

DISSOLVED OXYGEN CONTENT OF THE ELKHART RIVER SOUTH BRANCH

FINAL REPORT

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THE ELKHART RIVER SOUTH BRANCH

The Elkhart River South Branch drains a large portion of Noble County in northeast Indiana. Its headwaters begin at several lakes and flow, via the Thumma Ditch, to Port Mitchell Lake, located 3 miles southwest of Albion (Figure 1). Downstream from Port Mitchell Lake the South Branch meanders in a northerly direction through woodlands (Bender Woods Nature Preserve) and through extensive wetlands (Mallard Roost Wetland Area). It joins the Elkhart River North Branch near Ligonier. From this point the Elkhart River flows northwesterly to the St. Joseph River, which empties into Lake Michigan.

Several tributaries enter the South Branch. These include the Steffey Ditch, Croft Ditch, Long Ditch, and the outlets of Lower Long and Diamond Lakes. At Port Mitchell Lake, the South Branch drains $53\frac{1}{2}$ square miles.

Croft Ditch, the largest tributary, drains 25 square miles and enters the South Branch $1\frac{1}{2}$ miles downstream of Port Mitchell Lake. About $\frac{1}{2}$ mile up Croft Ditch, the town of Albion sewage treatment facility is located. At the confluence with the North Branch, the South Branch drains 114 square miles.

DISSOLVED OXYGEN CONTENT OF THE ELKHART RIVER SOUTH BRANCH

The Elkhart River South Branch is currently under consideration for inclusion in Indiana's Natural Rivers Program, a program whereby certain rivers still in a largely natural condition can be protected from channelization, floodplain development, or other alterations.

The Elkhart River South Branch, along its 16 mile course, flows through wooded knobs of glacial till and a broad wetland floodplain. It is considered to be a part of one of the largest remaining wetland areas in Indiana.

In spite of its natural character, the Elkhart River South Branch supports a poor quality sport fish population. Species diversity is low, standing crop is low, and few catchable-size game fish are present. A 1980 northern pike stocking failed to boost the river's pike population. Even nongame rough fish, such as carp and suckers, are scarce. In fact, lower sections of the South Branch at times contain no fish.

The poor quality of the fish community in the South Branch is a result of the river's poor water quality. Low dissolved oxygen concentrations, not tolerated by most fish, have been recorded in the river on isolated occasions. However, there has not been, to my knowledge, a systematic summer seasonal examination of dissolved oxygen levels throughout the river.

