

CITY OF BURNABY
ENVIRONMENT AND WASTE MANAGEMENT COMMITTEE

HIS WORSHIP, THE MAYOR
AND COUNCILLORS

Re: Proposed Remedial and Enhancement Measures for
Eagle Creek in Association with the Discharges of Silt
from the Hastings/Gaglardi Connector Project

RECOMMENDATION

1. THAT Council approval the remedial and enhancement measures proposed to be undertaken by the B.C. Ministry of Transportation and Highways; and
2. THAT a copy of this report be forwarded to the Parks and Recreation Commission.

REPORT

At its meeting of 1996 June 11 the Environment and Waste Management Committee adopted the attached report advising of the B.C. Ministry of Transportation and Highways' proposed plan to remediate and enhance Eagle Creek.

Respectfully submitted,

Councillor D.P. Drummond
Chair

Councillor D. Johnston
Member

Councillor D.A. Lawson
Member

**COPY - CITY MANAGER
- DIRECTOR ENGINEERING
- DIRECTOR PLNG. & BLDG.
- DIRECTOR REC. & CULT. SERVICES
- CHIEF ENVIRONMENT HEALTH OFFICER**

TO: CHAIRPERSON AND MEMBERS
ENVIRONMENT AND WASTE
MANAGEMENT COMMITTEE

1996 JUNE 11

FROM: CHIEF ENVIRONMENTAL HEALTH OFFICER

SUBJECT: PROPOSED REMEDIAL AND ENHANCEMENT MEASURES FOR EAGLE
CREEK IN ASSOCIATION WITH THE DISCHARGES OF SILT FROM
THE HASTINGS/GAGLARDI CONNECTOR PROJECT.

PURPOSE: TO INFORM THE COMMITTEE OF B.C. MINISTRY OF
TRANSPORTATION AND HIGHWAYS' PROPOSED PLAN TO REMEDIATE
AND ENHANCE EAGLE CREEK.

RECOMMENDATIONS:

1. THAT the Committee recommend to Council approval of the remedial and enhancement measures proposed to be undertaken by the B.C. Ministry of Transportation and Highways; and
2. THAT a copy of this report be forwarded to Parks and Recreation Commission.

REPORT

1.0 INTRODUCTION:

At the regular Council Meeting on 1996 May 06, Council adopted a Motion requesting staff to report to the Environment and Waste Management Committee on the Ministry of Transportation and Highways (MOTH) plan for the stream restoration work in Eagle Creek and that the consultation on the restoration proposal includes stakeholders such as B.C.I.T. and the Sapperton Fish and Game Club.

The following report responds to the noted Motion.

2.0 B.C. MINISTRY OF TRANSPORTATION AND HIGHWAYS' PROPOSED
REMEDIAL AND ENHANCEMENT OPPORTUNITIES FOR EAGLE CREEK:

Staff have met twice with officials from the MOTH and Federal Department of Fisheries and Oceans (DFO) to address outstanding issues relating to the discharges of silt into Eagle Creek from the Hastings/Gaglardi Connector Project. During the discussions, all parties agreed to the sensitivity in protecting, enhancing and restoring the impacted areas of Eagle Creek.

As a result, the MOTH has committed to remediate and restore the upper reaches of Eagle Creek (upstream of Squint Lake) which were impacted by the movement and deposition of sand and fine substrates from the Hastings/Gaglardi Connector Project. The MOTH has also agreed to identify enhancement opportunities in the lower reaches of Eagle Creek (down stream of Squint Lake), and investigate into the feasibility of undertaking some of the enhancement works. The remaining identified enhancement areas would assist other stakeholders in developing a restoration plan for the lower Eagle Creek System in the future.

A letter report identifying the remedial and enhancement opportunities in consultation with key stakeholders was prepared by Coast River Environmental Services Ltd. on behalf of MOTH and circulated to the City and DFO for their comments (see Attachment #1).

3.0 STAFF COMMENTS ON PROPOSED REMEDIAL AND ENHANCEMENT OPPORTUNITIES FOR EAGLE CREEK:

Staff from Engineering, Planning, Parks and Environmental Health Departments have reviewed the noted letter report and provide the following comments regarding the proposed remedial works and enhancement opportunities noted in the report:

3.1 Proposed Remedial Works

Staff concur with the proposed sites requiring remedial works (removal of excessive sediments: sands and fine substrates) in the upper reaches of Eagle Creek (upstream of Squint Lake). In addition, there is a general consensus that the installation of temporary sediment traps which will remain on site for a period of one year and located in areas where they can be easily accessed and cleaned would be least disruptive to the stream ecosystem.

Staff further agree with the MOTH that these proposed remedial works must be undertaken by MOTH during the fisheries instream work window this summer (July 15 to September 15).

Mr. Tom Tasaka, Project Director, Hastings/Gaglardi Connector Project has provided staff with a verbal committment to remove any accumulations of sediment on the bottom of Squint Lake and restore it to the state prior to it being impacted by discharges from their project. This is in addition to MOTH's previous committment to remove accumulated sand at the inlet of Squint Lake. Both of the remedial measures are proposed to be undertaken during the instream work window in 1996.

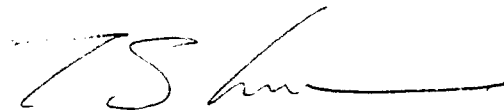
3.2 Proposed Enhancement Opportunities

Staff from MOTH, in consultation with DFO and the City, have identified four enhancement projects (E10, E12, E15, E17) in the lower reaches which they would like to undertake or sponsor in principle during this summer's fisheries instream window as a contribution to the long term restoration of the Eagle Creek system. In the event technical difficulties arise in undertaking any of these enhancement projects, MOTH has provided their committment to undertake or sponsor other equivalent enhancement opportunities upon discussions with DFO and City staff.

The remaining enhancement opportunities which were identified between MOTH and B.C.I.T. will serve as a guiding document for key stakeholders to further discuss and develop a comprehensive restoration/ enhancement plan for the lower Eagle Creek system.

4.0 CONCLUSION:

Staff have secured the commitment of the MOTH to fully remediate and restore the areas in Eagle Creek adversely impacted by the discharges of silt from the Hastings/Gaglardi Connector Project. In addition to identifying the remedial works in the upper reaches of Eagle Creek, the MOTH is also proposing to undertake or sponsor four enhancement projects. Staff have reviewed the proposed remediation, restoration, and enhancement works and concurred with the locations, methodologies, and the times that these works should be undertaken.



Tim Shum
CHIEF ENVIRONMENTAL HEALTH OFFICER

DD/TS/gl

Attachments

- cc: () City Manager
() Deputy City Manager
Corporate Labour Relations
() Director Engineering
() Director Planning & Building
() Director Recreation &
Cultural Services
() Medical Health Officer



COAST RIVER ENVIRONMENTAL SERVICES LTD

Fisheries Biology
Impact Assessment
Coastal Zone and
Watershed Management
Environmental Education

June 10, 1996

Greg Czernick
Highway Environment Branch
Ministry of Transportation and Highways
4W - 940 Blanshard Street
Victoria, B.C.
V8W 3E6

Dear Greg:

RE: Overview Assessment of Eagle Creek, Burnaby, B.C.

At your request, Coast River Environmental Services Ltd. has completed an overview assessment of Eagle Creek in Burnaby, B.C. to identify appropriate locations and methods to remediate the impact of recent sand and fine sediment accumulations upstream from Squint Lake. In addition, this report describes habitat restoration and enhancement opportunities throughout the system. The specific remediation works that will be undertaken by the Ministry of Transportation and Highways (MoTH) are restricted to the upper reaches of the system (upstream of Squint Lake) where sediment has accumulated. MoTH, through an interactive process with the Department of Fisheries and Oceans (DFO) and other stakeholder groups (including the City of Burnaby), has identified four restoration projects in the lower watershed which it would like to undertake or sponsor as a contribution to the long-term restoration of the Eagle Creek system. Additional restoration and enhancement opportunities which were identified as part of this study are also included in this report. It is hoped that the prioritized list of additional enhancement opportunities will be useful to the City of Burnaby, BCIT, and the other groups involved in the Burnaby Lake System Project in developing a long-term restoration plan for Eagle Creek.

Most of the sand and fine substrates introduced into the system appear to have originated during a culvert blockage and subsequent slope failure that occurred along an upper tributary to Eagle Creek on January 12, 1996. Some material was likely introduced before and after this event; however, these sources appear to be relatively minor in comparison to the early January event. The Hastings-Gaglardi Connector site is currently stable with hydroseeded or sodded cut and fill slopes, additional ditches, rock lined drainage channels, and paving and

curbs are also in place. In addition, the following measures were undertaken to ensure the stability of the fill slope south of Curtis Street (see Coast River memorandum of May 28, 1996):

1. Accumulations of fine sediments were removed from the base of the slope;
2. A berm of granular material was constructed at the toe of the slope to increase the slope's stability;
3. The slope was trimmed, regraded (to 1.5 to 1), and compacted; and,
4. Sod was laid over the regraded slope to ensure immediate vegetative cover.

In addition, all permanent slope and drainage control measures will be in place at the project's completion to ensure its long term stability.

Eagle Creek

Eagle Creek is the third largest tributary of the Brunette River system. It originates in a complex network of headwater tributaries that drain the upper slopes of the southwest side of Burnaby Mountain (see Fig. 1). Many of the headwater tributaries are characterized by high channel gradient and an ephemeral or intermittent flow regime. While most of the upper tributaries remain as open channels, several, especially to the west, are contained within the City of Burnaby storm drainage system. Short sections are also culverted under the Hastings-Gaglardi Connector and Curtis Street upslope of the present residential area.

Several of the larger tributaries join in Squint Lake Park and flow south into Squint Lake. Instream habitat above Squint Lake is relatively complex with a well defined pool/riffle ratio, moderate gradient, undercut banks, and large boulders. Downstream of Squint Lake, Eagle Creek is confined within a forested ravine which has been infilled to accommodate a fairway at the southern boundary of the golf course and to provide a crossing site for Broadway Avenue. Between Broadway Avenue and Lougheed Highway, the channel flows south through a forested ravine with residential development to the west and industrial development to the east. Downstream from Lougheed Highway, the stream channel is lower in gradient and not confined within a ravine. Residential development dominates the lower reaches between Lougheed Highway and Burnaby Lake. Portions of the stream have been channelized and straightened with many areas lacking riparian vegetation. A section of stream between Lougheed Highway and Government Street flows

