Friends of North Saanich Parks

North Saanich Parks

A Forest Stand Study – Based on Data from Don Skinner, Arborist, and FNSP

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Introduction

This report provides a discussion of the field work conducted by Mr. D. Skinner, arborist, of Concrete Jungle Ltd. contracted to the Friends of North Saanich Parks (FNSP) in 2023 to measure stands within a series of municipal forested parks. His results are presented in combination with work completed by FNSP to characterize some forest stands during 2021. Although FNSP collected single tree information, tree mortality through a student (Christensen, 2023a) and other similar information, it was necessary to collect standard mensuration information using a professional arborist in order to achieve a representative view of the forested parks as well as to gain stem/ha and basal area measures for the parks' stands. The information collected during 2021 by FNSP provides a supplement to the information collected this summer. Our student collected and reported on stand information in Plumper Park (Christensen, 2023b) this summer; as a result, that information is not included here.

The purpose of the report is to describe the tree species, height, ages, stems/ha, and basal areas for forest stands within nine municipal parks in which FNSP continues to work. This information was designed to give insight into the park species mix, the maturity of the stands, rates of growth in general terms, and stand density. When combined with the other ecological information that FNSP has collected it should give a fairly complete picture of the ecology for these parks.

The current North Saanich forest stands regenerated following several different disturbance events. These events include: European settlement and stand removal for agricultural purposes, clearing for development during and following the Second War, and a series of early logging events particularly in the Cloake Hill–Horth Hill area and on the northern borders of John Dean Park. As a result of these events, some forested parks may have stands of approximately the same age and development while others will not.

It is probable that stand replacement fires also contributed to the origins of some current old growth such as those trees in RO Bull Park as well as the old growth grove in Ardmore (Pavelic Park). The oldest known trees to my knowledge in the municipality have been cored and documented by the Forest Service as 1,100 years. Pre-European settlement fires probably affected North Saanich stands considerably, maintaining Garry Oak meadows and creating more open canopies than those found today. Early settlement ground photos taken in from 1855-1865 show a series of large trees and a multi-storied stand structure typical of old growth produced in the absence of any significant manmade disturbance. Charcoal has been found at depth in two soil pits; one at Woodcreek Park and one at Sumac Park. However, dating the charcoal has not been attempted because of cost considerations. This charcoal may only be roots that burned in more recent times (Richard Hebda personal communication, 2023).

Park General Descriptions

The nine parks selected for this study have been described in a number of reports by Christensen (2023), Adams (2021) and Hope and Bonsdorf (2022). Williams (2021) also covered several of these parks with general vegetation descriptions and plant lists.

Prentice Pond Park is located on Curteis Point; it is a bowl-shaped depression comprised of Red alder (*Alnus rubra)* with Douglas fir (*Pseudotsuga menziesii*) and some Western redcedar (*Thuja plicata*). The soil on the bowl floor that makes up most of the park is rich and moist even in mid-summer due to seepage from the artificial pond and the steeper slopes of the bowl. The herbaceous layer is mainly lady fern (*Athyrium filix femina*) and swordfern (*Polystichum munitum*) growing very robustly, with salmon berry *(Rubus spectabilis*) and thimbleberry (*Rubus parvifloris*) on the depression floor and some salal (*Gaultheria shallon*) on the gentler side slopes. The park is considerably wetter in moisture regime than the remainder of Curteis Point which is rocky and probably an Arbutus (*Arbutus menziesii*) -Douglas fir type with Ocean spray as a dry site indicator.

Prentice Pond Park; Red Alder at the Head of the Trail.

Green Park consists of two sections; the northern section with two ponds is quite rocky particularly on the east side with some salal on the eastern boundary and a canopy of Douglas fir with some Western redcedar clusters. This landscape trends into a flat receiving area near Salal Place with Red alder, Western redcedar, and sword fern while in the wettest point of this location, slough sedge (*Carex obnupta*) can be found. The southern section, sloping to the southeast has Western redcedar and red alder initially and an ephemeral stream from the ponds. The park then becomes more deciduous in nature. There are abundant invasive species remaining in the southern section which a volunteer group is removing. The invasive species currently consist of Himalayan blackberry (*Rubus armeniacus*) and English ivy (*Hedra helix*)*;* formerly there were many adult Daphne (*Daphne laureola*). The indigenous herbaceous layer consists of robust sword fern close to the stream with scattered salal (*Gaultheria shallon*) located upslope on the ravine sides. However because of the amount of invasive species this layer is still recovering its native plant population. The lowest elevations before Swartz Bay Road contain Douglas fir and Western redcedar with an increase in sword fern in response to downslope moisture seepage and the ephemeral stream. The southern section of Green Park is a moderately to highly disturbed location with scattered rather than a continuous canopy.

