

MAYNE ISLAND

Land Owners Coalition

Watershed Analysis

July 2010

The land owners on Mayne Island have commissioned the attached study to provide a scientific and complete analysis of three watersheds on Mayne Island. These three water sheds (the largest on Mayne Island) were identified in two earlier reports as potential fish habitat.

This study was done by Registered Professional Biologists, D.R.Clough Consulting, of Lantzville, BC. D.R. Clough Consulting is one of the leading Fish Resource Consulting companies in the region and is recognised by the BC Ministry of the Environment.

The results of the Mayne Island, Fish Presence Assessment, July 2010, concerning the water sheds of Campbell Creek, Deacon Creek and Horton Creek states that there are "no residual fish populations" and finds a "lack of water or intolerable water quality; thereby concluding that "there are no native fish populations on Mayne Island".

This is the only study that has scientifically measured the water and potential fish habitats of the water sheds on Mayne Island. Two previous papers, provided by the Mayne Island Planning Department were unscientific, incomplete, speculative and therefore misleading.

The detailed scientific report is attached.

Mayne Island Land Owners Coalition

D. R. Clough Consulting

Fisheries Resource Consultants

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Mayne Island Land Owners Coalition
Attn: Dean MacKay, P.Eng.
540 Fernhill Road, Mayne Island

Aug. 13, 2010

RE: Mayne Island, Fish Presence Assessment, July 2010.

Summary: A fisheries inventory including headwater electroshocking in the three largest watersheds (Campbell Creek, Deacon Creek and Horton Creek) found no resident fish populations due to barriers downstream and lack of fish habitat. All three streams suffer from lack of water or intolerable water quality in summer.

Introduction: The objective of the survey was to determine the extent of fish habitat on the three largest watercourses on Mayne Island.

Methods: Dave Clough, RPBio, Boone Barber, BIT and Brad Remillard, BIT, conducted the survey on July 6, 2010. Fish presence/absence was determined by the use of a Model 8a electroshocker along with habitat conditions (including water quality, flow regimes, and channel characteristics), and obstructions to fish passage. Electroshocking voltage ranged between 250 and 450 volts at 60 cycles. Stream survey information was collected at representative sample sites throughout the watercourse. The survey was conducted during the summer fish sampling window where water temperatures above 7C are required for effective electrofishing. Sampling was purposely done in July; any spawn will have hatched offering the best chance at capture of young of the year fry as well as any other age classes. We used a Garmin 450 GPS for survey locations. Observations and data collected are presented within the text below. Our results are shown in the text, summary table and our labels on the attached map. The report was written by Brad Remillard, B.I.T. and reviewed and edited by Dave Clough, RPBio.

Survey Area: The survey took place on the three largest watersheds of Mayne Island. Campbell Creek is located to the northeast, Deacon (Village Bay) Creek to the west and Horton Creek to the southeast. The study areas are based on previous stream habitat reaches identified in Reimer¹ and Swell² surveys submitted to Islands Trust.

Results – The survey was completed after two weeks of warm and dry weather after a wet spring. Drainages were approaching summer low flow with upper reaches dry or at a trickle flow.

Campbell Creek:

This stream is located on the northeast side of Mayne Island. It drains into Campbell Bay from drainages that extend 2.0 km to the Fernhill Road crossing. The watershed is comprised of open pasture land surrounded by second growth forest on a low relief. The majority of the 2.0 km mainstem channel is at 10m to 60m elevation. We describe the mainstem survey area in four reach segments below;

Reach 1: This drainage enters Campbell Bay at a fish barrier above the high tide mark. The first barrier is a 10m long bedrock chute on 24% gradient. A second barrier is located 50m above the ocean on a 9m long boulder cascade at 45% gradient. It is located on a fill slope created for a road crossing and berm for water retention pools on the upstream side. Between these barriers there is a short bench of 5% gradient with bedrock and boulder dominated substrate. On the day of the survey the channel had a minimal flow (approximately 3-lpm) indicating there is no flow later in the summer. This reach was electroshocked along all available wetted habitat with no fish being captured or observed. The first

¹ 2007, Reimer. Mayne Island Stream Survey Report.

² 2010, Swell Environmental. Review of Riparian Areas for Streams Mayne Island

barrier is a natural barrier; the second barrier appears as man-made rock berm on a native slope of similar gradient. There is no fish access in this reach, nor habitat to sustain resident fish.

