

To: Parks & Natural Environment Advisory Committee, District of North Vancouver

From: David L. Cook, P. Eng.

Title: Roche Point Creek - An Endangered Riparian Ecosystem

Date: November 22, 2002. (Amendments made December 14, 2002 are underlined)

Introduction:

Roche Point Creek is the lifeblood of Roche Point Forest, a sensitive ecosystem which has been reported on at length in a report by the writer to this Committee, to North Vancouver District Council and to district staff (Cook 2001). That report has been instrumental in influencing a recommendation within the Seymour Local Plan for conservation of Roche Point Forest and rezoning some of it from RS to PRO.

The hydrology of Roche Point Creek has been degraded to a major degree due to development throughout much of its historical drainage basin. (See Figure 1).

The report presented here summarizes observations made over a three year period and outlines a course of action for improving the water recharge to what remains of the natural water course of Roche Point Creek.

Location:

The original drainage basin for Roche Point Creek covered an area of about 130 ha which included the present Indian River residential development, the golf course of the Seymour Golf & Country Club and Roche Point Forest.

The present natural channels of Roche Point Creek now lie entirely within Roche Point Forest, which covers an area of about 23.5ha. Roche Point Forest is bound by Burrard Indian Reserve No 3 (Tsleil Waututh Nation) to the west, Dollarton Highway and some residential to the south, Roche Point Drive South and residential to the east, the playing field of Roche Point Park (east sector) to the north-east and the golf course of the Seymour Golf & Country Club to the north. Roche Point Park (west sector), a 5.6ha area of natural parkland, lies entirely within Roche Point Forest.

Geology and Geomorphology:

Most of the Roche Point Creek drainage basin is underlain by glacio-lacustrine clays that contain sparsely distributed cobbles and pebbles of granitic and metamorphic rocks derived from the Coast Range Metamorphic Complex that make up the North Shore mountains. These clays were deposited in a lake created by the damming effect of glacial till or stranded ice during the waning but fluctuating stages of the last glaciation (Fraser Glaciation) between 13000 and 11000 years ago. Incorporated within these clays are gravel rich areas representing gravel banks, gravel pockets and beach strand lines within the ancient lake. Where linear, these gravel rich areas function as channel ways for ground waters which pass through the otherwise impermeable clays, venting as seeps and springs.

As the ice melted, the land rose (differentially more to the north where the ice was thicker, than to the south) so that the former lake bed now forms a raised bench sloping towards Burrard Inlet of average elevation 100 metres. This raised sloping bench became the drainage basin for Roche Point Creek.

The clays are overlain by brown mineral soil from 0 to 1 metre thick which is in turn overlain by a thin layer of organic soil.

Hydrology:

The original natural drainage basin of Roche Point Creek once extended nearly 3km from Indian River Crescent at the south-west corner of Cove Forest Park where it was narrowest, south to Burrard Inlet and covered an area of about 130ha. Its greatest width, which was in the area of Roche Point Forest and the Seymour golf course, was about 1km. This impacted drainage basin is best described as three parts:-

1. The upper drainage basin of Roche Point Creek north of Mt. Seymour Parkway:- Prior to the Indian River residential development, the upper part of the Roche Point Creek drainage basin was a wetland fed by an 800m long north to south ditch (see Figure 1). This part of the Roche Point Creek drainage basin covered an area of about 45ha north of Mt Seymour Parkway. As a result of the Indian River residential development, the upper watershed basin of Roche Point Creek has been lost.
2. The golf course of the Seymour Golf & Country Club:- The former main channel and some tributaries of Roche Point Creek once crossed the area now covered by the Seymour golf course, an area of about 62ha. When the golf course was constructed in circa 1952, this part of the Roche Point Creek drainage was directed into culverts, ditches and ponds. The main channel of Roche Point Creek was truncated by the damming effect of the 6th Tee Pond thereby **completely** removing its role as the main course of Roche Point Creek. The drainage off the golf course was directed mainly into Tributary 3 from the 6th Tee Pond but also to a lesser extent into Tributary 2 from the 5th Tee Pond and by a storm-water channel (SW on Figure 2) that leaves the western boundary of the golf course at the cul de sac of Roche Point Drive North connecting with Tributaries 2 in Roche Point Forest via the Tsleil Waututh lands. Tributaries 2 & 3 are the only natural channels of Roche Point Creek that function as the present drainage system of Roche Point Creek.
3. The present natural channels of Roche Point Creek (both active and inactive):- These consist of the former main channel of Roche Point creek and its three tributaries, all located south of the southern boundary of the golf course and which pass through a natural forest known as Roche Point Forest and thence south into Burrard Inlet at a point immediately west of Cates Park. They are shown on Figure 2 as (1) to (4).

