

2000 October 05

**TO:** CITY MANAGER  
**FROM:** DIRECTOR PARKS, RECREATION AND CULTURAL SERVICES  
**SUBJECT:** BURNABY LAKE REGIONAL PARK TREE DECLINE  
**PURPOSE:** To provide Council with information regarding tree decline at Burnaby Lake Regional Park.

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**RECOMMENDATION:**

1. THAT this report be received for information.

**REPORT**

At its meeting of 2000 October 04, the Parks, Recreation and Culture Commission received the above noted report and adopted the five recommendations contained therein.



Kate Friars  
DIRECTOR PARKS, RECREATION  
AND CULTURAL SERVICES

tc

**Attachment**

d:\data\council reports-PK-BURNABY LAKE REGIONAL PARK TREE DECLINE

cc: Director Planning and Building

**SUBJECT: BURNABY LAKE REGIONAL PARK TREE DECLINE**

**RECOMMENDATIONS:**

1. THAT a copy of this report be forwarded to Mr. Jack Roff.
2. THAT a copy of this report be forwarded to City Council for information.
3. THAT a copy of this report be forwarded to the Environment and Waste Management Committee for information.
4. THAT a copy of this report be forwarded to the Burnaby Lake Park Association.
5. THAT a copy of this report be forwarded to the Area Superintendent, Regional Parks, Central Area.

**REPORT**

At its meeting of 2000 May 17, the Parks, Recreation and Culture Commission received a request from Mr. Jack Roff for information on the tree decline issue at Burnaby Lake Regional Park. This report reviews the history and current status of the issue.

**BACKGROUND**

On 1997 September 04, staff reported on the declining evergreen tree issue at Burnaby Lake Regional Nature Park to the Environment and Waste Management Committee (Attachment #1). This was in response to a letter received from Mr. R.A. Hankin, Manager, GVRD Regional Parks. Mr. Hankin's letter outlined possible factors contributing to the tree decline in the Burnaby Lake Regional Nature Park. They included highway construction work that affected water flow regimes, record setting winter rains, and beaver dam building activity. Mr. Hankin concluded that trees were suffering and could eventually die unless the water levels could be altered. It was indicated that GVRD staff would attempt to lower water levels by managing the beaver activity.

Burnaby staff subsequently reviewed the site and reached similar conclusions. Prolonged periods of flooding of the root zone had drowned the trees. Accelerated root decay from these conditions created unstable trees which were now predisposed to toppling. Retention of high water levels would result in further tree mortality and whole tree failures. Staff indicated that further research by the GVRD into the cause of the high water levels followed by a remediation plan was required.

On 1999 March, 12 Frieda Schade, Area Superintendent, Regional Parks, Central Area contacted the Burnaby Horseman's Association by letter to inform them of the results of a recent review of the condition and maintenance of the horse trails and drainage issue in that area (Attachment #2). The letter indicated that although area drainage was working as it was designed and that some improved controls had been installed at the Cariboo Dam. However, a recent proliferation of beavers was providing many challenges. Beavers are considered to be major contributors to poor drainage in the area. It was reported that GVRD staff were kept busy removing debris jams and beaver dams and also installing beaver controls which include stops and fences. In addition, a beaver trapping program was proposed in the spring of 2000.

The letter indicated that as the toppling of large conifers in the area was a complex topic, the GVRD was proposing to have the Regional Park assessed by a qualified forester and possibly a forest hydrologist as part of an intensive Forest Management Study.

In 2000 March, the GVRD received assessments of the tree toppling and flooding problem from a Registered Professional Forester (RPF), Don Harris RPF of Don Harris & Associates, and a GVRD Parks engineer ([Attachment #3](#)). These reports essentially confirmed that poor drainage was causing ground saturation leading to tree failure and that trail construction and alterations to Buena Vista Creek and its drainage basin were significant contributing factors. Mr. Harris noted that beaver activity was not observed to be a serious problem. Both reports noted the area was flat with only a very slight gradient. The GVRD decided to proceed with a more detailed survey to establish elevations along the water courses prior to considering a suitable plan of action.