Sumac Park on the north side of Cloake Hill is a relatively undisturbed park since logging with an ephemeral stream and good to excellent potential growing conditions for Grand fir (*Abies grandis*), Western redcedar and Douglas fir. In the municipality, the growth of Grand fir and Western red cedar however, is being impacted by climate change and this park is not an exception. The site has a diverse understory and herbaceous layer second only to the old growth RO Bull Park. The indicator species range from dry (Oceanspray-*Holodiscus discolor*) on the top of the gully on almost flat land to very wet vegetation (skunk cabbage-*Lysichiton americanum*) at the stream edge where there are still small standing pools of water in mid-summer. Spring board slots can be seen in a large stump indicating early logging. This park is an excellent site for educational tours.

Denham Till Park is a level homogenous park with the forest stands entered from Clayton Road. It has heavy clay soils which play a part in growth patterns here. It has a uniform Douglas fir-dominant canopy with salal an indicator of mesic conditions but a number of dry site indicators are also present as well in the form of Garry oak (*Quercus garryana*), considerable Arbutus and some ocean spray on the forest edges. The Douglas fir canopy in this park and on the southern slope in general below, is showing considerable stress. Friends of North Saanich parks conducted a soil moisture study two years ago that showed the site reached permanent wilting point during that summer.

Arbutus-Douglas fir with Salal at Denham Till Park.

Nymph Point Park is a small park resting primarily on a shell midden. The park is impacted by constant winds and as a result, the trees have broken tops. Above the beach the material is slumping due to the loose shell midden that comprises the majority of the anthropogenic soil. It is a classic coastal ocean spray-Douglas fir-Arbutus type with abundant snowberry and dry conditions during the summer. It is home to many lilies which make a spectacular showing in the spring. In spite of the dry site indicators the presence of the shell midden is a nutrient rich mitigating factor –holding moisture in its loose texture that should, in theory, be available during droughts. As a result, these trees visually appear to be surviving drought quite well compared to, for example, their Denham Till Park counterparts. There is a much wetter (standing water in winter) alder grove with Douglas fir on an easement entering the park from Marina Way which the Friends of North Saanich Parks considers to be also part of the park. A number of alder have fallen during the last 4-5 years. This extension portion of the park was not part of the scope of the consultant's work nor has FNSP taken measures of the deciduous trees in this portion.

RO Bull Park is the flagship of the Friends of North Saanich Parks being one of the only "classic" old growth parks in which the organization has worked thus far. It has typical CDFmm vegetation with Dull Oregon grape (*Mahonia nervosa*) understory and development according to slope position with a Garry oak meadow type at the highest slope position (top). The meadow contains typical wildflowers associated with Garry Oak meadows and at least two Juniper (*Juniperus maritima).* Juniper is not rare in North Saanich but it is uncommon (Williams personal communication 2021). The park has a dominant over story of tall Douglas fir on the mid to lower slope position with Grand fir in a co-dominant (A2) position, and Western redcedar on the slope toe in a receiving site. Much of the latter cohort is on a neighbor's property but is contiguous and not disturbed. As a result it can be described within the ecology of the park. The site has an abundant and diverse herbaceous layer with only a few scattered

shrubs. The multi storied nature of the canopy consisting of large diameter trees with few understory shrubs is more open than many other park stands.

RO Bull Park-an Old Growth Stand with Dull Oregon Grape.

Lillian Hoffar Park is a complex park with a long history of manmade disturbance. Like Nymph Point part of the forested section rests on a shell midden. About a third of the park is vintage garden from the time of the Hoffar's residence, another third consists of deciduous dominated moist sites including Red alder with thick brushy red osier dogwood (*Cornus stolonifera*) and scattered relatively older black cottonwood (*Populus trichocarpa*). The remainder of the park is comprised of several Western redcedar dominated groves. Since the Western redcedars in this park are suffering from drought, and indeed are dying, this park will require a future long term restoration plan.

