US Army Corps
of Engineers
St. Paul District
Mississippi Valley Division

Kinnickinnic River At River Falls, Wisconsin

Thermal Study

October 2003

Kinnickinnic River at River Falls, Wisconsin
Thermal Study

October 2003

U.S. Army Corps of Engineers
St. Paul District
St. Paul, Minnesota

Kinnickinnic River at River Falls, Wisconsin
Thermal Study

TABLE OF CONTENTS

Kinnickinnic River at River Falls, Wisconsin Thermal Study

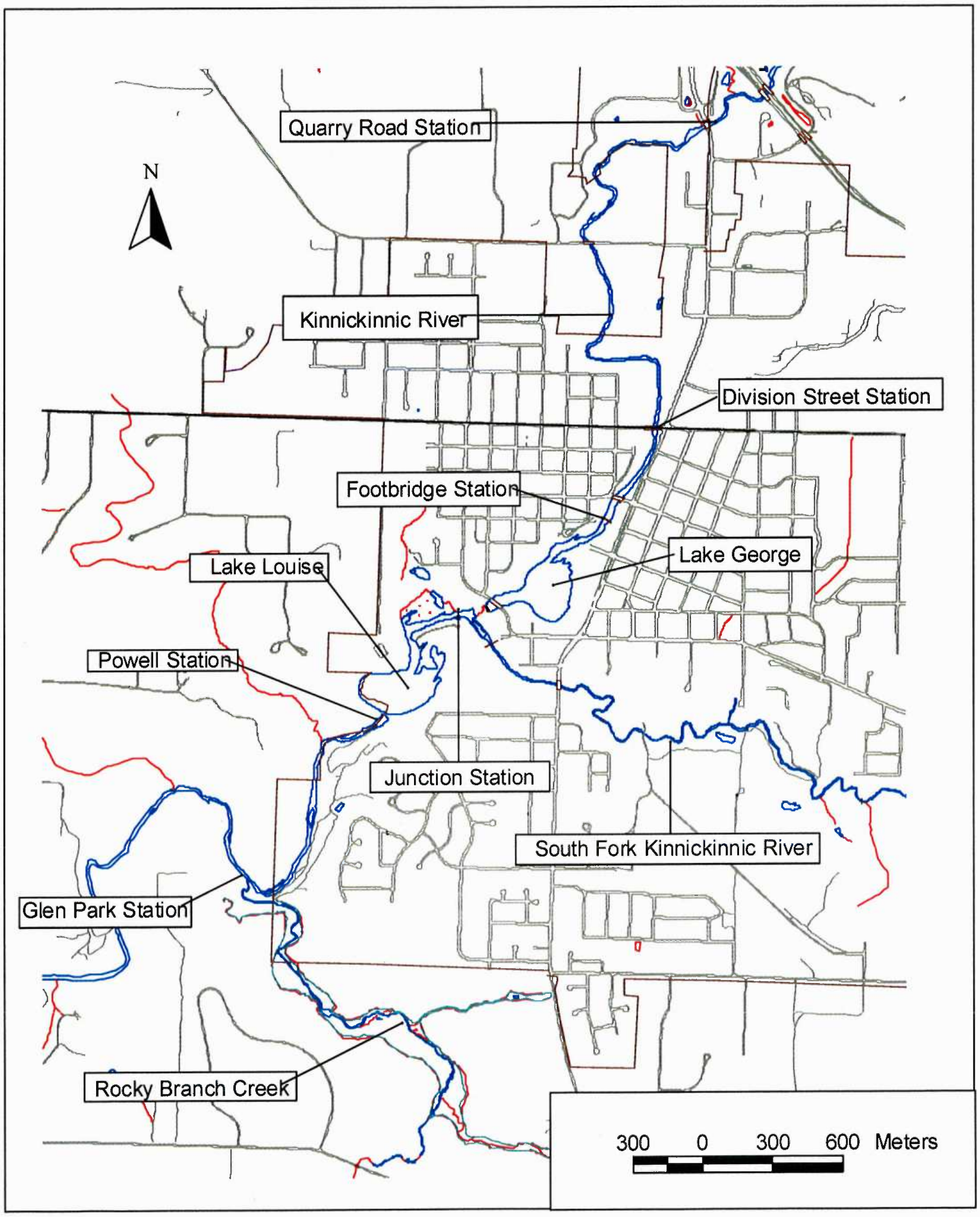
1.0 INTRODUCTION

The purpose of this study was to construct a Kinnickinnic River CE-QUAL-W2 thermal model that would help evaluate the efficacy of different storm runoff management plans currently being developed to manage a cold-water fishery downstream of River Falls, Wisconsin.

The Kinnickinnic River, a premier trout stream known for dense populations of brown trout, is an at-risk resource from the effects of a rapidly growing community (Johnson, 1995). Located in west-central Wisconsin, the City of River Falls (population 12,000) saw a 20 percent population increase in the 1990's. The city's population is projected to grow to 16,500 by the year 2010 (Johnson and Lamberson, 2003). As the community grows and creates more impervious land cover, the Kinnickinnic River would most likely be subjected to increased storm runoff flows and elevated temperatures.

In 1996 and 1997, the Wisconsin Department of Natural Resources (DNR) monitored stream temperatures upstream and downstream of downtown River Falls (Figure 1.1). During that time, flashes of increased stream temperatures downstream of the city's storm sewer effluents were observed during summer storm events. The magnitude of these temperature spikes was pronounced and usually ranged between 2 and 4 degrees C.

