

COME SAIL WITH ME

A story of boats through history and the trees that made them possible.

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Start Founder's Entrance.

1 Pinus – the Pines

Human development; start to move across country

Encounter river – wade or swim – cannot carry goods over

Branch to carry small parcel

Raft/skin covered frames

Reed boats covered in bitumen

Hollow log – keep dry and carry goods

Additional plank to increase carrying capacity – water leaks in. Sticky substance seals, and does not dissolve in water.

Naval stores - whole sap, remove turpentine leaves rosin, separate into tar and leave pitch

Noah in ark 'pitch the ark within and without with pitch' 50,000-30,000 BC

Strategic – ships can carry spars, masts, rope and canvas for extended voyages, but not sufficient naval stores in 14 – 15 century. Royal Navy

Harbours with water, shelter food, if naval stores available special advantage

On West Coast of America similar story with Spanish

Wood for building, Mediterranean used up, to Britain

Shortage wood for masts – North America 1652 first tree felled, shipbuilding by end of century

1760 land grants reserved trees suitable for masts to British

Pine tree on flag of independence and first coin

1772 Pine tree riot

1773 Boston tea party

The pines are part of the Pinaceae, contains the spruce, larch, Douglas fur, cedar and hemlock plus others. It is primarily a Northern Hemisphere group.

There are some 120 pine species. Some 30 species of pine were originally planted in the Garden, with 20 species (including species planted more recently) remaining.

About 30 of the 120 total species produce edible nuts.

Pinus pinea was the first pine used and cultivated by man, its edible seeds having been harvested for perhaps half a million years or more. Prehistoric man has used its seeds for food, shells being found at many prehistoric sites

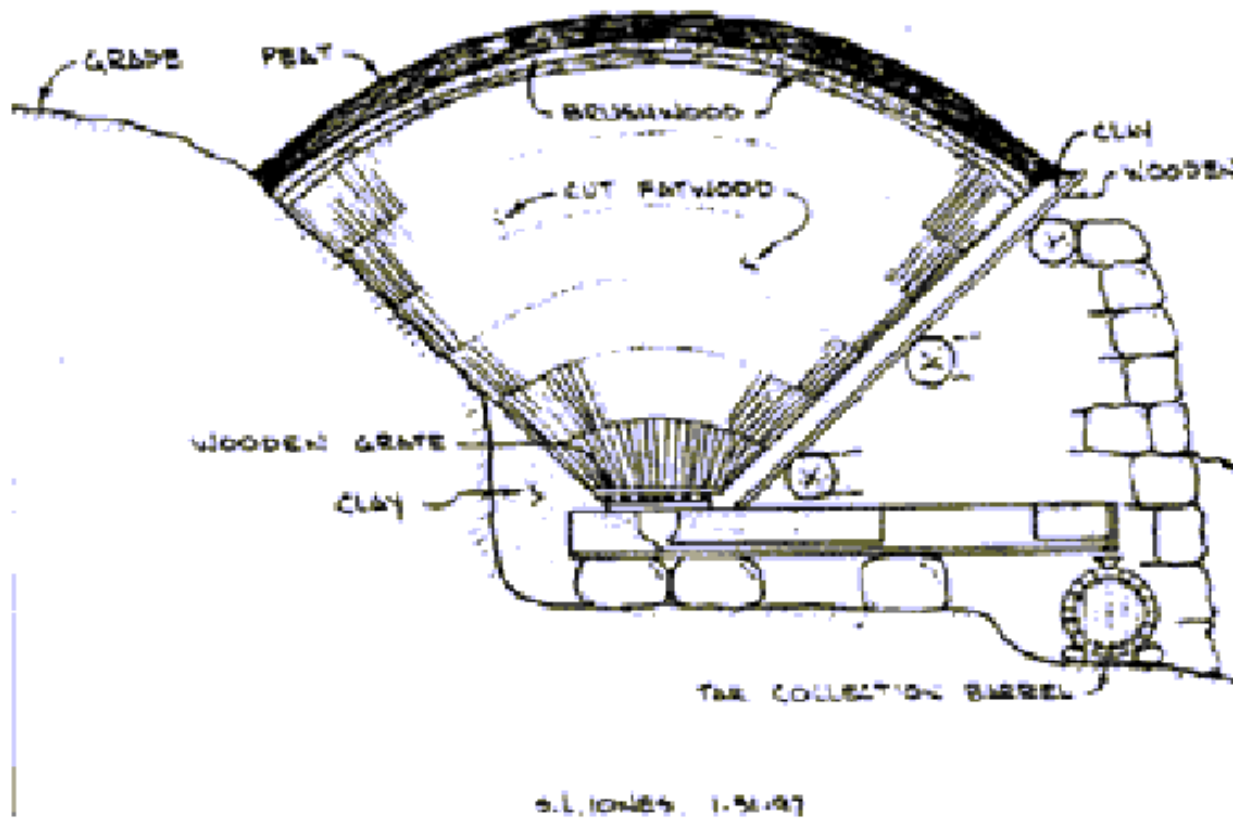
Most conifers will exude resin if wounded. Others will exude resin spontaneously from branches and cones. Several genera of conifers produce resin in copious quantities, which are then harvested and put to a wide variety of uses. These have made resin one of the most important non-wood products from conifers. The resin harvested from various species of *Pinus* is undoubtedly the oldest and most important of the non-wood products from conifers