Table 1: Campbell Creek, Reach 1 Habitat Card; Watershed Code 925-312280-779973

Average Channel Width (m)	3.2	Wetted Width (m)	0.4	Stream Gradient (%)	6
Water Temperature (C)	16.0	Est. Flow (lpm)	3	Fish Access/Presence	No
Survey Date	July 6/10	Bank Full Stage (%)	5		
Substrate (% & Type)	15% Boulder, 35% Cobble, 30% Gravel, 20% Fines				
Canopy (% & Type)	75% Douglas Fir, Cedar, Alder				
Instream Cover (% & Type)	10% Boulder, 5% LWD				

Reach 2: Beginning at 60m upstream, a short channel leads to a series of irrigation ponds that were created partly by fill materials in the creek valley and excavation of the channel. This work appears to have been done many years ago as the material is covered in moss and second growth Alder and Douglas Fir. Pond #1 begins at 69m and ends at 175m upstream. Its average wetted width is 15.0m and average depth is 1.5m. Pond #2 begins on the other side of a culverted abandoned road crossing (the culvert is plugged with debris). Pond # 2 ends at 200m upstream and is less than 1.0m deep and 25m wide. During the survey the pond and outlets had no apparent flow. These ponds have no fish habitat given the shallow depth, poor turnover and high nutrient loads. They appear to drop in level significantly over the summer period. The perimeter of the ponds were electroshocked with no fish being captured or observed.

Table 2: Pond #1 July 6, 2010 Water Quality

Time	Depth	Temperature	O ² ppm	O ² Sat
4:45 pm	1m	16.2	7.8	80

Reach 3: Above the irrigation ponds, the drainage is ditched along the perimeter of pasture within a 2m wide ditch. We observed man-made rock crests and gravel placement in small dug pools. The past owners had tried to create fish habitat structures. The site was now being used by Red Legged Frogs as tadpoles were observed throughout the seasonal pools on the day of the survey. There is another small excavated irrigation pond (#3) located off channel to the east. The outflow ditch was dry. Pond #3 was 30m by 12m by 2.0m on the July 6, 2010 survey date. A green algae bloom was occurring (supersaturated Oxygen) during the survey, which indicates the pond has large swings in Oxygen levels that will crash to intolerable levels when the algae dies. This pond lacks a riparian zone and limited water supply, which results in inhospitable conditions to support fish. We continued up the ditched channel, which bends sharply and ends at 375m and McDougall's pond (#4). A small dry ditchline enters from the south, which was not inventoried.

Table 3: Reach 3 July 6, 2010 Water Quality

Time	Site	Depth	Temperature	O ² ppm	O ² Sat
5:45 pm	Ditch pools	Surface	16.8	5.8	59
5:58 pm	Pond #3	Surface	19.2	10.1	107

McDougall's pond (#4) is a man-made irrigation pond and the largest body of water in the watershed. It is 130m long and 40m wide with an approximate area of 0.3ha. The mean depth is 3m. This water impoundment has been historically stocked with rainbow trout, the last time approximately 16 years ago. Since that time the trout have died and no further stocking has been undertaken and no fish observed³. The pond was surveyed for fish presence with 12 baited minnow traps placed around the perimeter and middle of the pond at depths ranging from 1-3m. No fish were captured but numerous red legged and tree frog tadpoles were collected.

³ Personal communication, Shanti McDougall

Table 4: McDougall's Pond #4 Water Quality

Time	Depth	Temperature	O ² ppm	O ² Sat
4:00pm	Surface	20.4	10.0	106
4:00pm	2m	14.2	2.5	19

This reach was virtually dry except for Pond #3 and #4. None of the habitat supports resident fish. The reach ends approximately 565m upstream at the beginning of a ditched inflow channel above the McDougall Farm Road.

Reach 4: This reach runs for approximately 1,150m from McDougall's Pond upstream through a pastured ditch to Fernhill Road. This reach featured a dense canopy of Nootka Rose, Crab Apple and grasses. The channel ran on a mean gradient of 4% and had a substrate of clay and organics. This reach has seasonal flow as indicated by the completely vegetated substrates. This reach was dry on the day of the survey and is inhospitable to fish. The channel was not surveyed above Fernhill Road given the lack of water presence.

Campbell Creek Summary: There are no fish present in the watershed. This channel has a series of barriers located directly at the mouth, which offers no fish access. The entire wetted area of the upper reach of this watershed was electroshocked with no fish captured. The main pond, once stocked with Rainbow Trout was minnow trapped with no fish being captured or observed. Water quality samples throughout indicate it is or becomes intolerable to fish due to drying, high temperatures, anoxia or a combination there of.

Deacon Creek (Village Creek):

Located on the west side of Mayne Island draining into Village Bay. It is locally known as Village Creek. The channel has been severely altered by historic development including the construction of an airplane runway along the historic channel. It drains farms and pastures for most of its length. Farm owners provided access to the watershed and historic information.