Gulf View Park, like Quarry Park located close by, is situated on East Saanich Road. It was established about 1932 as a picnic area for the newly created John Dean Park. Aerial photo coverage for 1932 shows scattered conifers estimated about 10-15 years old and the rest of the park appears at that time to be grazing land. There are no stumps on the property so we have no idea if it was horse-logged in 1912 as part of the Dominion Research Experimental Farm establishment or never had tree cover in known history before about 1915. We do know old growth existed on the Experimental Station lands close to the current border of Gulf View; a few old growth trees are still in existence on the current Plant Research Station federal property. The existing Douglas fir and at least two Grand fir now dominate the Gulf View site; the Douglas fir have reduced the view of the straits to the east considerably. There has been disturbance to the site with the development of the grassy opening with a bench and picnic tables, and a parking lot. It has a well-developed camas meadow on a rocky knoll near East Saanich Road and

ample dry site indicators in the form of Ocean spray and at least one large Arbutus. Unfortunately there is a constant renewal of Daphne seedlings in this park years after the adults were removed although the numbers are decreasing.

Quarry Park was in fact a former quarry used to make cement for paving the East Saanich Road. Thanks to 1920 photos provided by the King family the nature of the quarry is known before it revegetated. We can pin point the start of soil development to about 1926 but scattered Douglas fir existed on the portions of the quarry not excavated. Although the western portion of the park along East Saanich Road is mostly Douglas fir dominated, there is considerable Western red cedar of a younger age on the eastern slope. The soils are shallow to bedrock with bedrock being less than 20cm on the lip of the quarry. The top of the park near the border with Central Saanich and bordering the privately owned Longview Farm contains a lovely meadow with abundant wildflowers. This fragile ecosystem is threatened by bikers who continue to make trails and jumps in the location. Considerable wind throw has occurred in this park.

Quarry Park Forest Stand (top photo) and Spring Flowers in the Threatened Meadow at the Top of the Former Quarry.

Stand Information

Mr. Skinner has provided a 20 page summary of his measurements that accompany this document and has given his methods in some detail. As a result, this report will focus on synthesizing the information he gathered and providing any additional relevant information collected by the Friends of North Saanich Parks as a supplement. A plot is a standard area of size where ecological information can be taken and if a GPS location can be established, the plot can be deemed permanent and then can be revisited. Plot locations chosen by the investigator are designed to represent the vegetation within the park as a whole. However, plot information cannot be extended beyond the park boundaries because the parks were not chosen as representative of municipal forested lands. Site index curves (age to height relationships) were used where possible to rate the tree growth as good, medium or poor. Individual parks with their stand data are given below. Stems/ha and basal area have also been provided by Mr. Skinner as part of his data and placed in tables by myself.

Prentice Pond Park

The Douglas fir distribution in Plot 1 was 71% whereas the presence of Red alder, the secondary species, made up 29% of the plot. The chosen representative Douglas fir was 86 years while the tree height was 38.4m. In terms of stand growth the tree was rated as medium growth but the figure lies at the upper end of the scale, close to a rating of good growth. The chosen Red alder was 63 years with a height of 34.0m which is rated as good growth. The stand stem density was 427 stems /ha and the basal area was 63 m^2/ha. There was a single dead Douglas fir in this plot. In plot 2, Red alder was the only species present making it 100 percent of the species distribution for the plot. The sampled tree was 47 years with a height of 33.6m. This tree was rated as good growth. Stem density was 232 stems/ha and the basal area was 31m^2/ha. For the park as whole therefore the stem density averaged about 349 stems/ha. This is fairly typical of a mature forest in the CDFmm if the age range for maturity is taken as approximately 65 years plus.

