

Thomas M. Kelly, M.S.  
Marine Consultant

11 February 1985

Fisheries  
Limnology  
Resource Planning  
Vessel Surveys

MEMORANDUM

TO: Peg Peterson, Institute for Water Quality Research

FROM: Tom Kelly *TKM*

SUBJECT: Phosphorus results, 1983-1984.

The following is a summary of the phosphorus analyses done for us by Prein and Newhof Laboratories in Grand Rapids. I have attached their original letter and result sheet to this memo.

I. Shanty Creek Area Streams (See Kelly, 1983. A Survey of the Lake Bellaire Tributary Streams in the Shanty Creek Area).

| Station:   | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> |
|------------|----------|----------|----------|----------|----------|
| 15 Oct 83: | 45.0*    | 6.0      | 63.0     | 18.0     | 3.0      |
| 25 Oct.83: | 90.0     | 15.0     | 31.8     | 9.0      | 9.0      |
| 1 Nov.83:  | 18.0     | 3.6      | 12.0     | 6.0      | 9.6      |

The highest P concentrations correspond with the highest turbidity and discharge values.

II. Lake Bellaire and Tributaries, 1984. (See Sampling Reports, May-Dec. 1984).

| Station: | <u>1</u>         | <u>2</u>        | <u>3</u>        | <u>5-1m</u>           | <u>5-Bottom</u> |
|----------|------------------|-----------------|-----------------|-----------------------|-----------------|
|          | <u>Grass Cr.</u> | <u>Int. R.</u>  | <u>Int. R.</u>  | <u>Lake Bellaire,</u> | <u>Central</u>  |
|          |                  | <u>at M-620</u> | <u>at mouth</u> | <u>Basin</u>          |                 |
| 15 May:  | 6.0              | 8.4             | 6.0             | 9.6                   | --              |
| 15 June: | 9.0              | 10.8            | 6.0             | 7.2                   | 12.0            |
| 16 July: | 3.6              | 9.0             | 11.4            | 29.4                  | 5.4             |
| 15 Aug.: | <3.0             | 3.0             | 4.2             | 6.0                   | <3.0            |
| 15 Sept: | 6.0              | 9.6             | 6.6             | 8.4                   | 13.8            |
| 15 Oct:  | 6.0              | 4.8             | 8.4             | 6.6                   | 13.8            |
| 20 Nov:  | 5.4              | <3.0            | 6.0             | <3.0                  | 20.4            |
| 18 Dec:  | 12.0             | 12.6            | 11.4            | 12.6                  | 12.0            |

P values for 1984 are similar to those found during 1982-83 (Canale, Peterson, Weiss, 1983). The range of values is greater, reflecting the greater number of samples taken in 1984. The one value of 29.4 cannot be given too much weight without replication.

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\*All concentrations as ug/l P

REPORT OF LAKE BELLAIRE SAMPLING

15 MAY 1984

The following is a transcription of my field notes of 15 May 1984:

Station 1. (Grass Creek at County Road 620 culvert) Time: 1212 EDT  
Air temp: 12.2 C Sunny  
Water temp: 6.6 C  
Water clear  
BOD & P samples taken at surface  
BOD= 1.6 mg/l.

Station 2. (Intermediate R. at Riverside Marina dock) Time: 1150  
Air temp: 13.3 C Sunny  
Water temp: 9.5 C  
Water clear  
BOD & P samples taken at surface  
BOD= 1.6 mg/l

Station 3. (Intermediate R. just above outlet to L. Bellaire)  
Time: 1057  
Air temp: - Sunny, wind westerly at 12 mph  
Water temp: 9.5 C  
Water Clear  
BOD & P samples taken at surface  
BOD= 1.7 mg/l

Station 5. (Lake Bellaire at approx.  $44^{\circ} 57.2' N$ ,  $85^{\circ} 13.5' W$ )  
Time: 1120  
Air temp: 11.7 C  
Water temp, 1m: 9.2 C  
                  bottom: 7.6 C  
Station depth: 96 feet.  
BOD and P sample at bottom, P sample at surface.  
BOD at bottom= 1.7 mg/l

Notes: The phosphorus sampling bottles supplied by Prein & Newhof (disposable type) proved to be unsatisfactory. About 50% of the samples taken with this type of bottle were lost when the bottles split when the samples were frozen. Fortunately I took duplicate samples at most stations and only the Station 5 bottom sample was lost. In future I will be using Nalge 250 ml bottles for P sampling. These bottles are more robust and can take freezing w/o cracking.

No BOD sample was taken at the Lake Bellaire station at the surface. This can be done in future if desired. Please advise.


Continued

Lake Bellaire, 15 May 1984, Page 2.

The Traverse City WWTP is charging me \$8.00/BOD sample instead of \$20.00 as originally quoted. This is a considerable savings to the project. Perhaps some of the savings could be put toward the boat and motor rental at Riverside Marina (\$6.00 per monthly trip).