Reach 1: Beginning at Village Bay there is a long flat intertidal area with some gravel deposits but primarily fines from historic sediment deposition transported by the creek. The reach offers no barriers to fish habitat on a moderate 3% average gradient from the ocean upstream 140m to Dalton Road. This reach has been historically enhanced with Chum salmon fry⁴ without any evidence of long-term success. It is severely degraded and is suffering from bank erosion and head cutting resulting in very limited fish habitat (shallow pools, little spawning area and lack of flow). There were numerous small drops and debris jams through the channel to the Dalton Road culvert. The reach has no barriers but with its lack of summer water flow limits fish use. Native Chum salmon may have historically used this reach for spawning before upland areas were disturbed. The current lack of habitat quality is defined by no observed fish in several years.

Table 5: Deacon Creek Habitat Card Reach 1, Watershed Code 925-312280-313484

Average Channel Width (m)	2.8	Wetted Width (m)	0.2	Stream Gradient (%)	3
Water Temperature (C)	16.2	Est. Flow (lpm)	2	Fish Access/Presence	Yes
Survey Date	July 6/10	Bank Full Stage (%)	5		
Substrate (% & Type)	5% Boulder, 10% Gravel, 85% Fines				
Canopy (% & Type)	75% Douglas Fir, Alder, Salmonberry				
Instream Cover (% & Type)	5% Boulder				

Reach 2: The channel crosses Dalton Road through a 1500mm fish passable metal culvert. Above Dalton Road the stream has poor substrates. It has organic material and fine clays and sands from sidewall and upland erosion. Pools are shallow and rapidly drying. There is a small spring on river left bank with a trickle flow. Above the channel was only intermittently wet. The riparian consists of second growth Red Alder and Douglas Fir forest with an understory of Salmonberry and Himalayan Blackberry. Approximately 110m above Dalton Road, fish access and habitat significantly degrades in a series of head cut drops and debris jams. There are five jams present in gradients that increase from 6% to 15%

⁴ 2010, Swell Environmental. Review of Riparian Areas for Streams Mayne Island

respectively. Each jam reduces fish access and decreases habitat quality. At 256m above Dalton Road at Merryman Drive a 600mm culvert enters on the left bank. This small drainage supplied the majority of flow for this location. At 280m above from the start of the reach is a Red Alder growing within the steep (15%) channel creating at a 1m vertical drop over the root mass with no jump pool. Above this barrier the channel continues along side Dalton Road in a dry vegetated ditch line through pastures. This reach marks the end of potential fish access and habitat. While the possibility exists for salmon and trout to swim above the Deacon Road culvert in high flows, there is a distinct lack of habitat or food supplies for them in this reach.

Table 6: Deacon Creek Habitat Card Reach 2

Average Channel Width (m)	1.3	Wetted Width (m)	0.2	Stream Gradient (%)	7
Water Temperature (C)	13.2	Est. Flow (lpm)	2	Fish Access/Presence	Yes
Survey Date	July 6/10	Bank Full Stage (%)	5		
Substrate (% & Type)	5% Boulder, 10% Gravel, 85% Fines				
Canopy (% & Type)	80% Douglas Fir, Alder, Salmonberry				
Instream Cover (% & Type)	5% Undercuts				

Reach 3: This reach is above fish access and habitat along Merryman Drive. It is approximately 1.4km long and drops over 35m in vertical elevation from the upper most pond (#1). This area was historically a bog wetland, which was channelized to promote agricultural land uses and the construction of the island's airstrip⁵. There are irrigation ponds dug on the Oberdorf (mid reach) and Joyce Kelliwait (top end) properties. The agricultural uses have severely degraded any potential fish habitat of this watercourse. The dredging, grazing, and riparian vegetation removal has resulted in a sediment in-filled channel with little to no complexity or residual pools required for resident fish.

The water impoundments were never observed as fish habitat by the owners. They are too shallow with no turnover of water or shade. The water temperatures were uniform to the bottom with no cool areas. There was a thick soupy consistency indicating the first big algae bloom since the cool June weather, generating plenty of oxygen. As part of the algae cycle, the oxygen will crash with algae die off and result in intolerable levels for fish soon. We did see plenty of Red legged and Tree Frogs in various life stages in these ponds to recognize their non-fish importance.

Table 7: Kelliwait Pond #1 July 6, 2010 Water Quality

Time	Depth	Temperature	O ² ppm	O ² Sat
10:30am	Surface	19.7	7.9	86

Table 8: Kelliwait Pond #2 July 6, 2010 Water Quality

Time	Depth	Temperature	O ² ppm	O ² Sat
10:30am	Surface	22.4	11.2	128
10:30am	2m deep	19.0	8.5	110

Table 9: Kelliwait Pond #3 July 6, 2010 Water Quality

Time	Depth	Temperature	O ² ppm	O ² Sat
10:45am	Surface	20.1	7.5	93

Table 10: Oberdorf Pond #4 July 6, 2010 Water Quality

Time	Depth	Temperature	O ² ppm	O ² Sat
11:30am	Surface	21.0	8.0	89

Deacon Creek Summary

There is seasonal fish access to 280m above Dalton Road at a natural gradient barrier, although the actual utilization by fish likely ends near the Dalton Road culvert only 140m from the ocean. This channel has been historically altered by developments that have reduced its original fish habitat. It is a small drainage catchment and it likely never supported year round fish habitat due to lack of summer water.

