there was any cutting in past centuries, it was so minor as to have left no trace. This counters statements made by some that "the entire island was clearcut."

The southern part of the island was used during 1837-38 as a base by William Lyon Mackenzie who led a failed rebellion to take over Canada. Small agricultural operations cleared land on the southern third of the island between the 1850s and the early 1900s. In 1945, the island was unsuccessfully promoted as the site for the new United Nations, and in 1960, as the site for the World's Fair. The ancient forest would have been the loser if those decisions had been different. In the late 1900s, the Canadian military transferred it to Parks Canada as National Historic Site, to be treated as a preserve, with no resource exploitation, management or development.

Low level camping by permit is allowed on the island at one designated area. However, vandalistic cutting of trees, some relatively large, has occurred and reported to the site manager.
Since 1998, Parks Canada has been considering erecting nesting platforms to attract Bald Eagles to establish permanent residence. Birders regularly see Eagles using the island as a fishing and roosting site. The relationship to Old growth Forest is that large trees, including large *dead* trees (snags), are the ideal nest sites required by Eagles for nesting and the best source of them are ancient forests. Navy Island, in addition, is the ideal place for their fishing needs.

Old Growth Tree Data	Age (years) Range	Diameter Range	Comments
Bur Oak	200-250	up to 53.5"	
Pin Oak	233	28-33"	actual log ring count
Swamp Oak	180-225	34-41"	many log ring counts
No. Red Oak	150-200	32-56"	many log ring counts; 2nd largest tree on island, on east shore
White Oak	200-300	32-46"	215 yrs actual log ring count
Shumard Oak	180-250	35-42"	
Black Oak	150-200	32-40"	
Shellbark Hickory	120-200+	24-34"	
Bitternut Hickory	120-200+	24-35"	
Pignut Hickory	120-200+	24-30"	
Black Walnut	150-250	28-43.6"	Largest as isolated trees on east shore near former habitations
White Ash	160-275	30-56.6"	165 yrs log ring count; largest tree on island; one ash had lowest bough at 90 feet high!
Red Ash (var. of Green Ash)	175-300	30-51"	Very rare to find this species as old growth Lowest bough 75 feet high One 15" Diam. log = 190 yrs.
Black Ash	160-180?	14-18"	First time found as old growth in NE North America
Sugar Maple	120-225	24-32"	
Red Maple	120-180	36-50"	Hybrid of Red & Silver Maples (Freemans Maple) got to50"
Silver Maple	120-180	36-48"	Very rare as old growth
Beech	150-225	24-32	
Basswood			
Downy Serviceberry	165	11"	First time in NE North America that this species has been confirmed as Old Growth with actual ring count
Hop Hornbeam	150-250+	10-16"	many log ring counts
Sassafras	210?	34.5"	74.5 feet tall, new Canada record, at least for forest-grown tree
Red Elm	200	34"	Rare this large in a forest

Black Cherry	170	26”	
Eur. Sweet Cherry	150+	36”	Escaped from lunch-time visitor in 1800s, naturalized in woods at North end
Flowering Dogwood	150+	5”	

Non-Old Growth Tree Data:

Pawpaw	40.6 feet tall, 5.7” diam.	Canadian record & tied for NE North America height record
	36.4 ft tall; 5.4” diam.	
Spicebush	est. 24-30+ ft tall; 6” diam.	Canadian record; one of largest in world
Virginia Creeper	9 in. diam. vines	Record-size for this species
Poison Ivy	7 inch diameter vines	Record-size for this species
Shagbark Hickory	120-135 years old;	It is possible that Old Growth but more field work needed
Red Mulberry	this rare tree reportedly found here, but not seen during the 2 field trips	
Ohio Buckeye	not native to this region, found near formerly inhabited area, probably planted	

Notable Herbaceous Plant:

Eurasian Forget-Me-Not (*Myosotis stricta*) was found in 2000 by a local botanist on the island’s west shore. It is rare, and might be the first reported occurrence for Ontario’s Niagara Region.