Resin products from pines are commonly called naval stores. This term dates back to the days when the British Royal Navy used large quantities of resin products from pines to waterproof ships. Three products are involved. From the resin the volatile turpentine is extracted. Tar is then removed, and pitch remains.

Pine resin has been an important commodity at least since biblical times, as attested to by the story of Noah receiving instructions from God to "pitch the ark within and without with pitch". Dates of 20,000 to 50,000 years ago for that flood have been suggested.

To obtain resin from the pine trees which at that time grew in dense forests throughout Europe a herringbone pattern of cuts was gouged into the tree trunk and as the resin ran down the grooves it was collected in a pot at the base of the tree. Pine resin is still collected in this way in Poland, the Ukraine, Russia, Finland and other European countries where pine forests are still to be found.

When the resin had finished flowing, the trees were chopped down, covered in soil or ash, and burned slowly to produce a lightweight black pure form of carbon called charcoal. The last step in the process of making pitch was to add the powdered charcoal to the boiling pine resins. Different proportions of charcoal would produce pitch of different properties. It was this pitch that was used to waterproof the large ocean-going wooden ships. In my opinion it is no coincidence that pitch today can be extracted from coal much of which in Australia shows evidence of having been formed from pine tree debris.



The earliest Swedish methods of making tar in Norrland (Northern Sweden). The peasants dug up and cleaned the roots of Swedish pine trees (*Pinus silvestris*) in the late summer. They then transported the roots to the burn site where they were split and stacked to weather during the winter.

"The 'dale' or burning ground, was built of logs in a scientific manner. It was built on a slope which sometimes forms one side, in the shape of a funnel, with a spout at the lower end of the slope. The outer walls of the 'dale' were built with logs split in two, and a layer of earth was then placed thereon before the interior was lined, either with clay, iron sheet, or thick cardboard."

In the summer, the split roots or fatwood were stacked in the kiln and covered with peat and turf. Brush wood was used to provide heat, but the heat was controlled so that the remaining fibers were not burned and the roots give up their liquid. This tar was high in turpentine and was in great demand. By the turn of the 20th century, this traditional way competed with more modern methods of production. Although it produced higher quality tar, it was labour intensive and could not be competitive in the world market.

From the beginning, Britain's colonies in North America were encouraged to produce pine tar and pitch, and to collect gum from pine trees for later shipment to England. These fledgling industries in New England and the Carolinas were encouraged by the Bounty Act of 1705. At that time England had been cut off from its Scandinavian supplies by Russia's invasion of Sweden-Finland. "By 1725 four fifths of the tar and pitch used in England came from the American colonies..."⁴ This supply remained constant until the American Revolution in 1776, when England was again forced to trade with the Dutch for Scandinavian products. As the population of the United States grew and moved west, forests were cleared. The southern states began to monopolize the production, because of the type of trees in this region. By 1850 most of the U.S. production of tar and pitch was in North and South Carolina. As the 19th Century progressed the tar, pitch, and turpentine manufacturing spread south and west into the states of Georgia, Alabama, Mississippi, Louisiana, Texas, and Florida. By 1900, rosin and turpentine were the dominant products, and the states of Georgia, Florida, and Alabama were the three major producers.

The Roman statesman and poet Ausonius wrote about the tapping of pines for resin in Aquitania in the south-eastern part of France. The pine he referred to is *Pinus pinaster*.