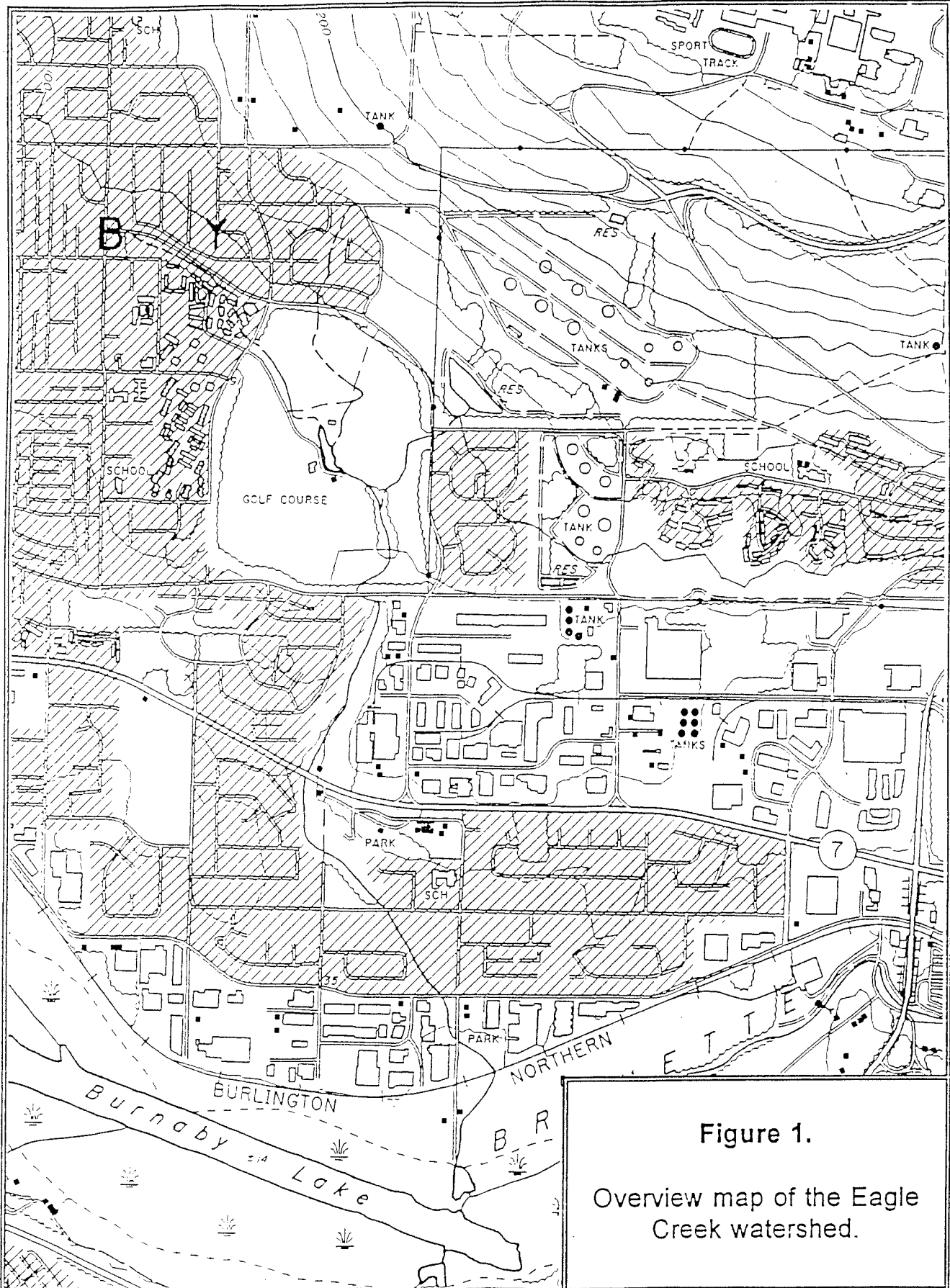


Figure 1.
 Overview map of the Eagle
 Creek watershed.

through a municipal park which has buffered urban encroachment into the stream corridor. As well, sections within Warner Loat Park and Burnaby Lake Regional Park provide good rearing and spawning habitat for salmonids.

Fish use in the Eagle Creek system can be divided into two distinct sections based on access. The upper section, which includes Squint Lake and approximately 800 m of stream channel, is currently inaccessible to anadromous fish species due to a steeply sloped, 120 m long culvert beneath Broadway Avenue and a portion of the golf course. As well, the high gradient of the stream immediately above the Broadway culvert may obstruct or preclude fish passage under some flow conditions. However, cutthroat trout (*Oncorhynchus clarki*) occur in, and upstream of, Squint Lake which suggests that fish access was possible historically, or that the upper reaches were stocked at some time in the past. In addition, nonanadromous western brook lamprey (*Lampetra richardsoni*) were observed above Squint Lake during several stream walks. Coho salmon (*O. kisutch*) and cutthroat trout fry have been outplanted into Eagle Creek above Squint Lake by the Department of Fisheries and Oceans through a recent salmonid enhancement initiative.

The lower section of Eagle Creek extends from Burnaby Lake to Broadway Avenue and is accessible to anadromous salmonids (B. Gunn, pers. comm.). Juvenile coho and cutthroat trout have been documented in the lower reaches of the stream, and adult coho spawners have been enumerated by BCIT students for several years. Three-spine stickleback (*Gasterosteus aculeatus*) and sculpin species (*Cottus spp.*) have also been captured during sampling programs. Hatchery raised juvenile coho have been released into the lower section of the stream by DFO's salmonid enhancement program.

Remediation Measures

The intent of the remediation measures is to remove sand that has accumulated in the Eagle Creek channel through localized small scale excavation or by installing sediment traps to capture sand as it migrates downstream toward Squint Lake. The majority of these measures should be undertaken in the short term (i.e., June/July 1996); however, several issues, such as the removal of accumulated sand at the inlet to Squint Lake and within the section of Eagle Creek immediately upstream from the inlet, will need to be addressed during the fisheries instream work window (i.e., August - September 1996).

Our field observations suggest that most of the sand introduced by sediment transport and erosion at the Hastings-Gaglardi Connector site has already

moved through the higher gradient headwater tributaries and settled in the lower gradient section of Eagle Creek at the inlet of Squint Lake. Sand deposition is also evident within the stream channel and along the banks of the west and central tributaries where small debris jams, pools, or other instream features have reduced velocities.

In our opinion, removing isolated pockets of sand will be extremely difficult and could cause considerable damage to stream banks and riparian vegetation if machine access needs to be created. However, we do recommend removal of excess sand at a number of specific sites where temporary sediment traps can be created at existing trail and roadway access points. A summary list of remediation measures is presented in Table 1. In addition, Figure 2 shows the location of remediation sites and representative site photos are shown in an attachment to this report.

Sediment Traps

Sediment traps function by intercepting fine sediments and sand as it moves downstream under normal flows. We recommend the sediment traps described in the following section be constructed of synthetic fabric bags filled with clean gravel or drain rock. In this case, we recommend that suitable substrate for cutthroat trout spawning be used to fill the bags (6 to 50 mm in diameter). From our experience, the use of drainrock filled bags has several advantages including:

1. Weirs can be constructed by hand with minimal damage to the stream bed and banks;
2. The height of the weir can be modified once its effectiveness under different flows is determined;
3. Lateral bank erosion or undercutting can be prevented by extending the side of the weir up the bank and by maintaining a well defined low flow notch at the thalweg; and,
4. After the weir is no longer useful, the bags can be split and the drain rock added to the existing stream bed substrates.

The drainrock bag weirs will be installed during the 1996 instream work window and remain in place for one year. They will be monitored and maintained monthly during this period. Sediment will be removed during early September 1996 and 1997 during the instream work window if significant accumulations have occurred. The weirs will then be removed if they are no longer required, or continue to be maintained if necessary.

Table 1. Summary of remediation measures in the upper reaches of Eagle Creek.

Site No.	Priority	Issue	Description
R1	high	sand removal, sediment trap creation (weir)	manhole installation, culvert clean-out, creation of sediment trap at culvert outlet using drainrock bags
R2	high	sediment trap creation (weir)	creation of a sediment trap at culvert outlet using drainrock
R3	high	sand removal	removal of sand buildup under pedestrian bridge
R4	high	sediment trap creation (weir)	creation of a sediment trap at culvert outlet using drainrock
R5	high	sediment trap creation (weir)	creation of a sediment trap at culvert outlet using drainrock
R6	high	sand removal	removal of sand from 40 m section upstream from Squint Lake
R7	high	sand removal	removal of sand from Squint Lake at creek inlet

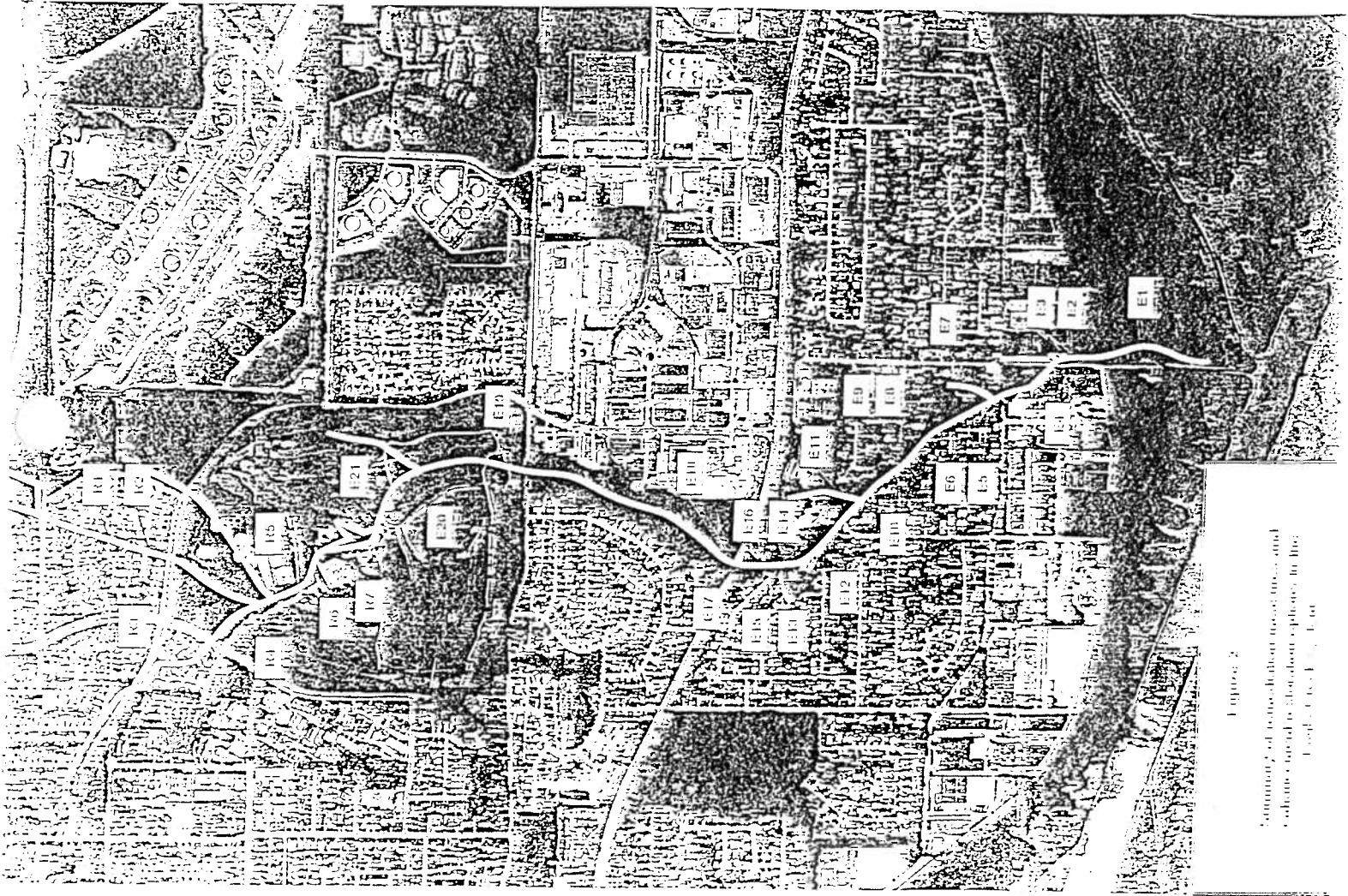


Figure 2

Summary of research that traces and
 evaluates the role of street systems in the
 development of cities.

