

## Orwell River Fish Kills July 12, 1999 and July 29, 1999

### INTRODUCTION

Two fish kills were reported in the Orwell River near Kinross in July, 1999. The investigations into the two fish kills are discussed in this report.

#### ORWELL RIVER FISH KILL - JULY 12, 1999

The Department of Technology and Environment (DT&E) received a call of a fish kill in the Orwell River on Monday, July 12, 1999. The Environmental Emergency number (1-800-565-1633) was notified, and Departmental staff were dispatched to investigate the fish kill. An examination of the River revealed that there were approximately 50 dead fish in, and around, the culvert that runs under Hwy 24 in Kinross (Figure 1). This was the only area of the River where dead fish were noted. The water in the area was clear and there were no potato fields in the immediate area.

Observations by local residents indicated that there was a heavy downpour on Saturday, July 10, 1999. However, the water in the stream was clear by Monday, July 12, 1999 when the investigation began. The fish that were collected were also showing signs of decay, suggesting that the fish kill may have happened a few days earlier than when it was reported.

Only a short section of the stream was affected, and no obvious sources of contamination were identified. The Valleyfield River fish kill was also reported the same day, and because this appeared to be a small fish kill, over a limited area, DT&E staff concentrated their efforts on the investigation of the Valleyfield River fish kill. There were no samples collected during the investigation of the first Orwell River fish kill on July 12, 1999.

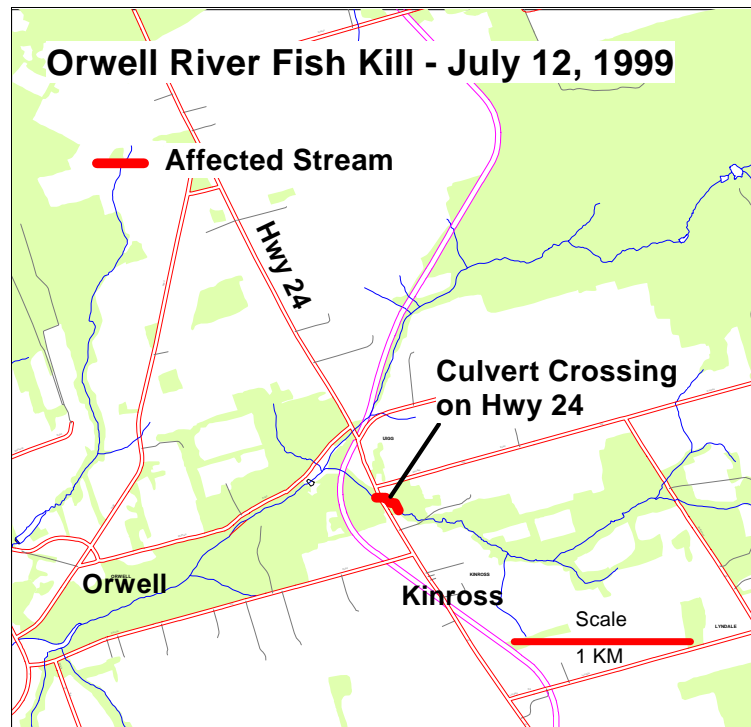


Figure 1 Location of the first fish kill on the Orwell River, July 12, 1999.

## ORWELL RIVER FISH KILL - JULY 29, 1999:

A second fish kill in the Orwell River was reported to the Department of Technology and Environment on July 29, 1999. A member of the public reported the kill after he had been walking the nature trails at MacPhail's Homestead. He reported approximately 50 dead fish in the stream next to the nature trail. The Environmental Emergency number (1-800-565-1633) was called so that the other appropriate government agencies would be notified, and Departmental staff were dispatched to investigate the fish kill.

Precipitation data from the Environment Canada weather station in Charlottetown indicates that there was 21.8 mm of precipitation on July 26, 1999, with trace amounts on July 27 and 0.6 mm on July 28, 1999.

An examination of the River revealed that the southern branch of the Orwell River was affected, but that the north branch that runs along the trail bed was unaffected. Water, sediment and fish samples were collected at various points on the River starting at the upper most extent of the fish kill. Table 1 lists the water and sediment samples that were collected during the investigation, and Figure 2 shows the locations. Dissolved oxygen and temperature readings were also taken at selected locations, and these readings are presented in Table 2. The results indicate that the temperature and dissolved oxygen conditions were within expected ranges for that time of the year, and would not be significant contributors to the fish kill that occurred.