On 2000 August 10, a report was received from Frieda Schade, GVRD describing a more detailed survey of the study area in the vicinity of the Burnaby Lake Horse Trails. The report included eight possible recommendations for drainage improvements ([Attachment #4](#)). It had been deduced that the cause of the localized flooding problem is due to increased run-off resulting from ongoing development in the upper watershed, highway construction of new HOV lanes, and higher than average annual precipitation over the last several years. The report detailed how this had been compounded by the evident inability of the west creek channel to manage the volume of incoming water and localized problems on the east creek channel.

### **CURRENT STATUS**

A site meeting between the GVRD Parks, City of Burnaby, Ministry of Highways, and the Greater Vancouver Utilities (Drainage) was held 2000 September 21 to discuss the report and its recommendations. It was agreed that the primary concern remained that of safety for users of the trail systems and the following issues were deemed a priority:

- trails must be stable and any pathways which have been deemed unsafe due to erosion must be immediately identified and restored;
- the immediate implementation of a hazardous tree mitigation program in all areas which are in close proximity to the trail systems;
- the placement of appropriate barriers and guardrails along areas where trail systems are crossing waterways;
- improving signage which notifies users of potential risks.

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To date, the following projects which were recommended at the site meeting have now been initiated:

- culverts at Locations 3 and 7 have now been reinstalled at the proper grade to reestablish a positive stream gradient. The implementation of these culverts should eliminate the localized upstream flooding which had been occurring at these two locations.
- the dismantlement of beaver dams and a beaver trapping program has been initiated. It has been estimated that currently there is a population of approximately one hundred and fifty beavers residing in the area.

As per items 6, 7, and 8 in the Investigative Report, it was also agreed that a continued investigation related to the potential dredging and retrenching of Locations 1, 2, 4 and 8 will also be considered. A meeting has been held between the GVRD and the Department of Highways to discuss further possibilities related to the retrenching of the areas cited in the report. Potential improvements in these areas can only be implemented pending further consultation with Environment and Fisheries Departments and the issuance of the necessary approvals and contracts.

### CONCLUSION

It appears that the flood damage to existing trees is irreversible but drainage improvements recommended in the report will allow rapid natural reforestation of the affected area should this be the desire. Parks staff will continue to monitor the site and work with GVRD staff to ensure the recommendations of the consultants report are implemented. This report is for the information of the Commission. Future considerations will be forwarded at a later date.

DOC:lmr:hh:tc

Attach.

d:\doc\bby.lk.tree decline update

cc: Director Planning and Building

1997 SEPTEMBER 04

**TO:** ENVIRONMENT AND WASTE MANAGEMENT COMMITTEE

**FROM:** ACTING DIRECTOR RECREATION & CULTURAL SERVICES

**SUBJECT:** LETTER DATED 1997 APRIL 30 FROM MR. R. A. HANKIN, MANAGER  
GVRD REGIONAL PARKS - BURNABY LAKE REGIONAL PARK -  
EVERGREEN INQUIRY

**PURPOSE:** To provide results of an assessment of the declining evergreen trees in  
Burnaby Lake Regional Nature Park.

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**RECOMMENDATION:**

1. THAT this report be received for information purposes.

**REPORT**

At its meeting of 1997 May 13, the Environment and Waste Management Committee received a letter from the Manager, GVRD Regional Parks, identifying some possible factors causing tree decline in Burnaby Lake Regional Nature Park and adopted the following motion:

That the letter dated 1997 April 30 From Mr. R.A. Hankin, Manager, GVRD Regional Parks, regarding the evergreen inquiry at Burnaby Lake Regional Park be referred to staff for report.

The City's Urban Forester has inspected the site and has documented in the attached report, the present site conditions and possible factors causing tree decline. The findings are similar to those in the GVRD letter; trees are dying as a result of continued flooding of the root zone. A high water table, coupled with poorly drained soil, has created a growing environment which lacks oxygen, and promotes root decay. No other possible causal factors such as forest disease or insect infestations were noted. The conifers in the area are also now in a weakened condition making them more susceptible to infestation and wind damage.

There is uncertainty about the factors causing the high water levels and the length of time the conditions have persisted. GVRD has suggested more recent events such as heavy rains, highway construction and flooding from beaver activity is likely the cause. However, evidence in the field, such as the state of decay of the trees and amount of regeneration which has occurred, suggest that process has been occurring for a much longer period of time. Given the close proximity of the forest stand to the lake edge and the extent of area involved, the flooding problem may also be a result of high fluctuating lake levels.