Remediation Sites

We recommend the following specific remediation measures be undertaken:

- R1. At the Trans-Mountain pipeline site, a manhole should be installed to facilitate removal of accumulated sand within the stormwater bypass culvert. A drainrock bag weir should also be installed at the outlet of the culvert to trap sediment. The manhole, culvert cleaning, and weir installation should be undertaken as soon as possible with the necessary DFO/MELP approvals in place. Removal of accumulated sediments from the sediment trap weir will be undertaken in late August or early September 1996. We do not recommend installation of a permanent sediment trap at this site because of the risk of disrupting natural sediment transport within Eagle Creek (i.e., spawning gravels).
- R2. A drainrock bag weir should be installed downstream of the culvert outlet to prevent backwatering of the culvert. Removal of accumulated sediments will be undertaken during the instream work window (July 15 to September 15) in isolation of flow. In addition, we recommend that approximately 25 riparian trees and shrubs be planted to replace those removed during emergency channel clean-out. Planting will conform to the MELP planting criteria.
- R3. Sand that has accumulated upstream of a small debris jam should be removed beneath the pedestrian bridge. This should be undertaken by hand or with a suction dredge with proper approvals and controls in place (i.e., isolation of flow).
- R4. Two partially spanning drainrock bag weirs should be installed upstream of the pedestrian bridge to trap sediment. Accumulated sediment will be removed at the end of the instream work window (July 15 to September 15). A full spanning weir was not recommended by DFO because of the close proximity of the Shell Canada oil line that could be damaged during clean-out work.
- R5. A drainrock bag weir should be installed upstream of the road crossing that leads to the Squint Lake Park tennis courts. Accumulated sediment will be removed during the instream work window (July 15 to September 15).

- R6. Accumulated sand in Eagle Creek immediately upstream of Squint Lake (between the outlet culvert which is located under the service yard access road and the pipeline crossing located approximately 45 m upstream) should be carefully cleaned out during the instream work window (July 15 to September 15) by either suction dredge or by hand. Initially we recommended that machine access to the channel could be accomplished if 4 to 6 riparian trees were removed. The advantage to this approach is that fill within the stream ravine could be pulled back and the entire area replanted following completion of the work. However, the City of Burnaby has indicated that machine access is unacceptable. One alternative may be to lift a small machine (i.e., Bobcat) into the channel or use hoses to wash sand into Squint Lake where it can be removed by machine.

Whatever method is ultimately selected to remove sand from this section of stream, the following general criteria will be applied:

1. All instream work must be undertaken in isolation of flowing or standing water using diversion dams, flexible piping, or pumps;
 2. Changes in water quality (e.g., turbidity) in Squint Lake must meet or exceed standards outlined in the *Land Development Guidelines for the Protection of Aquatic Habitat* (DFO/MELP); and,
 3. Riparian vegetation must not be damaged or removed unless formal approval has been obtained from DFO and the City of Burnaby.
- R7. Accumulated sand at the inlet of Squint Lake (immediately downstream from the service road crossing) will be removed during the instream work window in 1996. It appears practical to use a long-boomed excavator to remove sand from shore if the works can be undertaken in isolation from flowing or standing water. Sediment curtains may be another acceptable alternative. A temporary rock pad may need to be constructed on the western shore of the lake to provide a stable work site for an excavator. Any vegetation removed during this operation will be replaced by native riparian trees and shrubs following completion of the works. Planting will conform to the MELP planting criteria. Sediment removal at the inlet of Squint Lake will not address any sand accumulations on the bottom of Squint Lake which are not considered to present a fish habitat issue. This issue will be addressed separately between MoTH and the City of Burnaby.

Restoration and Enhancement Opportunities

In order to place the upper reaches of Eagle Creek into an appropriate fish habitat context, it was necessary to inspect all of Eagle Creek downstream from the project site. Although Eagle Creek downstream from Squint Lake was not impacted by sediment deposition from the project site, we documented several opportunities to restore or enhance fish habitat in the lower reaches of Eagle Creek. Specific enhancement sites were identified in consultation with Bob Gunn of the BCIT Fish and Wildlife program. Table 2 summarizes potential restoration and enhancement opportunities and Figure 2 shows the location of sites. It is important to note that fish habitat concerns were the primary factor in determining these opportunities; concerns such as hydraulic capacity of the channel or culverts, land ownership, and technical feasibility are not addressed in this report. These issues will need to be addressed by future stakeholders who wish to undertake enhancement work. In addition, a number of important problems that stem from urbanization of the watershed such as degraded water quality and the effect of impervious surfacing on the hydrologic regime, are not discussed in this report. However, these factors should be addressed by a watershed level management program.

Restoration and enhancement options can be divided into the following classes:

- removal, replacement, or modification of fish passage barriers including culverts and weirs;
- revegetation of unforested or poorly vegetated riparian areas;
- removal or modification of bank armoring to allow for natural lateral stream migration and re-establish natural floodplain areas;
- enhancement or creation of wetlands to increase detention capacity and/or biofiltration processes;
- construction of off-channel ponds to create high water refuge habitat; and,
- installation of instream structures (i.e., logs, boulders) to increase channel complexity.

Specific Enhancement Projects

After reviewing the results of the preliminary restoration and enhancement review with DFO and the City of Burnaby, MoTH has indicated that it wishes to undertake or sponsor the following enhancement projects.

1. E12 (Charles Rummel Park) - Modification of concrete weir to create

- R6. Accumulated sand in Eagle Creek immediately upstream of Squint Lake (between the outlet culvert which is located under the service yard access road and the pipeline crossing located approximately 45 m upstream) should be carefully cleaned out during the instream work window (July 15 to September 15) by either suction dredge or by hand. Initially we recommended that machine access to the channel could be accomplished if 4 to 6 riparian trees were removed. The advantage to this approach is that fill within the stream ravine could be pulled back and the entire area replanted following completion of the work. However, the City of Burnaby has indicated that machine access is unacceptable. One alternative may be to lift a small machine (i.e., Bobcat) into the channel or use hoses to wash sand into Squint Lake where it can be removed by machine.

Whatever method is ultimately selected to remove sand from this section of stream, the following general criteria will be applied:

1. All instream work must be undertaken in isolation of flowing or standing water using diversion dams, flexible piping, or pumps;
 2. Changes in water quality (e.g., turbidity) in Squint Lake must meet or exceed standards outlined in the *Land Development Guidelines for the Protection of Aquatic Habitat* (DFO/MELP); and,
 3. Riparian vegetation must not be damaged or removed unless formal approval has been obtained from DFO and the City of Burnaby.
- R7. Accumulated sand at the inlet of Squint Lake (immediately downstream from the service road crossing) will be removed during the instream work window in 1996. It appears practical to use a long-boomed excavator to remove sand from shore if the works can be undertaken in isolation from flowing or standing water. Sediment curtains may be another acceptable alternative. A temporary rock pad may need to be constructed on the western shore of the lake to provide a stable work site for an excavator. Any vegetation removed during this operation will be replaced by native riparian trees and shrubs following completion of the works. Planting will conform to the MELP planting criteria. Sediment removal at the inlet of Squint Lake will not address any sand accumulations on the bottom of Squint Lake which are not considered to present a fish habitat issue. This issue will be addressed separately between MoTH and the City of Burnaby.

Restoration and Enhancement Opportunities

In order to place the upper reaches of Eagle Creek into an appropriate fish habitat context, it was necessary to inspect all of Eagle Creek downstream from the project site. Although Eagle Creek downstream from Squint Lake was not impacted by sediment deposition from the project site, we documented several opportunities to restore or enhance fish habitat in the lower reaches of Eagle Creek. Specific enhancement sites were identified in consultation with Bob Gunn of the BCIT Fish and Wildlife program. Table 2 summarizes potential restoration and enhancement opportunities and Figure 2 shows the location of sites. It is important to note that fish habitat concerns were the primary factor in determining these opportunities; concerns such as hydraulic capacity of the channel or culverts, land ownership, and technical feasibility are not addressed in this report. These issues will need to be addressed by future stakeholders who wish to undertake enhancement work. In addition, a number of important problems that stem from urbanization of the watershed such as degraded water quality and the effect of impervious surfacing on the hydrologic regime, are not discussed in this report. However, these factors should be addressed by a watershed level management program.

Restoration and enhancement options can be divided into the following classes:

- removal, replacement, or modification of fish passage barriers including culverts and weirs;
- revegetation of unforested or poorly vegetated riparian areas;
- removal or modification of bank armoring to allow for natural lateral stream migration and re-establish natural floodplain areas;
- enhancement or creation of wetlands to increase detention capacity and/or biofiltration processes;
- construction of off-channel ponds to create high water refuge habitat; and,
- installation of instream structures (i.e., logs, boulders) to increase channel complexity.

Specific Enhancement Projects

After reviewing the results of the preliminary restoration and enhancement review with DFO and the City of Burnaby, MoTH has indicated that it wishes to undertake or sponsor the following enhancement projects.

1. E12 (Charles Rummel Park) - Modification of concrete weir to create

Table 2. Summary of enhancement and restoration opportunities in the lower reaches of Eagle Creek.

Site No.	Priority	Issue	Description
E1	low	fish passage	removal of plywood bank protection
E2	moderate	lack of riparian vegetation	riparian revegetation, east and west banks - Warner Loat Park
E3	low	channel confinement	reduce or remove bank armour, east and west banks - Warner Loat Park
E4	unknown	culvert upgrade	culvert replacement by City of Burnaby in 1996; ensure fish passage and bedload movement
E5	moderate	lack of riparian vegetation	riparian revegetation, east and west banks - residential properties
E6	moderate	channel confinement	reduce or remove bank armour, east and west banks
E7	low	wetland infilling	wetland restoration / enhancement; check on water quality issues, technical feasibility
E8	moderate	lack of riparian vegetation	riparian revegetation, east and west banks - residential properties
E9	moderate	channel confinement	reduce or remove bank armour, east and west banks
E10	high / mod.	passage obstruction	concrete inlet to culvert potential velocity barrier
E11	moderate	wetland infilling	potential wetland enhancement; biofiltration wetland creation; check on water quality issues, technical feasibility
E12	moderate	passage obstruction	backwatering or modification of double concrete weir
E13	moderate	lack of riparian vegetation	riparian revegetation along recreational trail, east bank
E14	moderate	lack of riparian vegetation	riparian revegetation along recreational trail, east bank riparian revegetation - private residential property
E15	high	passage obstruction	construction of low flow notch and backwater outlet control structure to ensure fish passage
E16	low	wetland infilling	potential wetland enhancement; biofiltration wetland creation
E17	moderate	passage obstruction	backwater outlet control structure - remove wood debris - Lougheed Highway culvert
E18	low	off-channel pond	creation of off-channel pond - private residential property
E19	high?	fish passage barrier	unknown if fish passage occurred historically; provision of fish passage when culvert is replaced?; cost and technical feasibility to be determined
E20	low	ravine stabilization	installation of control points to reduce channel downcutting; City of Burnaby undertaking work in 1996?
E21	low	passage barrier	Squint Lake weir - modification of weir or installation of fish ladder; not a priority if Broadway culvert not fish passable

Greg Czernick
June 10, 1996
Page 12

- low flow notch (i.e., installation of concrete or wood curb, removal of concrete to create notch);
2. E15 (Kraft Place?) - Installation of wood or concrete curb to create low flow notch and construction of a boulder weir to create an outlet pool below concrete spillway; and,
 3. E17 (Lougheed Highway) - Removal of loose debris and construction of a boulder weir to create an outlet pool below concrete spillway.