Oleo-resins are present in the tissues of all species of pines. Turpentine consists of an average of 20% of the oleo-resin and is separated by distillation. Turpentine has a wide range of uses including as a solvent for waxes etc, for making varnish, medicinal etc. Rosin is the substance left after turpentine is removed. This is used by violinists on their bows and also in making sealing wax, varnish etc. Pitch can also be obtained from the resin and is used for waterproofing, as a wood preservative, adhesive and diluted, even as a protective surface coating.

When sail tied the world together, pines often assumed strategic importance providing naval stores, influencing the pattern of Western colonisation. When oak started to become scarce in Britain, the availability of pine and other good ship building trees in North America was an important reason for early colonisation. They were the first timber resource exploited in North America.

Pine resin was very important to the British shipbuilding industry during the fifteenth and sixteenth centuries. When America was a series of British Colonies, the capacity of two indigenous pines: *Pinus elliotii* and *P. palustris*, to produce resins of excellent quality and quantity was recognised and naval stores became an important export commodity from the South Carolina and Georgia colonies. The tapping of resin from these pines was, until recently, a major industry in southeastern United States when high labour costs reduced its profitability.

In 1652 the first New England pine trees were felled for British ship masts. Before the end of the century, British warships were being built in North America because suitable timber supplies were in short supply in Britain.

The pine tree was used as one of the symbols on the first American-made coins, issued in Boston.

1761 By this year British land grants in New England required that pine trees, most notably white pine (*Pinus strobus* – Eastern White Pine, also known as Northern White Pine), that were suitable as ship masts be conserved - to be cut only under license from the crown. Appointed surveyors marked trees to be protected with the "king's broad arrow," a triangular scar. This decree, among many others, greatly perturbed American colonists.

The first flag used by Revolutionaries bore the image of a single white pine - representing the state of Massachusetts.

P. strobus was a valued source of naval stores in the 1700's, and large tracts were once reserved for exploitation by the Royal Navy. Vast stands were logged in the 1700's and 1800's for masts, buildings, and furniture. Because of extensive lumbering, few uncut stands remain.

Eastern white pine is the provincial tree of Ontario and the state tree of Maine and Michigan

1772 An uprising against British authority in New England, the Pine Tree Riot, resulted from the levying of fines on a New Hampshire man for cutting what were determined to be the King's pines. This was one of the precursor events leading to the Boston Tea Party in the following year.

1773 Americans were displeased by a 3% tax imposed by the English Parliament on tea and other products. That small tax added to a 100% import duty that all English subjects already paid on tea, and led to an increase in smuggling of tea from Holland. Loss of business for the London-based John Company resulted in the Tea Act of 1773, which eliminated the 100% tax - meaning the Dutch would be undersold. Even though this change

represented savings for American tea drinkers, the monopoly granted to the John Company continued to carry a 3% tax for colonists who had no representation in Parliament. The uniting of American colonists resulted in some ships being turned away at their ports, but for others (in Boston, Greenwich, Charleston, Philadelphia, New York, Annapolis, and Edenton), boarding parties threw consignments into the sea. The Boston Tea party
By 1775 easy sources of wood for masts had been stripped from Eastern North America.

Let us now move to the West Coast of America.

Pine resin was used in California by Indians and the Spanish, long before the territory became part of the United States, again as an essential element of Spanish shipping.

The origin of the name "California" may be linked to pine trees and the resin they produced. Padre Arroyo, one of the early priests who converted the Indians of California to Christianity and ultimately wrote a vocabulary of the California Indian languages, told an officer of Captain Beechey's expedition in 1826 that the word "*California*" was a corruption of the Spanish word *colofón* meaning "resin". He indicated it was suggested by the numerous pines, primarily *Pinus radiata*, that produced resin around the old Spanish city of Monterrey.

In south-western United States, the Pueblo and Navajo Indians used the resin of various species of piñon pines to give their stone griddles a non-sticking surface, something like the Teflon of today.

The Hopi Indians, of American southwest, used resin to repair broken ceramic pottery

In Asia there are numerous records of the use of pine resin for medicinal purposes.

2 *Pinus pinea*

High quality food – pine nuts - easily transported Important item of trade even by prehistoric man

The Mediterranean Stone Pine also known in older publications as the umbrella pine (obsolete). *Sciadopitys verticillata* is also known as Umbrella pine, more correctly as the Japanese Umbrella Pine.

