1. INTRODUCTION

History of the Watershed

Very little is known about the quality of water in the Cottonwood River or its tributaries during pre-settlement and settlement times. Accounts by early explorers describe the river at its mouth as being "…four to six feet deep …and so transparent that one can see many little objects at the bottom."[1] Descriptions of other nearby rivers of that time period are consistent with this account and indicate a profoundly different environment than that of today.

According to survey notes of the early 1860s, many lakes and sloughs populated the watershed and the landscape was dominated by tall grasses in the east and shorter grasses in the west. Trees, mostly cottonwood and willow, were seen along the Cottonwood River and its tributaries, as well as in the rare "little isles" which early explorers found in areas that were protected from fires. The Dakota people called the Cottonwood River the "Waraju," because the cottonwood tree was so common along the banks. Many of the settlers traveled to the river, and transplanted cottonwood trees to their farms, settlements and towns.

Agricultural settlement of the watershed began after explorers, such as Joseph N. Nicollet, traveled across the prairie in the early 1800s. The first settlers used oxen and cleared small portions of land, providing enough food for themselves and small amounts to trade for the supplies they needed.

As the settling of the prairie continued, more land was put into production and tools became more efficient. Mechanization enabled most of the wetlands and sloughs to be drained, although the first drainage projects were completed by hand with a shovel in the early 1900s. Statistics from the United States Department of Agriculture show that in 1880, a farmer in Redwood County could raise enough food to feed just over six people. By 1940 that number had risen to over eleven, and in 1996, it was estimated that one farmer could raise enough to feed one hundred twenty-eight people.

By 1948, siltation and flooding were listed as major deterrents to fish populations in the Cottonwood River.[2] Throughout the 70s and 80s, fishery surveys and inventories repeatedly confirmed that polluted runoff was entering the river and adversely affecting fish populations. More recently, the lower reach of the river has been found unable to support swimming, one of its designated uses, due to the presence of fecal coliform bacteria.

Settlement, drainage, and agricultural development also brought about increased flooding and flood damages. Floods in 1957, 1969 and 1993 were the most severe, but annual spring flooding is very common and often results in road damages and spring planting delays. The floods of 1993 finally prompted relocation of several floodplain residences in the City of Springfield. Recurrent flooding has also led to the enrollment of

[1] This observation was made on June 20, 1838 and is recorded in Edmund C. Bray and Martha Coleman Bray, editors, Joseph N. Nicollet on the Plains and Prairies (St. Paul: Minnesota Historical Society Press, 1976), p. 54.

[2] See discussion of fishery resources in Section 2 of this report.

substantial floodplain acres along the Cottonwood River in permanent land retirement programs.

A related flooding concern of many watershed residents since the early 1970s is the redesign of the Marshall Flood Control Project that will divert excess floodwater from the Redwood River to a tributary of the Cottonwood River. A major federal study (639 Study) of flooding in five tributaries to the Minnesota River including the Cottonwood River produced very little in the way of affordable flood damage reduction measures.

Dramatic changes have occurred in the watershed in the past one hundred and fifty years, stemming mostly from the introduction of production agriculture and mechanization. The river once used for travel, food, recreation and a water source is now almost forgotten except for its use as a drainage ditch.

History of the Project

The Cottonwood River Restoration Project officially began in the spring of 1996, following the award of a Clean Water Partnership grant from the Minnesota Pollution Control Agency (MPCA). The Project, sponsored by the Redwood-Cottonwood Rivers Control Area (RCRCA), was designed to investigate water quality conditions in the Cottonwood River, and develop and implement measures that will improve the quality and usefulness of the river.

In recent years, particularly within the Minnesota River Basin, watershed-based studies that address major river systems have become more common. The Redwood River Clean Water Project, one of the first of these investigations, has shown a great deal of success in cleaning up the Redwood River. The Redwood River Project began with a Clean Water Partnership (CWP) Resource Investigation grant in 1989. Following completion of the study, implementation activities began in 1995. Success that was shown in the Redwood Watershed stimulated interest among residents of the Cottonwood Watershed, leading RCRCA to sponsor a CWP Resource Investigation grant application for the Cottonwood River. One of the main purposes of RCRCA is to develop and implement plans to reduce pollution and improve water quality in the Redwood and Cottonwood Watersheds. The Cottonwood River Restoration Project, therefore, was an inherent function of the organization.

The Cottonwood River Restoration Project established a broad base of support from the very beginning. RCRCA, by virtue of its organizational structure, has representation from eight counties and eight Soil and Water Conservation Districts. Staff of the SWCDs participated in the watershed assessment portion of the study. The U.S. Geological Survey (USGS) provided considerable technical assistance. Staff of USGS developed rating curves, and were responsible for collecting and analyzing samples at the New Ulm station. They also assisted with data analysis and interpretation. Minnesota State University staff developed geographic information system (GIS) layers used for watershed assessments and Project mapping. The University's laboratory analyzed all water samples except those collected by USGS staff. Staff of the Minnesota Pollution Control Agency (MPCA) helped guide the monitoring program and were instrumental in developing and carrying out the tailored integrated stream and watershed assessment (TISWA) program. They also assisted with data analysis and interpretation and provided guidance on the implementation plan. RCRCA staff had primary responsibility for water

quality monitoring activities at eight stations in 1997 and five stations in 1998 and 1999. Data analysis and interpretation, calculation of loading estimates, and preparation of the final report including the implementation plan were the responsibility of RCRCA staff, with assistance from an advisory committee.