In addition, MoTH will undertake further work on Site E10 (Government St. culvert). The intake structure to this culvert was qualitatively identified as a velocity barrier to fish passage under high flows. More work will be needed to confirm this and determine the technical feasibility of removing or modifying the structure. Site E18 was identified by DFO as an appropriate site for off-channel pool creation; however, the City of Burnaby has concerns for the work in this area. As well, because it is privately owned, there may be long delays in securing approval from the owner.

As a next step in the process, enhancement opportunities which have been identified but which will not be undertaken as part of this project will be extracted from this document and provided to the City of Burnaby, DFO, MELP, G.V.S.&D.D., and BCIT - Fish and Wildlife. It is hoped that these stakeholder groups will, at some time in the future, develop an implementation plan for these additional restoration/enhancement projects in the lower watershed. MoTH has submitted a MELP Planning and Assessment application for approval to undertake the identified urgent remedial instream works as soon as possible.

If you have any questions or require additional information, please do not hesitate to contact me at 879-5593.

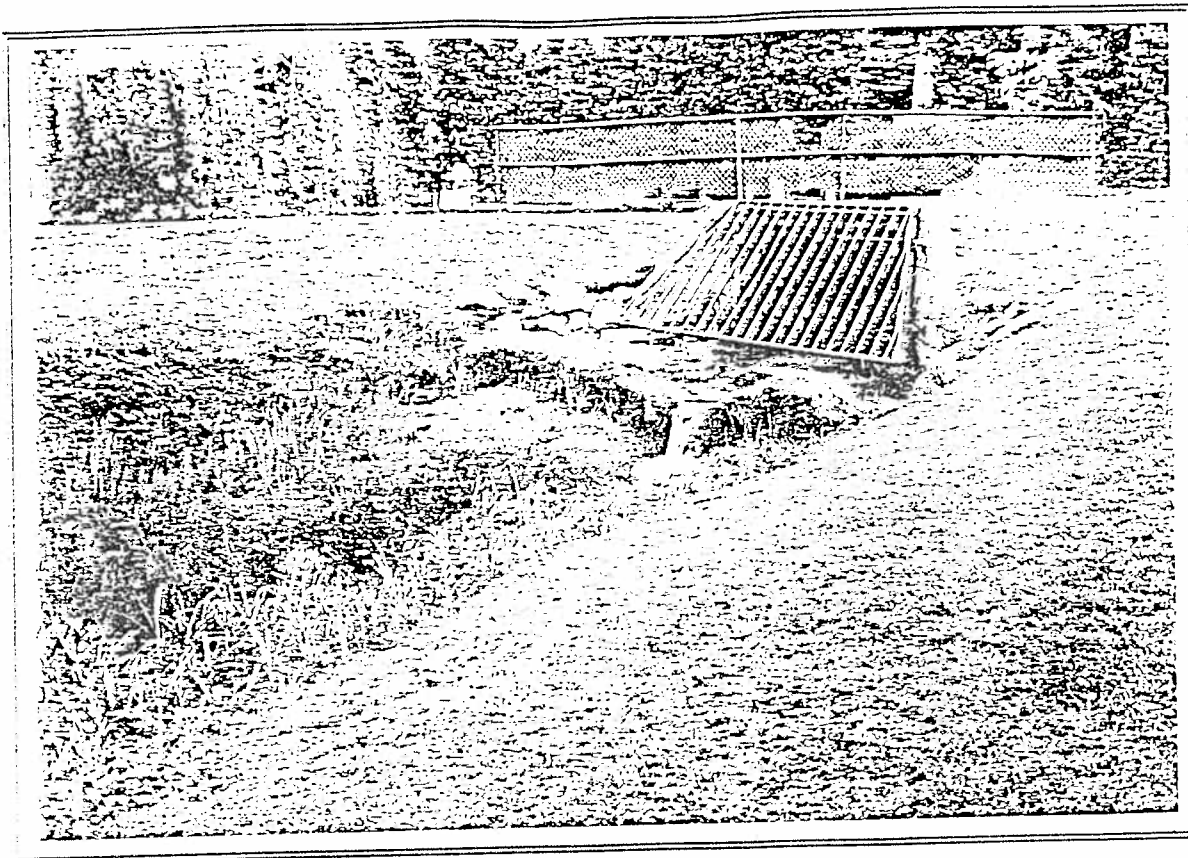
Sincerely,
COAST RIVER ENVIRONMENTAL SERVICES LTD.

John Millar, R.P.Bio.
Principal

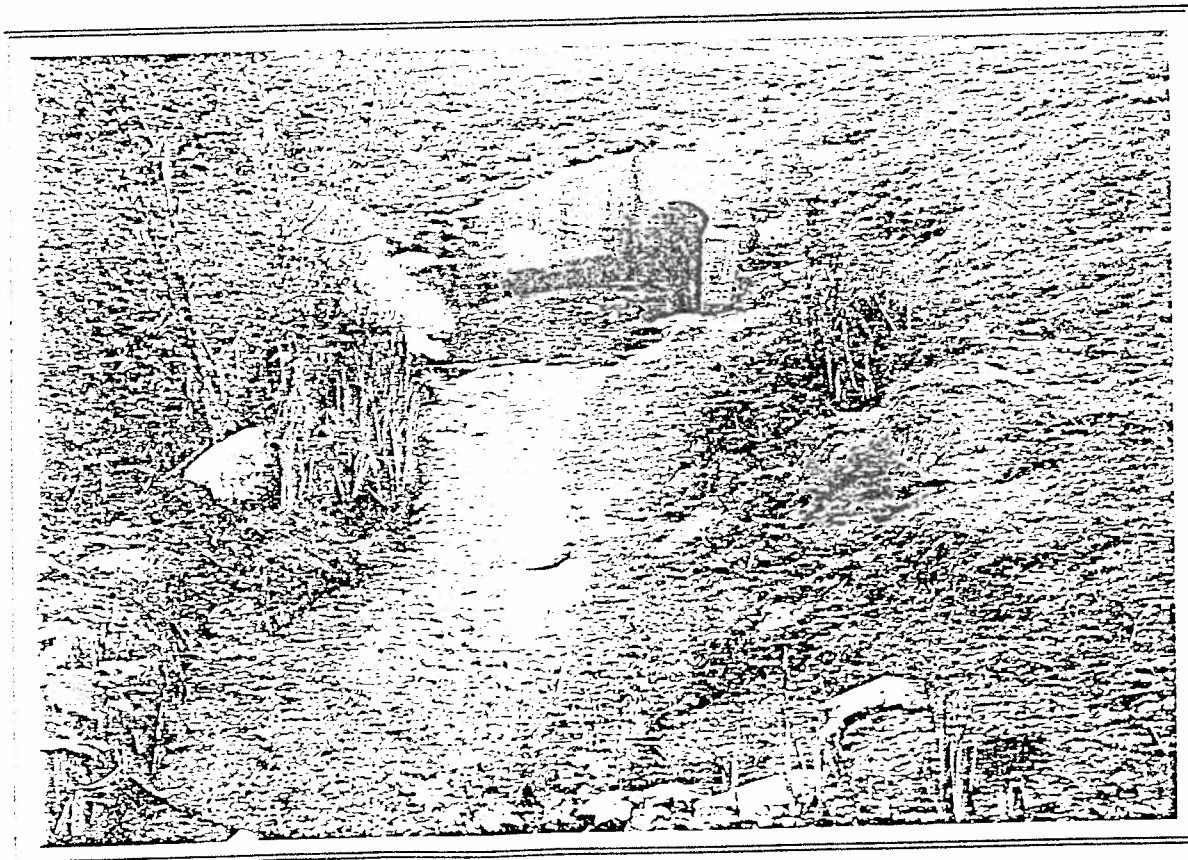
cc: Tom Tasaka - MoTH
Terry Walton - MoTH
Bruce Reid - DFO
Karen Calla - DFO
Tim Shum - City of Burnaby
attachment: representative site photos

PHOTOGRAPHS

REMEDIATION SITES



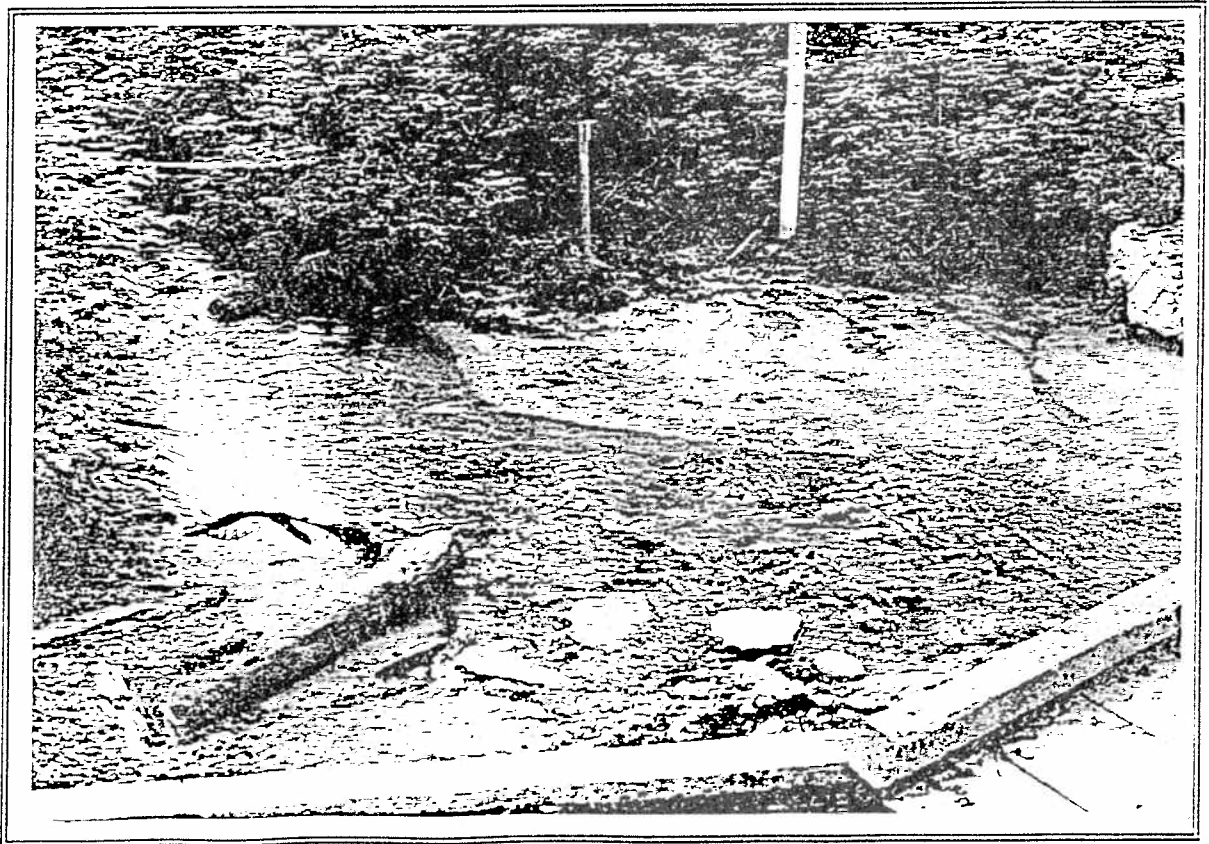
Site R1. Removal of sand from outlet pool and bypass culvert. Installation of sediment trap weir.