Trees will continue to be lost as long as the water levels remain high. Some conifer regeneration is occurring and opportunities do exist for limited replanting on dryer hummocks within the zone. The site is also being recolonized by more water tolerant plants adapted to existing conditions. This may be viewed as a positive successional change in response to fluctuations in environmental conditions which has actually increased biodiversity of the area. Further research into the possible causes of the high water levels and plans for remediation of the area will be researched further in the park management plan currently in process.



Kate Friars  
ACTING DIRECTOR RECREATION &  
CULTURAL SERVICES

JK:seo  
Attachment  
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cc: Director Planning & Building  
Director Engineering

CITY OF BURNABY

INTER-OFFICE COMMUNICATION

1997 MAY 20

TO: SUPERINTENDENT - PARKS OPERATIONS

FROM: FOREMAN - URBAN FORESTRY

SUBJECT: BURNABY LAKE REGIONAL PARK - EVERGREEN TREE INQUIRY

An examination of the coniferous stand in the southeast corner of the park in the vicinity of junction of Southshore and Avalon Trails was conducted on 1997 May 20. Western hemlock is dominant with some western red cedar and sitka spruce.

**GENERAL OBSERVATIONS**

The stand is not vigorous or thriving. Many trees, including deciduous species illustrate the symptoms of years, likely decades, of poor growth. Symptoms include leaning stems, snaking stems, thin and drooping canopies, multiple co-dominant stems and bark/wood damage. In contrast, mid and lower level vegetation is strong, varied and abundant. The species mix includes bog lantern, false lily-of-the-valley, foam flower, spiny wood fern, bracken fern, twin-berry, cascara, vine maple, false azalea, saskatoon berry, salmonberry and mountain ash among others.

The observation is that the site is presently suitable for a great many species but not for the large conifers or even some of the larger deciduous trees such as red alder. This indicates that site conditions are changing and can no longer be considered optimum for the coniferous vegetation that began and thrived for decades prior to the evolution of site characteristics reaching a stage unsuitable for their continued support. The lower vegetation levels include apparently healthy young hemlock and cedar natural regens that will be expected to grow strongly for only a comparatively short time before site limitations halt vigorous growth.

An indication of the duration of the successional changes occurring are the many standing dead trees in various stages of breakdown and decay. Many of these trees have been dead for years. Other trees, generally hemlock, have suffered catastrophic mainstem failure at 30 - 40 ft. Much of the bark still remains, indicating that more recent events may have impacted these trees over the last few years, causing internal heartrot decay, leading to an inability of the tree to withstand winter storms. Although no indication of hemlock parasitic dwarf mistletoe was observed in the tree canopies, it is possible that this agent has infiltrated the hemlocks in this stand and assisted in the characteristic mainstem failures.

### CONTRIBUTIONS TO EVERGREEN TREE DECLINE

There appears strong evidence that tree decline and mortality can be attributed to water inundation. The coniferous stand is immediately adjacent the lakeshore conjunction. In many areas the rooting zone is saturated. In addition, the soils are heavy, organic mucks that do not permit good drainage or aeration. The presence of herbaceous and woody lower canopy species that thrive in such environments verifies site conditions. Moderate to strong flows into the lake were observed along much of the perimeter of Burnaby Lake. It was noted that in some cases the water channels were indistinct and may be contributing to water flowing outwards over a large area rather than directly into the lake. Examination of windfalls well illustrates the very shallow root plates of the trees in this area. The root mat appears to exist predominantly in the upper .5m. The relatively clean breaks on the roots indicate the roots were dead and rotten at the time of tree failure. This can likely be attributed to root drowning. Depending on circumstances and species, this rot can extend upward from the roots to within the mainstem and cause stem failure well above ground level, a characteristic pattern of many of the failures in this area.

Western hemlock is the dominant tree species within this stand. Although hemlock dwarf mistletoes was not observed, it may present and could account for the characteristic failure patterns seen on hemlock at this site, or be contributing to it. In addition, hemlock are strong natural regenerators on moist, acidic stumps and nurse logs as found here. Many of these "nurseries" have now rotted to the extent they no longer provide mechanical support to the maturing tree. Given the nature of the soil at this site, characteristically saturated muck, peat and layered moss, there may be a sufficient diminution of structural support that some trees will take on progressive leans, breaking supportive and absorbing roots and ultimately, falling or declining.