Navy Island - Oak

Navy Island - Silver Maple

Navy Island - White Ash

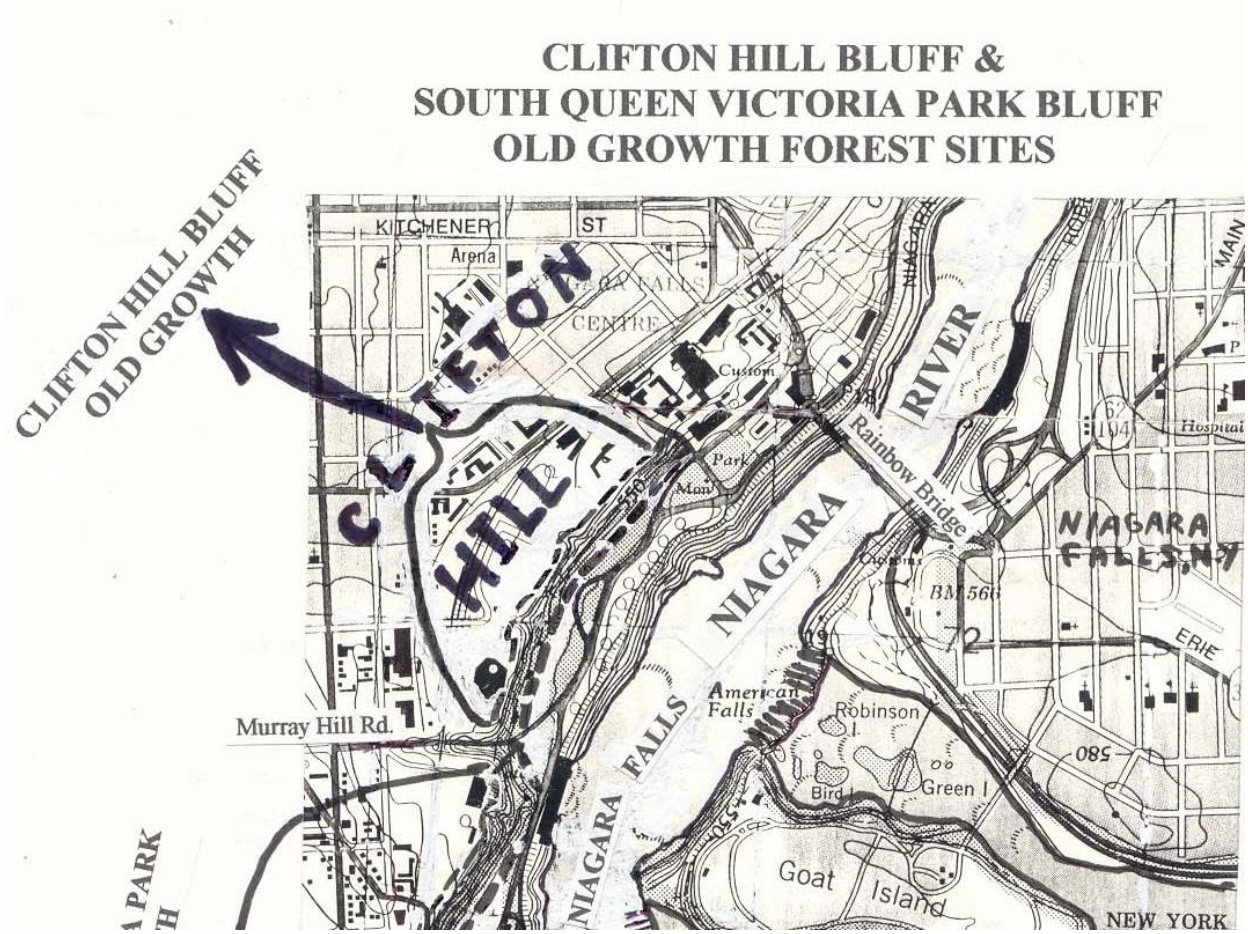
Navy Island - Grape Vine

Navy Island – Pawpaw

Navy Island – Pawpaw

Navy Island – Pin Oak

Navy Island - Black Walnut



Clifton Hill Bluff and South Queen Victoria Park Bluff Old growth

CLIFTON HILL BLUFF

The wooded bluff between the Great Falls of Niagara and Clifton Hill tourist district has been anonymous to the millions of tourists who come to the world's oldest tourist attraction. Now it can be applauded as a historic and natural treasure in its own right. This steep, 50-foot high bluff has harboured an Old growth Forest with 11 ancient tree species, up to 4.3 feet diameter. Its oldest trees, 275 years old, were living before Europeans settled here. These sentinels have borne silent witness to all the changes that have occurred at Niagara Falls.

This forest is probably unique among all Old growth Forests in this part of the continent. No matter where you are in this forest, the roar of Niagara is continuous. For periods of time, a light mist may descend for hours, even when it is sunny. It is puzzling until one realizes the spray of the Falls is "falling" on you.

The northern end of this forest begins *within 75 feet of Clifton Hill Road*, known for its numerous tourist amusement establishments. The ancient forest-covered bluff continues south for ½-mile before ending at Murray Hill Road (which stirred controversy when it was recently cut through the bluff to allow access to the new casino). It continues another 1.5 miles south of Murray Hill Road, with more Old Growth (described under "South Queen Victoria Park Bluff).

From the foot of the bluff to the edge of the Niagara Gorge is Queen Victoria Park and botanical gardens. Because both tourists and the general public find Old Growth and giant trees attractive, it makes sense to devise a plan that would enable people to appreciate this ancient forest. An example is an "Ancient Forest Trail" along the bottom of the bluff (possibly supplemented with a trail with steps constructed on the milder slopes), with signs, tree plaques, brochures, and naturalist programs. The

