

Friends of North Saanich Parks

**Soil Moisture Content
Study in Three North
Saanich Parks in 2024**



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Introduction

The Coastal Douglas fir Moist Maritime Biogeoclimatic Subzone (CDFmm) occurs along the south-east portion of Vancouver Island, portions of the Gulf Islands, and in isolated pockets on the BC mainland. The subzone comprises only 0.3% of BC's area, yet it has the highest diversity of plant species in the province. Eighty percent of the CDFmm is privately owned. The CDFmm contains several rare ecological communities, such as Douglas fir–Arbutus as well as a number of individual critically endangered and vulnerable species. Due to the inherent drier nature of this subzone lying in the rain shadow of the Olympic Mountains, it is at risk from climate change.

Soil moisture content controls vegetation nutrient uptake and, as a result, governs most aspects of forest ecosystem productivity. Moreover, the rate at which carbon is released from forest soils is dependent on temperature and moisture levels influencing soil microbial activity (Hannam, Berch and Kranabetter no date). Most recent literature has linked climate change to declines in summer soil moisture levels.

One finding from a research report on Southern Vancouver Island concluded that low moisture was the controlling factor in Douglas-fir diameter growth (Griesbauer, Klassen, Saunders and Spittlehouse 2019). A practical example of where ecosystem moisture is a high priority for ecological restoration can be seen in the Maxwell Watershed project on Saltspring Island. Here a consortium of groups are setting up experimental plots, measuring ecosystem characteristics and considering the impact of global climate change on the watershed (Transition Saltspring: Watershed Resilience Guide 2023).

The threshold used for determining serious drought conditions is termed the permanent wilting point. The permanent wilting point refers to the moisture point in mineral soils where water is inaccessible to plants and plants wilt often beyond recovery (Powers 1922).

In 2022, the Friends of North Saanich Parks, conducted summer soil moisture content studies within several of North Saanich parks located within the CDFmm. The results showed that when the driest of these parks were sampled in August, they had moisture content percentages that had reached the permanent wilting point. The objective of this small 2024 study was to resample the driest of the parks used in the 2022 study to determine if this trend was continuing.

Methods

The North Saanich parks chosen for the 2024 study were: Nymph Point Park, Denham Till Park and Gulf View Park. Nymph Point Park is an Arbutus-Douglas fir type with heavy clay soils due to marine sediment deposition during glaciation. Nymph Point is partly south facing and Denham Till Park is fully south facing. Denham Till Park is a uniform Douglas fir-Salal type with similar soil characteristics as Nymph Point. It has Garry oak lining the southern edge of the forested section indicating that it is likely drier than the mesic moisture regime normally associated with a salal type. Gulf View Park is east facing with sandy loam, well-drained soils. It is a Douglas fir–Ocean Spray type, where Ocean Spray is recognized as a drier site indicator species. Gulf View Park is located at a mid-slope site position on the flanks of LAU,WELNEW (Mount Newton). Both Nymph Point and Denham Till Parks are essentially flat.

The 2022 and 2024 sampling methods were identical. Sampling took place in mid-May and mid-August. Calculations of gravimetric soil moisture followed standard practice. In litter (L), fermented/partially rotten (F) and humus (H) layers known together as the LFH layer, moisture contents were calculated as original weight minus dry weight divided by the original weight times 100. This was done to account for moisture within the plant tissue itself. Mineral soil moisture was calculated as original weight minus dry weight divided by the dry weight times 100. Bulk density was sampled from each horizon of the three soil profiles found in Gulf View, Nymph Point and Denham Till Park respectively. The

samples were weighed and dried at 76^o C for 48 hours. Volumetric moisture values were found by multiplying the gravimetric moisture content times the soil bulk density.

