it, compressed, slightly thickened in margin, and produced into a thin peripheral reticulate membranous wing. Seed solitary, suspended from the apex of the cavity, without albumen; cotyledons flat, raised above the ground in ger-mination.

***Ulmus pumila* L**. A tree commonly known as the **Asiatic elm.** First published in Species Plantarum (1753) by Carl Linnaeus . A tree attaining so 25-30 in height in Eastern Asia, but often shrubby, Bark furrowed and scaly. Young branchlets slender, clothed with a dense short white pubescence, persistent more or less on the second year's branchlets, which are fissured and finely striate. Buds minute, ovoid, pubescent. Leaves membranous and thin in texture, ovate to ovate-lanceolate, about 1 to 1,5 inches in long, and 0,5 to 1 inch in broad; acute or shortly acuminate at the apex; nearly equal, occasionally subcordate, at the base; upper surface dark green, glabrous or scabrous and minutely pubescent; lower surface lighter green, with a scattered minute pubes-cence, often conspicuous on the midrib, and with minute often obsolete axil-tufts at the junctions of the midrib and nerves; nerves about ten pairs, often forked; margin simply and regularly serrate; petiole 0,5 to 0,75 inches in. long, pubescent. Flowers five to six in a fascicle, appearing in spring, on very short pedicels; tetramerous or pentamerous. Samara orbicular, about 0,75 inches in. in diameter, glabrous, non-ciliate, with a deep notch at the apex, usually closed by the overlapping incurved stigmas; seed in the centre of the samara, with its apex close to the base of the notch. Siberian elm has a shallow and widely spreading root system. When Siberian elm trees are cut, they can resprout from the stump and roots. (1,1-photo)

***Ulmus glabra* Huds.** First published in Flora Anglica (1762) by William Hudson. Common names:wych elm, Scots elm can grow to a height of 40 m. The bark is smooth and grey when young, becoming grey-brown and fissured after 20 years. Twigs are dark grey and covered in coarse hairs, and leaf buds are hairy, purple-black and squat in shape. Leaves toothed, and 7–16cm in length, they are larger than those of other elms. They have a characteristic asymmetrical base and taper to a sudden point at the top. Flowers, Appear before the leaves in early spring. They are red-purple in colour and grow in clusters of 10–20, spaced out along the twigs and small branches. Elms are hermaphrodite, meaning that both male and female reproductive parts are contained within each flower. Fruits, After being pollinated by wind, flowers develop into small, winged fruits known as samaras. The seed is located at the centre of the wing and are dispersed by wind. (2-photo)

Decimated by Dutch elm disease, the sweeping and majestic wych elm is a much rarer sight these days. Its loss goes hand-in-hand with the decline of the elusive white-letter hairstreak butterfly, whose caterpillars rely on elm leaves.

***Ulmus Laevis* Pall.** A tree variously known as the European white elm,[6] fluttering elm, spreading elm, stately elm and, in the United States, the Russian elm, is a large deciduous tree. The species was first identified, as *Ulmus laevis*, by Pallas, in his Flora Rossica published in 1784[7]. The tree is allogamous and is most closely related to the American elm U. americana[8]. *Ulmus laevis* is rarely encountered at elevations above 400 m[9]. *Ulmus laevis* is similar in stature to the wych elm, if rather less symmetric, with a looser, untidy, branch structure and less neatly rounded crown. The tree typically reaches a height and breadth of 30 m, with a trunk 2 m d.b.h. The extensive shallow root system ultimately forms distinctive high buttresses around the base of the trunk. The bark is smooth at first, then in early maturity breaks into thin grey scales, which separate with age into a network of grey-brown scales and reddish-brown underbark, and finally is deeply fissured in old age like other elms. (1,1-photo) The *leaves* are *deciduous*, alternate, simple *ovate* with a markedly asymmetric base,10 cm in long and 7 cm in broad, comparatively thin, often almost papery in texture and very translucent, smooth above with a downy underside. Significantly, the leaf veins do not divide from the central vein to the leaf margin. The leaves are shed earlier in autumn than other species of European elm[10].The tree is most reliably distinguished from other European elms by its long flower stems, averaging 20 mm. Moreover, the apetalous wind-pollinated flowers are distinctively cream-coloured, appearing before the leaves in early spring in clusters of 15-30; they are 3–4 mm across. The fruit is a winged samara < 15 mm long by 10 mm broad with a ciliate margin, the single round 5 mm seed maturing in late spring. The seeds have a generally high rate of germination, 45–60% for Serbian trees examined by Stilinović[11,12].