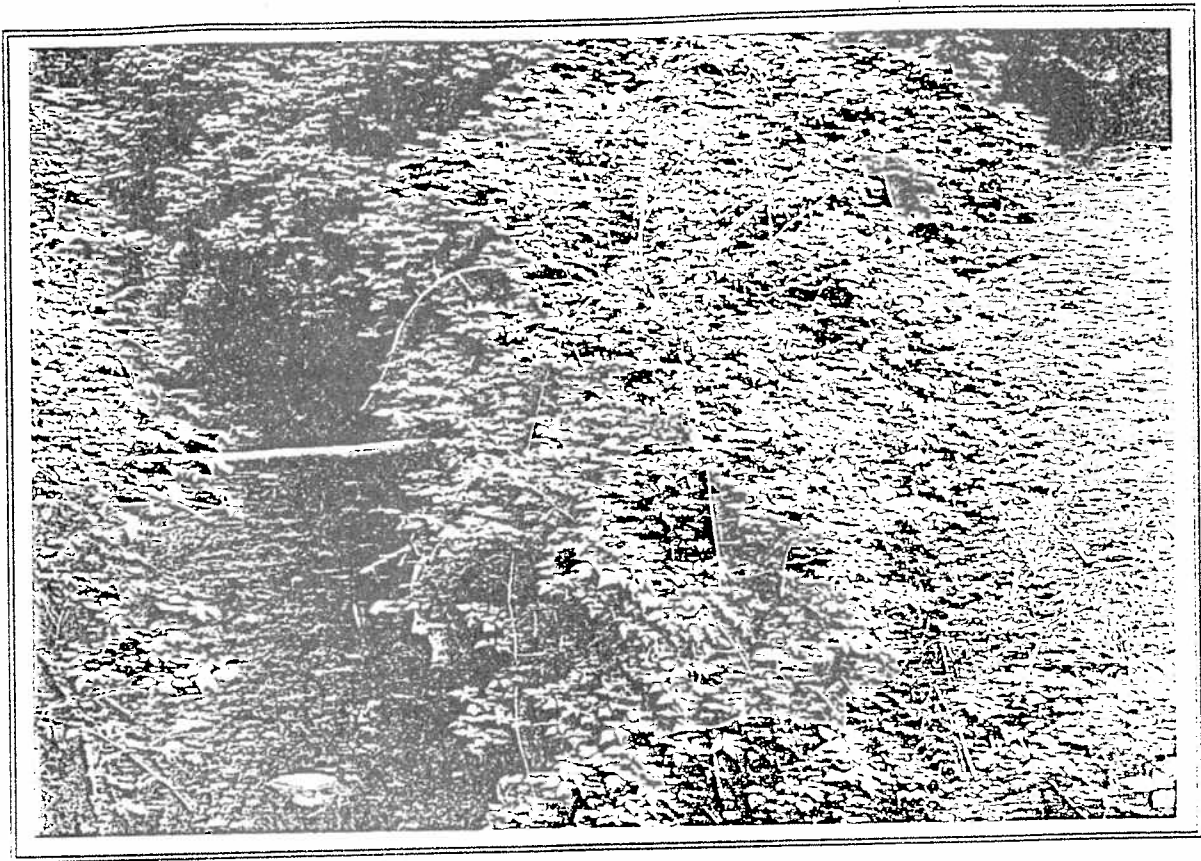
Site R2. Installation of sediment trap weir downstream of culvert outlet.



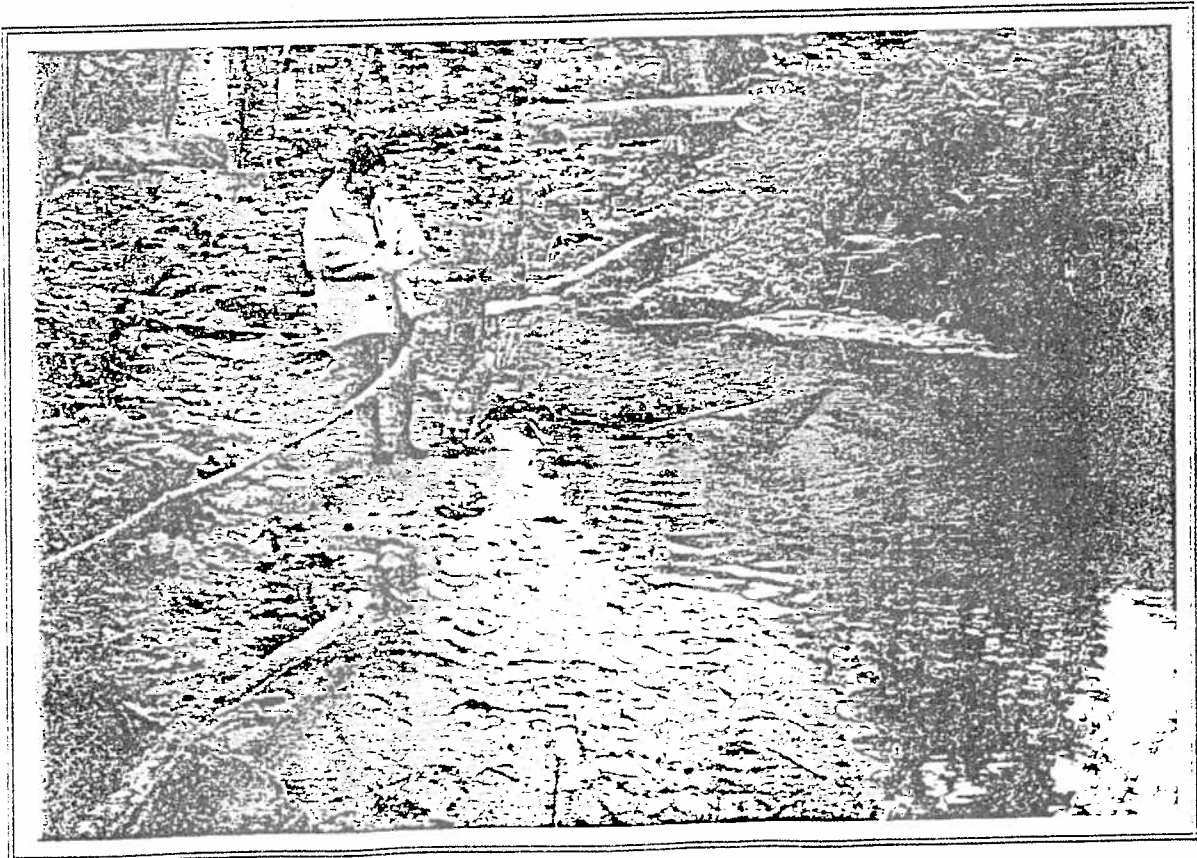
Site R3. Removal of accumulated sand below pedestrian bridge.



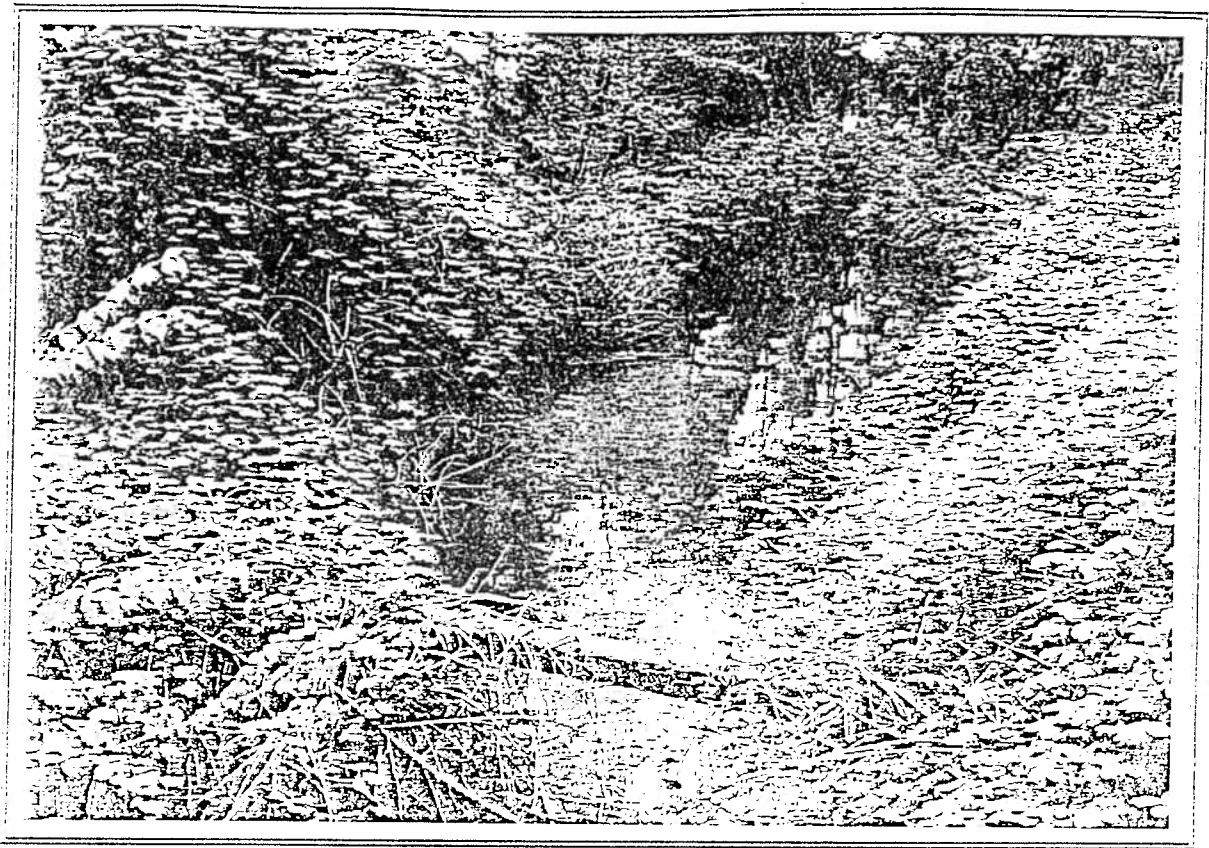
Site R4. Installation of sediment trap weir upstream of pedestrian bridge.



Site R5. Installation of sediment trap weir above culvert inlet.



Site R6. Removal of sand from creek channel upstream of Squint Lake.



Site 37. Removal of accumulated sand from Squint Lake inlet.