Green Park

In Plot 1, located in the northern section of the park, Douglas fir, the dominant species, was 67 percent of the stems and the secondary species Western redcedar made up the remaining 33 percent. The sampled Douglas fir was 85 years with a height of 40.8m which is considered good growth. The Western redcedar was 100 years but in contrast, only had a height of 20m which rated as poor growth. The stem density was 239 stems/ha; the basal area was 54m^2/ha. There was a dead Douglas fir in the plot. Plot 2, located in the southern section of the park, had exclusively deciduous trees. Red alder made up 86 percent and Big leaf maple (*Acer macrophyllum*) accounted for the remaining 14 percent of the plot species. The sampled Red alder was 38 years with a height of 24m whereas the Big leaf maple was 41 years and 18.5m in height. The Red alder rated as solidly medium growth whereas the maple was at the low end of medium growth. The density here was 988 stems/ha which is more typical of younger stands;

the basal area was 63m²/ha. Based on the stem density, this plot (and park section) constituted an immature forest type. The contractor Mr. Skinner noted a general decline in Western redcedar for the north section of the park.

On behalf of FNSP, during 2021, the late Gordon Joyce RPF also measured a number of single trees in only the northern section of the park. He measured three Douglas fir, four Western redcedar, two Grand fir and a Red alder. The average height of the Douglas fir was 37.6m with the western red cedar measuring 28.0m. The Grand fir averaged 38.0m in height and finally the Red alder was 27m tall. Gordon also obtained a counted age for a Western red cedar outside the park but in the same cohort. His counted age was 113 years. This age matches the Western redcedar age Mr. Skinner obtained quite well.

Left: Green Park North Section Snag Cluster. Right: Deciduous Green Park South.

Sumac Park

Plot 1, where Western redcedar was the dominant species comprised 50 percent of the stems compared to Douglas fir with 33 percent; Big leaf maple the third component of the plot, was 17 percent. The sampled Western red cedar was 113 years with a height of 30.8m which met the criteria for medium growth. The Douglas fir on the other hand, was considerably younger at 84 years but achieved a superior height of 50.7m which certainly constituted good growth. The estimated stems/ ha was 507 and the basal area was 96m²/ha which was considerably higher than some previous park plots reported here. There was one dead Grand fir in the plot. The second plot established here was 100 percent Douglas fir and the selected Douglas fir was counted as 79 years old with a height of 40.3m. The height over age relationship for this tree placed it at the upper end of the medium growth category. The density was 271 stems/ha and the basal area dropped to 63m²/ha in keeping with the somewhat drier site position compared to plot 1. The mean stem density/ha for both plots was 389 which together with the ages of the trees points to this park as a mature forest site.

Sumac Park: An Example of a Rich Receiving Site with Swordfern.

Denham Till Park

The single plot was located in an area with 100 percent Douglas fir. The selected tree was 98 years achieving a height of 37.3m which categorizes it as medium growth. The stand had 211 stems /ha and a basal area of 45m^2/ha which is lower compared to some other parks. In 2021 FNSP measured single trees in Denham Till; five Douglas fir and three Grand fir. The average height of the Douglas fir was 34.0m and the average height of the Grand fir was 34.7m. Three Grand fir cut stumps in the stand gave some idea of ages: 123, 121, and 105 respectively for an average of 119 years. This data indicates Denham Till Park contains a fairly uniform even aged early to mature stand. However visual observation of this park indicates the Douglas fir and Grand fir are not doing well and the basal area is low in comparison to some other parks.

Thinning Canopies in Denham Till Park taken from the Till Vintage Garden.

Nymph Point Park

By observation where the plot was located there are mature Arbutus and a few young Grand fir regeneration <3m in height as well as some tall shrubs; the coniferous tree cover

however, is exclusively Douglas fir. Mr. Skinner's plot was located on the shell midden with a representative Douglas fir tree of 193 years and a height of 31.3m. This height–age relationship is considered poor growth. Stand density was 163 stems per/ha. The basal area was 61 m^2/ha which seems comparable with many other plots but not the RO Bull old growth site. Friends of North Saanich Parks measured single trees just exterior to this park in the same cohort as the plot. Obtaining accurate heights proved a challenge due to the broken tops which almost all trees exhibited. Most of the trees were older (established by coring) than the 193 years measured in the plot. Two Douglas fir with reasonable tops measured oddly enough, the same height of 32.9m. The ages however were different for each: 189 and 216 years respectively. Both of these trees were just on the border between poor and medium growth. The oldest tree bored at Nymph Point yielded an age of 301 years. Given the ages of this stand I would venture to classify the park as maturing old growth.

Nymph Point Park: Arbutus-Douglas fir with Snowberry and Ocean spray as a Dry Site Indicator.