I expect to make my next sampling on 15 June 1984.

Submitted 5 June 1984

  
Thomas M. Kelly  
Limnologist

CC: Comfort/Peterson

Attachment: Invoice

P.S.: I have never received a contract for this work.

REPORT OF LAKE BELLAIRE SAMPLING

14 JUNE 1984

The following are the results of field work done on 14 June 1984:

Station 1. (Grass Creek) Time: 1230 EDT

Air temp: 13.9 C

Water temp: 11.5 C

Water clear

Sky overcast, wind variable

BOD and P samples taken at surface

Brook lamprey (Lampetra appendix) observed on spawning redd.

Station 2. (Intermediate River at Riverside Marina) Time: 1154 EDT

Air temp: 12.2 C

Water temp: 17.5 C

Sky overcast, wind calm at river surface

Water has slight brown tint

BOD & P samples taken at surface.

Station 3. (Intermediate River at mouth) Time: 1055 EDT

Air Temp: 12.8 C

Water temp: 17.6 C

Sky overcast, wind 337 degrees true, 6-8 mph.

Snapping turtle almost got my sample bottle and fingers!

P & BOD samples taken at surface.

Station 5. (Lake Bellaire, Main basin) Time: 1110 EDT

Air temp: 13.3 C

Sky overcast, wind 354 degrees T, 10-12 mph.

Water temp: 1 m: 17.8 C

Bottom: 9.1 C

Station depth: 96.5 ft. (29.4 m)

BOD & P samples taken at 1m and 0.5m above bottom.

BOD Results: (Analyses done by Traverse City WWTP)

Station 1: 0.8 mg/l


2: 0.9

3: 0.9

5; 1m: 0.3

Bot: 0.7

My next sampling is planned for July 16 (Monday).

  
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Limnologist

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REPORT OF LAKE BELLAIRE SAMPLING

16 JULY 1984

The following are the results of field work done on 16 July 1984. Field work by T. Kelly, A. Weber, assisting. BOD<sub>5</sub> analyses were done by the Traverse City Wastewater Treatment Plant laboratory.


Station 1. (Grass Creek) Time 1009 (all times are local time, EDT)  
Weather: Heavy overcast. Air temp: 21.7 C  
Wind 2-5 mph from 257 degrees T  
Water temp: 15.0 C Water clear  
BOD: 2.2 mg/l P sample taken and frozen

Station 2. (Intermediate River at Riverside Marina) Time: 1157  
Weather: Broken overcast. Air temp: 22.5 C  
Wind variable  
Water temp: 21.0 C Water clear, slight brown tint.  
BOD: 2.0 mg/l P sample taken and frozen.

Station 3. (Intermediate River at mouth) Time: 1100  
Weather: Heavy overcast. Air temp: 22.8 C  
Wind 347 at 8-10 mph.  
Water temp: 21.0 C Water clear, light brown tint.  
BOD: 1.9 mg/l P sample taken and frozen.

Station 5. Lake Bellaire, central basin) Time: 1115  
Weather: Broken cumulus. Air temp: 19.2 C  
Wind 317 T at 10-15 mph.  
Lake surface choppy  
Water temp: 10 C (Bottom), 22.2 C (1m)  
Water has slight green tint  
BOD: 2.1 mg/l (bottom), 2.3 mg/l (1m)  
Station depth: 87 feet  
P samples taken and frozen

My next sampling trip is scheduled for August 14 (Friday).

  
Thomas M. Kelly  
Limnologist

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Marine Consultant

Fisheries  
Limnology  
Resource Planning

REPORT OF LAKE BELLAIRE SAMPLING

14 SEPTEMBER 1984

Station 1. Grassy Creek at M-620

Time: 0950 EDT

Air Temp: 16.7 C

Sky: Broken strato-cumulus Wind: calm

Water Temp: 12.0 C Water clear

BOD: 1.5 mg/l

Note: Since the parking area here has been blocked off the stream bank has stabilized and good vegetation cover has grown up.

Station 2. Intermediate River at Riverside Marina, Bellaire

Time: 1120

Air Temp: 19.4 C

Sky: Overcast Wind: Light and variable

Water Temp: 16.9 C Water clear, slight brown-green tint

BOD: 1.5 mg/l

Station 3. Intermediate River at mouth

Time: 1030

Air Temp: 19.4 C

Sky: Overcast, broken strato-cumulus Wind: Calm

Water Temp: 16.8 C

BOD: 1.4 mg/l

Note: Lots of minnows here.

Station 5. Lake Bellaire, Central Basin

Time: 1045

Air Temp: 16.7 C

Sky: Overcast, broken strato-cumulus Wind: 181 deg. T  
at 3-4 mph.

Lake surface rippled. Water has slight green tint.

