Stephenfield Reservoir and Upper Boyne River Watershed
Provincial Fisheries Report

Background History

The Boyne River originates in the Pembina escarpment and flows eastward into the Morris River. The Morris River drains into the Red River. There are a number of tributaries but the significant ones within this watershed are Roseisle and Lyle Creeks. Several communities are situated along the river, including the Village of Treherne and just downstream of this watershed study area, the Town of Carman.

In 1963 a dam was constructed in the Boyne River and the Stephenfield Reservoir was created. The main purpose of the dam was to supply water for agricultural and domestic use. In 1999 the Stephenfield Water Treatment Plant officially opened and it supplies water to the R.M. of Dufferin and surrounding area.

The creation of the reservoir also provided recreational opportunities. A provincial park was developed on the south side of the lake with ~177 serviced and unserviced sites, group use areas, unsupervised beach area, trails, boat launches, mini-golf, playground and concession. In an area of the province where fishing opportunities were limited, Stephenfield Lake now provides an opportunity for recreational angling.

Stocking History

Not long after Stephenfield Lake was created there was a demand to stock it. From 1964-66, brook and rainbow trout fingerlings were stocked but these attempts were unsuccessful. The winter oxygen levels were too low. This was attributed to the decay of flooded vegetation. Adult northern pike, perch and the occasional walleye fry have been stocked since and the following is a summary of the stocking history.

Legend **Egg = Egg Fry = Fry 12-15 cm 18+ cm A = Adult (>30 cm)**

1964	RAINBOW TROUT	Fingerling	50,000
1965	BROOK TROUT	Fingerling	11,000
1965	RAINBOW TROUT	>1 year	4,825
1965	RAINBOW TROUT	Fingerling	10,000
1966	BROOK TROUT	Fingerling	5,000
1966	RAINBOW TROUT	Fingerling	12,000
1967	NORTHERN PIKE	Adult (>30 cm)	350
1968	YELLOW PERCH	Adult (>30 cm)	4,000
1968	NORTHERN PIKE	Adult (>30 cm)	200
1972	NORTHERN PIKE	Adult (>30 cm)	1,000
1972	YELLOW PERCH	Adult (>30 cm)	5,000
1973	NORTHERN PIKE	Adult (>30 cm)	1,000
1974	YELLOW PERCH	Adult (>30 cm)	4,000

Stocking History Cont'd

Legend **Egg = Egg Fry = Fry 12-15 cm 18+ cm A = Adult (>30 cm)**

1975	NORTHERN PIKE	Adult (>30 cm)	2,000
1975	YELLOW PERCH	Adult (>30 cm)	4,000
1976	YELLOW PERCH	Adult (>30 cm)	5,500
1978	YELLOW PERCH	Adult (>30 cm)	4,500
1978	NORTHERN PIKE	Adult (>30 cm)	1,000
1979	YELLOW PERCH	Adult (>30 cm)	4,000
1980	NORTHERN PIKE	Adult (>30 cm)	825
1980	YELLOW PERCH	Adult (>30 cm)	4,000
1981	YELLOW PERCH		4,000
1983	NORTHERN PIKE		442
1984	WALLEYE	Fry	200,000
1985	WALLEYE	Fry	50,000
1988	NORTHERN PIKE	Adult (>30 cm)	200
1988	NORTHERN PIKE	>1 year	175
1988	WALLEYE	Fry	100,000
1989	WALLEYE	Fry	50,000
1989	NORTHERN PIKE	Adult (>30 cm)	379
1990	NORTHERN PIKE	Adult (>30 cm)	568
1991	WALLEYE	Fry	100,000
1992	NORTHERN PIKE	Adult (>30 cm)	188
1993	NORTHERN PIKE	Adult (>30 cm)	250
1994	WALLEYE	Fry	50,000
1995	WALLEYE	Fry	50,000
1995	NORTHERN PIKE	Fry	100,000
1996	WALLEYE	Fry	100,000
1996	NORTHERN PIKE	Fry	650,000
2002	NORTHERN PIKE	Adult (>30 cm)	245

Angling Success

A report to our files from 1966 indicates how quickly fishing took off in Stephenfield Lake: "the amount of northern pike taken out of the dam astounds me…some seven pound northerns' have been weighed in." More recently Don Lamont wrote the following in his Complete Angler column in January 2002: "There were rumblings through the fishing grapevine of a reservoir in southern Manitoba that was producing some excellent perch and pike fishing. ..We fished for about three hours that day out of the same two holes and we caught lots of perch though the size was a little smaller than I was used to in other areas, the biggest about nine inches. We did catch some bonus pike, with one about eight pounds getting off right below the ice. All in all, an excellent day on a new body of water that obviously has a lot of fish."