RO Bull Park

The percent cover of species in plot 1 was 63% Douglas fir with 12% Grand fir. The selected Douglas fir was 48m in height but no age was given for technical reasons given below. Stand density is 312 stems /ha and the basal area was 128m^2/ha. This latter figure was substantially more than other parks indicating much larger diameter trees. There were five snags /ha noted for the site.

This park is a national historic site and FNSP would not take cores in the park. Because of the challenges within the park in gathering stand information we came to an agreement with a neighbor so we might obtain ages of trees in the same cohort. The trees were large diameter so we sought the help of the Pacific Forestry Centre's Lara Van Akker, a dendrologist with expertise

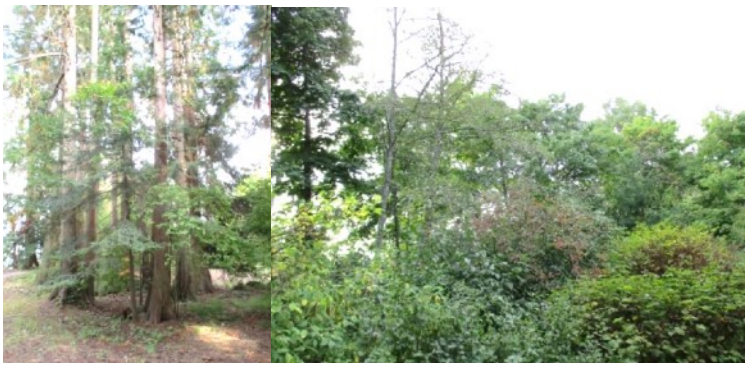
in stands of this type. She assisted with tree coring; she had an appropriate increment borer suitable for old growth trees.

During 2021, FNSP obtained heights of two Douglas fir and two Western redcedar trees, and a Grand fir in the park all of which had intact tops and good form. The height of the two Douglas fir trees was 52.2m and 34.8m respectively. The height of the Western redcedars was 34.0m and 32.6m respectively. The Grand fir was 37.8m in height. The data from the offsite cored trees was as follows: the selected Western redcedar with a broken top was 31.6m in height and the age was 289 years adjusting for rot. The Douglas fir was 38.6m with a broken top and with an age of 359 years adjusting for rot. These figures were beyond the scope of the site index tables for measuring good, medium and poor growth. A Grand fir stump yielded an age of 215 years. This data confirms the old growth nature of the stand.

Lillian Hoffar Park

The single plot consisted of 50% species distribution of Douglas fir, 30% Western redcedar and 20% Red alder. The age of the selected Douglas fir was 128 years and the height was 28.8m which places it in the poor growth category. The stem density was 518/ha and the basal area was 90m^2/ha. The estimated number of snags/ha was 10. This plot was located in a conifer dominant location compared to the open deciduous area also located in the park.

FNSP also collected stand information in Lillian Hoffar Park during 2021. We acquired height information from at least 5 Douglas fir with good tops; the results for height were as follows: 32.3m, 29.4m, 26.4m, 32.4m, and 30.8m respectively. Unfortunately no matching cores could be obtained within the park because at that time we were prohibited from collecting age information. However, we did estimate some ages from three young Grand fir stumps. These had diameters of: .925m, 1.16m and 1.28 respectively. The ages were: 49, 63, and 62 years. It would be useful to have at least two more mature tree ages. The height of a cottonwood in the deciduous section of the park was 31.2m. The large deciduous component with pioneer species renders this park as diverse in development as Green Park.



Lillian Hoffar Park Left: Douglas fir–Western Redcedar Grove, Right: The Deciduous Section of Lillian Hoffar Park; Big Leaf Maple, Red Alder and Black Cottonwood.

Gulf View Park

Plot 1 consisted of 86% Douglas fir and 14% Grand fir; the selected Douglas fir had a height of 34.1m and an age of 63 years. According to the height age relationships this is considered good growth. The Grand fir was assessed at 71 years with a height of 32.0m which is just on the border between medium and good growth. The stem density was measured as 428/ha and the basal area was calculated as 112m^2/ha. FNSP also collected single Douglas fir tree information in 2021 on the boundaries of Gulf View but still within the cohort. The heights for the three additional trees were: 30.1m, 28.4m, and 34.4m respectively. For each tree the ages were: 98, 123, and 106 years respectively. These figures resulted in estimates of medium, poor and medium growth ratings although the latter tree was closer to a good rating. The average for the site would be a solid medium growth rating.