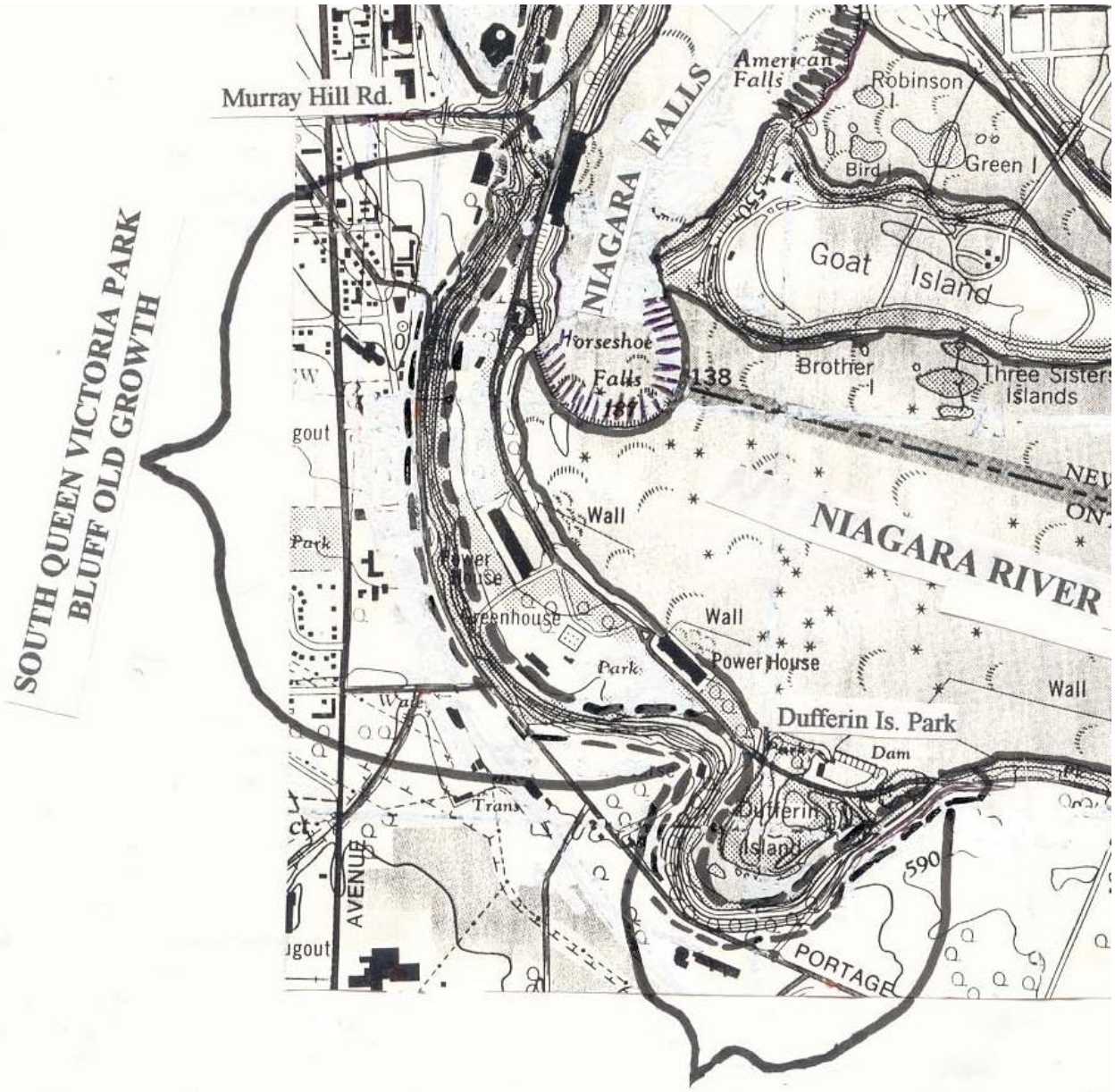
bluff is officially known as the "Queen Victoria Park Moraine Bluff," deposited by the melting glacier long ago before the Falls existed.

Most of this forest is surprisingly intact from an ecological standpoint, with healthy colonies of wildflowers, and minimal erosion except in a few gullies or trails that cut up the bluff. Considering its urban location, there is no dumping and virtually no litter from above. In an area that began development so early, it is surprising that this forest survived for 200 years without being cut. One possible clue is that an early founder of Niagara Falls, Captain Ogden Creighton, acquired Clifton Hill around 1830, became wealthy, and built his estate on the top of the hill overlooking the Falls. Although he left in the 1840s, it is possible that his estate may have been bought by another affluent person. One of the likeliest places where ancient forests have survived is on old wealthy estates. Their owners typically prefer not to cut their forest since it is part of their scenic view or setting, and they don't need the revenues. If Clifton Hill's forest remained uncut until the late 1800s, it gained protection when converted to parkland at that time.

However, only the lower half of the bluff's slopes are protected park land. Its upper slopes are privately owned and have no clear protection. The recent, complete clearing of forest on the bluff (including Old Growth) to construct Murray Hill Road to the bottom is a reminder that the lucky survival of the forest for the past two centuries does not mean anything about the future.

