Robinia pseudoacacia ' Frisia'	Spreading tree with compound fernlike foliage pale yellow in spring, pale green in summer, rich yellow in autumn. Very popular in new gardens.
Locations	Left lobe of upper Stainton Dell.
Sassafras albidum	Aromatic foliage rangeing from oval to lobed. Wood and bark yield sassafras oil used medicinally. Colours early from yellow to red. Not common.
Locations	Above Racecourse Walk amongst cycads (single), left lobe upper Stainton Dell, lower end of Torbay St entry to Vogeltown Park.
Swamp cypress (Taxodium distichum)	From the 'Everglades' Florida. Another deciduous conifer with fernlike leaves but finer than the dawn redwood. Thrives in damp conditions where it may develop extraordinary 'protrusions' which serve as 'breathers' for the roots (snorkels!) In colder regions colours, extend into fiery rust reds but seldom here. However it is a little more exciting than the dawn redwood.
Locations	There is a group near the far, Maranui, end of Brooklands Lake (hunt for snorkels), and a single specimen hiding amongst other large trees in Truby King Dell.

George Fuller

For Friends of the Park

May 2nd 2004

AUTUMN COLOUR IN PUKEKURA AND BROOKLANDS PARKS

Part 1

Because there are few if any trees native to New Zealand that drop their leaves over the winter, our bush colour is predominantly verdant monochrome - green. Therefore, if a tree is deciduous (drops it's leaves in winter) it is fairly safe to conclude that it is not a N.Z. native. Deciduous trees and shrubs are characteristic of the native flora of the temperate zone of the northern hemisphere. However there are some exceptions such as where autumnal colour change is evident in some of the native flora of our alpine regions.

Factors which enhance the development of autumn colour:

clear sunny days.
cool nights.
increased differential between day and night temperatures.
dry autumn conditions.
injury to sap flow in a limb or in the trunk.

Factors which threaten longevity of autumn colour:

high wind.
heavy rainfall.

Suitability of New Plymouth's climate to the development of autumn colour:

New Plymouth boasts a mild, equable climate with reliable rainfall, limited extremes of heat or cold, and prevailing northerly and westerly winds which are quite often salt- laden. These are all negative factors when it comes to initiation and retention of autumn colour. Put simply - New Plymouth is a disappointing area to view such colour. Despite this, a few tree and shrub species can be relied upon to perform well; but before listing these, just what is autumn colour ?

The chemical and physiological changes that occur are quite complex and I do not claim to fully understand them so can only provide a simplified explanation based on somewhat ancient information. It will help to understand a modicum of basic plant physiology.

The cross-section of a tree trunk reveals three distinct zones. On the outside is the bark which tends to be either cracked or flaky. On the inside is wood with annular rings. Between bark and wood is soft tissue, slimy in the season when the tree is in vigorous growth. This zone is called the cambium and is the band in which cell division (stem growth) occurs. Wood tissue is formed on the inner interface of the cambium and bark on the outer. This results in the oldest wood cells being toward the central core (Heart) whereas the oldest bark cells are on the outside.
Two very strong sap flows occur in the trunk - travelling in opposite directions ! How could this be ? Before we try to untangle that phenomenon we should try to understand the basics of photosynthesis, that vital plant function without which life on earth as we know it could not exist - and neither would autumn colour !

Photosynthesis

Leaves and young stems contain a green- coloured pigment called chloropyhll which has remarkable qualities. In its presence the plant is able to convert radiant energy (which one can feel but not grasp) into a solid called carbohydrate. This involves combining the trapped energy with water and minerals sourced from the roots and carbon dioxide gas absorbed from the air. In the locking up of a proportion of carbon from the air the level of oxygen is raised. This is the reverse of human respiration in which oxygen is retained and carbon dioxide is expelled, but that factor is only coincidental here.

The carbohydrates are first formed as soluble sugars in which state they are transportable throughout the vascular system to fruits, seeds, stems, roots etc firstly as an energy source for cell division. Excess to immediate growth need is then stored as insoluble starch in all the above organs.

The downward sap flow

Water with minerals in solution flows upward via young, still actively conducting wood tissue. Carbohydrates as soluble sugars flow downward via young still actively conducting bark tissue to provide a vital energy source for cell division (growth) of the roots and for storage in that zone. It is noteworthy that this downward flow occurs most strongly at night.

What has all this to do with autumn colour ?