⁵ Personal Communication Joyce Kelliwait

Horton Bay Creek (Hunts Brook):

This creek is located to the southeast of Mayne Island and drains into Horton Bay. The main channel has been historically ditched through peat bogs. The watershed drains rural and agricultural properties (Glenwood Farm for 1.0km). This channel was surveyed in March and April 2008 including an extensive electroshock survey.

Reach 1:

This channel begins at the ocean and ends at a man-made dam. Beginning at Horton Bay with 150m of tidal reach on a mixed gravel and sand substrate to the Horton Bay Road 900m round metal culvert. At high tide the culvert is flooded. The channel runs upstream another 100m on a shallow clay covered glide with no spawning gravel or pool depth. It is within a forested canopy but lacks any habitat complexity. The reach ends at an old dam used for power generation. Before that, the pond likely was a water supply for farm irrigation. Water flows over the dam through a half culvert overflow. This is the fish barrier as the water drops vertically almost 2.0m from the culvert. The tide was out at the time of our survey leaving very little rearing habitat to survey. We shocked the culvert pool (3x3x0.5m) and did not capture any fish and the area above the culvert was too shallow to shock and inhospitable to fish. There are no recent records of fish presence. The channel likely lacks sufficient fresh water and suitable spawning bed quality to support egg and alevin survival at lower winter water levels. Eggs likely suffocate in sediment or dry in low flow. There is no Trout or Coho rearing habitat due to drying. Feeding by Sea Run Cutthroat on freshwater aquatic insects is unlikely as there is little invertebrate production due to low flow.

Table 11; Horton Bay Creek Habitat Card: Watershed Code 925-312280-313484

Average Channel Width (m)	1.4	Wetted Width (m)	1.3	Stream Gradient (%)	1
Water Temperature (C)	15.5	Est. Flow (lpm)	5	Fish Access/Presence	Yes
Survey Date	July 6/10	Bank Full Stage (%)	5		
Substrate (% & Type)	10% Boulder, 20% Cobble, 50% Gravel, 20% Fines/Organics				
Canopy (% & Type)	80% - Douglas Fir, Cedar, Alder				
Instream Cover (% & Type)	5% LWD				

Reach 2:

This reach passes through the historic Glenwood Farm property. It begins at the dam pond, which is 40m long and 20m wide. This 1-2.5 m deep pond is regulated by valves and culverts and has been de-watered in summer low flow events. Above the pond, the mainstem forks in the middle of Glenwood farm. The mainstem continues from the west and the other branch originates from the northeast at the intersection with Gallagher Bay Road. It flows in ditch lines from its origins along Horton Bay road ditch line down to the farm. This ephemeral drainage passes under Gallagher Bay Road through a 400mm metal culvert. It then enters a peat pasture where the surface water table rises in winter to flood part of this pasture for several weeks. It flows approximately 900m on the farm to enter mainstem Hunt Brook in the centre of the farm through a partially submerged 1100mm culvert.

The mainstem reach is almost entirely on flat gradient that had long shallow pools connected with short riffle sequences, the entire length dries in mid summer. The riparian vegetation consisted of shrubs such as Nootka Rose and Pacific Crab-Apple; there were some sporadic juvenile Red Alder and Cedar. Most of the channel was fine organic peat material or clays. There was very little instream cover habitat such as woody debris, which can be accredited to the farm management of drainage. We noticed several old cedar fence posts, which have sloughed into the channel. Above the pastures the channel enters a mature forest and the gradient begins to rise. The stream has head cut down through the soft substrates down to the harder non-erodible materials such as bedrock and boulders. Here there was suitable spawning gravel, but this area is limited in flow. The reach ends at a bedrock cascade leading up a 25% gradient to bedrock falls at Simpson Road.

An earlier electroshock survey (April 4, 2008) at the generator pond and upstream through the Glenwood Farm in the mainstem channel (approx. 1000m) to Simpson and Gallagher Roads. The survey was conducted in dry weather during low flow. Our electroshocking of the entire reach took 890 seconds of

machine time; we did not capture or observe any fish. We observed Worms, Blackfly, Scuds and a few Mayfly and Caddisflies, no Stonefly were observed. In July 2010, the reach was virtually dry.

Table 12; Hunt Brook Habitat Card: Reach 2 Glenwood Farm.