Old growth Tree Data:	Age (years) Range	Diameter Range	Comment
No. Red Oak	150-230	20-48"	Largest is a Heritage Oak on lawn just outside the forest. Several stump/log ring counts used; Examples: 25 inch log =180 yrs 32" log=165 yrs; 18" log=176 yrs 30 inch stump =~240-260 yrs at N. end of woods
Tulip Tree	150-250	26-51.6"	Largest is the "Clifton Hill Giant"
White Oak	170-275	20-32"	Oldest is a Heritage Oak on lawn on forest margin
Black Walnut	150-225+	20-32"	
Sugar Maple	170-250	20-30"	27 inch stump =205 yrs at N. end of woods 26 inch stump =160 yrs
Bitternut Hickory	180+	20-24"	
White Ash	150-180	24-28"	
Beech	150-225	18-26"	
Yellow Birch	160-175	18-26"	
Black Cherry	150	16"	
Hop Hornbeam	120-180	6-12"	Conspicuous staghorn crowns
Cottonwood	115	48"	NOT OLD GROWTH

Clifton Hill Bluff - Red Oak



SOUTH QUEEN VICTORIA PARK
BLUFF OLD GROWTH
(Dufferin Island Section)

SOUTH QUEEN VICTORIA PARK BLUFF

South of the Murray Hill Road cut, Clifton Hill Bluff extends another 1.5-mile further south, winding its way around to the end of Dufferin Islands Park. Because its forest requires a different description, this section is referred to as "South Queen Victoria Park Bluff." (The formal geological name for the entire bluff is Queen Victoria Park Glacial Moraine Hill.)

Ranging from 130 feet tall at its northern end to 40 feet tall at its southern terminus, this bluff is not covered entirely by Original Old growth Forest, as is the Clifton Hill Bluff. It has all of the following categories:

- Secondary Old growth Forest
- Original Old Growth mixed with Secondary Old Growth
- Second-Growth Mature Forest (sometimes with a scattering of Old growth individuals)
- Second-Growth Young Forests
- Non-native, scrubby invasive vegetation

These forest categories alternate randomly, with no pattern as to the length a particular stretch of Old growth will be, whether Old Growth or another kind forest will come next, etc. The random pattern is partly due to the capricious way that invasive species may take hold and spread, or which large tree may topple and open up the forest to invasion by non-native species.

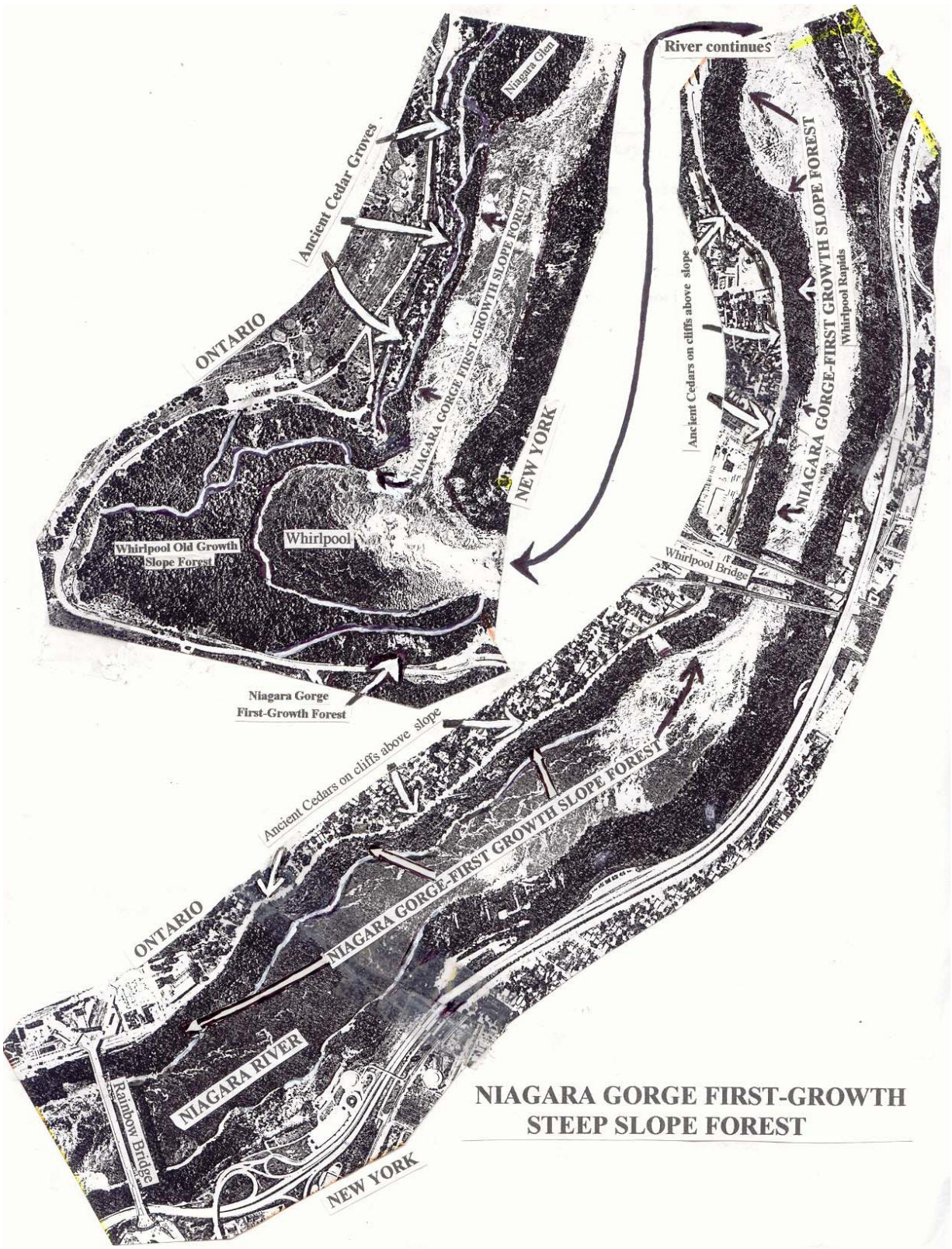
What *is* clear however is that this is another site where an ecological restoration project would be highly beneficial, both environmentally and as an opportunity to expand/enhance the ecotourism experience. By walking the entire length of this bluff all along its mid-slope (a very challenging effort!), it was revealing to see the former walking paths that were properly carved into the hill slope and provided enjoyment for tourists of the past. At one time, a person could walk through much of this forest along a substantial portion of the bluff's north-south length. It is unfortunate this trail has been abandoned. In most places, only woody debris and shrubs obscure it. Erosion has been minor.