The tree has an interesting and distinctive flattened crown like an umbrella, and a straight though often leaning trunk. It can cope with extremes of heat and drought, though it is often stunted in the wild. Its globe-like cones are shiny brown. The bark is reddish-grey and furrowed. It can reach a height of 25 m (80 feet).

It is found from Portugal to Syria, although originally is thought to have come from the Iberian Peninsula, the only area where it is found away from the main trade routes, being introduced into many areas by primitive man.

***Pinus pinea* was the first pine used and cultivated by man**, its **edible seeds** having been harvested for perhaps 50-100,000 years or more. Its seeds have been used for food by prehistoric man, shells being found at many prehistoric sites, and are believed to have been widely traded.

The tree has been **cultivated for well over 6,000 years, and possibly for 12,000 to 15,000 years**. It is commonly found along the old trade routes. It continues to be widely cultivated through the Mediterranean area, the richly flavoured seeds essential for many Portuguese, Spanish and Italian recipes.

Its timber is used occasionally, but the trees are normally reserved for their value as a food source.

More than 4,000 years ago the Egyptians wrote about trees being transported with a ball of soil around their roots, some specimens being moved 2,400 kilometres by boat.

In ancient Rome a wine was made from the nuts and evidence from Pompeii indicated it was widely used in cooking. The **Romans** referred to it as the 'Domestic Pine'.

The seed is a good size, up to 20 mm x 10 mm, and is a major source of pinenuts in commerce. **The protein content of some pine nuts exceeds that of all other commercial nuts except the cashews, and is comparable to that of beefsteak. The protein quality is also very high.**

Each cone produces approximately **50 nuts**, and a pure stand will produce **500 kg cones per hectare** per year, which will give around **100 kg of nuts**. The nuts are protected by a very hard shell, but can be released by placing them in a warm oven where they will split open.

3 *Araucaria araucana*

Masts from Monkey Puzzle – South America

The **Monkey Puzzle** is **long lived**, possibly living over 1000 years.

Historically the tall straight **trunks** of the trees were used as the **masts** for sailing ships. It is now protected in the world, and is now widely grown as an ornamental throughout the world.

Araucaria heterophylla

James Cook unsuccessfully tried Norfolk Island Pine for masts

The **Norfolk Island Pine**, endemic to Norfolk Island, is widely grown in coastal areas of Australia and NZ because it is both salt-spray and wind tolerant, and able to grow in sandy soil. It is also drought tolerant, and grows rapidly to 30 m (100 feet).

Captain Cook thought this tree would provide masts for the largest ships, but it was found later to be unsuitable for this purpose. Its timber is used for other purposes. It is the *Araucaria* most used as an **ornamental**.

This tree is said to have been **common in NZ** during the Jurassic period some 150-200 million years ago.

4 a *Phoenix dactylifera*, the date palm

Ideal item of food for provisioning long journeys

Leaves used to make ropes

Phoenix is the ancient Greek name given to the Date Palm, *Phoenix dactylifera*.

The date palm, its archaeology

50,000 BC Wild date seed were left in the Shanidar Cave of Northern Iraq. Also found at that site was evidence that cave dwellers consumed

chestnuts, walnuts, pine nuts, and acorns. (Root, 1980)

Earliest finds: 5000-6000 BC, from Iran, Egypt, and Pakistan: probably wild

Earliest cultivated find: 4000 BC from Eridu, Lower Mesopotamia (Bronze Age)

Mentioned in Akkadian and Sumerian cuneiform sources: 2500 BC and later

Origin and Diversity: *Phoenix dactylifera* well known since ancient times, was regarded by the Egyptians as being a fertility symbol, it was represented on coins and monuments by the Carthaginians and used as an ornament in triumph pageants by the Greeks and Romans. In the Christian tradition, its leaves have symbolised peace and reminded of Jesus' entry to Jerusalem.

A Bit of History Over 3,000 years ago the Phoenicians were the dominant seafaring nation of the Mediterranean. From their base in the east in which is roughly modern Lebanon, they explored westwards, establishing colonies and trading posts, the most important being the ancient city of Carthage on the coast of North Africa. The Phoenicians extended their influence farther west as far as the Pillars of Hercules (the Straits of Gibraltar) and beyond, using their trading posts as stations where boats could take on food and water and be repaired. One such trading post in the western part of the Mediterranean was south of modern Valencia in southern Spain at the site of the modern city of Elche (Elx in the Catalan language and Jlice in Latin).