Trees that shed their leaves do so as a means of survival over a very unfavourable season embracing coldness, wetness, perhaps wind, and certainly long periods of low light intensity. Colouration in autumn has two major sources. Chloropyhll in most plants masks other similar 'plastid' pigments, notably carotenes (orange-red) and xanophylls (yellow). As autumn weather begins to induce leaf senescence, chlorophyll is the first type of pigment to decompose because it no longer has a function, thereby unmasking the yellows and oranges. But there is another source of colour, the understanding of which required the lecture on sap- flow. The "flavinoid" pigments of flavones (orange) and anthocyanins (red/purple) are associated with cell sap and are formed from excess sugars. As night temperatures drop in autumn the translocation of sugars from the leaves down to the trunk and roots is inhibited, detaining them and thus enhancing the production of flavinoid pigments. The greater the extremes between day and night temperatures (often accompanied by bright sunny days), the richer the colours, helping to explain the brilliance of autumn colours in deciduous trees growing in the central and eastern North Island and areas east of the Southern Alps.

In New Plymouth with its mild, equable climate we have to be content with a very limited range of trees that can be relied upon to give autumn colour. Oak, beech, birch, lime, sycamore, elm, larch, poplar etc. here are only a dingy reminder of their brilliant counterparts in the above regions - unless one is excited by shades of brown ! The nearest location for a reliable feast of rich autumn colour is undoubtedly the arboretum at the entrance to the Te Wera forest on SH43 inland from Stratford. It is readily accessible, free, and well worth a visit between mid April and early May. Very notable are the dawn redwoods (Metasequoia glyptostroboides) and swamp cypress (Taxodium distichum) - breathtaking when at their best. There are also many bonuses in the vegetation of the surrounding countryside.

George Fuller April 2004
For Friends of the Park

Part II lists details of individual plants and their locations.

Ref:-Vo LXCII,Pt2,Journal of the Royal Horticultural Soc Feb 1967. 'Autumn Colour' by John O'Connor.

Part II

Autumn Colour in Pukekura and Brooklands - the Park

Plants affording reliable autumn colour in New Plymouth

Part I covers an insight into the chemistry and physiology of autumn colour and how this is influenced by the New Plymouth climate.
The New Plymouth climate is too mild, equable, humid, wet and windy to be ideal for the development and retention of autumn colour in trees renowned for that quality in their Northern Hemisphere native habitats and several inland and eastern locations elsewhere in New Zealand. There are however, certain species (sp.,spp.) which can be relied upon to give satisfaction here.
Performance and some level of timing may be variable annually as the consequence of differing climatic conditions each season. Individual clones (cl.) and cultivars(ctv.) can be expected to give differing colour quality.
The following are listed in alphabetical sequence of botanical names.

Maple. (Acer spp.)

Great diversity of heights and habits from pendulous shrubs to large trees with divergent leaf shapes and colours. Attractive spring foliage. Well suited to home gardens. Distributed widely throughout the Park.

Shagbark hickory (Carya ovata)

Large tree, simply breathtaking for New Plymouth. Large compound leaves turn brilliant yellow. My favourite, equal to the best anywhere. Rare in Taranaki, and one has to ask 'why'? Early.

Correction reqrd on disk.

Locations -

Maranui Gully, Brooklands; in the short loop which enters/leaves the main path a few metres down from the bridge junction. Skyline feature across Maranui Gully when viewed from the upper terrace if approaching via Kaimata St and giant puriri. Well worth the hike in mid-April.

Only other, and younger specimen beside lakeside path between fountain pump house and Hatchery Lawn, Pukekura. This plant was obtained from an enthusiast near Nelson by trading with plants of the also seldom seen Sassafras albidum (see under sassafras). Planted only 7m from Ginkgo biloba because the gingko was supposed to be fastigiated form (tall, erect) but has turned out to be as wide as it is high !

Cotinus or Rhus -
(Cotinus americanus syn. Rhus cotinoides).
Relative of the smoke bush (Cotinus coggyria)

Exceptionally fine autumn colours ranging through yellow, scarlet to deep red. Up to about 4 metres tall and equally wide. Benefits greatly from very heavy cutting back (pollarding) in mid-winter Some people are allergic to the very sticky sap. Overalls and gloves should be worn if handling.