The total acreage of any combination of Secondary or Original Old growth Forest is estimated at 30 acres. Highlights include two Black Walnuts that are among the largest trees found during this survey, the Dufferin Park Giant (61-inch diam) and a 58-inch diam. "runner-up"; massive Tulip Trees, Cottonwood, Red and White Oaks, and a White Ash; many American Chestnut logs (dating back to mid-1930s).

Old growth Tree Data	Age (years) Range	Diameter Range	Comments
Sugar Maple	150-200	21-30"	
Tulip Tree	230	36-39"	Impressive with buttress & roots
Beech	160-210	20-28"	
No. Red Oak	125-200	27-36"	Log ring count 36" diam=~200 yrs
White Oak	170-210	20-36"	
Green Ash	150+?	20-30"	This species rarely becomes old growth
White Ash	150-170	24-36"	Log ring count: 18" diam.=165 yrs; compare this to the 27" & 36" trees, both of which are also 165 yr old. Most common at south end of bluff
Black Walnut	180-200	30-36"	Grows in forest; also the next one …
	250	61"	"The Dufferin Park Giant Walnut"
	230	58"	On lawn near forest S. of Dufferin Park
Hop Hornbeam	170	12"	Most common at south end of bluff
Basswood	175	20-26"	
Bitternut Hickory	190	27"	
Cottonwood	100	46"	Very mature for this species; others 30-36" diam.

South Queen Victoria Park Bluff Old Growth

South Queen Victoria Park Bluff – Black Walnut


River continues
Niagara Glen
Ancient Cedar Groves
ONTARIO
NIAGARA GORGE FIRST-GROWTH SLOPE FOREST
NEW YORK
Whirlpool Old Growth Slope Forest
Whirlpool
Niagara Gorge First-Growth Forest
Ancient Cedars on cliffs above slope
NIAGARA GORGE-FIRST GROWTH SLOPE FOREST
Whirlpool Rapids
Whirlpool Bridge
ONTARIO
NIAGARA GORGE-FIRST GROWTH SLOPE FOREST
NIAGARA RIVER
Rainbow Bridge
NEW YORK
NIAGARA GORGE FIRST-GROWTH
STEEP SLOPE FOREST