***Ulmus Parvifolia* Jacq**. A tree commonly known as the Chinese elm[13] or lacebark elm. First published in "Plantae Horti Schoenbrunnensis"(1798) by Nikolaus Joseph von Jacquin. A small to medium deciduous or semideciduous (rarely semievergreen) tree, it grows to 10–18 m (33–59 ft) tall and 15–20 m (49–66 ft) wide with a slender trunk and crown. The leathery, lustrous green, single-toothed leaves are small, 2–5 cm long by 1–3 cm broad, and often retained as late as December or even January in Europe and North America. In some years the leaves take on a purplish-red autumn colour. (1,1-photo) The apetalous wind-pollinated perfect flowers are produced in early autumn, small and inconspicuous. The fruit is a samara, elliptical to ovate-elliptical, 10–13 mm long by 6–8 mm broad. The samara is mostly glabrous, the seed at the centre or toward the apex, is borne on a stalk 1–3 mm in length; it matures rapidly and disperses by late autumn. The trunk has a handsome, flaking bark of mottled greys with tans and reds,

giving rise to its other common name, the lacebark elm, although scarring from major branch loss can lead to large, canker-like wounds.







a



b

c **d**

2- photo. a-*Ulmus pumila* L, b- *Ulmus glabra* Huds , c- *Ulmus Laevis* Pall., d-*Ulmus Parvifolia* Jacq.

Importance and Usage For centuries elms have played an important cultural role in rural areas, being part of the traditional landscape as a tree of multiple uses. From a commercial point of view, elms are a source of good-quality wood, easy to work and used for furniture, flooring and as firewood, except *Ulmus laevis*, which has a lower density and cross-grained wood, which causes difficulty in machine cutting and defects. It has also an exceptional resistance to water decay, so that timbers are used as underwater piles, in shipbuilding and for water pipes, *Ulmus glabra* grows at relatively high altitudes and also in European boreal areas. The European mountainous areas are associated with soil erosion rates higher than the average. As this phenomenon is particularly serious in the boreal mountain system, *Ulmus glabra* contributes to provide a valuable service in watershed protection and soil stabilisation. Given the suitability for elms to live in high humidity areas, all the European elms may help to mitigate soil erosion by water even where particularly frequent or intense precipitation patterns are observed, and along riparian areas. However, the pandemics of the vascular Dutch elm disease starting in the last century devastated the elm populations in the whole of Europe, making it necessary to substitute it with other tree species or with other Dutch elm disease-resistant elms, such as Siberian elm and its hybrids.

Conclusion. Based on the theoretical research we conducted on representatives of the elm genus (*Ulmus*), we concluded that several introduced species, such as the Siberian elm (*Ulmus pumila* L.), Wych elm (*Ulmus glabra* Huds), European white elm (*Ulmus laevis* Pall), and Chinese elm (*Ulmus parvifolia* Jacq), along with their synonymous forms, are widely distributed in our country today.Plants belonging to this genus hold significant importance in Uzbekistan's dendroflora, forestry, landscaping, agriculture, construction, and the timber industry.The above information provides valuable preliminary theoretical insights for the establishment of cultural forests, seed production, and wood plantations, as well as for creating protective forests around highways, water structures, and agricultural crops. It is also beneficial for greening residential areas and cultivating and caring for elm seedlings.

2-Table

The tolerance and growth characteristics of elm species to various factors

Tree and Shrub Species	Gas resistance	Noise protection capabilities	Dust protection capabilities	Phytoncide production	Soil requirements	Cold resistance	Growth rate	Recommended Planting Areas
Siberian elm (*Ulmus pumila* L.)	+++	+++	+++	++	+	+++	+++	Along roadsides, sunny areas, saline soils, rest areas, and in front of buildings, along large irrigation canals in gardens and parks.
Wych elm (*Ulmus glabra* Huds)	++	++	++	++	+	+++	+++	
European white elm (*Ulmus laevis* Pall),	++	+++	+++	++	++	++	++	
Chinese elm (*Ulmus parvifolia* Jacq)	+++	+++	+	+++	+	++	+++	

Note: *+++ high, ++ moderate, + low.*

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