Average Channel Width (m)	1.4	Wetted Width (m)	0.2	Stream Gradient (%)	3
Water Temperature (C)	15.5	Est. Flow (lpm)	2	Fish Access/Presence	No
Survey Date	July 6/10	Bank Full Stage (%)	5		
Substrate (% & Type)	5% Gravel, 95% Fines/Organics				
Canopy (% & Type)	40% - Alder, Cedar, Shrub				
Instream Cover (% & Type)	<5% LWD				

Reach 3:

Above Simpson Road the mainstem is significantly diminished. The channel travels through back yards and ditches, small ponds and several driveway and road culverts. Inspection in July 2010 showed the channel to have no flow and the small ponds to be stagnant. The riparian area along the creek is narrow. There is no fish habitat or access nor does it support native resident fish populations.

Water Quality:

We found the July 6, 2010 water quality (Table 2) to indicate poor water conditions. The best water quality was at the lowest reaches of Hunt Brook where flow was highest. The conditions at the mouth represent fairly low oxygen levels. As water flows drop and temperatures rise, the high organic load of peat from Hunts Brook ditch line will be typical of the entire stream. Acidic water and low oxygen levels are intolerable to fish, which avoid a ph less than 6.0 and an oxygen level of less than 6.0 ppm.

Table 13: Horton Bay Creek at Horton Bay Road Culvert , July 6, 2010 Water Quality

Time	Temperature	O ² ppm	O ² Sat
6:30pm	15.5	4.0	46

Water quality samples from our April 4, 2008 survey below also indicated a trend towards anoxic and acidic water that by mid summer if not before would be intolerable to fish. The low ph and oxygen in the Hunts Brook Reach 2 ditch line prevails after water stops flowing in summer.