Since time immemorial, dates (*Phoenix dactylifera*) have been an important food crop, especially in the Middle East and North Africa. Not only are dates used locally, but they are also an **ideal item of food for provisioning long journeys**, and, indeed, wherever one travels in the drier tropics and subtropics, one can expect to find scattered groves of dates that, presumably, originate from discarded stones. However, in Elche the Phoenicians found a climate ideal for growing dates. Here they deliberately planted and cultivated the date for provisioning their trading ships.

The power of the Phoenicians waxed and waned, and other powers became dominant in the Mediterranean region. By AD 670, Elche was already under the influence of Islam and the Arabs. During the period of Arabic control that ended towards the end of the Middle Ages, dates in Elche were cultivated in proper plantation plots, in a way similar to that common in the Middle East and North Africa. These plots were square and separated by irrigation ditches, dates being planted along the edges. The centres of the plots were used for the cultivation of other crops such as pomegranates, also introduced by the Phoenicians. The plots were irrigated with ground water, which, in the Elche area, is quite saline. By the early 16th Century it is thought that there were some 1,300,000 date palms in the plantations of Elche. The life expectancy of a date palm in cultivation is about two to three hundred years. By the end of the 19th Century, the huge number of palms had been reduced by approximately one half, largely due to lack of replacement of dead palms.

Uses - Dates, due to their high sugar content, represent the basic, fundamental food for North Africa, Arabia and Persia's peoples, where hundreds of varieties are grown for commercial purposes.

The date palm, its uses Every part of the tree has its uses. The *leaves* are used for making **ropes**,

4 *b Cocos nucifera*, the Coconut Palm

Husk coir, fibre resistant to seawater and is used woven into strong twine or rope, life preservers, cables and rigging on ships

Two thousand years ago served to identify seashore locations with fresh ground water, but in those places it literally acted as a *natural desalination plant*

The coconut was first domesticated and originated in the region between south East Asia and Australasia (known as Malesia), where over half of the palm species come from. Its early history, like many plants, is full on uncertainty and conjecture.

The ancestral coconut may have originated in *western Gondwanaland* at the time it split up into the present continents. This raises the possibility that the wild type coconut may have existed on the fringes of the Pacific and Indian oceans since the earliest time. In that case the coconut palm could be considered indigenous over a very large area, including the coast and islands of East Africa

Two thousand years ago or more, the coconut palm not only served to **identify seashore locations with fresh ground water**, but in those places it literally acted as a *natural desalination plant*. The sweet, uncontaminated drinking water from the immature nut was then, and is still now, an important use of this plant to the local community. This applies to offshore islands and to favourable parts of the African and Indian coast. It is not suggested that the early coconuts were present in large numbers or spread over extensive lengths of coastline and were certainly not found naturally anywhere in the hinterland.

Uses of coconut: *Cocos nucifera* is one of the most valuable plants to man. It is a primary source of food, drink, and shelter. In Sanskrit the coconut palm is called "kalpa vriksha", which is defined as "**the tree that provides all the necessities of life.**"

Nut has a **husk**, which is a mass of packed fibres called **coir**, which can be woven into **strong twine or rope**, and is used for padding mattresses, upholstery and **life preservers**. **Fibre resistant to sea water and is used for cables and rigging on ships**, for making mats, rugs, bags, brooms, brushes

5 *Agathis australis* The Kauri

Construction of war canoes. Easily worked

Pioneers –American source not available, regarded as good for masts and spars

Kauri **timber** is light and very durable, straight grained and free of knots, and easily worked. It has had many building uses in the past but today is a scarce resource.

Maori used kauri for the **construction of war canoes**.

6 *Picea sitchensis*

Pound for pound it is stronger than steel' rowing shells

A pitch is obtained from the tree and is used for caulking boats The rendered pitch has been used as a glue. The pitch can be melted then used as a protective varnish-like coat on wood.

The Sitka Spruce is native of the Northwest coast of North America from Kodiak Island Alaska to California, never more than 200 km from the coast

'Pound for pound it is stronger than steel!' It has the highest strength to weight ratio of any tree. The wood is elastic, soft, light, straight grained and is sought where these characteristics are required, e.g. in **rowing shells**, and aircraft (Howard Hughes 'Spruce Goose' was substantially made from timber of this tree), guitar faces, ladders, and turbine blades for wind energy generators. Aircraft quality planks only represent a small percentage of total timber yield, however. It is preferred for acoustic uses such as piano sounding boards. Despite these desirable timber characteristics, it is widely used as a pulpwood tree

. The roots, peeled, split and dried, were used to make watertight hats and baskets. **The roots were used by several native North American**

Indian tribes to make tightly woven baskets that would hold water.