NIAGARA GORGE FIRST-GROWTH STEEP SLOPE FOREST

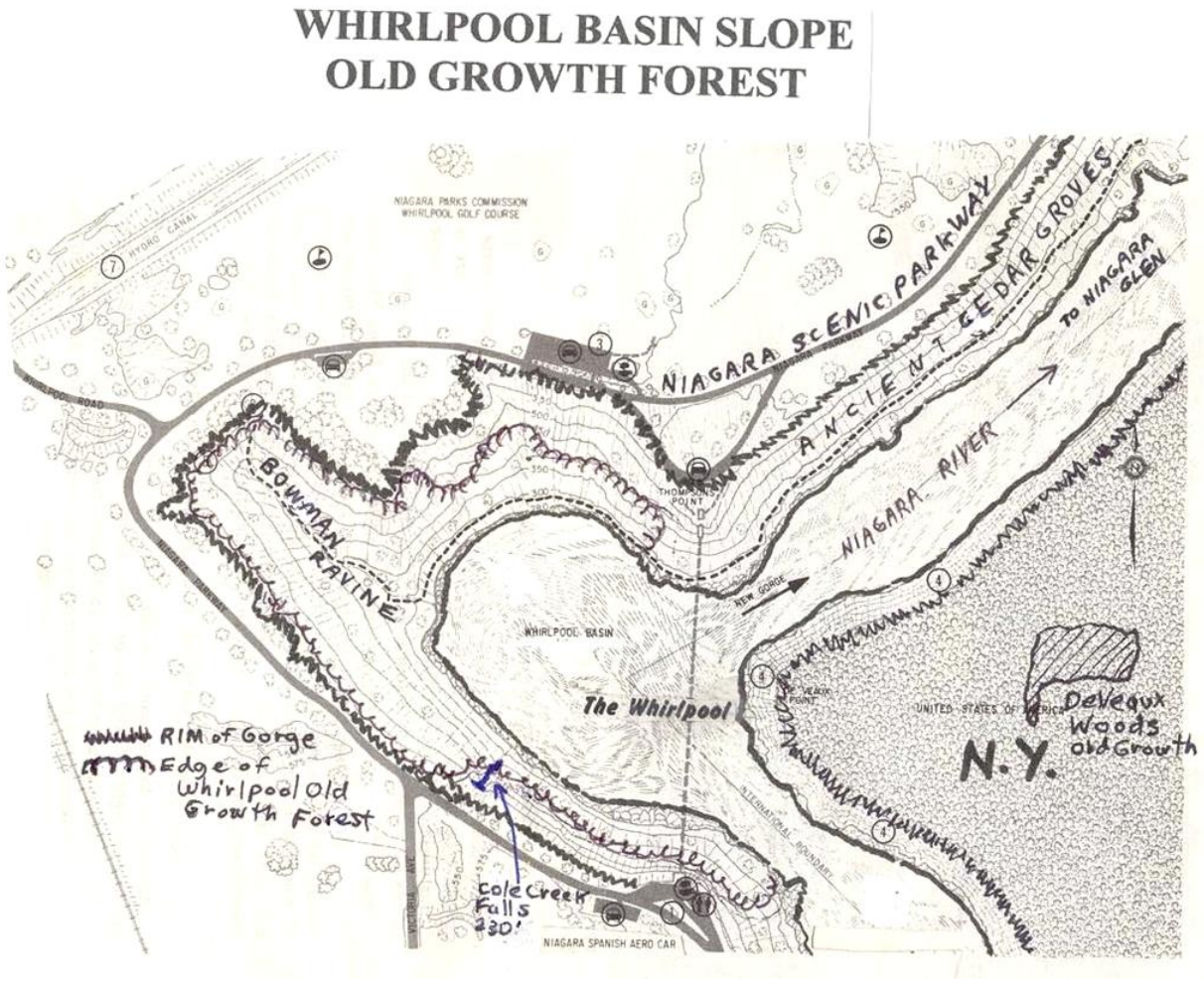
The Niagara Gorge possesses roughly 40 acres of "First-Growth Steep Slope Forest," an unconventional category of Old growth Forest. These are forested slopes that are very steep and inaccessible and were never logged. Yet their trees rarely get to be old because the slopes they inhabit are so steep and unstable, that gravity combined with heavy rain causes collapsing soil, land slumping, and sliding rocks. These topple most trees before they can become "old growth." This kind of disturbed soil is actually the competitive habitat for many of the "pioneer" and invasive tree species, which is why they are so prevalent in these habitats.

A good example is the entire wooded stretch of slope from the Whirlpool Bridge downstream to just before the Whirlpool begins. This forest is a mix of young native White Ash, Manitoba Maple, Cottonwood, Paper Birch, Sumac, Choke Cherry, willows, along with non-native, invasive Norway Maple, Buckthorn, and maybe some Ailanthus (Tree of Heaven). However, a few mature Sugar Maple, and even several Old growth Hemlock, White Cedar, and even an Old growth Hop Hornbeam or Sugar Maple grow here and there, with no pattern. Except for the last group, it is obvious that most of the trees listed above rarely would become Old Growth; in fact most of them would rarely be found in Old growth Forests. They fit into these categories: 1) fast-growing "pioneer" (early successional) species that colonize unforested sites or inhabit forests that are ecologically disturbed, with typically short life spans (less than 150 years), rarely becoming "old growth" 2) non-native, invasive pest trees that are normally indicators that a site is ***not*** Old Growth.

Obviously, these trees cannot be called "Old Growth." But since their trees are mostly young, they deceptively appear like the second-growth or formerly logged forests that dominate the landscape outside of the gorge. When this survey began, this investigator overlooked this kind of forest in Niagara Gorge since the trees and their ages didn't meet the criteria for "Old growth Forest." Yet, they are definitely "virgin" from the standpoint of human disturbance and exploitation since humans have never cut down trees in these forests or cleared them. They are also the *first* forest to grow on that site, hence they are "*first-growth*," not "second-growth.

The confusion is based on "old growth trees" versus "old growth forest" To avoid the confusion caused by having a "virgin" forest comprised of young trees solely because of natural process, the term "first-growth" is used. A First-Growth Forest is a totally *natural, virgin* forest comprised mostly of young trees … and it is the first forest on that naturally disturbed site. Although its trees may be young, the *forest itself may have been there, continually, for centuries or millennia*, hence it is indeed a kind of "Old growth Forest. "

The First-Growth Forests of the Niagara Gorge are found along steep slopes where no person, prior to World War I, would have been physically capable of systematically destroying or removing the forest (and would not have not had any conceivable reason either). Niagara Gorge's First-Growth Forests are located primarily: 1) inaccessible parts of the wooded slope between Rainbow Bridge and Whirlpool Bridge, 2) along the entire lower slope from Whirlpool Bridge downstream to where the Whirlpool begins, 3) small sections between Queenston-Lewiston Bridge and the end of the gorge.