Correction regrd. on disk

Persimmon (Diospyros kaki)	Edible fruits are not often associated with autumn colour especially in Taranaki, but this is an outstanding exception. Not only do the roundish leaves assume brilliant shades of orange, scarlet, red and purple, but when shed they reveal the globular orange/tangerine fruits - the best of both worlds. Not surprisingly there are no specimens in the Park but it is a very rewarding small tree for a home garden.
Ash (European, English.) (Fraxinus excelsior)	The ash doesn't flourish in New Plymouth but young plants can be expected to produce good colour, specially the varieties 'Aurea' (yellow) and 'Aurea pendula'. The ctv.'Raywoodii' (claret ash) produces colours in the red/purple range. Leaves are compound and dormant buds attractively black.
Locations	One large specimen close behind the Tea House.
Ginkgo (ginkgo biloba)	Handsome 'clean-looking' tree with uniquely-shaped (maidenhair) leaves. Golden yellow, but one of the latest, not colouring until mid-May - early June.
Locations	An exceptionally large specimen is located on the short loop track entering/leaving the main path through the Maranui Gully, Brooklands, close to the bridge. Another is on Smith Walk just inside the Gilbert St entrance.
Honey locust (Gleditsia tricanthos 'Sunburst')	Fern-like compound foliage, yellow in spring and reverting to yellow in autumn.
Locations	Right lobe, upper Stainton Dell. Above lower end of Saxton Walk.
Hydrangea quercifolia (oak-shaped leaves)	Most hydrangeas provide some form of autumn response, even in aging flower-heads, but the large dramatically shaped leaves of this species turn rich red/purple.
Locations	Right lobe, upper Stainton Dell beside pond.

Wonder tree (Idesia polycarpa)	Spreading with large heart-shaped leaves which turn yellow in autumn. Male and female flowers borne on separate trees. Where both are present in the same proximity there is a bonus of large clusters of very durable bright red berries on the females. Handsome but space consuming.
Locations	Above Racecourse Walk opposite Fernery. A large fruiting specimen overhangs the margin of the Hatchery Lawn.
Liquidambar (Liquidambar styraciflua)	Potentially large. Prone to wind damage, spectacular for it's wide range of colours. The ctv. 'Festeri'is notable for strong red enduring into winter
Locations	Brooklands main lawn near far margin. Two large specimens in the frontage to the Gables. Struan Walk, where several have recently been blown down. The ctv. 'Festeri' is above Racecourse Walk opposite the Fernery, behind cycads. Right lobe of upper Stainton Dell.
Tulip tree (Liriodendron tulipifera)	Potentially a very large tree with large leaves of a good yellow colouration. Attractive green and orange flowers.
Locations	Above Racecourse Walk opposite Fernery and also behind Bellringer Pavilion.
Dawn redwood (Metasequoia glyptostroboides)	A potentially tall, handsome tree with interesting history; thought to be extinct until discovery in China in 1942. Deciduous conifer with fine fern-like leaves which in ideal autumnal weather will turn rich rust-red, but are usually a less lustrous shade here.
Locations	A group overhang the lower portion of the Brooklands Lake and another is located in Truby King Dell. Individual specimens are in Struan Walk and beside the Palm Lawn (Pukekura).
Nyssa. Tupelo. (Nyssa sylvatica)	One of the finest and more reliable small/medium trees. Responds well to damp conditions. It has a light open habit and reliably produces brilliant shades from yellow to bright scarlet.
Locations	Sunken garden near Tea House; left lobe of Upper Stainton Dell; Truby King Dell.

Sorrell tree (Oxydendrum arboreum)	Low spreading tree, not common, with strong red colouration.
Locations	Two specimens, both in the lawn area just inside the entrance to the Zoo, one free-standing.
Persian ironwood (Parrotia persica)	Potentially large tree, not very common, with minor floral value in spring. In this area autumn colours tend to be yellow.
Locations	A young plant is located on the lower side of the upper section of the Scanlan Walk. Older plants occur beside the Torbay St entrance path to Vogeltown Park.
Cherry (Prunus spp. & ctv.)	Very reliable for both spring blossoms and autumn colour. Single flowered forms tend to be more vigorous and produce better autumn colour. Small to medium sized tree. Pendulous to erect habit. Colours yellow, orange, red.
Locations	Dispersed by birds throughout the Park including Maranui Gully. Not many double forms survive but there is one at the frontage to The Gables. Several large singles are near the Waterfall.
Oak (Quercus spp.)	Oaks are particularly disappointing in New Plymouth. Even the red oak (Q.rubra) in from Fillis St beside Smith Walk, which can be absolutely breathtaking elsewhere with its large seemingly gnawed leaves won't even generate a murmur - except perhaps of disappointment from those who have seen it elsewhere.
Locations	As described above.
Rhus succedanea (Syn. Toxicodendron. Derivation 'poison tree')	WARNING - the derivation says it all. Some individuals are very highly allergic to the sap of this low-spreading tree, the compound leaves of which can be relied upon to produce brilliant shades of red.
Locations	It was at one time incarcerated on one of the islands at the upper end of the Main Lake but is probably no longer there.