### RECOMMENDATION

Patches of deciduous and coniferous tree decline are noted throughout the periphery of the entire park, affecting a variety of species. It can be argued that forces affecting the ecology of the lake, including those causing an apparent rise in the water table, are "natural". As such, the lake and its surrounding vegetation are undergoing a successional change in response to changing environmental conditions. There are positives to this change. It may be advantageous to work with nature rather than attempt to impose a plan on the lake based on a preconceived notion of the desired vegetation cover and slow decline of the coniferous component the following may assist:

1. Determine the trend in the lake water level and what measures may be undertaken to stabilize it at the desired level. It may be desirable and necessary to lower the lake by improving outflow and/or removing infill accumulated over time.
2. Ensure inflow streams and channels adequately move the water to the lake without permitting its dissemination throughout a wider area on its way to the lake.



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3. Ensure trails are designed, constructed and maintained in the best interests of the sensitive ecology of the area. It may be best to consider boardwalks where current paths may act as dams.
  4. Undertake selective planting to improve species and age diversity. Healthy natural regens do exist of western hemlock. It may be possible to support these young trees by plantings of seedlings in the same vicinity. Dryer hummocks should also be sought to further enhance plantings. Planting opportunities will be sparse but are an important component of any undertaking intended to prolong the existence of this and other coniferous stands around Burnaby Lake. The species mix should include western red cedar, sitka spruce, grand fir and to a lesser extent, western hemlock where suitable sites can be located that meet the specific needs of each species.

BR:seo

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ATTACHMENT #2

Regional Parks, Central Area  
Phone: (604) 520-6442  
Fax: (604) 520-3520

File No.: C813.02.04.07

12 March 1999

Burnaby Horsemen's Association Executive  
9080 Avalon Avenue  
Burnaby, BC  
V3N 4G8

Dear President and Members of the Executive:

Re: Horse Trails at Burnaby Lake Regional Park

We have just finished reviewing with City of Burnaby staff the condition of the horse trail, our maintenance and drainage activities and division of responsibility between Burnaby and GVRD in the vicinity of the Burnaby Lake Equestrian Centre. I thought it timely to fill you in on the discussion and to offer to meet with the executive or any members who wish to discuss our trail maintenance activities. It is our objective to always keep these trails in as good a condition as possible, and those of you who ride the trails regularly will see much evidence of our staff working in the area; however, these past few wet years along with the proliferation of beavers have given us many challenges. Below I've described what we are doing.

GVRD Parks Department staff continually keep an eye on the two small streams that flow through the riding ring area (see map) and we remove debris jams and beavers dams within our property to keep water flowing. If there is a jam on Burnaby's property we notify Burnaby and they come out and remove it. Where the two streams cross Avalon Avenue, there is a sewer pipe which is exposed and which, in fact, has been designed to have water flowing over it. Today, GVRD Sewer Operations staff, who maintain the pipe, came out and looked at it and said it is working pretty much as it has been for the past ten years. They do not feel that the pipe itself is the reason for poor drainage upstream. While the water flow may slow slightly at the pipe, it is flowing freely and does not appear to have backed up significantly there, even with the heavy winter storms we've had this year. Parks staff have agreed to place some rip-rap and filter cloth around the pipe to channel water flow better. This will be done shortly. The bearing capacity of the soils beneath the sewer line is not enough to support

12 March 1999

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installation of a siphon underneath the sewer line. GVRD Sewer Operations staff also mentioned that their controls at the Cariboo Dam have been improved and now respond better than before to facilitate the evacuation of water from the Park.

In recent years, GVRD Parks staff have observed that highway HOV lane construction (which included drainage improvements) and increased urban development in Burnaby upstream of the Regional Park trails, have channeled much more water into the Park. Consequently, water flows into the Park faster than before, causing some flooding. This winter a culvert plugged on the horse trail (just south of the jumping ring) during a heavy rain storm, and caused quite a bit of flooding and damage upstream. This may have caused concern among your members. The blockage was removed as soon as it was found. Trail repairs are underway and the construction area is clearly marked so that horseback riders can make their way carefully past the damaged section.