Figure 1.1 - Stream monitoring stations- Kinnickinnic River flowing through two impoundments and downtown River Falls



In Figure 1.2, stream temperatures at different points along the Kinnickinnic River are shown for two particular 1997 storms. Both figures depict a stream temperature spike that appeared below Quarry Road, became diminished at Junction Station, and then reappeared below Lake Powell.

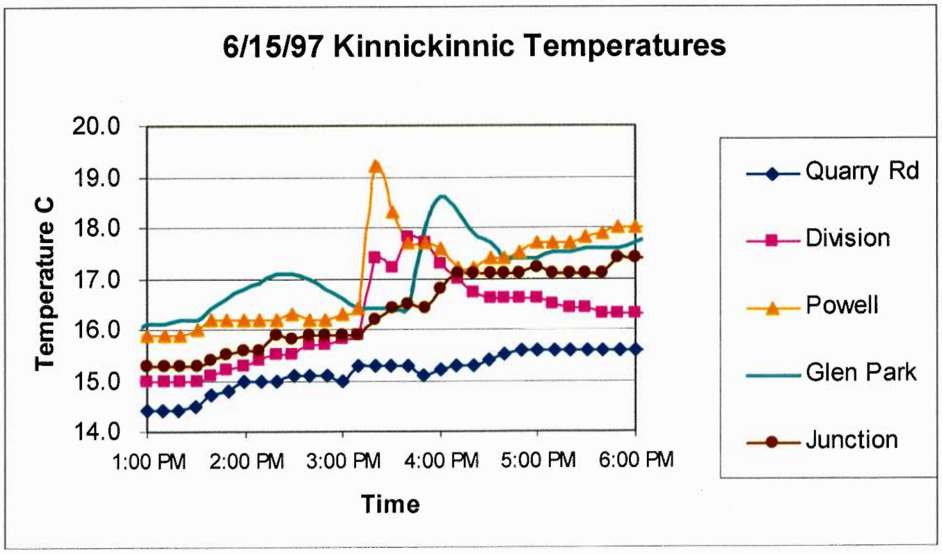
The temperature spikes seen between Quarry Road and Lake George were probably due to storm sewers discharging heated runoff from impervious areas into the river.

The temperature regime seen at Junction Station was primarily an outcome of mixing outflows from Junction Dam and the South Fork Kinnickinnic (Figure 1.3). During the 6/15/97 and 7/1/97 storm sewer runoff periods, the temperatures observed at Junction Station were cooler than the temperatures observed above Lake George at Division Station and at the South Fork Kinnickinnic Station. The dam's discharge at Lake George effectively dampened the temperature spike seen above the reservoir and overwhelmed with much larger flows the warmer temperatures contributed by the South Fork Kinnickinnic at Junction Station.

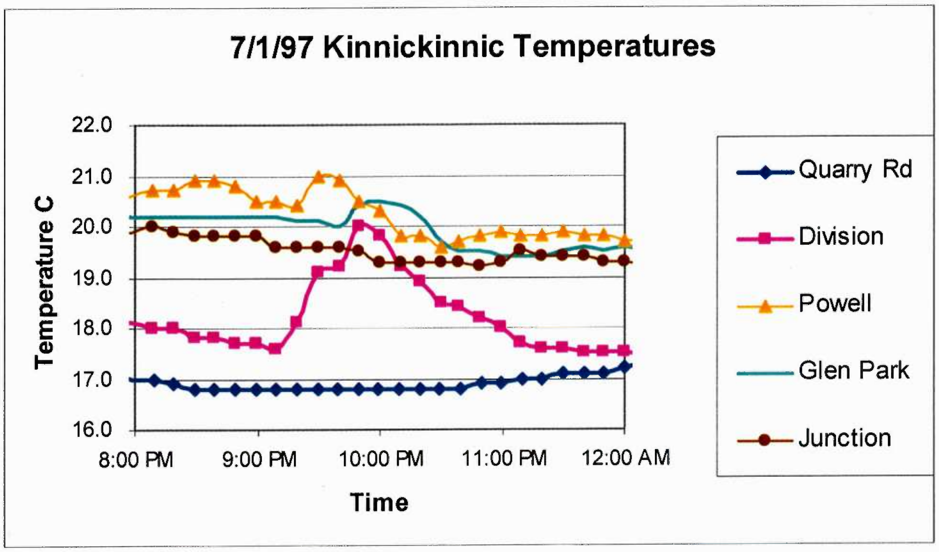
After the storm runoffs flowed through Powell Dam, a temperature spike reappeared at Powell station and at Glen Park for both storm events. Again, the spikes were probably caused by storm sewer discharges into Lake Louise and into the Kinnickinnic River below Powell Dam. The reason that the maximum temperatures seen at Glen Park were less than the maximum temperatures seen at Powell Station was probably due to the relatively cold-water discharge from Rocky Branch into the Kinnickinnic River immediately upstream from Glen Park.

Figure 1.2 - Stream temperatures observed during a) 6/15/97 and b) 7/1/97 at different river stations along the Kinnickinnic River

a)



b)



Supported by earlier studies that documented elevated stream temperatures after storm events (Johnson, 1995), a need to address the effects of the city's storm sewer system downstream developed. Utilizing data from these two 1997 rain events and a dry period in August 1997, a CE-QUAL-W2 model was created to simulate the June 15, 1997, and July 1, 1997, storm sewer runoff conditions and the 1997 summer base flow condition. The intended use for the model was to assist water resource managers in evaluating how different storm runoff management plans will alter the temperature and flow regimes observed during these three specific time periods.