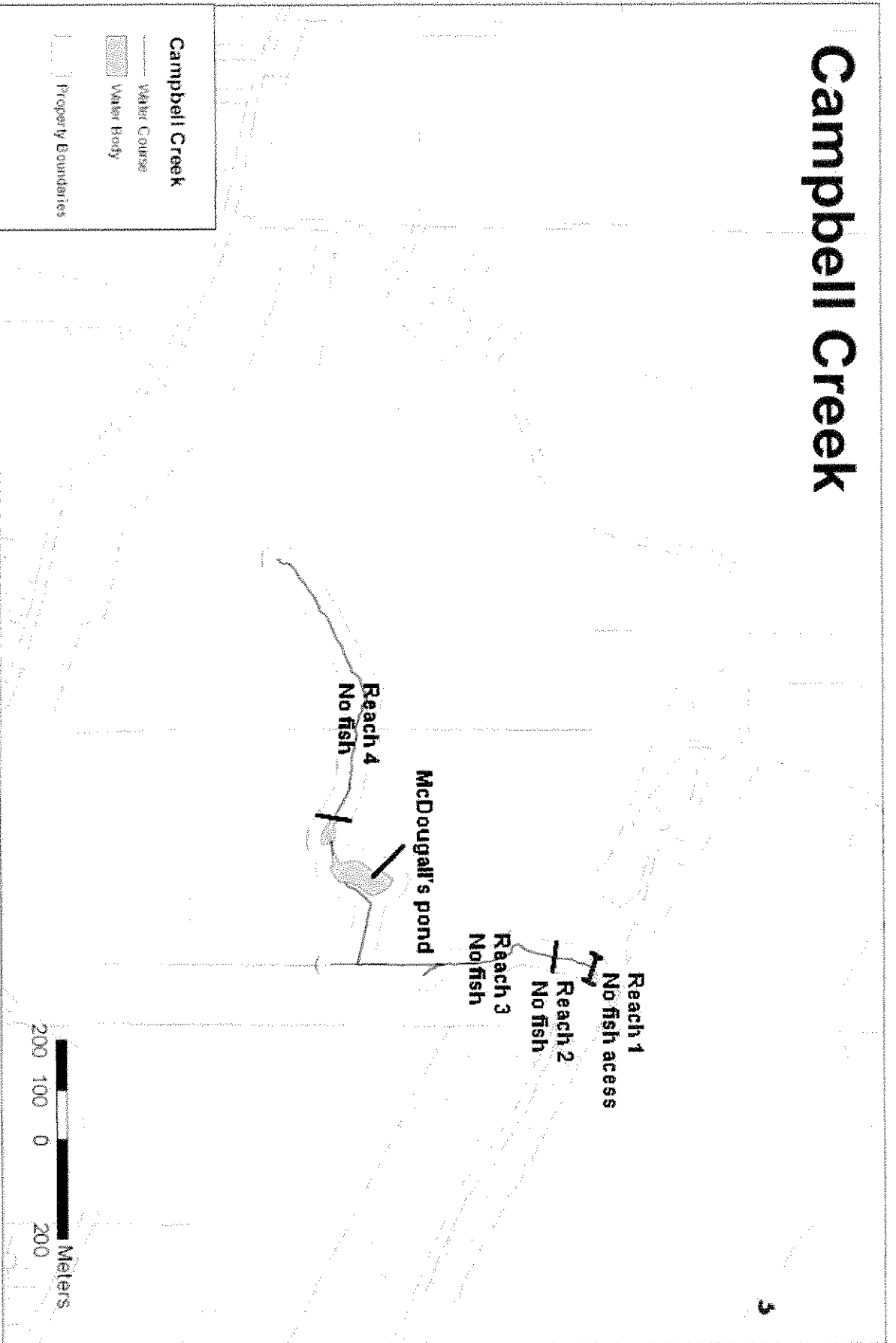
Table 14 – April 4, 2008 Water Samples

Site	pH	Dissolved Oxygen (mg/L)	Percent Saturation
Reach 1 at Tidal culvert pool	6.7	10.8	90
Reach 2 at Dam pond lower fence line	6.5	9.2	72
Reach 2 –farm ditch	5.7	1.6	15
Reach 3- upper channel at Simpson	7	11.2	94

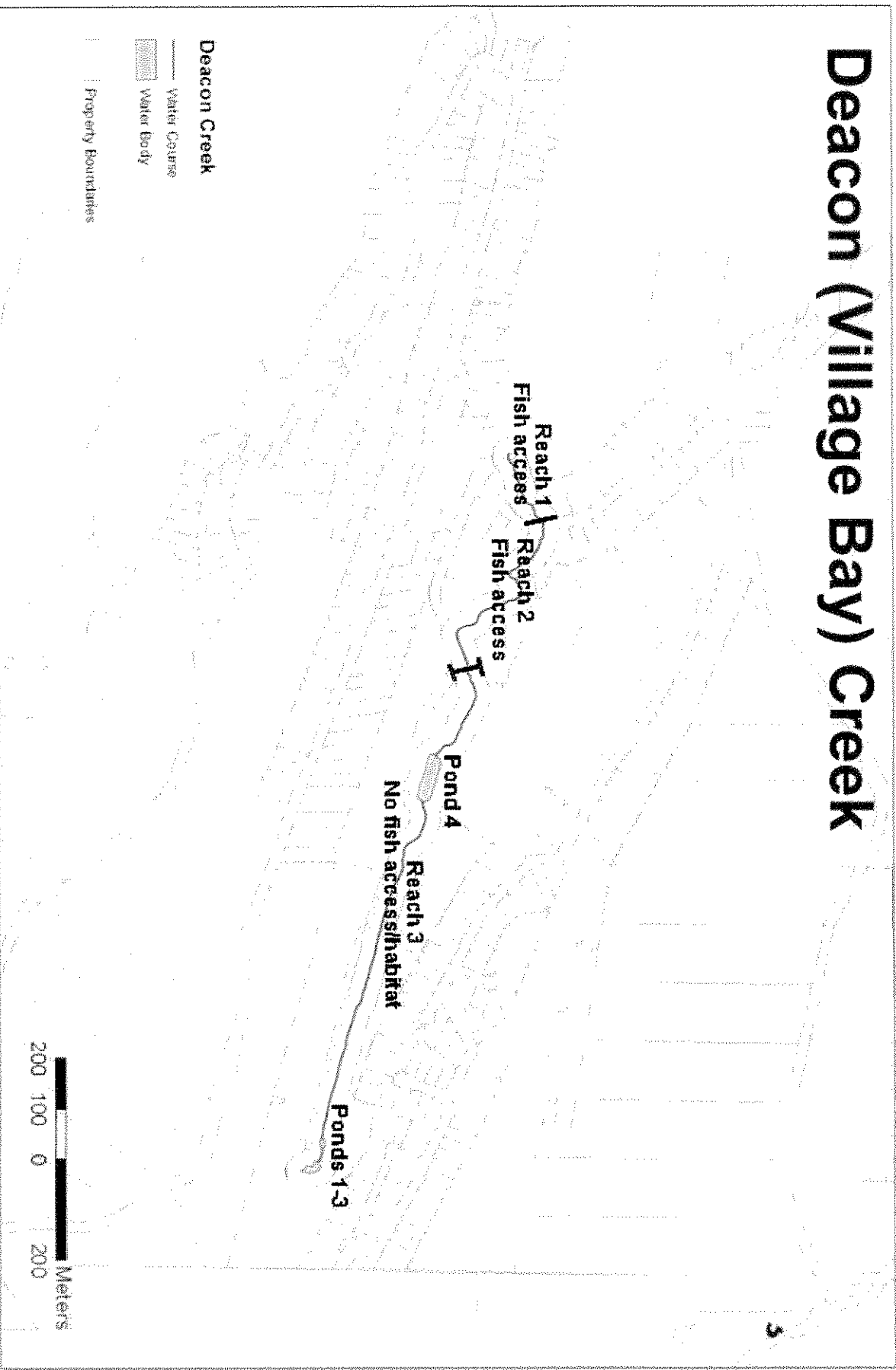
Horton/Hunts Brook Summary:

There were no fish observed or captured in the entire length of stream. Its lower reach, which has potential fish access, has never revealed any fish use in the three inspections in the last three years. Our 2008 fisheries assessment report had the same result. The tidal reach lacks sufficient fresh water and suitable substrate to offer spawning success. Upstream; the dam is a man-made impoundment, it is hard to tell if there is a natural barrier feature it was built upon. Regardless, we have inspected the Reach 2 and 3 on three separate occasions in winter and summer and find the habitat above the dam to not offer any potential for fish populations. It dries to mud or stagnant pools that would kill fish.

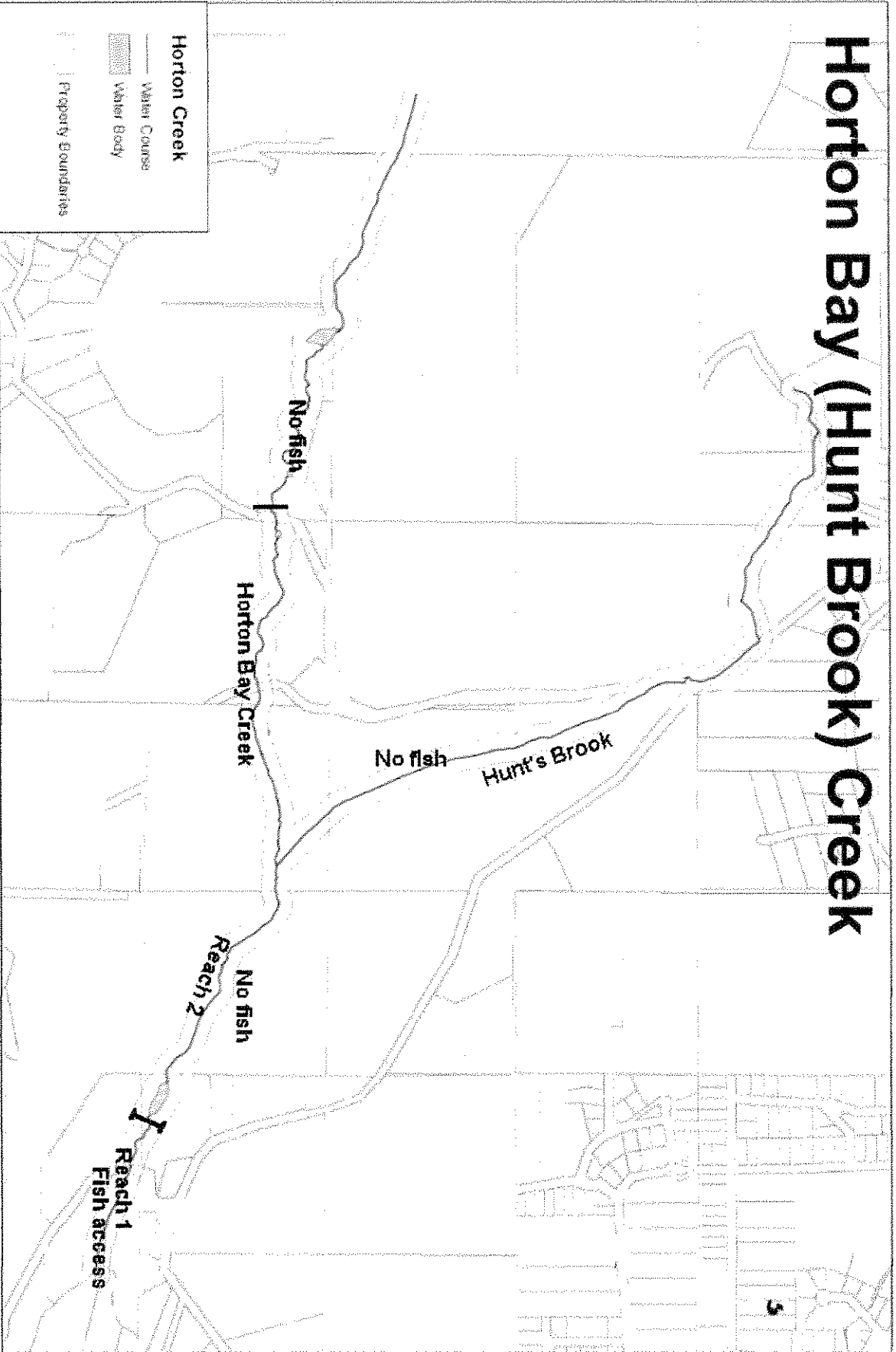
Campbell Creek



Deacon (Village Bay) Creek