The three areas described above and the boundary of the former drainage basin of Roche Point Creek, are shown on Figure 1.

The following observations were made by the writer during a cursory site tour of the southern boundary of the golf course with J. McGarvey, Course Superintendent, Seymour Golf & Country Club on October 31, 2002:-

The present golf course drainage system is a complex of ditches and ponds connected by an array of buried pipes (wood stave, black corrugated plastic, black and white PVC).

At the southern boundary of the golf course, this system vents into two of the tributaries of Roche Point Creek; one west of the 6th Tee Pond into Tributary 2 and the other east of the 5th Tee Pond into Tributary 3 (see Figure 2). The main channel and Tributary 1 now play no part in the present hydrology of Roche Point Creek, having lost their function during development of the golf course by the damming effect of the 5th and 6th Tee Ponds.

Along the western boundary of the golf course, there are two drainage outlets from the golf course: the storm-water channel described above (SW on Figure 2) which connects with Tributary 2 after passing through Tsleil Waututh land and another outlet which flows into ditches on either side of the gravel extension of Roche Point Drive North. These ditches do not connect with Roche Point Creek but flow into a large sump at the end of the gravel extension of Roche Point Drive North.

The following observations were made by the writer where the natural channels of Roche Point Creek and the storm-water channel presently exist outside the boundary of the golf course. These water courses are shown on Figure 2 as (1) to (4) and (SW). Descriptions of these water courses are as follows:-