WHIRLPOOL SLOPE FOREST

Roughly 25 acres of Carolinian Forest grows on the steep slopes overlooking the Niagara Gorge's famous Whirlpool Basin 275' below. In addition, ancient Northern White Cedars line the upper cliffs on the Basin's downstream portion, and also the portion downstream from where 240' Cole Creek Falls plunges off. This forest contains some of the largest Tulip trees in the region. The largest is the 350-year old, 46-inch diameter "Whirlpool Giant" which is bald all the way up to its crown.

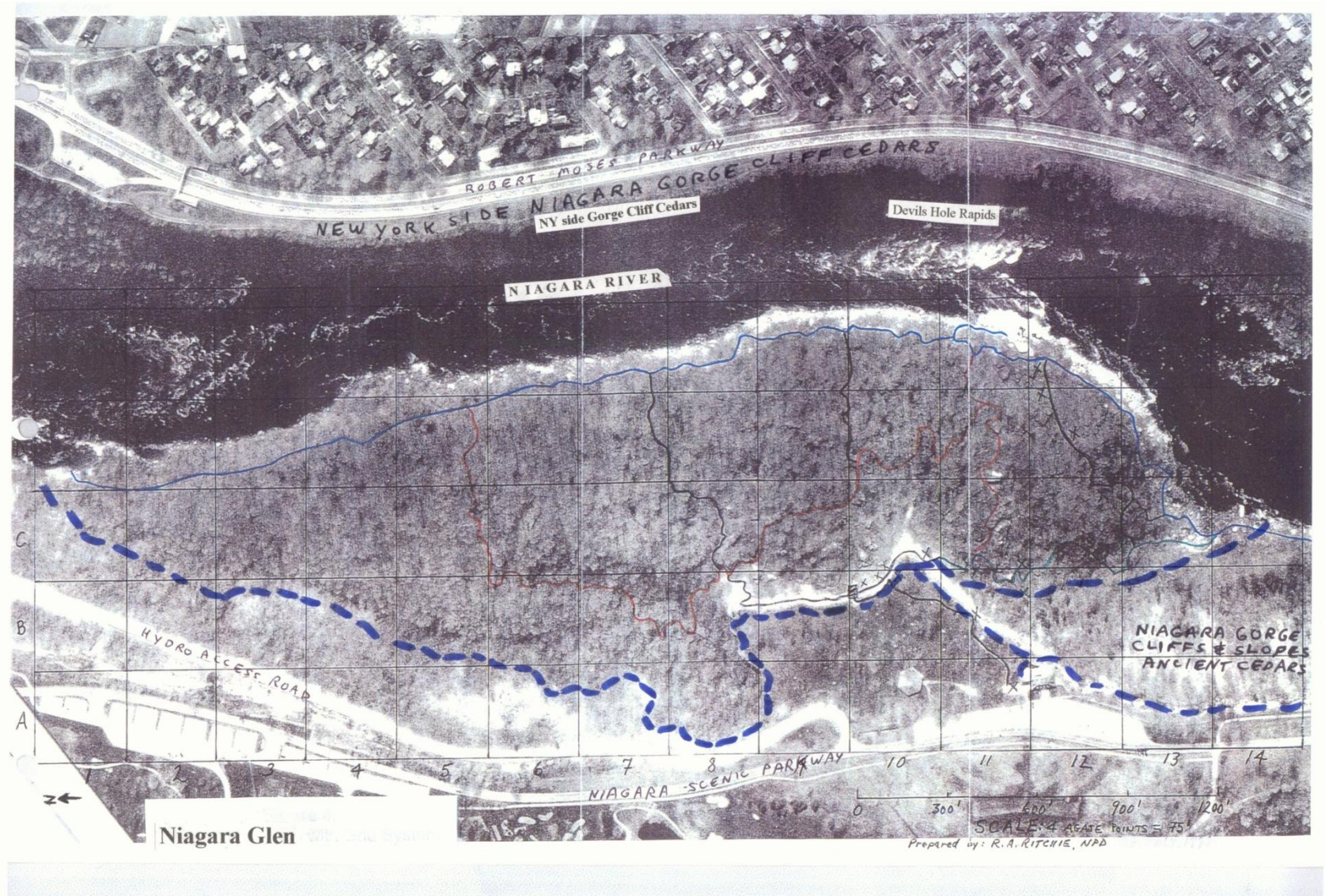
A superficial look at this slope from the gorge bottom or the rim would not reveal that it is Old growth Forest. People who descend into gorge along the Bowmans Ravine Trail see a mature forest with some large trees, but would not conclude the forest is remarkable.

Only a challenging crossing along its midslope, and just below its cliffy rim, allows one to observe its wide range of Old growth features on the trees and forest structure. Most of the ancient trees are medium diameter, but very tall, on this steep slope. More massive trees topple more easily on steep slopes (with exceptions such as the Tulip Trees), leaving the more slender, but still ancient trees.

This Old growth Forest was overlooked until the end of this survey based on the assumption that it must have been logged because it was accessible via the Bowman's Ravine. Obviously, the assumption was erroneous. Its conversion to protected park land in the late 1800s obviously preceded wood cutters. They must have still had enough timber on the surrounding landscape that they did not need to seek the more challenging source in this part of the gorge.