PHOTOGRAPHS

ENHANCEMENT / RESTORATION SITES

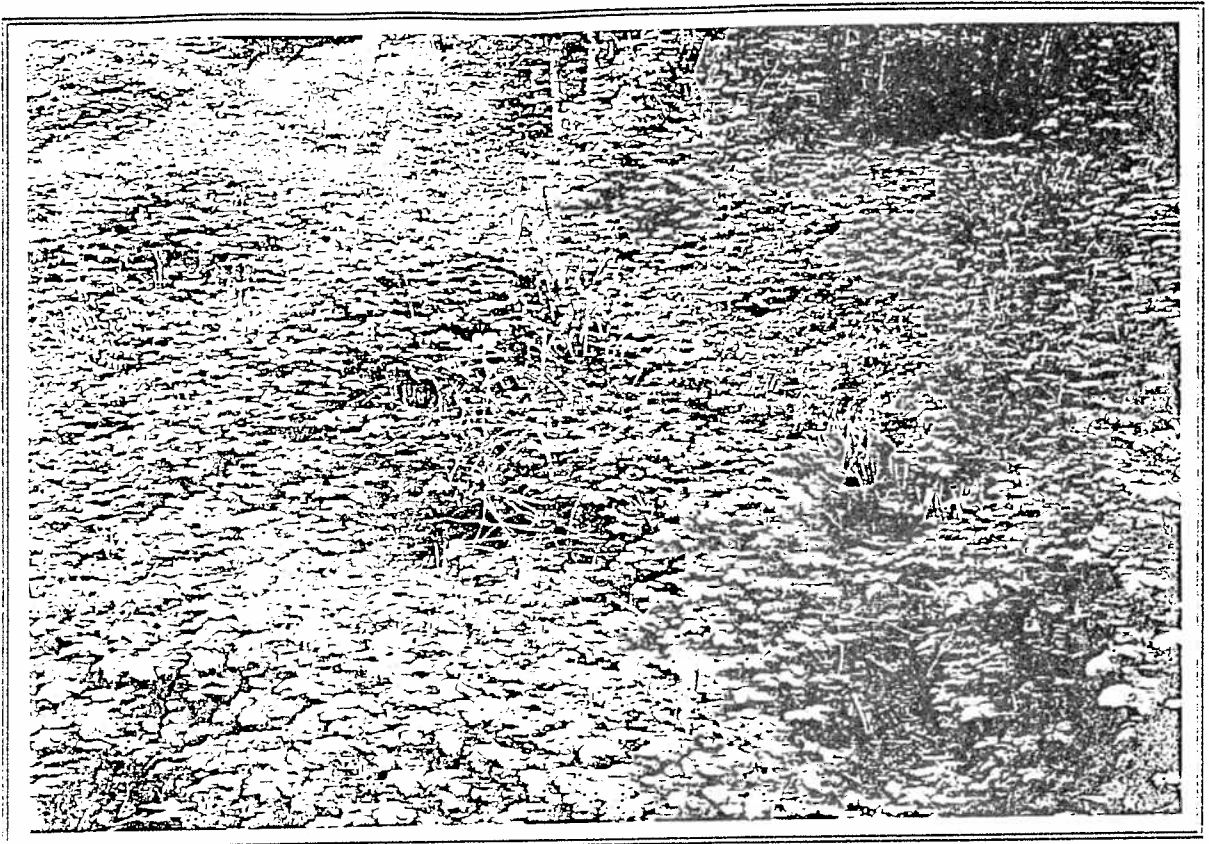


FIG. 11. Wetland area could be restored or enhanced for stormwater biofiltration or detention storage.

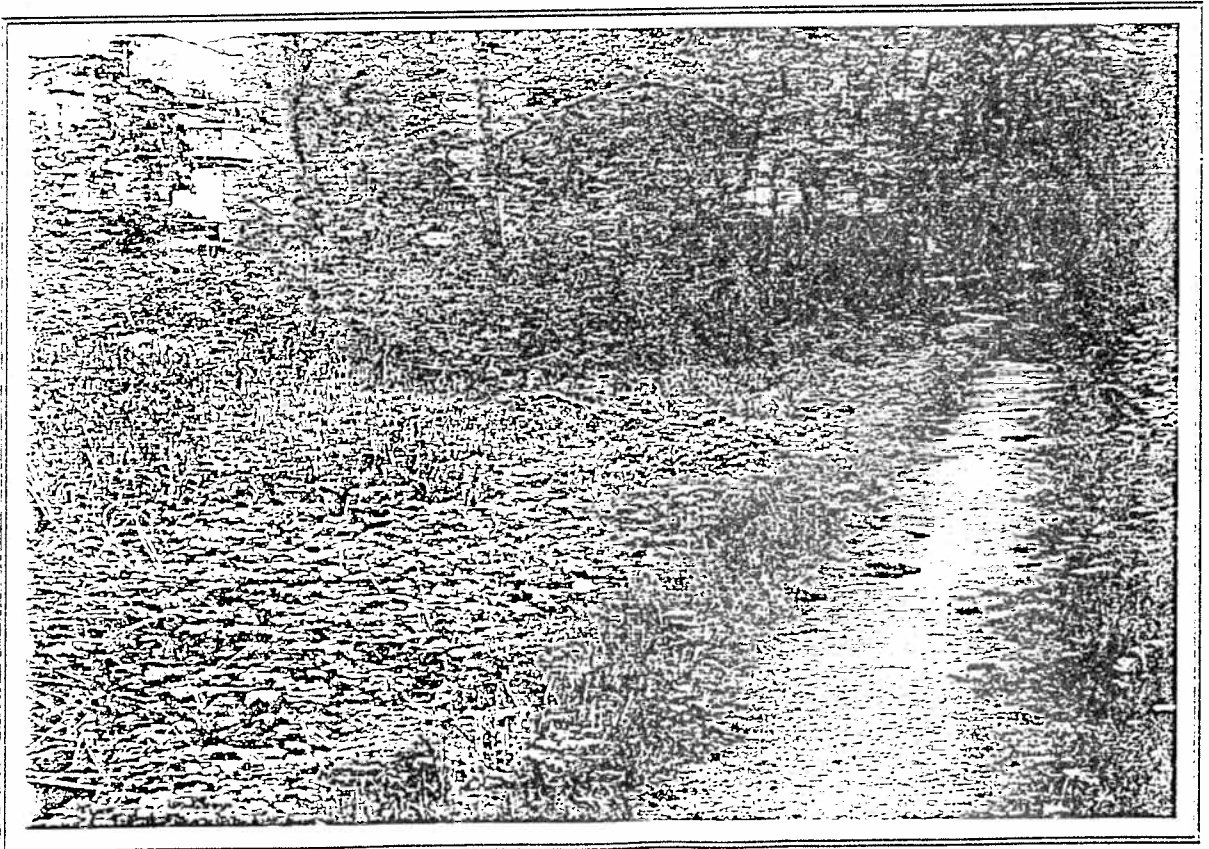
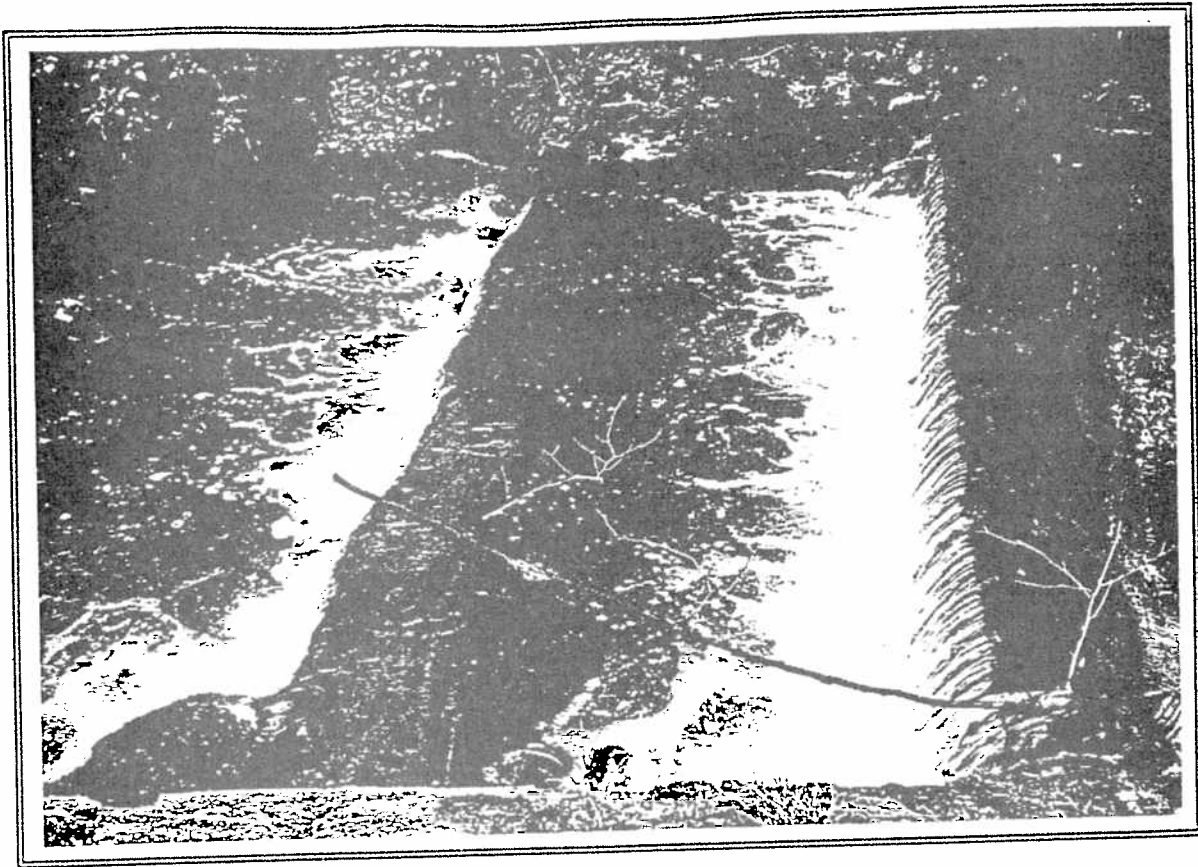
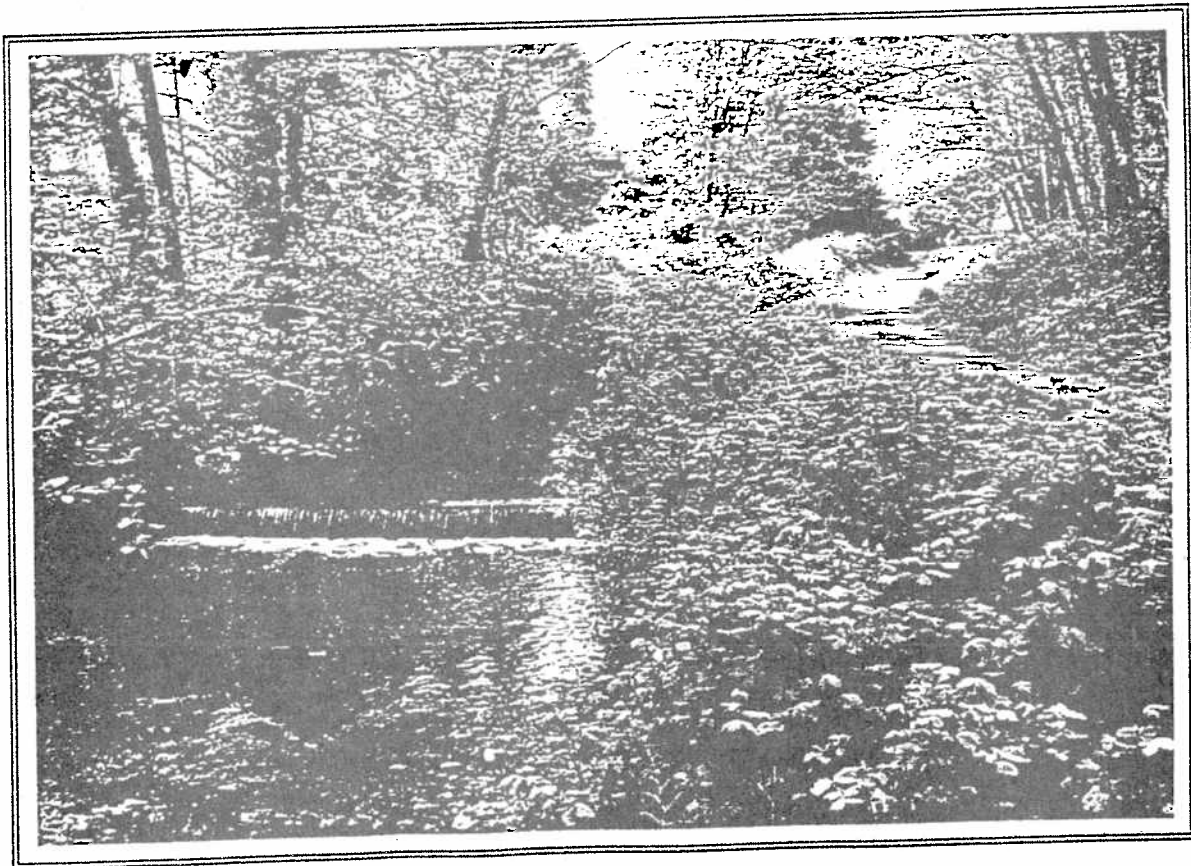