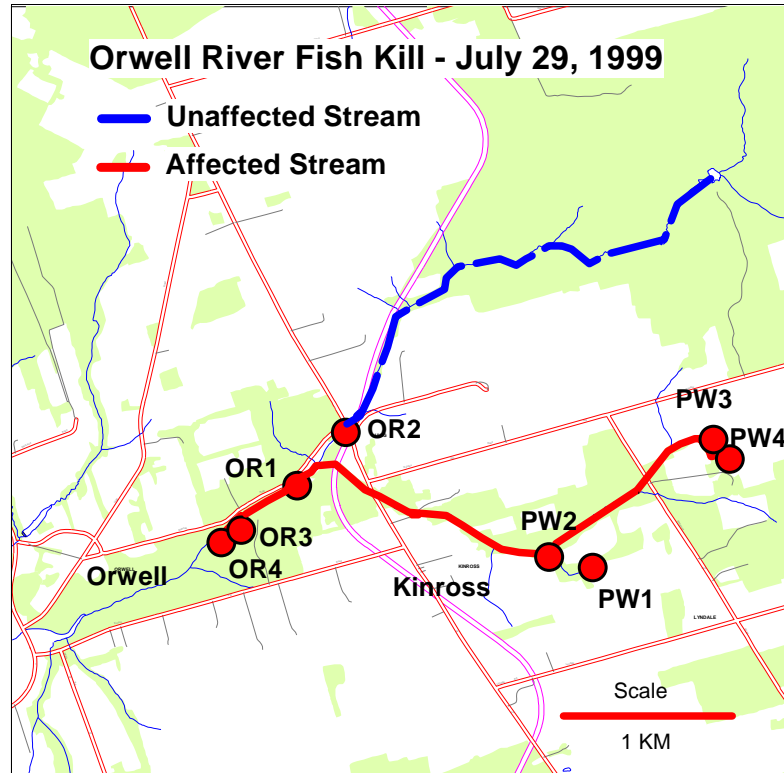


Figure 2. Location, extent and sampling locations for the Orwell River Fish Kill, July 29, 1999.

Two sites were identified as potential primary sources for the contaminants. A large pond of runoff water was found at the bottom of one field towards the upper end of the south branch (in the area of PW3 and PW4 in Figure 2), but it was not clear that there had been discharge from the area of collected water into the stream. The second suspected source was located in the area of PW2 in Figure 2. A large potato field in this area showed signs of runoff and erosion that lead to the stream. Samples were collected at both these sites, and it appears that the second site at PW2 may be the more likely source, although dead fish were also noted above this site, indicating that there may have been multiple entry points. Selected photographs are presented in Appendix A.

Table 1. List of samples collected during the Orwell River Fish Kill, July 29, 1999.

Site Location	Description	Samples collected
PW1	Samples from a drainage swale that was not flowing at the time, but contained ponded water - low swampy depressional area.	1-L Amber Glass - Water 250 mL Glass - Sediment
PW2	Samples taken from a small side stream just before it joins with the main stream between the Lindale Road and Hwy 24.	1-L Amber Glass - Water 250 mL Glass - Sediment
PW3	Sediment sample taken from the area between the suspected field and the stream.	250 mL Glass - Soil
PW4	Water and sediment samples taken from the large pond of water between the suspected field and the stream (See Figure 4 in App. A)	1-L Amber Glass - Water 250 mL Glass - Sediment
OR1	Samples taken upstream of Pond spillway, on the left hand side of the spillway	1-L Amber Glass - Water 1-L Amber Glass - Water
OR2	Samples taken upstream at Rte. 24 at the culvert. Taken on the upstream side of the road at the beginning of the wooden box culvert - stream is 2.5 to 3 feet wide.	1-L Amber Glass - Water 1-L Amber Glass - Water 1-L Plastic Water 250 mL Glass - Sediment 250 mL Glass - Sediment
OR3	Samples taken approximately 10 meters from the upper bridge below the pond at MacPhail's. Bridge is directly below the old driveway to MacPhail's Homestead along the nature trail.	1-L Amber Glass - Water 1-L Amber Glass - Water 250 mL Glass - Sediment
OR4	Approximately 100 ft below lower foot bridge	4 Fish Collected

Table 2. Dissolved Oxygen and Temperature Readings - Orwell River Fish Kill, July 29, 1999

Station	Time	Temp. °C	Dissolved Oxygen	% Saturation
OR#1 - Upstream of spillway pond, lefthand side, upstream of spillway pond	13:47	13.6	10.3	99.1
OR#2 - Upstream side at Hwy 24 at wooden box culvert	14:06	13.6	9.7	93.4
OR#3 - Approx. 10 m down stream of upper bridge below pond at MacPhail's. Directly below old driveway to MacPhail's Homestead along a nature trail.	14:33	12.9	10.6	99.9

## Atlantic Veterinary College Lab Results

### **Pesticide Analyses:**

Selected samples were sent to the Atlantic Veterinary College (AVC) lab for analysis. Alpha-endosulfan (0.15 ppb), Beta-endosulfan (0.20 ppb) and azinphos methyl (0.34 ppb) were found in the water sample from PW2. Alpha-endosulfan (14.0 ppb), Beta-endosulfan (28.0 ppb), azinphos methyl (57.0 ppb) and dithiocarbamate residues (2540 ppb) were detected in a sediment sample from the same location.