Old growth Tree Data:	Age (years) Range	Diameter Range	Comment
Sugar Maple	150-240	20-28”	Very shaggy bark, staghead crown
Tulip Tree	200-350	36-46	The “Whirlpool Giant” is bald all the way up to its crown!
American Elm	180	26”	Rare tree, especially in this habitat
Bitternut Hickory	150-180	20-26.5”	
White Ash	150-200	24-30”	
Beech	160-225	20-28”	
No. Red Oak	150-200+	30-40”	
No. White Cedar	180-400	8-15”	Only grow on upper cliffs & ledges

Whirlpool Slope Forest - Tuliptree


ROBERT MOSES PARKWAY
NEW YORK SIDE NIAGARA GORGE CLIFF CEDARS
NY side Gorge Cliff Cedars
Devils Hole Rapids
NIAGARA RIVER
HYDRO ACCESS ROAD
NIAGARA GORGE CLIFFS & SLOPES ANCIENT CEDARS
NIAGARA SCENIC PARKWAY
Niagara Glen
SCALE: 4 AGATE POINTS = 75'
Prepared by: R.A. RITCHIE, NPD

NIAGARA GLEN NATURE PRESERVE

Before Old growth Forest was discovered in Niagara Glen, this globally significant nature preserve already had a long list of superlatives for its spectacular scenery and geology (gorge, rock formations, whitewater, majestic forest), ecology (record-breaking biodiversity, rare species, spring wildflower displays) and human history, made more significant because of its bi-national location. As a result of this study, even more superlatives can now be added:

- Possibly Ontario's tallest broadleaf (hardwood) forest
- Champion-size Tulip Trees up to 134 ft. tall, 45.8 inch diameter, up to 250 years
- tallest Tulip Trees are second tallest hardwood trees in Province of Ontario
- likely second tallest Canadian Sassafras – 72.3 feet
- Probable Canada Champion Chinkapin Oak for tallness
- Northern White Cedar (20-32 inch diameter) up to 500 years old, possibly older ! they grow in fantastic shapes on boulders and cliffs in the glen
- 60 acres of high quality original Old growth Forest, with selective cutting in 1800s only in the northern third
- Forest type: Carolinian Maple-Tulip Tree Forest
- Dominant Old Growth: Sugar Maple – 175-235 yrs, 18-34 inch diameter, up to at least 90 ft. tall,
- Other Old Growth: 280 yr. Hemlock, 43 inch diameter White Oak, 130-220 yr. Black Maple, Red Oak, Black Cherry, White Ash, Beech, Black Oak, Basswood, Red Elm
- Trees that rarely attain Old Growth grow here: Hop Hornbeam (30 inch diameter, up to 300 yrs. old), Chinkapin Oak, Sassafras, Butternut. Giant (10 inch thick) River Grape, 180 yrs old.
- Management problems: park maintenance workers occasionally cut ancient trees along trails for trail grooming or "hazard tree" removal without oversight. Rock climbers damage old trees.

Other notable previously known features of this preserve:

- 16 nationally & provincially rare trees and plants, including red Mulberry, the only deerberry (a single individual) in the entire country (!), as well as 7 nationally & provincially rare animals including Carolina wren.
- Part of International Important Bird Area, the world's greatest number of gull species concentrating in one area
- A considerable amount of new tree measurements were taken in Niagara Glen during Phase 2. An extensive record has now been obtained for Niagara Glen's forest, not just for its trees' ages and diameters, but its exceptional tree heights. These are displayed on the following separate chart.

OLD GROWTH TREES OF NIAGARA GLEN
Measurements of Their Age, Diameter and Height*

Old growth Tree	Age years	Diameter Inches	Comment
No. White Cedar	283	14	Log ring count
	260 extrap.	17.5	Stump; 30 ring per inch
	330	30	Log ring count; 22 ring per inch
	360	22	Log ring count; 32 ring per inch, 6' from base
Sugar Maple	300+	26	E. of Leaning Rock
	250	32.3	On ridge above big pothole, super craggy
	185	35.2	Stump ring count; N. side of Red Trail Where it cuts W. inland & up to exit
	220	32	Log ring count
Hemlock	230		Stump on Lavender Trail, S. side
	113	8	Log ring count; aver. 28 yrs. per inch!
White Ash	130	18	Stump ring count; near north end
	140	17	Cut log; Fosters Flats
	250	24	Cut log across trail w/in 50' of river bank
	280	38.9	Bald trunk to 40'; At uphill base of rocky ridge
	180		Below Rattlesnake Ledge
	80	8	Stump; vandals cut tree; very old for small size
Northern Red Oak	110	26	Stump ring count; at river bank edge in abundant light
	248	36	Stump ring count; river bank in abundant light
Black Cherry	180	21	On Yellow Trail above Cripps Eddy
Beech	265	38	Just fallen
Sassafras	160	17	Fallen & cut; ring count Hop Hornbeam
200 +	12.5	Above Cripps Eddy	
Tulip Tree	250	40.5	Oldest of Glen's Tulips; just S. of North Ridge 100' inland
Butternut	?	26.1	On boulder above Cripps Eddy
Red Elm	135		