Fish Presence

The following fish species were documented for Stephenfield Lake from a 1983 test netting survey and were listed on the Fisheries Habitat and Inventory Classification System (FIHCS): northern pike, yellow perch, white sucker, fathead minnows and walleye.
In July 2002, fish collections were taken with a seine, at three sites along Stephenfield Lake (south shore). There were many yellow perch, northern pike (including young of

the year), white suckers (young of the year), johnny darters, fathead minnows and other cyprinids collected.
There was also a dead northern pike just off from the buoyed beach area.

Fisheries Limitations

Stephenfield Lake has a documented history of nutrient loading attributed to runoff from agricultural lands and shoreline erosion (FHICS, 1992). In 1983, regional Fisheries staff (on file) investigated the option of an aeration unit to offset low oxygen conditions experienced during the winter and the threat of winterkill. It was generally felt, however; that oxygen levels were good enough when there was limited to snow cover to support a pike (not walleye) fishery. As of 2002, low oxygen levels have certainly stressed if not caused both summer and winter kills almost annually.

When fisheries staff sampled in July 2002, there was a considerable algal bloom occurring and toxic green algae were present. A fall tour of the watershed included a visit to the water treatment plant at Stephenfield reservoir. It was there that they indicated they had come close to closing the plant down due to the inability to treat the water effectively and had to issue "boil water" restrictions.

Although there is limited information, Stephenfield Lake appears to be a productive lake in that:

- There appears to be a naturally reproducing population of game fish (pike and perch) and
- There appears to be a good forage base of minnows.

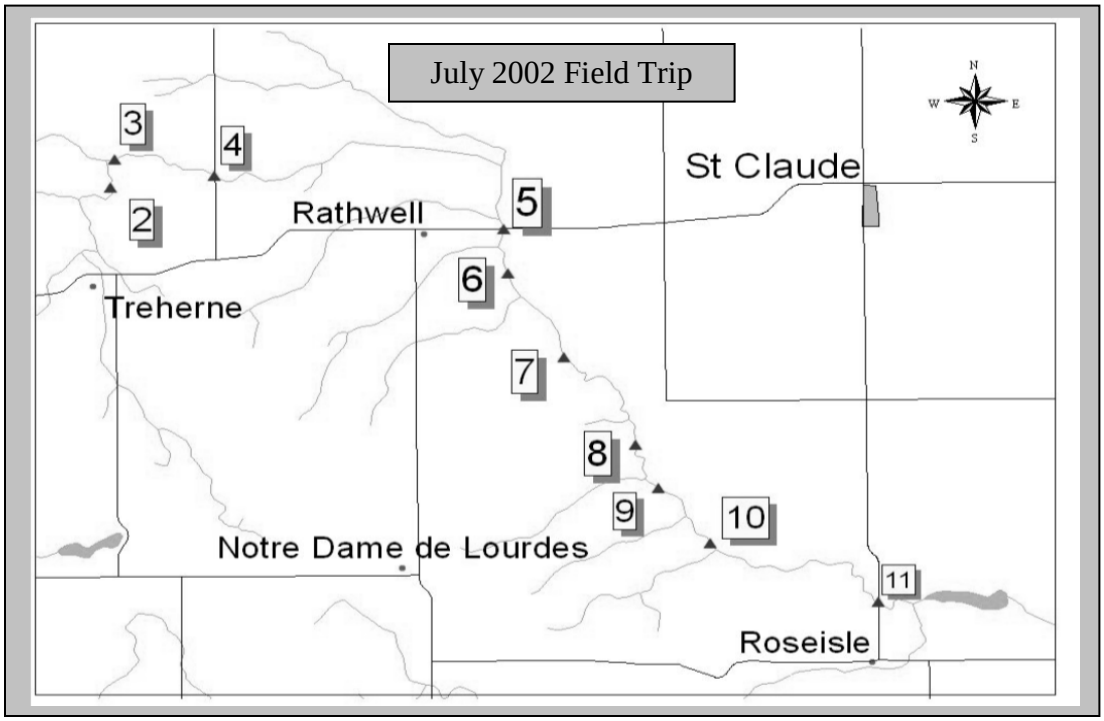
The lake, however; is under intense fishing pressure coupled with declining water quality. These factors may end up limiting not only the fishery but recreational opportunities and drinking water availability.