A water sample from PW4 was analyzed and 6.9 ppb of dithiocarbamate residue was detected in the sample.

A water sample from site OR2 was also analyzed for inorganic chemistry at the Department's Environmental Services Lab. Nothing out of the ordinary was noted in the results. Copies of the pesticide and inorganic results are included in Appendix B.

### **Fish Examination:**

Fish collected from the Orwell River fish kill were examined by Fish Pathologists at the AVC. Their observations included that the fish showed moderate post mortem changes, suggesting that death occurred 12-24 hours prior to collection. There was no evidence of lesions suggestive of an infection process, and the fish were feeding prior to their deaths.

The diagnosis was acute mortality, consistent with anoxia or toxic insult.

Gill and liver tissues from the fish that were collected from the River were also analyzed for several pesticide residues at the AVC. No pesticide residues were found in either tissue.

Copies of the AVC reports on the fish samples are included in Appendix C.

### **Discussion of Investigation Findings**

Similar to the other fish kills that occurred in 1999, there was evidence of runoff and erosion from potato fields at the upper end of the fish kill on the Orwell River following heavy rainfall events. Two of the more toxic insecticides (azinphos methyl and endosulfan) that have been linked to many of the other fish kills were found at the PW2 site, where there was evidence of washoff into the Orwell River. However, dead fish were also found above this site, indicating that contaminants from more than one entry point may have been responsible for the fish kill on the Orwell River. At the upper-most sampling location, only dithiocarbamates were detected in the standing water sample (PW4). However, the dithiocarbamate concentrations were well below its toxicity levels for this pesticide, so it is not clear what the responsible agent was in this location.

The analysis of the fish tissues did not shed any additional light on what products may have been responsible for the fish kill. No pesticide residues were detected in the fish tissues, but this would not rule out the possibility of pesticides being responsible for the fish mortalities. Pesticides can continue to decay in the fish tissue even after the death of the fish. In addition, the other organic material in the fish tissues makes the extraction and detection of pesticide residues more difficult.

As a result, detection limits for the pesticides are at a much higher level than they would be in water or sediment samples. Pesticides could still potentially be present in the fish tissues, but at levels below the Lab's detection limit.

Signs of runoff and erosion were seen at several locations on the Orwell River during the fish kill investigations. The pesticides that were detected from these sites are known to sorb to soil and are toxic to aquatic species. If fish kills are to be avoided in the future, significant work will be required in terms of soil conservation to keep the soil and the attached pesticides in the field when large rainfall events occur.

## **Appendix A**

### **Selected Photographs from the Orwell River Fish Kill July 29, 1999**



Figure 1. Suspected potato field near sampling sites PW3 and PW4 (see map in report). The photo shows the length of the rows and slope in the suspected field.



Figure 2. Staff person indicating the point where runoff from the suspected field enters the wooded buffer area between the field and stream.



Figure 3. Photo shows the path that the runoff water from the suspected field would follow as it moved through the wooded buffer area between the suspected field and stream.



Figure 4. Depressional area where runoff water from the suspect field collects prior to reaching the stream.

## **Appendix B**

# **Pesticide and Inorganic Chemistry Results on Water and Sediment Samples Orwell River Fish Kill July 29, 1999**





**University of  
Prince Edward Island**

ANTIC VETERINARY COLLEGE

550 UNIVERSITY AVENUE, CHARLOTTETOWN  
PRINCE EDWARD ISLAND, CANADA C1A 4P3

**DIAGNOSTIC SERVICES**  
(902) 566-0863 (LABORATORIES)  
(902) 566-0864 (POST MORTEM)  
FAX # (902) 566-0723

Toxicology & Analytical Services  
(902) 566-0833 (Laboratory)  
(902) 566-0832 (Fax)

**DIAGNOSTIC TOXICOLOGY REPORT**

AVC Lab No.: 21319  
Year: 1999

Hospital No.:                      Ref. No./ID: PW2 SEDIMENT

Received: 28-SEP-99      Birth Date:                      Sex:                      Species: Other  
Owner: DEPT. OF ENVIRONMENT,

Request by Dr. J. MUTCH                      DEPT. OF THE ENVIRONMENT      (Clinic # 26)  
368-5056 CHARLOTTETOWN, PEI  
Fax #: 368-5830

Samples Received	Tests Requested	Completed	Reported
SEDIMENT x 1	M-RESIDUE PEST	01-OCT-99	01-OCT-99
SEDIMENT x 1	DITHIOCARB 1-3	01-OCT-99	01-OCT-99