Beavers are also major contributors to the poor drainage in the area. There is a large beaver pond just south of the trail, which supports two lodges. The attached map also identifies many other known beaver dam locations and spots where dams have been removed by GVRD staff. GVRD Parks' philosophy is to work with the beavers as much as possible and try to channel their activities into areas where there will be no flooding of trails. Riders will see everywhere the "beaver stops" and fences meant to contain and re-direct beaver activity. The amount of work staff have devoted to this end is obvious, but the population seems to continue to grow. This spring we will begin a trapping program as a test to see if we can reduce their numbers, hopefully reducing drainage problems along the trail.

At present there are parts of the trail where there is standing water on both sides. We do not believe that adding additional culverts would make a significant difference to the drainage as there is very little grade to help move water away in the first place, or beavers would fill in the culverts making them ineffective. The standing water could be perceived as a hazard by horseback riders. Even where there is no standing water, the bog soils on either side of the trail are very soft and deep and could not support a horse's weight. Extreme care is advisable at all times, and as you know the trails are not for beginner riders. We'd appreciate it if you would communicate with your members and remind them to use caution, or if you prefer we can produce a notice that you can insert in your newsletter or other mailing.

Our goal is to keep the horse trails safe and usable all year round. Sometimes this is just not possible. If we feel that a section of the trail is in such poor shape that it must be closed we will certainly take action to close it. However, we are not horse experts and we are not there riding every day as some of your members are. If your members find parts of the trail are in a dangerous condition, we would appreciate knowing right away. That way we can act

Burnaby Horsemen's Association Executive

12 March 1999

Page Three

immediately to mark the hazard, close or repair the trail. If staff are not available to take your call, a message can be left on the answering machine at our office at any time and staff will be informed on the next business day. The number is 520-6442.

Another issue that we believe is associated with poor drainage is the issue of windfall, particularly where it involves the toppling of large conifers. This has been one of the worst years on record for wind, rain and trees falling in all 22 Regional Parks, not just Burnaby Lake. It is always disturbing when a large old conifer falls, and the opinions about why this happens are many. Some of the factors outlined above are no doubt involved. We have numerous letters and comments about this on file over the years. Because this is a complex topic, GVRD proposes to have the Regional Park assessed by a qualified forester and possibly a forest hydrologist, as part of a proper Forest Management Study. I anticipate that this will provide us with recommendations about how to best manage the forest, including drainage, disease control, trail relocation, if necessary, and replanting. Our goal is to preserve a healthy, attractive forest for future generations

That sums up what we're doing and our thoughts, but I'd like to hear ideas from your Association, if you think that would be useful. Perhaps there are things we can do to serve you better in terms of trail maintenance. Just call to arrange a convenient time, we're available in the day or evening and we have a meeting room in our office, next to your indoor riding ring.

Yours truly,



Frieda Schade  
Area Superintendent  
Regional Parks, Central Area

FS/lgd

cc: Hugh Monroe, Burnaby Parks and Recreation

Preamble

This report is an overview of the "tree toppling" problem, its causes and some possible courses of action to solve these. The report is not meant to be a technical or scientific report, nor a finite solution for this problem.

During the 3.5 hour visit to the site (my 3<sup>rd</sup>), I attempted to locate and examine culverts, ditches and creek channels to observe water flow, maintenance, and the general relationship of these structures to roads, trails, sewerline and various Burnaby Horsemen's installations.

Also traversed was the area west of the Trans Canada Highway.

**DON HARRIS & ASSOCIATES**  
*Urban Forestry Consultants*

ATTACHMENT #3

702 - 1590 West 1st Avenue  
Vancouver, B.C.  
V6J 4X4

Telephone: 736-9222

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February 14, 2000

G.V.R.D.  
Central Area Parks  
9146 Avalon Avenue  
Burnaby, B.C.

Attention: Mr. John Shaw, Operations Supervisor

A report reviewing the tree toppling problem at Burnaby Lake Regional Park

Yours truly,

Don Harris, R.P.F.

Overview of problem area

There are approximately 50 acres in this forested area due west of the Burnaby Horsemen's barns, an area consisting of riding paths, outdoor training rings, a road, a large parking lot and a sewer pipeline. ( The forest stand is a mixture of native deciduous and coniferous trees, approximately 40 - 120 years old.) Elevation maps show an 18.1' - 19.4' elevation near the Trans Canada highway and a 13.5' elevation at the Brunette River; or an approximate 6 to 7' gradient over 1600 - 2000'. A very slight gradient on undulating topography..