The Boyne River Upstream of Stephenfield Reservoir

The total drainage area of the Boyne River is 574 km^2 (FHICS 1992). Limited physical, chemical or biological data exists for this river, particularly the upstream section included in this watershed. As indicated above the headwaters of the Boyne River originate in the Pembina escarpment and flow through approximately 112 km of agricultural land until it joins the Morris River. According to the 1980 1:250 map, sections have been channelized, there are off channel (12) and instream (3) water impoundments and a number of seasonal and permanent road crossings.

Fish Presence
The FHICS Data indicates that the following fish species have been identified in the Boyne River: blacksided darter, creek chub, fathead minnow, johnny darter, northern pike, walleye, white sucker and yellow perch.

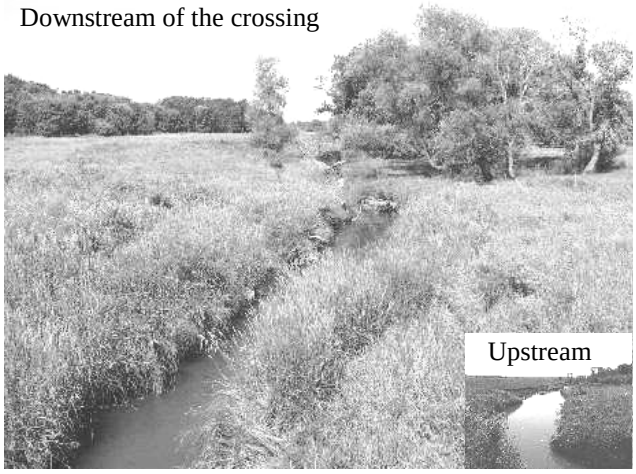
In July 2002, Fisheries and Wildlife staff toured the upstream segment of the Boyne River and sampled at a number of sites. The following summarizes the results from that field trip.



Site 1 at Treherne looking downstream from the Highway. Current land management practices may be affecting riparian vegetation and adding a source of nutrients to the river.

Site 2
Good streambank vegetation.
Rock riffle run below culvert, pool upstream of culvert. Downstream of culvert there were lots of dragonflies. Instream there were lots of young of the year crayfish, gammarus, mayflies and johnny darter.
Temperature: 24.7 C 0xygen: 6.33 mg/l
pH: 7.91

Downstream of the crossing



Site 4

Extensive riparian area limited as cattle appear to access the stream sometime during the year.
Downstream of the bridge was a pool/riffle run. Water depth about 2 ft deep. Young of the year white suckers, johnny darters and other cyprinids collected in the seine. Good clam bed in this reach.
Temperature: 23.7^{0C}
Oxygen: 6.12 mg/l pH: 8.10

Site 5 - Hwy 2 Road Crossing

Watercourse choked with aquatic vegetation: pond weed, bladderwort and duck weed.
Bottom substrate is mud/silt and there are lots of snails attached to the vegetation and floating on the surface. Notice the river is wider here and according to the 1:250 map a large portion of the river upstream has been channelized to this point. The upsream photo (inset) gives a glimpse of the stream as it starts into a more natural segment.
Temperature: 21.7 ^{0C} Oxygen: 5.5 mg/l
pH: 7.8

Site 8
Good riparian vegetation in a natural segment of stream. The culvert has constricted the flow, backflooding upstream of the culvert causing the river to widen and creating a deep pool.
Seined the riffle reach and collected blacksided darters and johnny darters. Also collected a couple pond snails.