Relatively Young Trees at Quarry Park on the Former Quarry Floor.

Quarry Park

Plot 1 contained 80% Western red cedar and 20% Big leaf maple. The age of the selected Western red cedar was 110 years; the tree height was 35.1m. The Big leaf maple was 78 years with a height of 28.7m. The stand had 589 stems/ha and a basal area of 80m^2/ha. Based on the height–age relationships the Western redcedar achieved medium growth and the maple had good growth. Within Plot 2, located in 100 percent Douglas fir, the selected Douglas fir tree aged 65, had a height of 32.2m. These figures placed the tree into the medium growth category. There were 739 stems /ha and the basal area was 56m^2/ha. The mean stems per/ ha for the plots would be 664 and the mean basal area was 66m^2/ha. The ages listed here are consistent with the quarry ceasing in use about 1926.

FNSP also collected some single tree information on the borders of the park. These consisted of a smaller suppressed Western redcedar 18.9m in height with an age of 90, and a small suppressed Douglas fir of 15.4m aged 93. These trees both met poor growth criteria using site index tables). There were two dominant Douglas firs FNSP measured: one 48.6m in height aged 143 and second 42.7m in height with an age of 100. Both of these trees were considered

good growth. Quarry stumps supplied some additional ages: Douglas fir: 127 years, Western red cedar 110 years, a Red alder of 76 years, and two big leaf maples, one 46 years and one 48 years respectively. From this data it appears there were trees which originated before the quarry opened or before about 1920, a few grew during the quarry use and then more trees regenerated after the quarry use ceased.

Discussion

Mr. Skinner pointed out the most frequent age range for the 9 parks that have been sampled is between 65-125 years which closely relates to the past logging, other industry activities and residential development disturbance within the North Saanich municipality. Classifying these stands in terms of maturity however, depends on the science conducted to examine differences in stand characteristics. Differences are traditionally not only based on age but on other characteristics such the amounts of coarse woody debris, tree diameter or presence and abundance of key lichens and mosses. Although coarse woody debris has not been measured in the parks as yet, observation has revealed only two sites of the nine would possibly have any significant well decayed coarse woody debris as an attribute: those parks would be RO Bull Park and Sumac Park. As a consequence, measuring natural coarse woody debris amounts and distribution in future would be a valuable attribute to examine for a number of ecological reasons.

Morgantini et al. (2003) in Alberta established that old growth attributes appear at ages 160-180 years. The stands that the authors studied, however, were not CDFmm types. Trofeymow et al. (2003) investigated many Douglas fir old growth attributes in a series of chronosequences on Vancouver Island and used age classes younger than those employed in the Pacific Northwest United States research studies (Spies and Franklin 1991). Again their sites were not in the CDFmm. However, Saanich (through Diamond Head Consulting 2023) provided the following age categories: Pole Saplings:< 20 years, Young Forest: 20-80 years, Mature Forest: 80-140 years and Old Growth:140+years.

The question of using old growth age ranges beginning at 140 years has been accepted for drier areas (like Interior BC) and has been applied in the Diamond Head Consulting categories for Saanich's CDFmm listed above. However from our brief investigations, the reality is we have at least two different "old growth" categories in North Saanich. As a result, using the stand ages of North Saanich parks listed here, I formed the following fluid categories as relevant for this particular study: Regeneration 2-15 years, Immature 16-55 years, Young Mature 56 -75, Mature 76-130 years, Maturing Old Growth 131-250 years and finally, what could be termed "classic" Old Growth from 251-1100 years (Government of British Columbia [2017] does indicate 250 years as the initiation of old growth).

I have used 1,100 years a current "end point" with reference to the documented oldest trees that I am aware of in North Saanich. In theory there is no end point as the ecologic cycle perpetuates-simply beginning again but this breakdown allows for more discovery of North

Saanich old growth in the future. The Douglas fir stand ages in Pavelic Park are unknown for example, but some trees could potentially fall into both of the old growth categories. Moreover, the ages of the old growth in John Dean Park part of which lies in the municipality, would ultimately require placement in a classification for the District.