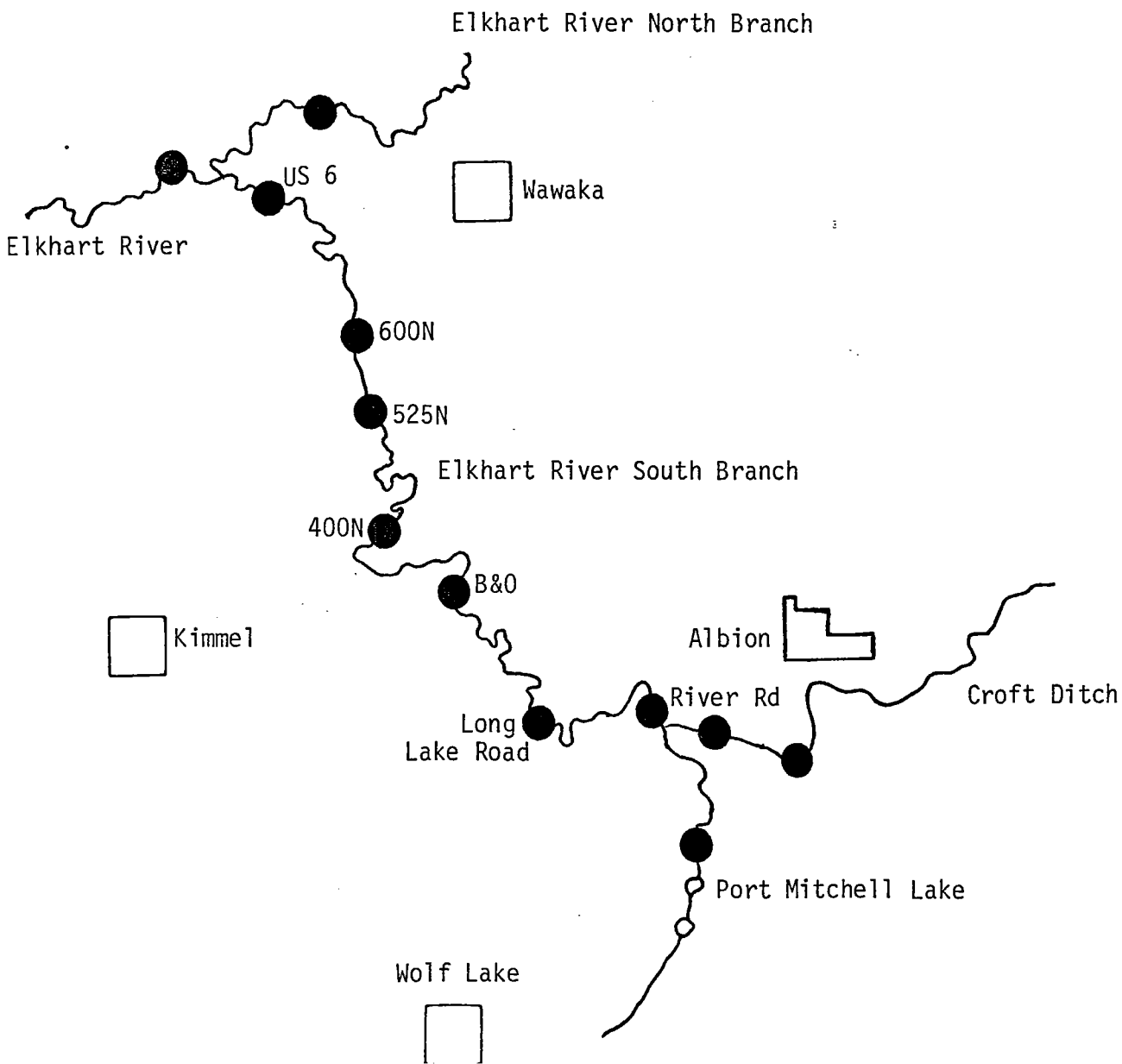
To document the amount of dissolved oxygen in the South Branch, oxygen concentrations were monitored at eight stations during summer 1986 and 1987. Also examined were oxygen concentrations in the Croft Ditch, a major tributary, and the Elkhart River North Branch and the Elkhart River mainstem. Objectives of the project were to determine periods of low oxygen levels. This information could form the basis of a program to improve water quality in the Elkhart River South Branch.

The results are presented in this report.

SAMPLING SITES AND METHODS

Dissolved oxygen concentrations were recorded at 12 locations (8 sites in the South Branch) on seven occasions from June 5-August 28, 1986 and from June 5-August 27, 1987. Oxygen levels, measured in parts per million (PPM), were determined by using a Hach portable field kit. Water samples were taken along roads or at bridge and culvert crossings. Where needed, samples were collected by using a Kemmerer water sampler. Water temperatures were also recorded.

Figure 1. Dissolved oxygen monitoring sites along the Elkhart River South Branch.



DISSOLVED OXYGEN CONCENTRATIONS

Oxygen concentrations in 1986 at the eight South Branch stations ranged from a low of $2\frac{1}{2}$ ppm on July 18 at the B & O Railroad bridge to a high of 9 ppm on August 15 at the Port Mitchell Lake outlet. The average concentration was $5\frac{1}{2}$ ppm. In 1987, oxygen concentrations ranged from $2\frac{1}{2}$ ppm on August 27 at the Highway 6 bridge to 11 ppm at County Road 525N (July 17) and at the Port Mitchell outlet (July 31). Average concentration during 1987 was 6 ppm. Mean seasonal oxygen concentrations were slightly higher at each station in 1987 than 1986 (Table 1).

In both years, oxygen concentrations gradually declined downstream of Port Mitchell Lake as the river entered the Mallard Roost Wetland Area. Oxygen concentrations less than 5 ppm were recorded once (August 27, 1987) at the Port Mitchell outlet, never at River Road despite being downstream of the Albion wastewater discharge, and only once (June 5, 1986) at the Long Lake Road. Oxygen concentrations less than 5 ppm were found on three or more occasions at all stations downstream of the Long Lake Road.