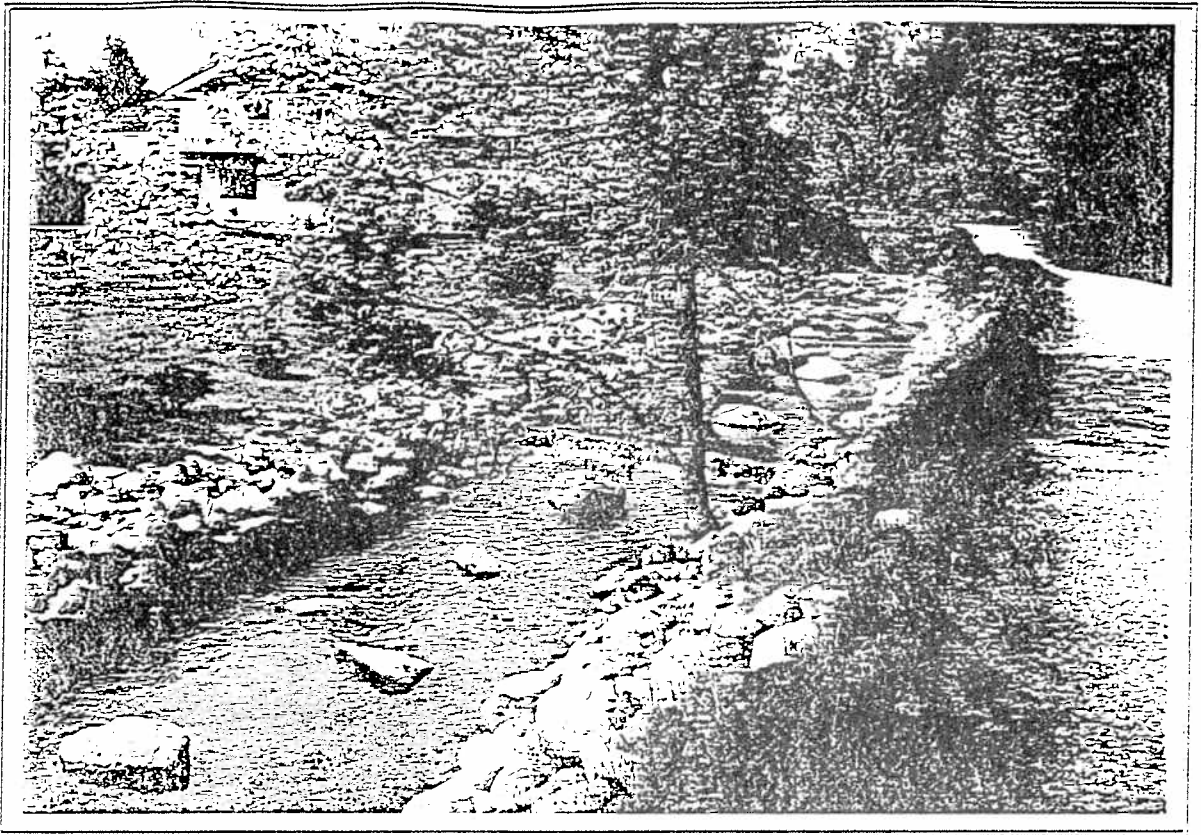
FIG. 12. Wetland area adjacent to pedestrian trail.



E12. Backwatering of weir structure or notching to confine low flows could improve fish passage.



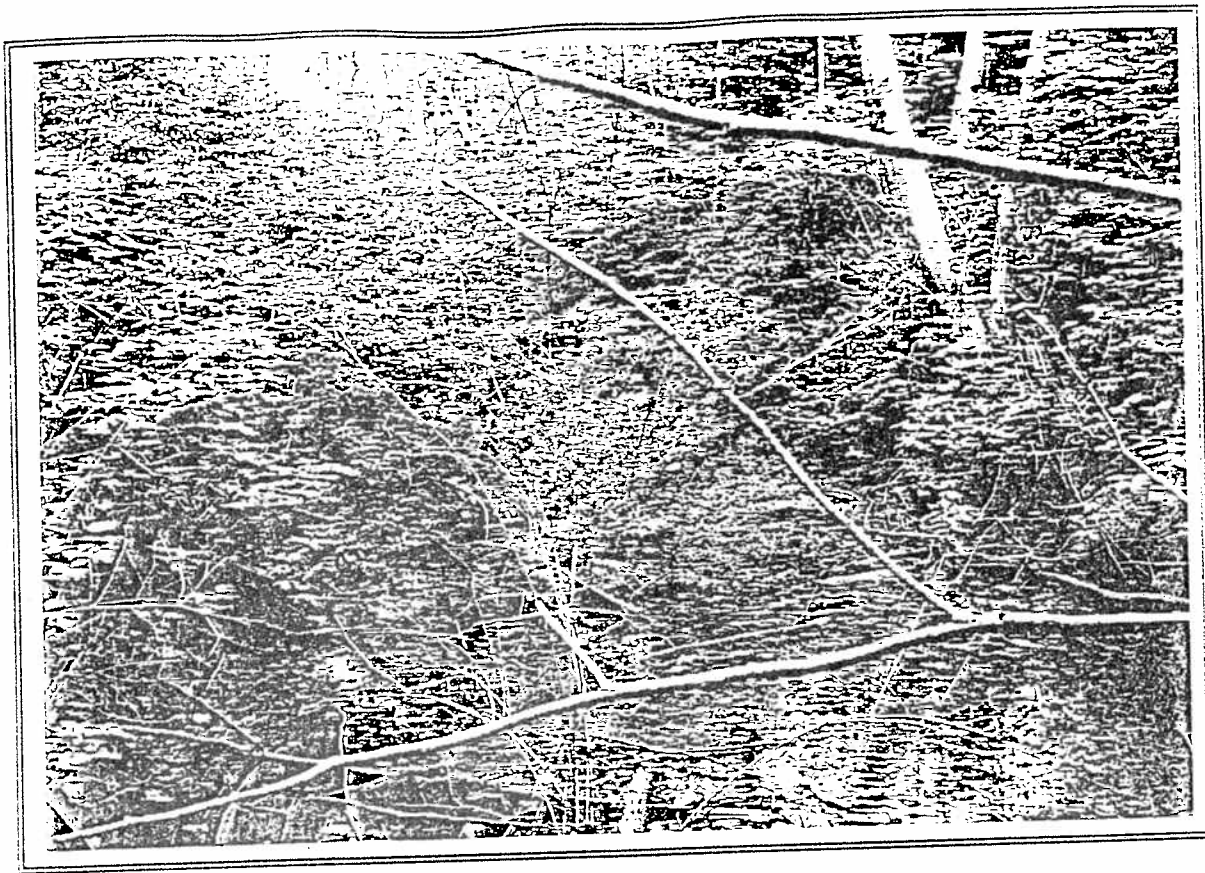
E13. Trailside riparian areas could be planted with trees to increase overhead channel cover.



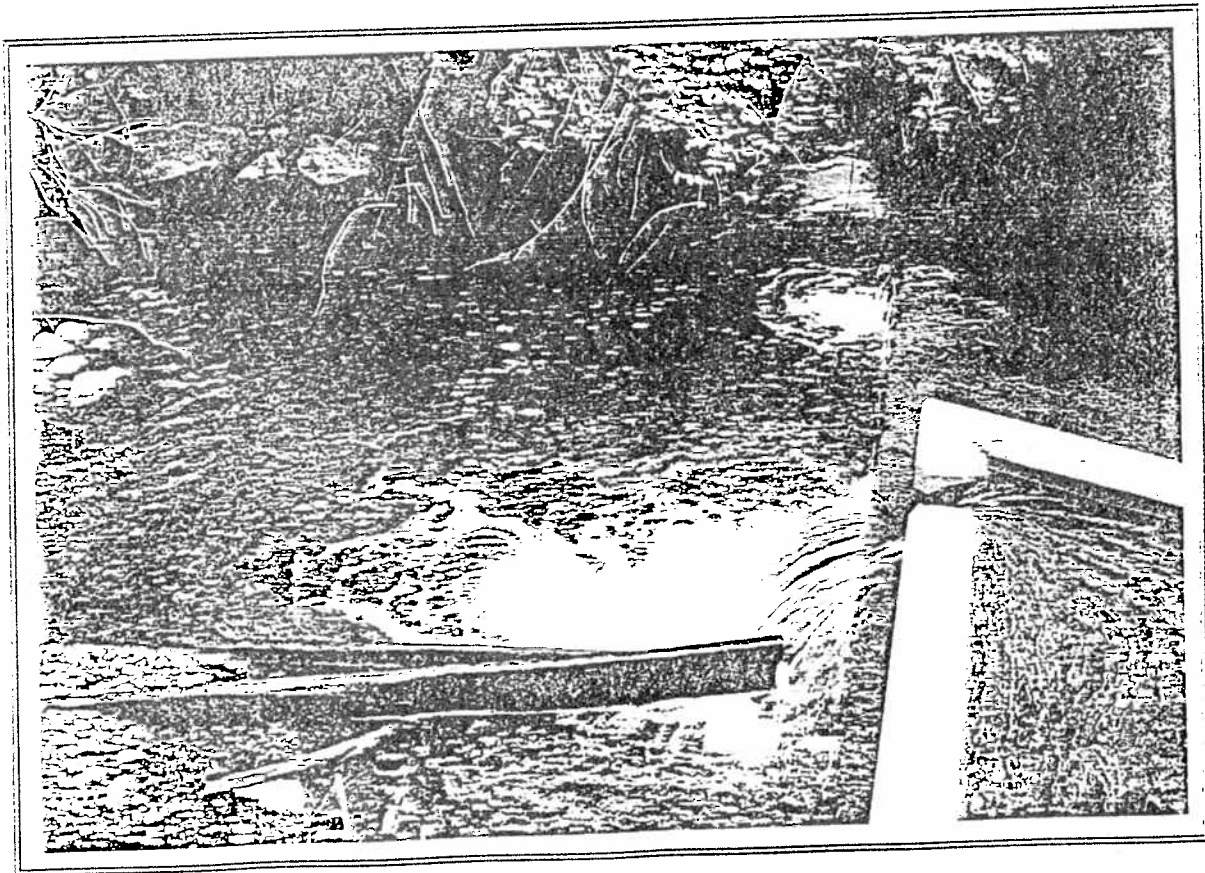
E14. Riparian revegetation could be used to improve habitat conditions.