This categorization is my own interpretation for the purposes of this specific North Saanich report and there is much more data collection necessary to scientifically verify it for North Saanich. Given this type of categorization 7 out of 9 forested parks fall into the young mature or mature categories along a continuum with only one each falling into the maturing old growth and the classic old growth category respectively. Lillian Hoffar Park does have some scattered large diameter trees which could be considered as at least mature but the park is very disturbed and it is difficult to assign the park an overall classification because it has a significant deciduous portion.

Basal area, using the diameter of trees, is a measure of occupancy can also be considered an important feature of maturity. In simple terms one might expect the basal area of stands to increase with age as tree diameters increased and the stems/ha to decrease with age as competition reduced the number of stems. However, there are many variables at work as stands evolve so this relationship does not always hold true. Moreover, in terms of context, there is very little literature with appropriate figures to compare with the North Saanich park stands. Below is a table showing the parks' mean basal area distribution by the designated age categories.

Table 1: Age Categories and Mean Basal Area for Nine North Saanich Parks in the CDFmm

Age Range in Years Beginning with Young Mature	Young Mature 55-75	Mature 76-130	Maturing Old Growth 131-250	Old Growth 251-1,100
Basal Area m^2/ha				
Prentice Pond	47			
Green	*Section2: 63	*Section 1: 54		
Sumac		79		
Denham Till		45		
Nymph Pt			61	
RO Bull				128
Lillian Hoffar		90		
Gulf View		112		
Quarry		88		

*Green Park because of substantial differences in forest stands in the southern and northern sections is shown as two entities.

The basal areas for these stands do not follow an age related trend except perhaps RO Bull Park. Denham Till had the lowest basal area despite being placed in a mature age category. This could mean that its growth is slower/poorer than expected for its age; this interpretation is compatible with visual observations that the trees in the park are stressed. The canopies are thinning (see Denham Till photo).

Despite the sections of Green Park containing very different species mixes their basal areas do not differ very much, indicating again that many factors contribute to the stand growth of different species. The Nymph Point Park basal area is somewhat lower than expected for a maturing to classic old growth site. The trees are scattered and separated by pathways; they do not form a cohesive undisturbed stand unit but instead, resemble a grove. Like Denham Till, this basal area figure may also indicate a site struggling due to dry summer conditions. Gulf View on the other hand had somewhat higher than expected basal area considering the relative youth of the site and its dry site indicators. Perhaps the openness of the site with growth opportunities may have been a contributing factor to larger diameter trees. The highest basal area was in RO Bull Park which could have been expected.

Table 2: Mean Stems/Ha by Age Classes for Nine North Saanich Parks.

Age range in years beginning with Young Mature	Young Mature -55-75	Mature 75-130	Maturing Old Growth 131-250	Old Growth 251-1,100
Stems/ha				
Prentice Pond	329			
Green Park	*988	*239		
Sumac		389		
Denham Till		211		
Nymph Pt			163	
RO Bull				312
Lillian Hoffar		518		
Gulf View		428		
Quarry		664		

*Green Park is shown as two entities because of the substantial differences in stand type.

A clear high density to lower stem density relationship with age did not occur in the North Saanich parks we sampled except for the younger area in Green Park-even RO Bull with old growth characteristics had approximately the same stem density as the mature stands. The highest stem density would theoretically occur in younger stands < 55 years which do not form part of the North Saanich Parks system described thus far. The low stem density in Denham Till with its dry site indicators may be due to the difficult growth conditions for the park and was indeed accompanied by low basal area as mentioned before. Price et al. (2020) found there was no relationship for stems/ha and big treed old growth and as a result, no relationship to basal area because the two measures are linked. The North Saanich figures are somewhat lower than stems/ha measured by the Galiano Conservancy Association located on Galiano Island within the CDFmm and their slightly younger stands (Scholz et al. 2004). The mature stand figures from the Galiano study do resemble the North Saanich figures somewhat. The old growth at Rocky Point outside Victoria used by the authors was 409 stems/ha while RO Bull Park was approximately 100 stems below it. It is possible that most of the North Saanich stands (which have not been measured as yet in 2023) could resemble the CWDmm Galiano study.

Perhaps the best reference with respect to stem density is the CDFmm stocking standards produced by the Ministry of Forests for the various vegetation associations in the Vancouver Forest District that includes the Island. This table is helpful in providing insight into satisfactory or minimum preferred stem density for species growing under various moisture and nutrient regimes. The limitation is that these standards were formed for young regenerating stands.