Seasonal lows in oxygen levels occurred in mid-July 1986, mid June 1987, and late August 1987. Oxygen levels less than 3 ppm, considered dangerous to fish, occurred once in 1986 (July 18) and 1987 (August 27). Oxygen levels of $3-3\frac{1}{2}$ ppm were found three times in 1986 and 1987. As mentioned, oxygen levels in the South Branch at River Road or Long Lake Road were not reduced by the discharge from the Albion sewage treatment ponds. Furthermore, oxygen levels within Croft Ditch at the State Road 9 site were not reduced downstream of the sewage treatment ponds. In fact, oxygen concentrations as high as 18 ppm were found in Croft Ditch (Table 2).

In the Elkhart River mainstem, oxygen levels were higher than they were just upstream in the South Branch on all but four occasions, due to the influence of the North Branch. Average oxygen levels in the North Branch were

1½-2 ppm greater than average oxygen levels at Highway 6 on the South Branch. On seven occasions, the difference was as much as 3 ppm between the North and South Branches.

During 1986, water temperatures in the South Branch ranged from 59-83°F and averaged 71° (Table 3). In 1987, water temperatures ranged from 64-82° and averaged 73°. Highest temperatures were recorded in mid-July 1986 and in late July 1987. Temperatures were typically higher at the Port Mitchell outlet and decreased through the Bender Woods Area downstream to Long Lake Road. The river is mostly shaded through this section. Water temperatures gradually increased as the river flowed through the open wetland areas. Average water temperatures in Croft Ditch were higher upstream of the sewage treatment facility than they were downstream (Table 4). Water temperatures were also lower in Croft Ditch, as well as the Elkhart River North Branch and Mainstem, than temperatures in the South Branch. In 1986, temperatures in the North Branch were not significantly different than water temperatures in the South Branch at Highway 6. However, in 1987 water temperatures in the North Branch were consistently lower than the South Branch at Highway 6. In both years, the water temperature of the Elkhart mainstem averaged about 72°F.

Table 1. Dissolved oxygen concentrations (ppm) in the Elkhart River South Branch, 1986 and 1987*

Site	Early June	Mid-June	Early July	Mid-July	Late July	Mid-August	Late August
Port Mitchell Outlet							
1986	7	7	6	7	8	9	6
1987	8	9	7	9	11	-	4½
River Road							
1986	7	6	6	5	8	7	7
1987	8	5	7	10	7	7	5
Long Lake Road							
1986	4	6	7	5	6	6	7
1987	7	5	6	10	6	6	5
B & O Railroad							
1986	5	7	4	2½	5	5	4
1987	4	3	5	10	4	5	3
400 North							
1986	5	6	4	3	5	7	4
1987	5	4	5	10	7	5	3½
525 North							
1986	6	6	5	4	5	7	5
1987	5	4	6	11	7	5	4
500 North							
1986	6	6	4	4	4½	5	5
1987	6	4	6	10	6	4	4½
Highway 6							
1986	6	6	5	3	3	8	4
1987	9	5	5	9	7	5	2½

Sampling days listed in Appendix.

Table 2. Dissolved oxygen concentrations (ppm) in the Croft Ditch, Elkhart River mainstem, and the Elkhart River North Branch, 1986 and 1987.*

Site	Early June	Mid-June	Early July	Mid-July	Late July	Mid-August	Late August
Croft Ditch (SR 9)							
1986	6	11	9	7	11	6	8
1987	13	13	9	11	7	8	7
Croft Ditch (STP)							
1986	6	10	10	6	10	17	9
1987	14	5	8	18	11	8	3
Elkhart River (600W)							
1986	7	7	7	4	5	6	7
1987	9	5	7	10	7	6	4
North Branch (450W)							
1986	7	9	6	5	6	6	7
1987	8	8	8	10	7	8	6

* Sampling days listed in Appendix.