Horton Bay (Hunt Brook) Creek



Horton Bay/Hunts Brook Photo Page
July 2010 & April 2008



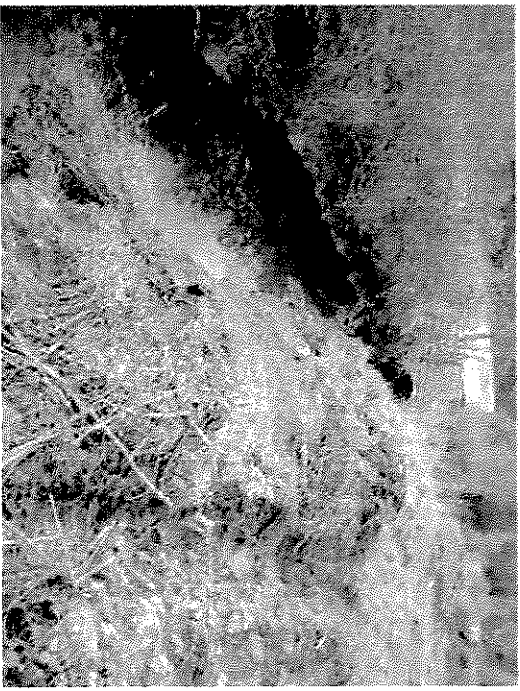
1.) Reach 1 at Tidal area below road (note gravel) Jul/10



2.) Poor but accessible habitat above Horton Bay Rd culvert.



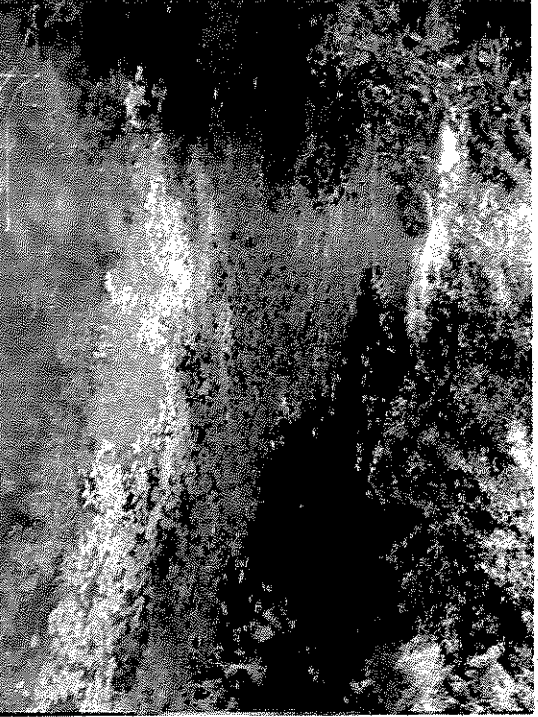
3.) End Reach 1 at Dam, 100m above Horton Bay Rd
End fish access.



4.) Reach 2 mainstem in April 2008 before going dry.
No fish access/presence.



1.) Looking upstream at fish barrier located at mouth



2.) Reach 3 pond adjacent pasture



3.) McDougall's pond reach 3



4.) Reach 4 typical habitat within farm pasture



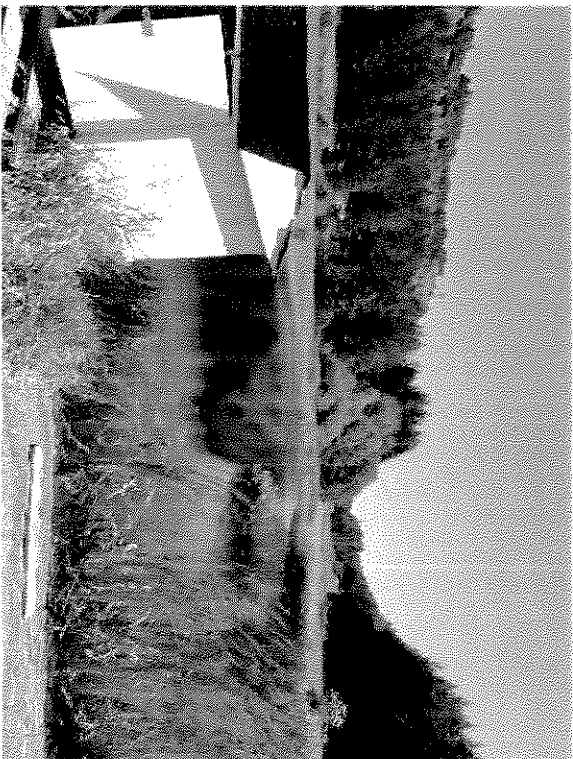
1.) Reach 1 Creek mouth near Village Bay



2.) Reach 2 above Dakon Road (debris jam)



3.) Reach 2 fish barrier along Merryman Road



4.) Oberdoffs pond reach 3