- Tributary 1 (1 on Figure 2):- This minor tributary has lost its role as part of the drainage system of Roche Point Creek due to the golf course development over its watershed. Its former bed in Roche Point Forest has been almost completely in-filled by silt and overtaken by vegetation. The 5th Tee Pond lies immediately up drainage (i.e. north) from it and collects any water that might have once entered it. The lower part of Tributary 1 is preserved where the storm-water channel (SW) uses part of it before connecting with Tributary 2.
- Tributary 2 (2 on Figure 2):- The natural channel of this tributary is filled with large quantities of coarse woody debris (CWD), small organic material and soil that have slumped in from the sides of the channel. This is indicative of long periods of no or limited water flow. With the accumulation of soil and organics, this limited water flow has been forced to pass beneath it as a subterranean stream which emerges just before the confluence of Tributary 2 with Tributary 3. During periods of rainfall, Tributary 2 does flow, mostly beneath the debris in its bed. This rate of flow is about half that of Tributary 3, the only other flowing channel of Roche Point Creek. During periods of no rain, there is no flow in Tributary 2. At the golf course boundary, Tributary 2 meets a narrow, north-south man-made ditch on the golf course which has three narrow black corrugated plastic pipes entering it from the 5th Tee Pond to the west which carry the overflow from that pond. In former times, Tributary 2 would have received the flow from the storm-water channel (SW on Figure 2), but as explained below most of this water is lost into the surrounding area of salmonberry thickets.
- Tributary 3 (3 on Figure 2):- This tributary has become the main flow channel of Roche Point Creek, having taken over the role of the inactive main channel. When active during periods of rain, its rate of flow is about twice that of Tributary 2. During peak rainfall periods, flow along Tributary 3 reaches flash-flood proportions which has resulted in deeply cut gouge pools. Any fry in these pools are probably flushed downstream during such events. By reactivating the main channel of Roche Point Creek (4 on Figure 2), this flooding effect could be reduced. During periods of no rainfall, the only flow within Tributary 3 is an almost imperceptible trickle of water emanating from a “spring” or seepage area along its north-east bank where the clays have a higher gravel content than elsewhere. This seep is mildly active year-round and does not vary in its yield of water. Because it is about 30 metres from the 6th Tee Pond, it is thought that the water is channeling from the pond via the gravel in the otherwise impermeable clay. This seep is the only source of water for the whole of Roche Point Creek during periods of no rainfall. Upstream from the seepage area at the golf course boundary, Tributary 3 meets a wood stave pipe which drains the overflow from the 6th Tee Pond further to the east. The overflow from this pond is the main source of water for Roche Point Creek during periods of rainfall.
- The former main channel of Roche Point Creek (4 on Figure 1):- As indicated by its greater width and depth, this permanently dry gully was once the main water course of Roche Point Creek. It has **completely** lost its role as the main channel for Roche Point Creek by the construction of a dam built to form the 6th Tee Pond on the golf course. Soil slump, vegetation growth and CWD indicate this channel has been inactive for a very long time.
- The storm-water channel (SW on Figure 2), which flows from the west boundary of the golf course and once connected with Tributary 2, is a man-made channel and not therefore part of the original natural hydrology of Roche Point Creek. Its connection with Roche Point Creek **has not been maintained** and as a consequence there has been silting up of its bed. This has caused flooding into the adjacent forest which has raised the water table inhibiting tree growth and causing development of shallow root systems for any trees that were able to develop there. Shallow root systems left the trees vulnerable to wind-throw. In addition, silting of this storm water channel with loss of water into the adjacent forest has reduced water recharge into Roche Point Creek. The present habitat of this high water table area consists of dense thickets of Salmonberry with only a very few unhealthy looking trees. By cleaning out the channel on a regular basis and maintaining its connection with Tributary 2, a healthier forest should develop and water recharge to Roche Point Creek should be enhanced.

Spread-leaved Peat Moss, also known as shaggy sphagnum (*Sphagnum squarrosum*), is a moss common along water-filled ditches on the golf course. It has been found at only one location within Roche Point Forest. The preferred habitat for this moss is swampy or seepage areas, along water courses or near

waterfalls. In other words it requires a permanent water habitat. The significant difference in its incidence between the golf course and Roche Point Forest indicates that many parts of the golf course are well supplied with permanent water, while Roche Point Forest is not. This implies a hydrological imbalance between the golf course and Roche Point Forest.

Fish Habitat:

Historically, Roche Point Creek has been the home of cutthroat trout, which are still surviving as a very limited-size population of immature individuals and fry in small pools located below the confluence of Tributaries 2 & 3. For much of the year, the very limited number of pools in the otherwise dry Roche Point Creek, are “fed” by an almost imperceptible trickle of water from the seep located along the bank of Tributary 3 (see “Hydrology”)

A trap and release survey by the Department of Fisheries and Oceans on June 18, 2002, at the request of the writer, yielded 12 immature cutthroat trout between 8.7 and 14.3 cm in length from the deepest pool in Roche Point Creek about 80m below the confluence of Tributaries 2 & 3. Some fry were seen in one other shallower pool about 40m below the confluence of Tributaries 2 & 3. No other fish were seen.

The pools in which these immature trout and fry are living are probably too small and shallow to support larger individuals. Not only would there be insufficient food to support larger individuals, but they would have difficulty hiding from predators. Later in the year no fry could be found in the pools of Roche Point Creek probably due to one or more of the following factors; depletion of food supply, increased temperature of the water, oxygen starvation, predation, flushing downstream by the first floods or sensitivity to chemicals (if used) from the golf course .

The larger cutthroat trout seen in one deep golf course drainage ditch were not trapped, but were estimated to be 20cm or more in length. Judging by their behavior, these large adult Trout are probably being hand fed and should not be considered as a natural population. They are unlikely to be the source of the fry seen in the Roche Point Creek pool as their pool is too deep for spawning.