The Buena Vista Creek system drains a large North facing slope as it flows toward the Brunette River prior to the construction of the Trans Canada Highway . Observed culverts and ditching adjacent to and under the highway and access roads designed to channel drainage and runoff water into the two creek channels that run through the problem area. Easterly highway culverts consisted of two 36" or 42" diameter steel culvert pipes. Following several days of no precipitation there was an estimated 30 - 40 gallons per minute water flow. Also noted log restrictions approximate 100' downstream. The westerly culvert was a single 24 (to 30") steel culvert pipe.

### Response to Questions

1. Tree toppling in continuously saturated soils is due to weakened root anchorage caused by:

(a) physiological damage to roots (drowning) due to the total absence of oxygen and the high levels of carbon dioxide (up to 20%) - and -

(b) weakened mechanical anchorage for roots

The tree toppling is occurring with both native conifers and deciduous trees as evidenced in varying degrees of tree decline, standing dead and windthrown trees. Small pockets of conifers are still viable, likely due to the topography being higher at these locations, hence better drainage. I believe the damage is irreversible for trees that have had roots submerged over long periods of time.

Forested areas unaffected or on relatively better drained areas would benefit from any solution that would lower the water table in areas subject to ponding or stagnant water.

There are many dead standing and leaning trees due to root failure. These trees are potentially hazardous to the many people using trails and horse activity areas. Immediate attention should be given to removal of these hazardous trees.

2. Drainage along the two water courses to the Brunette River.

As noted earlier, the gradient over the affected area is very slight and for large areas where ponding or stagnant water occur, there is a 0 or negative gradient.

Solutions maybe a series of surveys followed by a plan of remedial action.

(a) establish a fairly accurate mapping of creek channels, culverts, trail systems and horse activity areas.



- (b) establish permanent elevation points along creek channels to determine if:
- i. creek channels should be deepened or widened?
  - ii. straitening a channel should improve rate of water flow?
  - iii. it would be possible to drain adjacent areas by digging side channels to the two creeks?
  - iv. the present culverts and ditches are at the lowest point for maximum drainage?
  - v. more culverts and ditches would be helpful - where, how deep, size?

3. a) I believe this question refers to creek channel, ditch and culvert maintenance. A map with permanent elevation points, etc. produced from the proposed survey should provide a basis for regular inspections and a guide for action when water ponding problems occur. A regular inspection should include all elements of the drainage system. The present program of culvert repair and stream maintenance be continued.

b) I did not observe anything that indicated beaver were a serious problem. Pro-active effort to prevent and remove beaver dams have been successful. As well as a program to trap and remove beaver from this area.

c) Excessive water ponding occurred on both sides of the trail nearest to the highway. Removal of this trail would only exacerbate excessive water ponding in lower areas toward the Brunette River. Large numbers of recent blowdown were noted in this

area between the trail and highway. A survey would help a decision to establish additional drainage points.

d) The survey should provide a guide to the most effective culvert locations and drainage channels to minimize the transferring of water problem from one area to the next.

e) Regarding GVS & DD'S sewer line. The feasibility of placing submerged culverts under the pipeline should be considered as a solution to this blockage. A 12 - 14" difference in water height was observed at the point where the most westerly creek channel was blocked by the sewer pipeline.

f) One of the purposes for a survey would be to plan a course of action that would solve the problem and not relocate it.

4. The existing native forest trees (approx. 40 - 120 + years old) were naturally seeded and grew on an area where the original drainage patterns and water tables provided an favorable site. Obviously the water table in the peat soil was not a limiting factor at that time. However the present persistent high water table must be reduced to a point where tree roots can survive and perform their many functions i.e. anchorage, water and nutrient uptake etc.

5. Recommend a regular monitoring or study to measure the volume of water input to the two creek channels from highway culverts and runoff water in ditches; compared to the measured volume of water at the two creek culverts under Avalon access road. Measurements should occur during and after prolonged precipitation events. As well a trail be cleared along the creek channels to provide easy monitoring of the creeks ability to handle the high water volumes and identify where problems are occurring e.g. overflow of creek channels during high run-off periods. I believe there are grounds to speculate that the alteration to Buena Vista Creek and its drainage basin are a major contributing factor to water problems in this study area. As well the GVS and DD sewer pipeline, Avalon access road, numerous trails and Burnaby Horsemen's Association installations all act as water blockage obstacles.