Water Temp: 1m: 18.3 C

Bot: 9.3 C

Station depth: 93 feet (28.3 m)

BOD: 1m: 0.8 mg/l

Bot: 1.5 mg/l

The next sampling trip is scheduled for October 15 (Monday).  
I have run out of room to store the frozen phosphorus samples.

Respectfully submitted,

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THOMAS M. KELLY  
Limnologist

REPORT OF LAKE BELLAIRE SAMPLING

15 OCTOBER 1984

- Station 1. Grassy Creek at M-620  
Time: 0930 EDT  
Air temp: 16.0 C  
Sky: Heavy overcast  
Water Temp: 13.6 C  
BOD: \*  
Wind: Light and variable  
Water clear
- Station 2. Intermediate River at Riverside Marina  
Time: 1025  
Air temp: (thermometer broke!)  
Sky: Heavy overcast  
Water temp: 13.6 C  
BOD: \*  
Wind: Less than 5 mph  
from 065 degrees T  
Water: Clear
- Station 3. Intermediate River at Mouth  
Time: 1021  
Air temp: -  
Water temp: 13.6 C  
BOD: \*  
Wind: 2-3 mph, variable  
Water: Clear
- Station 4. Lake Bellaire, Central Basin  
Time: 1053  
Air temp: -  
Sky: Overcast, occasional bright periods  
Sea state: Small wavelets  
Secchi disc depth: 14.8 feet  
Water temp: 1m. 15.3 C  
Bot. 10.0 C  
Station depth: 87 feet  
Water has slight green tint  
BOD: 1m. \*  
Bot. \*

The next sampling is scheduled for 15 November (Thursday).

Respectfully Submitted,

\*BOD samples lost in lab  
proceedural problem.

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Fisheries  
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REPORT OF LAKE BELLAIRE SAMPLING

20 NOVEMBER 1984

- Station 1. Grassy Creek at M-620  
Time: 1011 EST  
Air temp: 29.3F (-1.5 C)  
Water Temp: 2.0 C  
Water clear  
Sky: Overcast Wind: Light and variable  
BOD: 6.5 mg/l\*
- Station 2. Intermediate River at Riverside Marina, Bellaire  
Time: 1120  
Air temp: 0.4 C  
Sky: Overcast, occasional snow flurries  
Wind: Light and variable  
Water temp: 2.8 C  
Water clear  
BOD: 6.5 gm/l\*
- Station 3. Intermediate River at mouth.  
Time: 1042  
Air temp: 0.2 C  
Sky: Overcast, light snow  
Wind: NNW at 6 mph  
Water temp: 2.2 C  
Water clear. Some ice at river banks.  
BOD: 6.7 mg/l\*
- Station 5. Lake Bellaire, central basin.  
Time: 1058  
Station depth: 29.9 m (98 ft.)  
Air temp: 0.4 C  
Sky: Stratus cover, few breaks in clouds  
Wind: NW at 9 mph  
Sea state: Slight chop  
Water temp: 1m: 5.5 C  
                  27.4m: 4.5 C  
Secchi disc depth: 12.5 ft. (3.8m)  
BOD: 1m: 6.6 mg/l\*  
                  27.4m: 0.7 mg/l

\* BOD concentrations are several times higher than expected. Discussions with laboratory personnel indicate error possible in oxygen instrument.

My next (and final) sampling will be made on 17 December 1984.

Respectfully submitted:

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REPORT OF LAKE BELLAIRE SAMPLING

18 DECEMBER 1984

- Station 1. Grassy Creek at M-620 crossing.  
Time: 1122 EST  
Air temp: -3.7 C (25.3 F)  
Sky: Overcast, snow shower Wind: West, 6-8 mph  
Water: Clear, more suspended organic particles than usual  
Water temp: 2.0 C  
BOD: 5 mg/l
- Station 2. Intermediate River at Riverside Marina, Bellaire  
Time: 1315  
Air temp: (no data-thermometer got wet)  
Sky: Overcast, snow shower Wind: Light & variable  
Water: Clear  
Water temp: 2.0 C  
BOD: 3 mg/l
- Station 3. Intermediate River at mouth.  
Time: 1154  
Air temp: -3.2 C  
Sky: Overcast Wind: Gusty, variable  
Water: Clear  
Water temp: 2.0 C  
BOD: 3 mg/l  
Lots of ducks (mallards & goldeneyes) on the River. One muskrat seen.
- Station 5. Lake Bellaire, Central Basin.  
Time: 1215  
Air temp: -2.3 C  
Sky: Overcast Wind: NNW, 8-12 mph  
Sea state: Choppy, some white caps  
Secchi disc depth: 4.1m (13.5 ft)  
Station depth: 27.8m (94 ft)  
Water temp: Surface: 3.1 C  
Bottom: 2.7 C  
BOD: 1m: 3 mg/l  
Bot.: 2 mg/l

This report completes the 1984 sampling. A final summary report will be submitted in Mid January, 1985. Phosphorus samples will be shipped this wk

Respectfully submitted.

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