In 1995, Coast River Environmental Services reported possible sea-run cutthroat trout within the lower reach of Roche Point Creek just before it enters Burrard Inlet. The present study did not include the lower reach of Roche Point Creek.

Up until 1993, employees of Noble Towing located at the mouth of Roche Point Creek, noted small runs of Coho Salmon spawning at the mouth of the creek on an annual basis. No salmon were seen during the 1995 survey of Coast River Environmental Services Ltd.

Discussion:

In the writer’s report of June 6, 2002 and an earlier report by Coast River Environmental Services Ltd. (1995), it was amply demonstrated that Roche Point Forest is worthy of conservation both in terms of its value as a rich and unique wildlife area and as a heritage forest. Roche Point Forest is also an integral part of the Cates Wildlife Corridor and contains old growth Douglas-firs used by bald eagles both for nesting and roosting as well as observation sites for hunting. The eagles have raised five young during the three years of this present study. Other pairs of eagles were reported nesting in the same tree in 1987 and earlier.

For the reasons that Roche Point Creek is the lifeblood of Roche Point Forest as well as being a fish-bearing stream, it is worthwhile to attempt an upgrade of its degraded hydrology.

How this can be done over the golf course requires additional information that only the Seymour Golf & Country Club or a study of the golf course hydrology can supply.

Some questions are:-

1. Where is the golf course water coming from before it enters Tributaries 2 & 3? As no plans of the channeling system were made available to the writer either by the Seymour Golf & Country Club or by District Hall, it is not clear with what degree of efficiency water is being collected over the golf course for delivery to Roche Point Creek. If there is room for increasing this efficiency, then it may be possible under the proposed “Long Term Golf Course Enhancement Program” presently before the membership of the Seymour Golf & Country Club, to implement this.
2. Is storm water being used on the greens? If so, how is this being done and how does it relate to depleted water recharge into Roche Point Creek?
3. Would it be feasible to store more water in ponds and implement a slower release into Roche Point Creek during periods of no rainfall? If this is possible, could the main channel of Roche Point Creek be brought back into commission?
4. Would it be feasible to tap ground–water and direct it into Roche Point Creek during times of no rain–fall? Such a system is used to correct a water recharge problem at Park Street Marsh located within the Conservation Area at Maplewood Flats. At a location well removed from the marsh, ground water is pumped and directed into the marsh. The water is aerated to remove hydrogen sulfide and passed through a simple process to remove some forms of iron. In order to minimize vandalism , such a system should be located on the golf course grounds.
5. Ditches on either side of the gravel road extension of Roche Point Drive North receive their water from an outlet on the west boundary of the golf course which is located along the gravel extension of Roche Point Drive North. These ditches drain into a catchment sump at the end of the gravel road before it turns into the Tseil Waututh land. This water does not enter Roche Point Creek. The ditches have not been maintained for a very long time and need to be cleared of debris and vegetation. Would it be feasible to redirect this water into Roche Point Creek?

Conclusions:

1. Development over a major part of the Roche Point Creek drainage basin over the last 50 years has degraded its hydrology and impacted the natural ecosystem of Roche Point Creek.
2. Roche Point Creek has historically been the habitat for at least two species of salmonid; cutthroat trout (*Oncorhynchus clarki*) and coho salmon (*O. kisutch*). For reasons probably related to degradation of the hydrology of Roche Point Creek, cutthroat trout are experiencing reduced habitat and habitat stress. Fry do not seem to be surviving, at least in the upper reaches of Roche Point Creek.
3. Any suppression of the hydrology of Roche Point Creek not only affects the fish habitat but that of the adjacent wildlife and forest ecosystem.
4. If recommendations made in this report are implemented, even if only in part, it is possible that the hydrology of the creek and the habitat of its resident Cutthroat Trout can be enhanced.
5. For reasons as yet unknown, Coho salmon no longer spawn at the mouth of Roche Point Creek.
6. Sea-run trout at the mouth of Roche Point Creek may also be an issue.
7. There is evidence that the water channeling system, when originally emplaced throughout the golf course, fell short of replicating the efficiency of the natural drainage system.
8. The main course of Roche Point Creek and its westernmost tributary have **completely** lost their roles as part of the Roche Point Creek hydrology by the damming effect of the 5th and 6th Tee Ponds. It would be ecologically desirable for at least the main course of Roche Point Creek to be reactivated. This may also reduce the intensity of flash-floods that sweep down Tributary 3 during periods of high rain-fall
9. Tributaries 2 & 3, with their culverted connections from the 5th & 6th Tee Ponds, function as the only significant water recharge channels for Roche Point Creek. Flow within them takes place only briefly during and for short periods after rain.
10. The seep or “spring” along the north-east bank of Tributary 3 is the only consistent, year-round source of water recharge to Roche Point Creek. It is a very limited, almost imperceptible trickle that does not vary. The source of this water is very likely the 6th Tee Pond. The value of this “spring” to