In conclusion, I believe it would be necessary to involve all groups e.g. G.V.R.D., City of Burnaby, B.C. Highways Dept., Burnaby Horsemen's Association, etc. (see # 5) in a plan of action to resolve the causes for the tree toppling problems.

**Burnaby Lake Regional Park  
City of Burnaby  
Drainage Problem Investigation Report  
S-E Horse Trail Site**

**Problem Statement**

Poor drainage is causing ground saturation and excessive tree fall. This problem has accelerated in recent years.

**Possible Causes**

- Trail construction interrupting natural drainage channels;
- New offsite drainage contributing to the local drainage due to:
  - ❖ Extension of drainage boundaries by man-made activities;
  - ❖ Increase in imperviousness within the drainage basin;
- Natural obstruction to drainage (siltation, beaver dams).

**Drainage Basin Description**

Flat area located south of Brunette River and north of highway #1, with east boundary defined by Cariboo/Gaglardi clover leaves and City of Burnaby horse facilities. The west boundary is difficult to describe in absence of detailed site reconnaissance. Drainage is provided by a number of small channels contributing to two main creeks – see attached plan (Creeks A & B). Horse trails criss-cross the basin and drainage is accommodated by bridges or mainly culverts.

**Proposed Scope of Engineering Investigation**

1. Field reconnaissance (3 man-days)
2. Survey of main watercourses (7 man-days)
3. Investigation of man-made drainage influences:
  - 3.1 Within drainage basin (trails, culverts, GVS&DD syphon, etc.) (3 man-days)
  - 3.2 Beyond natural basin boundary (drainage diversions, impermeability, etc.) (5 man-days)
  - 3.3 Natural obstructions to drainage (1 man-day)
4. Report and recommendations complete with drainage plans – (4 man-days)
5. Meetings – (2 man-days)

**Total Proposed Cost**

**\$10,000.00**

Note: This report will be confined to the drainage issues only (not addressing arborist type issues).

Attachment: SON (“Tree Toppling Problem”)  
Watershed Plan  
Photos

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## Burnaby Lake Regional Park Tree Toppling Problem

1. What is causing the trees to fall in this area? What could be done to stop trees from falling?
2. Review drainage along two water courses into the Brunette River. Is there anything that could be done to speed the flow of water along these two water courses?
3. Review adequacy of GVRD's actions in trail maintenance and beaver control. Is there anything more or different that could be done to achieve better results?
  - Would removal of the trail solve the problem?
  - Would installation of more culverts solve the problem?
  - Would installation of a siphon at GVS & DD's sewer line help solve the problem and if so, is it technically feasible?
  - If the problem is solved in one location would the problem likely reappear elsewhere?
  - Would ditching or channelization of the two streams help?
4. To what extent is the high water table in the peat soils a factor in this problem? If the surface water level was substantially lowered, what effect would this have on trees that are still standing?



Greater  
Vancouver  
Regional  
District

ATTACHMENT #4

Regional Parks Department

## BURNABY LAKE REGIONAL PARK

### DRAINAGE PROBLEM

### INVESTIGATION REPORT

Prepared by: Stephanie Arabsky, P. Eng.  
Survey by: Diego Bittante  
Reviewed by: Thomas Day-Madunicky, P. Eng  
Brian Farquhar, Park Planner  
Date: August, 2000

## 8.0 CONCLUSIONS AND RECOMMENDATIONS

From the data collected and observed, we can conclude that the cause of the problem of localized flooding and “toppling of trees” within the study area is probably twofold. Firstly, it appears that the Buena Vista Creek system is experiencing an increase in runoff due to ongoing development within the upper watershed and recent construction of the Trans Canada Highway HOV lanes. The problem may have been compounded by the above average annual precipitation over the past four years. While this could not be confirmed within the scope of this study, further work planned as part of the Brunette Basin Watershed Plan is expected to include more detailed survey mapping and analysis of the watershed’s tributaries, including the Buena Vista Creek system. Evidence of siltation within the creek’s reaches within the study area certainly is an indication that changes in the watershed above the Burnaby Lake Regional Park is having some effect.