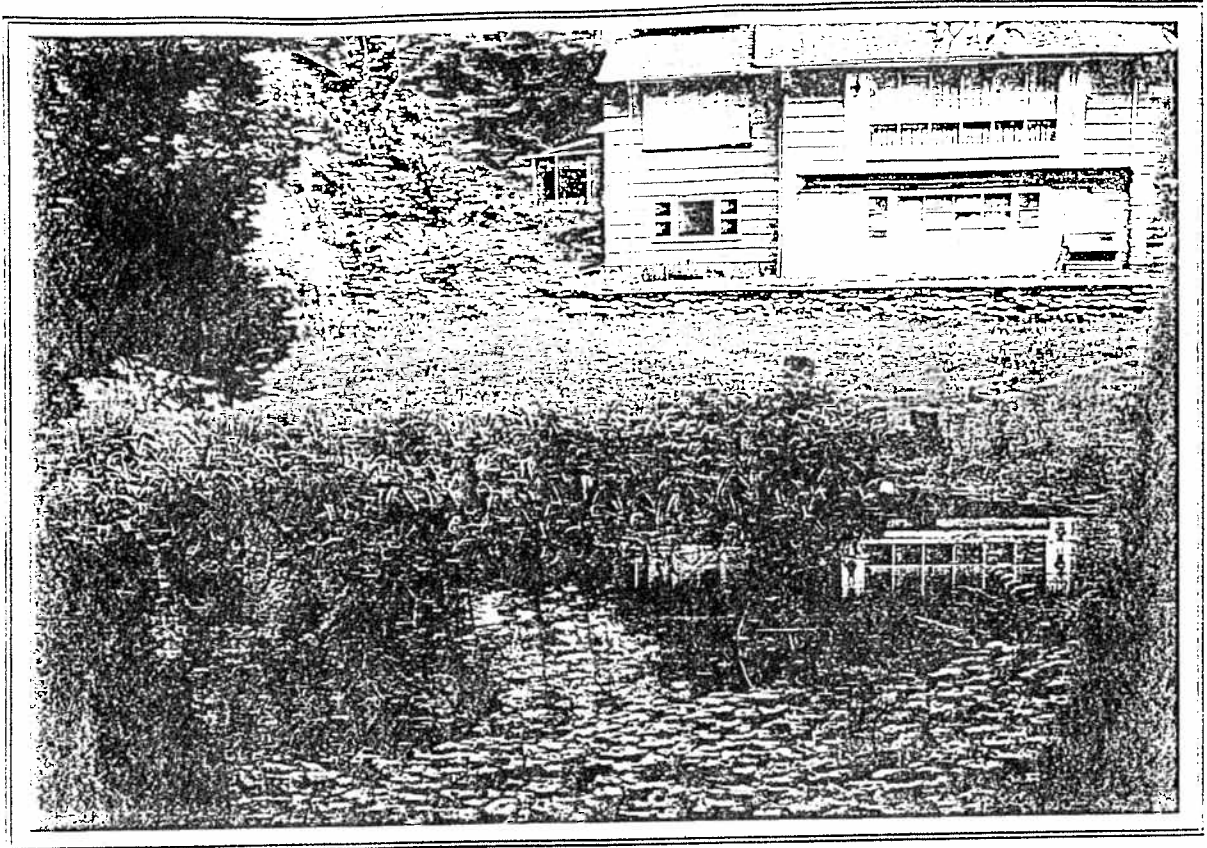
E15. Backwatering of the spillway and installation of a low flow notch could improve fish passage.



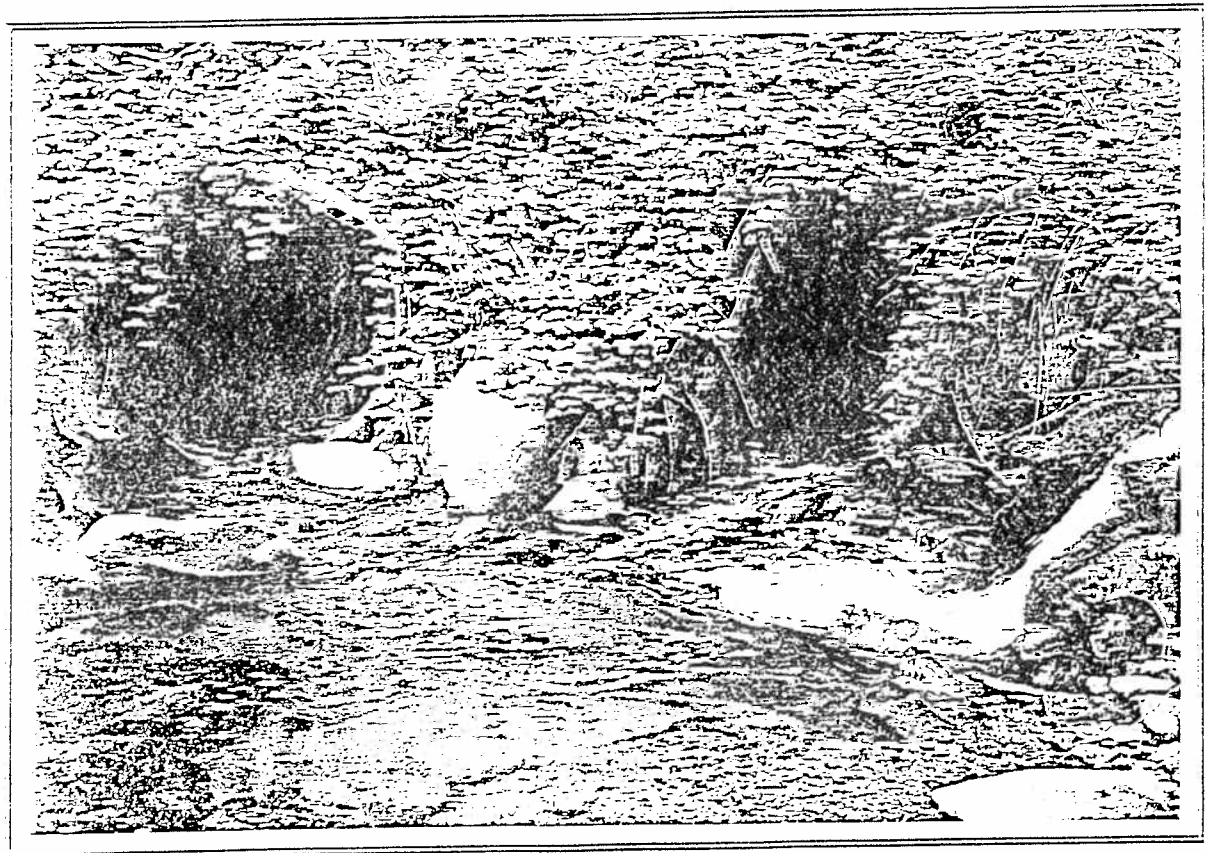
E16. Wetland area could be restored or enhanced for stormwater biofiltration or detention storage.



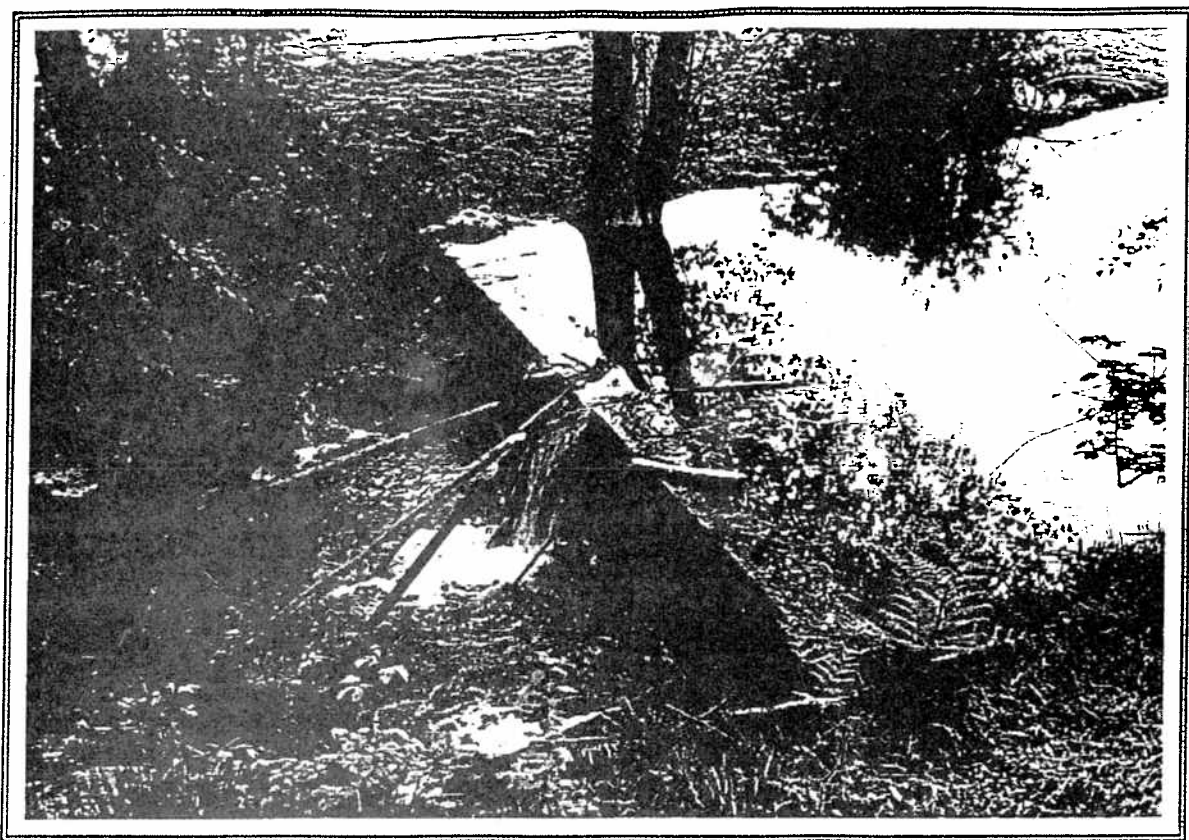
E17. Spillway structure could be backwatered to provide fish access at a range of flow levels.



E18. Possible site for off-channel pool creation on private residential property.



E19. Broadway culvert could be modified during replacement to provide fish passage.



E21. Squint Lake weir could be backwatered or a fish ladder installed to provide fish passage.