Results and Discussion

According to prior studies, permanent wilting point is reached at between 15-20% volumetric moisture content for clayish soils and at 5-10% for sandier soils. On the whole, May 2024 volumetric soil moisture percentages were lower than those of May 2022. Using the above definition, the 2024 results showed that all soil horizons were at permanent wilting point by mid-August 2024 despite a cooler spring than in 2022. In 2022, all but one horizon had reached permanent wilting point by mid-August. Although there have been only two sampling years thus far, it appears the low soil moisture content trend has continued. The C horizon of the Denham Till pit in May 2024, with a relatively high clay content, achieved 20% moisture content. This is a soil which has mottling at depth, which indicates exposure to rising and falling water levels. In May of 2022 the C horizon had 32% volumetric moisture content.

By observation, the sandier soils of Gulf View Park should allow for greater moisture uptake during late spring. The trees at Gulf View are not showing visual drought stress. Its mid-slope position may allow for more ground water movement from upslope and continued water absorption for longer periods by plants. On the other hand, trees in Denham Till Park continue to show signs of distress described first in 2022. Shell middens continue to nurture some of the trees growing in Nymph Point Park on its east facing aspect, although not where sampling took place on its south facing aspect.

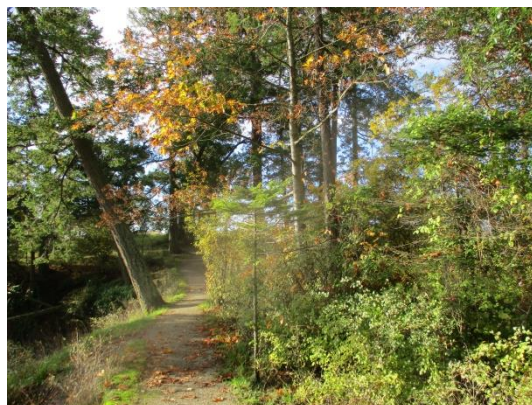
Forest Management Recommendations

With the onset of drought, photosynthesis ceases, water and nutrients are not available from the soil, and the plant species affected may die. Consequently, it is important to take steps to buffer the impact of drought on plant species as much as possible, including those forests on public lands where governments have a duty of care. For example, mulch applications can reduce soil temperatures and retain moisture resulting in a positive effect on drought-stricken plants.

Some actions could be:

- 1) Educate government employees to recognize the symptoms of drought stress in plants, shrubs and trees.
- 2) Seek a means to irrigate forested public lands through appropriately placed reserve ponds. Water could be released during mid-summer.
- 3) Create a system of ditching that might bring water to forested lands located adjacent to roads.
- 4) For governments: create a policy of mulching in the most distressed forested public lands.
- 5) Make wood chips and fine organic materials available free to the public so that these can be spread at the base of trees or shrubs.
- 6) Reduce competition from invasive species by removing them.
- 7) Plant species adapted to drier conditions.
- 8) When planting, choose appropriate microsites where a good microsite might be a location with shade or fertile soils that meet the physical and nutrient needs of the species.

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Left: Douglas fir-Arbutus ecosystem community on the south aspect of Nymph Point Park where 2024 soil moisture sampling took place. Right: Eastern facing section of Nymph Point; growth is lush on the shell midden to the right. Photos taken in October 2024.

Literature Cited

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Transition Saltspring-Mount Maxwell Watershed Project.
<https://transitionsaltspring.com/maxwell-creek-watershed-project/>

Appendix 1: Comparative Soil Horizon Moisture Content Percent for May and August 2022 and May and August 2024 in Gulf View, Denham Till and Nymph Point Parks.

	Horizon	May-22	22-Aug	May-24	Aug-24
Gulf View	LFH	5	1	9	1
	A	48	6	17	6
	B	28	5	13	6
	C	23	5	19	8
Denham Till	LFH	3	1	6	1
	A	25	7	20	8
	B	28	7	18	10
	C	37	21	20	10
Nymph Point	LFH	8	2	5	<1
	A	24	6	14	2
	B	23	7	18	4
	C	22	5	10	3

Appendix 2: Graph of Permanent Wilting Point, Soil Moisture by Volume and Soil Textural Class.