Regardless of the possible influences from development and other activities within the watershed, it was apparent that the west creek channel at the time of the site observations was not capable of managing the volume of incoming water, and there were localized problems with the east creek. Some of the flooding was the result of two trail culverts which, due to reverse grades, had impounded water immediately upstream of Locations 3 and 7 (see Figure 2). The area of flooding as a result of these two culverts was, however, localized compared to the overall degree of flooding observed on 18 April 2000.

Siltation deposits have also created reverse grades within the creek channels, especially notable on the west creek between Locations 2 and 4. Water impounded by these siltation deposits has caused flooding outside the creek channels. Flooding has been compounded due to the lack of topographic relief, causing the water to disperse and pool over a wide area. The noted increase in beaver activity has likely been due in part, to both the increase in standing water and flows. The effects of the beaver dams on

flooding are most notable within Area 1, where the dams parallel the south side of the southernmost equestrian trail.

Combined, the influences noted above have resulted in the loss of trees within the study area, either from standing water drowning the roots causing the trees to die or soil saturation reaching the point where the roots are loosened and the trees topple.

The following recommendations are made to attempt to address the above problems noted. Recommendations are listed in order of easiest to implement to the more complex involving considerable effort, approvals, funding, etc.:

1. The culverts at Locations 3 and 7 should be reinstalled at the proper grade to re-establish a positive stream gradient. This should eliminate the localized upstream flooding occurring at these two locations.
2. The remaining beaver dams should be removed immediately, including those in Area 1, and a continuous program of beaver dam dismantling and trapping out of beavers within the entire study area should be implemented.
3. The problem of water impoundment immediately upstream of the trunk sewer crossings on the east and west creeks should be reviewed with GVS&DD. A possible solution to improving streamflows past the pipeline would be to excavate the streambed and support the pipe on a bridge such that flows would run under the pipe, or lower the pipes by constructing syphons.
4. Meet with Ministry of Highways to review location and management of highway ditch system discharging water into Area 1.
5. The results of the survey and analysis work underway on the Buena Vista Creek watershed as part of the Brunette Basin Watershed Plan study should be reviewed to assess options for flow and siltation management off-site.. Implementation of stream improvement initiatives outside Burnaby Lake Regional Park will need to be initiated by the City of Burnaby, GVS&DD and/or other agencies as it would be beyond the scope of the GVRD Parks Department's mandate.



6. The above actions will not control future flooding problems within the study area, especially on the west creek, due to the low profile grade and amount of siltation deposited on the stream bed. One option to control existing flooding between Locations 4 and 2 would be to retrench the creek channel from the trail bridge at Location 4 to a point approximately 60 metres upstream of Location 2. This would establish a 0.6 percent stream gradient in place of the existing  $-0.2\%$  and  $-0.5\%$  stream gradients within this section the creek. Retrenching the creek would require the use of excavation equipment. The area of impact would have extend beyond the width of the creek channel in order for equipment access and deposition of excavated material. Some trees may have to be removed in order to facilitate equipment access or realignment of the creek channel. Environmental approvals would also be required for such instream works.
7. To improve the overall drainage of Area 1, a new stream channel could be trenched from a point midway between Location 4 and Location 8 through the southernmost equestrian trail. From this point, a channel could be trenched for approximately 50 metres, intersecting with the west creek channel just downstream of Location 3. However, this work could only be done in conjunction with the retrenching work outlined in recommendation 6, to address the reverse stream gradient downstream of the intersection point of the new channel alignment outlined above.
8. A channel will have to be established through Area 1 to tie further upstream with the drainage ditch on MoH property. The profile of this channel should be an extension of the work under #6.

It should be noted that the kind of actions proposed in recommendations 6, 7 and 8 require careful consideration to be certain they are both beneficial and appropriate in a Nature park. Steps should be taken to accomplish this work with a minimum of disturbance to the area. At this point, preparation of cost estimates for the above work and discussion among several parties is required to reach consensus on how to proceed.

In conclusion, the flood damage to the existing trees impacted within Area 1 and the localized area to northwest is "irreversible" as stated in D. Harris's report. However, if reforestation is the objective, the above drainage improvement measures will allow rapid natural reforestation. This has been the historical trend in the general area as evident from the succession of aerial photos dating from 1963 through 1999.