the cutthroat trout habitat is not clear at this time, but it may be the difference between their survival and extirpation.

11. There has probably been deterioration of the original channeling system through the golf course over its life of 50 years, thus reducing water collection efficiency for Roche Point Creek. This could be due to silting within the pipe and ditch network, deterioration of wood stave pipes or mechanical damage. This is suggested by the proposal within the “Long Range Golf Course Enhancement Program” that there be some wood stave pipe replacement.
12. Clearing and deepening the storm-water channel (SW on Figure 2) will improve water recharge to Roche Point Creek.
13. The salmonberry/wind-throw area of Roche Point Forest through which the storm-water channel flows, can be rehabilitated by the deepening of the channel.

Recommendations:

1. A flow augmentation study for Roche Point Creek should be undertaken with the cooperation of the Seymour Golf & Country Club.
2. The pattern and efficiency of the existing drainage system throughout the golf course should be assessed.
3. The feasibility of tapping ground water as a source for Roche Point Creek in times of no rain should be examined.
4. The possibility of increasing the efficiency of the present water collecting system over the golf course in order to capture more water for Roche Point Creek should be examined.
5. The main channel of Roche Point Creek (4 on Figure 2) should be reactivated for reasons of ecological enhancement and to reduce the flash-flood effect along Tributary 3 during peak rainfall periods.
6. The storm-water channel (SW on Figure 1) should be cleaned out where it passes through Roche Point Forest, and a more efficient connection established between it and Tributary 2 of Roche Point Creek. The drainage efficiency of this channel should be monitored on an ongoing basis, so that silting and consequent flooding into the adjacent forest does not occur again.
7. Damage or blockage in pipes or non-functioning drainage ditches should be identified and repaired. Under the proposed Long Range Golf Course Enhancement Program currently before the membership of the Seymour Golf & Country Club, proposals have been made to upgrade drainage associated with holes 1 to 9 and to replace wood stave pipes on holes 1 and 4. How this work relates to the hydrology of Roche Point Creek, if at all, is unknown to this writer.
8. The feasibility of engineering a slower release from ponds so that water flow into Roche Point Creek takes place over a longer period and does not occur as a short-lived flood as is now the case, should be examined.
9. In the light of the proposed \$2,950,000 Long Range Golf Course Enhancement Program presently before the Seymour Golf & Country Club membership, it would seem to be an opportune time to carry out such a study and upgrade of the hydrology of Roche Point Creek.

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Maps:

Figure 1: Original *Roche Point Creek Drainage Basin*. Map Courtesy of the Municipality of the District of North Vancouver (March 1977). Additions by D.L. Cook.

Figure 2: *Roche Point Creek and Environs. Zoning Map No 2P03*, Map Courtesy of the District of North Vancouver Planning Department (last revised July 21, 1999). Additions by D.L. Cook.

Photos:

Photo 1: *Golf Course Ditch and 5th Tee Pond Outlet*, which Drain Into Tributary 2 of Roche Point Creek. Looking North from Roche Point Forest towards the Golf Course.

Photo 2: *Cutthroat Trout Trapped in Roche Point Creek Pool*, June 18-19, 2002.