The limbs and roots can be pounded, shredded and used to make **ropes**.

A **pitch** is obtained from the tree and is used for **caulking boats**, waterproofing boxes etc. The rendered pitch has been used as a **glue**. The pitch can be melted then used as a **protective varnish-like coat** on wood.

7 *Cordyline australis*

Leaves are incredibly strong and don't get waterlogged easily. used for rope and cord.

Cordyline group consists of fifteen evergreen trees and shrubs that are natives of New Zealand, Australia, South America, India, and Polynesia.

Fibre - Ti leaves are incredibly strong and don't get waterlogged easily, so were used for sandals, Kete (baskets), bird snares, sieves (e.g. to separate the stones from mashed up Hinau berries), thatch for rooves, rope and **cord**.

8 *Cedrus libani*

**Cedar wood slow to decay widely used for shipbuilding
Supplies short, widely traded**

The Cedar of Lebanon is the national emblem of Lebanon, but only a few small groves survive there today because grazing animals prevent their regeneration. Larger populations survive in Turkey. Its natural range: N. Africa to W. Asia - Lebanon, Syria and Turkey.

Cedar wood is light and soft and has a very pleasant aroma. It was greatly esteemed in antiquity and it was transported from Lebanon to Egypt and Mesopotamia as far back as 3000 BC. Cedars provided the timber for temples, palaces, **ships** and royal coffins, because it is **slow to decay**. So quickly were the trees cut down in Lebanon that by 330 BC, Alexander the Great had to import the timber for his ships from Syria. It was **widely used for shipbuilding**. As supplies ran out in one area the industry kept shifting around from North Africa around to Greece and Italy. From there it shifted to Britain and Northern Europe. The use of steel came at a time when the supply of Oaks started run out.

In 2750 BC a coffin from the Egyptian Saqqara Pyramid was made of six layers of wood veneers, sandwiched and glued together like plywood. Cypress, juniper, and Cedar of Lebanon were used.

In 1840 John Dresser (Stockbridge, Massachusetts) devised a hand powered veneer lathe. Thin sheets of wood are used for creating finished surfaces as well as in the manufacture of plywood, but they must be shaved or sawed from the original block. Dresser's lathe pointed the way to mechanisation of this process, leading to the commercial manufacture of plywood

9 *Taxodium distichum*

Curved knees important for boat building

The generic name refers to *taxos* the yew and *eidos* meaning resembling, in reference to the similarity in the shape of the leaves.

The Swamp Cypress (sometimes called the Bald Cypress) is an important timber tree of the coastal swamps in the southeastern USA, and develops unique "knees", which project from the root system upwards above the water level, but are absent when it grows in dry soil. These growths are thought to allow the tree to breathe with its root system submerged. The swamp cypress belongs to the same family as the giant sequoia and the Japanese cedar.

The wood is not given to excessive warping or shrinking. **The knees are frequently used for curved members of wooden boats.**

The **bark** has been used to make **cordage**.

10 *Fraxinus – Ash*

Wood fine-grained, light, very tough, used for oars, paddles, rudders

American White Ash inhabits eastern North America. The **wood** is economically important due to its strength, hardness, weight, and shock resistance. It is second only to hickory for use in the production of tool handles. Nearly all **wooden baseball bats** are made from white ash. The wood used in furniture, antique vehicle parts, railroad cars and ties, canoe paddles, snowshoes, boats, doors, and cabinets.

Fraxinus excelsior

Before the use of iron and steel was universal, ash timber was in demand for many uses where metals are now used. Its wood is widely used for axe handles, oars etc where small diameters are required, being obtained from coppiced plantations.

Its timber is one of the **most important native timbers of the UK**, being used for carts, furniture, ladders, and table-tops. It is fine-grained, light, very tough and pale in colour. Used for hockey sticks, oars, paddles, rudders, billiard cues, cricket stumps, polo sticks and policemen's truncheons. Also used for veneer and furniture.