Test	Sample	Result
M-RESIDUE PEST	SEDIMENT	see below
DITHIOCARB 1-3	SEDIMENT	2540 ppb reported as mancozeb

**Comments**

Endosulfan-I: 0.014 ppm  
Endosulfan-II: 0.028 ppm  
Azinphos-methyl: 0.057 ppm  
LOQ on most pesticides = 2-10 ppb  
Dithiocarbamate residues LOQ (soil) = 100 ppb LOD (soil) = 30 ppb

*B2*



University of Prince Edward Island

ANTIC VETERINARY COLLEGE

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DIAGNOSTIC SERVICES  
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FAX # (902) 566-0723

Toxicology & Analytical Services  
(902) 566-0833 (Laboratory)  
(902) 566-0832 (Fax)

*Ami*

DIAGNOSTIC TOXICOLOGY REPORT

AVC Lab No.: 17512  
Year: 1999

Hospital No.: Ref. No./ID: PW4

Received: 12-AUG-99 Birth Date: Sex: Species: Other  
Owner: DEPT. OF ENVIRONMENT,

Request by Dr. J. MUTCH DEPT. OF THE ENVIRONMENT (Clinic # 26)  
368-5056 CHARLOTTETOWN, PEI  
Fax #: 368-5830

Samples Received	Tests Requested	Completed	Reported
WATER x 1	DITHIOCARB 1-3	12-AUG-99	12-AUG-99

Test	Sample	Result
DITHIOCARB 1-3	WATER	6.9 ppb dithiocarbamate residue

Comments:

Dithiocarbamate residues reported as mancozeb; LOQ=6ppb, LOD=2ppb

*BS*

## **Appendix C**

### **AVC Reports on Fish Samples Orwell River Fish Kill July 29, 1999**

**DIAGNOSTIC SERVICES**

(902) 566-0863 (Laboratories)  
(902) 566-0864 (Post Mortem)  
Fax # (902) 566-0871

Orwell River	Lab No: U-16354 Clinic No: Date: July 29/99 Phone:
Clinician/Clinic: Bruce Raymond PEI Environment & Technology - Water Resources P.O. Box 2000 Charlottetown, PEI C1A 7N8	
Brook Trout At Risk:      Sick:      Dead: Submitted by: Vet              Specimen: Tissue	

**History:** Stock Origin - Orwell River. Type of Facility - wild. Initial problem 29/07/99. Found dead, suspect toxic or anoxic etiology - please assess and store for Toxicology.

**Gross Examination:**

Rt#24 (4 fish) - Moderate autolysis, food present in digestive tract. No signs of infectious disease or significant lesions. Both male and female fish affected.

OR3D (7 fish) - As noted above.


OR4A (8 fish) - As noted above.

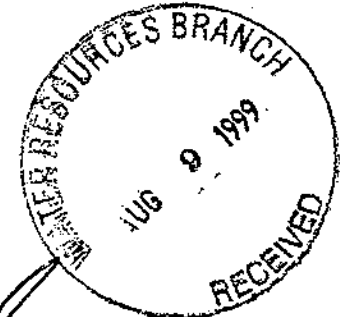
OR4B (1 fish) - As noted above.

**Tentative Diagnosis:**

Acute mortality, consistent with anoxia or toxic insult.

**Comment:** This group of fish showed moderate post mortem changes, suggesting death occurred 12-24 hours prior to collection. I could find no evidence of lesions suggestive of an infectious process and based on feeding activity it is likely fish died fairly acutely. Samples stored for Toxicology.

  
David Groman, MSc. Ph.D  
Diagnostic  
Fish Pathologist





## DIAGNOSTIC TOXICOLOGY REPORT

AVC Lab No.: 16354  
Year: 1999

Hospital No.: FH00011 Ref. No./ID: ORWELL RIVER

Received: 30-JUL-99 Birth Date: Sex: Species: Aquatic  
Owner: PEI TECHNOLOGY & ENVIRONMENT, FISH & WILRequest by Dr. B. RAYMOND FHU-PEI (Clinic # 16)  
566-0824 CHARLOTTETOWN, PEI

Samples Received	Tests Requested	Completed	Reported
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GILLS x 1	M-R PESTICIDE	30-NOV-99	previously
LIVER x 1	M-R PESTICIDE	30-NOV-99	previously

Test	Sample	Result
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M-R PESTICIDE	GILLS	No pesticides were detected
M-R PESTICIDE	LIVER	No pesticides were detected

## Comments

Specific pesticides looked for (limit of detection in brackets in ppm)  
 Carbofuran (0.07); Metribuzin (0.03); Endosulfan-I (0.17); Endosulfan-II  
 (0.33); Cypermethrin (0.07); Deltamethrin (0.08); Azinphos-methyl (0.09)