The Douglas fir-shore pine-Arbutus type, for example, which constitutes many of the parks has 200 stems/ha as satisfactory whereas the Douglas fir-Salal and Douglas fir-Dull Oregon grape mesic sites list 500-400 stems/ha as appropriate. The Western redcedar-Grand fir-foamflower type (a rich site) also list 500-400 stems/ha as satisfactory. Table 3 below shows the stems/ha and basal area by approximate vegetation association for each North Saanich park in the study.

Table 3: Plot Stems/ha and Basal area (m^2/ha) by CDFmm Vegetation Association

Vegetation Association	Douglas fir/ (Shore Pine)/ Arbutus with Ocean Spray	Douglas fir/Salal (Grand Fir or Western redcedar)	Douglas fir/ Dull Oregon Grape (Grand fir/ Western red cedar	Western redcedar-Douglas fir / Grand fir/ Foamflower	Douglas fir/ Alder/ Sword fern	Alder/ Swordfern
Park Plots						
Prentice Pond					427/63	232/31

Green Park		239/54				988/63
Sumac	271/63			507/96		
Denham Till (dry site		211/45				
Nymph Point	163/61					
RO Bull			312/128			
Lillian Hoffar			518/90			
Gulf View Dry site indicators		428/112				
Quarry		589/80	730/56			

Here we do see a trend toward drier sites with lower stem density and lower basal areas. Pioneer species sites with exclusive Red alder in this study can apparently have relatively high stem density. Because of the connection of stems/ha to the vegetation associations and moisture regimes, Terrestrial Ecosystem Mapping of the District stands is desirable.

Recommendations

These parks are, on the whole, variable, small and often disturbed so their ecosystem patterns are challenging to interpret. Interpretation is further complicated by the fact the number of mensuration plots presented here is small. Establishing additional mensuration plots would be helpful in some parks such as Lillian Hoffar as well as continuing to gather information within the other forested parks not as yet entered by FNSP.

The purchase of large intact tracts for parks by the municipality in future would be conducive to the preservation of a suite of ecosystems representative of North Saanich. Long term preservation is mandatory because of the dearth of old growth stands in North Saanich and the potential loss of biodiversity those types of stands represent. There are very few parks thus far which could be classified as nearing or attaining old growth status. This fact is well known on the Peninsula and a concern of many citizens.

In terms of future research, amounts of well decayed down woody debris per park would be useful to measure since sufficient amounts are not only a sign of mature stands with good growth but are an important source of nutrients for forest stands in general.

We have no idea if the parks provide sufficient habitat and connectivity for wildlife; one study the municipality might consider could be potential forest connectivity or the converse,

forest fragmentation. This suggestion was also made by LGL in the wildlife study they provided to FNSP and also appeared as statements in Negrave and Stewart (2010). These authors believed that fragmentation and attrition put populations at risk and decreased the resilience of communities, thereby increasing the chance of extirpation and extinction.

The decline in forest health of Denham Till should be a concern since it may be indicative of stand declines on a much broader scale on similar southwest facing slopes in the District and on sites with similar clay soil properties. The decline of Western redcedar in Lillian Hoffar, for example, indicates a restoration plan for this park and others with Western redcedar as a major species should be created in the near future. The mortality study by Christensen (2023a) gives a fairly good idea of Western redcedar decline in each of several parks and a similar study should be conducted within stands throughout the municipality. It appears that in examining cores of the Douglas fir and other living trees in these parks, the incremental growth over the last 5 years has not shown any reduction (Skinner, personal communication 2023). However, the incremental growth patterns of dying or recently dead trees have not been examined in North Saanich forested sites and this might be an avenue to explore.

Placing the park ecosystem information within the context of the municipality as a whole is an important consideration but will require a series of District –wide studies. According to Negrave and Stewart (2010), silvicultural researchers recommended that all stands greater than 140 years as well as a large portion of younger stands be protected to provide potential recruitment to the older stands. What stands should be selected and how much forested land should be preserved within North Saanich requires further study.

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Errata: Mr. Skinner mentions in his data summary that ages were not taken in Denham Till Park but in fact the park where he did not collect age information was RO Bull Park.