Burns fragrantly when freshly cut green or dried due to low water content even when green (30 - 35%) but seasoning (to 15% water) does improve efficiency. This is one of the most prized firewood

11 *Thuja plicata- Western Red Cedar*

Use of waterproof bark for canoe skins Durable wood also important Rope made from slim pliable limbs split in halves or quarters and soaked in water and twisted into rope

The generic name Thuja, meaning sacrifice, is an allusion to the use of the resin for incense, although may be the old Greek name for the tree. The genus is native of Western North America, China and Japan.

Western Red Cedar has been called 'the cornerstone of Northwest coast Indian culture' and the large-scale use of its wood and bark delineates the cultural boundary of the Northwest coast peoples within its range. Few cedar trees were actually felled before European contact. Instead, fallen logs or boards split from standing trees were used. To split off cedar boards for house planks or half-logs for canoes, a series of wood or antler wedges were pounded into living trees along the grain.

"Throughout the whole Northwest the wood most extensively used by the Indians is cedar. House planks, house posts, roof boards, and canoes are made exclusively of this wood.

"The limbs of the cedar tree are stripped of their leaves, soaked in water, and twisted into rope. The heavier grades are used by the whale-hunting tribes for towing home dead whales. It has remarkable strength. Single limbs which have been worked to pliability are used to tie or sew the corners of wooden boxes and tie cross pieces in canoes. Some string pecten shells on a small cedar limb as a dance rattle. Cedar limbs are used for openwork baskets, and also for weaving with vine maple sticks for fish weirs, and for tying the poles of the summer house.

The slender pliable branches are used as a high quality rope. They are gathered in spring, peeled and, if thick, are split into halves or quarters. They are then twisted and worked until soft and pliable and finally woven together to make the rope.

12 Quercus robur

**Used in shipbuilding around Mediterranean after North African sources used. Then Roman moved to Britain with large stocks of mature oak
Open grown trees with large branches furnished bent "knees" and other framing for sailing ships.
2,000 mature oak trees were required to build a single 1,350 ton warship.**

The English Oak or common oak is the most famous of all oaks, and is one of Europe's most valuable timber trees. It is native of Britain and Ireland and most of Western Europe and Asia Minor.

Called Pedunculate Oak, Common Oak, English Oak, Irish Dair.

Large deciduous tree and probably the commonest English tree.

It is the most famous of the oaks.

It is one of Europe's most valuable timber trees. It is used for building, for making furniture, and for wine barrels, and was once used for building ships.

It was used in ancient shipbuilding especially around the Mediterranean, and this caused new sources to be sought when local supplies were largely exhausted. Much shipbuilding moved to the UK in more 'recent' times because it had large sources of quality oak.

2,000 mature oak trees were required to build a single 1,350 ton warship.

English oak is venerated in England because it grows to large sizes and produces strong wood. **Open grown trees with large branches furnished bent "knees" and other framing for sailing ships.**

The wood is impermeable to liquids

13 Metrosideros excelsa Pohutukawa

**Wood strong durable used in shipbuilding
Curved roots and branches for angled stems and keel**

At the time of European settlement the New Zealand **Pohutukawa** was confined to the coastal area of the North Island from the Three Kings Islands southwards to Poverty Bay and the east coast and around the mouth of the Urenui River on the west coast. It also grew around the shores of some of the Rotorua lakes. It has subsequently been extensively planted throughout the country.

Its **wood is hard dense tough and durable, very strong** and was much used in **the early times in NZ for boat building**. Its **curved roots and branches** made it possible to construct boats angled stems and keel from a single piece of timber. Also used for bearings, machine beds etc

14 Ulmus The elms

**Wood - very durable under water – ships keels
Inner bark fibre for ropes**

Wych Elm is native of Britain.

The name 'Wych' meaning is uncertain. It is probably a form of witch. Just as Hazel-rod is used by water finders who declare that its movement indicates the presence of hidden springs, so a wand of this tree may have furnished the witch finder with a witch hazel for the detection of witches.

Wood - very durable under water, fairly hard, elastic, withstands abrasion and salt water. Used for water pipes, wheels, mallet heads, **ships keels** etc..

A **fibre from the inner bark** is used for mats and making ropes.

15 Betula pendula

Waterproof bark for canoe skins Glue from sap

Silver Birch a native of Britain

The **bark** is used to make drinking vessels, **canoe skins**, roofing tiles etc. It is waterproof, durable, tough and resinous. Only outer bark is removed, this does not kill the tree. It is most easily removed in late spring to early summer. The inner bark can also be separated into thin layers and used as a substitute for oiled paper

Glue is made from the sap.

Betula papyfera the paper birch most important