Table 3. Water temperatures (°F) at various sites in the Elkhart River South Branch watershed in 1986 and 1987.*

Site	Early June	Mid-June	Early July	Mid-July	Late July	Mid-August	Late August
Port Mitchell Outlet							
1986	70	69	69	80	80	74	67
1987	72	77	74	78	82	-	70
River Road							
1986	72	69	65	79	78	73	62
1987	68	74	71	76	78½	74	68
Long Lake Road							
1986	72	69	65	79	75	71	61
1987	67	72½	71	71	74	74	65
B & O Railroad							
1986	71	70	65	80	78	71	60
1987	67	73	69½	77	78	75	65
400 North							
1986	71	70	65	81	78	72	59
1987	68	73	69½	77	78	75	65
525 North							
1986	72	70	66	82	78	73	60
1987	69	75	72	78	78	77	64
500 North							
1986	72	70	66	82	78	73	60
1987	69	75	72	78	79½	76	65
Highway 6							
1986	73	71	66	83	77	74	61
1987	69½	77	74	78	80	78½	66

*Sampling days listed in Appendix.

Table 4. Water temperatures (°F) at various sites in the Croft Ditch, Elkhart River mainstem, and the Elkhart River North Branch, 1986 and 1987*.

Site	Early June	Mid-June	Early July	Mid-July	Late July	Mid-August	Late August
Croft Ditch (SR9)							
1986	76	73	68	79	82	76	66
1987	65	71	67	80	76	71½	63½
Croft Ditch (STP)							
1986	72	70	64	80	80	68	63
1987	62	66	63	78	78½	74	63½
Elkhart River							
1986	73	70	66	80	78	74	61
1987	68	75	72	76	76	75½	64½
North Branch							
1986	76	70	67	80	79	73	64
1987	67½	73	69	75	74	72	64½

* Sampling days listed in Appendix.

MANAGEMENT IMPLICATIONS

Unlike previous occasions, oxygen concentrations in the Elkhart River South Branch during summer 1986 and 1987 seldom decreased to levels inadequate for warmwater fish (less than 3 ppm) but did drop to levels considered stressful to fish (less than 5 ppm). Earlier data had indicated very low oxygen levels may occur regularly in the river.

On June 10, 1982 no oxygen was present at the Highway 6 site. In early July 1981, oxygen levels were 1 ppm at Highway 6 and 2 ppm at 600 North. In 1971, the concentration was $2\frac{1}{2}$ ppm at Highway 6 on June 30 and $3\frac{1}{4}$ ppm at 600 North on June 2. As far back as 1967, oxygen levels of 1 ppm were recorded at these sites.

While this project demonstrated oxygen levels in the South Branch are not as low as suspected, it confirmed the river, despite its natural character, contains poor water quality and cannot support a high-quality sport fishery. Data from this project also failed to implicate the Albion sewage treatment facility as direct cause of low oxygen levels in the river.

However, nutrient inputs (phosphorous, nitrogen, etc) from the treatment ponds and from watershed runoff, coupled with the shallow, slow flow of the river through a broad wetland area, greatly increase the organic productivity of the South Branch. The natural decomposition of organic materials (algae, plants, bacteria, etc.) in turn reduced the amount of oxygen in the river.

One way to increase the oxygen content of the river is to speed flow and create greater water turbulence. Speeding flow would carry and distribute the organic load downstream. Creating turbulence would aerate the water. However, speeding flow by restricting the channel would adversely affect the adjacent wetlands and is not recommended.

The Elkhart River South Branch in its present state provides more benefits than can be expected from trying to restrict the channel to improve fishing.

The South Branch currently filters nutrients and silt from the water before it enters the Elkhart mainstem. The broad channel and adjacent wetlands reduce the threat of downstream flooding. The area produces and attracts waterfowl and wildlife. The South Branch, because of its unique natural and scenic character, is also valuable in its present condition for other recreational, educational, and aesthetic uses.

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Date: 9/23/87

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Date: 9/24/87

REFERENCES

- Pearson, J. 1981. Elkhart River South Branch Fishery Survey. Indiana Department of Natural Resources.
- Peterson, R. 1971. Elkhart River Basin stream survey report. Indiana Department of Natural Resources.

Appendix: Sampling dates when dissolved oxygen concentrations were monitored in the Elkhart River South Branch, 1986 and 1987.

1986	1987
June 5	June 5
June 17	June 18
July 3	July 1
July 18	July 17
July 31	July 31
August 15	August 14
August 28	August 27