Site 10
Looking downstream, just around the bend in this photograph there is a riffle pool run. Northern pike, white suckers, blacksided darters, johnny darters and fathead minnows were collected in two seine runs. There were young of the year and one plus pike and perch indicating they may be year round residents.
In the surber sampler dragonfly nymph, mayflies, damselflies, pond snails and clams were also collected. There were a lot of dead clams at this site.

Fish Habitat Conditions
The upstream reaches of the Boyne alternate between natural sections and those affected by man made influences. There are a number of components that are critical for fish survival and reproduction: streambank vegetation; water quantity; water quality; and instream features like: riffles; pools; boulders and logs and undercut banks.

Healthy **streambank** or **riparian vegetation** is critical to fish, wildlife and water quality. The vegetation filters sediment, excess nutrients and toxic substances before they reach the water. The roots stabilize the banks reducing erosion and the amount of sediment entering the river. Overhanging vegetation shades the river, lowering the water temperature and provides a food source as leaves or the insects on the trees fall into the river.

The Boyne River is an alluvial river. Its' natural function is to erode, transport and deposit sediments. It is this process that creates the instream features critical for aquatic ecosystems. When rivers are channelized (straightened) or impounded, these actions affect the river's natural processes.

When channelized the natural river morphology (meanders, riffles and pools, and bank vegetation) are removed and the river hydrology is altered. The result is often:
1. increased water temperatures: no shading; no cover for fish life; rapid daily and seasonal fluctuations in temperatures; reduced leaf material input
2. substrate is mostly unsorted gravel: reduction in habitats; fewer organisms
3. under high flows river velocities are now higher than some aquatic life can withstand and there are few or no resting places

4. under low flows there is insufficient depth of flow during dry seasons to support diversity of fish and aquatic life. There are few if any pools.

In the case of impoundments the sediment that the water needs to carry is deposited in the reservoir. The water leaving the impoundment is devoid of sediment and the need to transport sediment accelerates the rate of erosion. The result is steep banks and alterations to the instream habitat.

With so many alterations to rivers and demand for water, it is important to determine the instream flow that is necessary to maintain a healthy and diverse aquatic ecosystem. In order to determine instream flow needs a number of factors are considered:

1. Hydrology: magnitude, frequency, timing, rate of change and duration
2. Geomorphology: river forming and maintenance requirements
3. Connectivity: both upstream and downstream as well as laterally to surrounding wetlands
4. Biology: a determination of the aquatic inhabitants (not just fish) and their requirements at different life stages
5. Water quality (from an instream flow perspective, this mean the inherent WQ associated with flow and geomorphology rather than measures of P or N compounds for example).

Although water temperatures taken at the various sites along the river were nearing the upper limit for cool water fish species like walleye, the oxygen levels were within an acceptable range (5.5 mg/l - 6.33 mg/l). Generally 5.0 mg/l and up supports a diverse range of organisms. In the lake, oxygen values taken near the bottom under the extensive algal bloom were definitely limiting (0 mg/l). The dead pike may have resulted from a combination of high water temperatures (26 ^{0C} and low oxygen) although there are a number of other factors that were not examined. Concerns over winter and summer oxygen depletion have been documented since 1983.
pH values appeared to be reaching the upper end of the range suitable for supporting a diverse range of organisms (6.5-8.5), particularly at site 4 (8.10) and at the lake (8.67). When pH values are outside the acceptable range, fish start to have difficulty breathing as it interferes with the gas exchange across their gill membranes.

Conclusion and Recommendation

The Boyne River was classified as a river with slight to moderate limitations in it's ability to support fish (FHICS 1992). Current land management practices have attributed to a decline in riparian and instream features. Both man made and natural conditions have contributed to the decline in water quality.

Given the limited biological, chemical and physical data that is currently available, an inventory of this watershed study area would be beneficial in identifying, assessing and prioritizing issues affecting the aquatic ecosystem and water quality.

References:

D.S. MacDonell and R. A. Remnant. 1999 Assessment of instream flow needs in streams undergoing irrigation development in southern Manitoba. 173 pp. A report prepared for Association of Irrigators in Manitoba (Carman, Manitoba).

FHICS 1992. Fisheries Inventory and Habitat Classification System for Boyne River. Manitoba Conservation Fisheries Branch, Box 20, 200 Saulteaux Crescent, Winnipeg, Manitoba R3J 3W3

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