Public participation was an important aspect of this study. This was accomplished through a number of public meetings, most of which were scheduled early in the morning at local restaurants. The public was kept informed of Project activities through the news media and through presentations at watershed events.

The current study represents the only detailed water quality investigation of the Cottonwood River and its tributaries. It provides answers to questions about current water quality conditions and establishes a plan that, when carried out, will restore portions of the watershed to a healthier state.

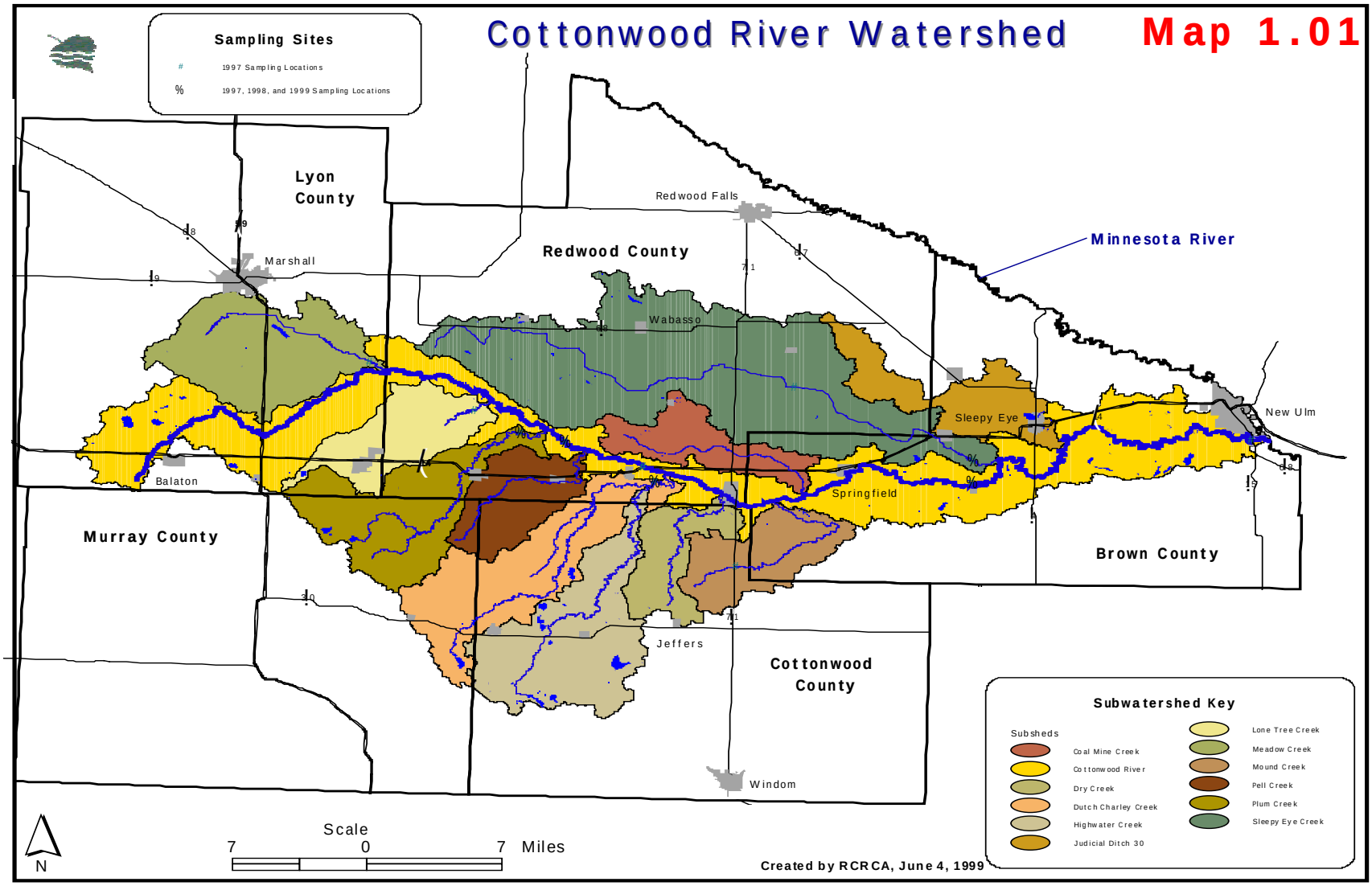
Refer to Map 1.01 and 1.02 to view the Cottonwood River Watershed.

Table 1.01: Cottonwood River Characteristics

Drainage Area	1,310 mi^2 or 840,200 acres
Length	150 miles
Gradient	7.5 feet per mile
Mean Flow at New Ulm	377 cfs
Peak Instantaneous Flow at New Ulm	28,700 cfs
Major Lakes	30
Wetland Acreage	19,522 acres

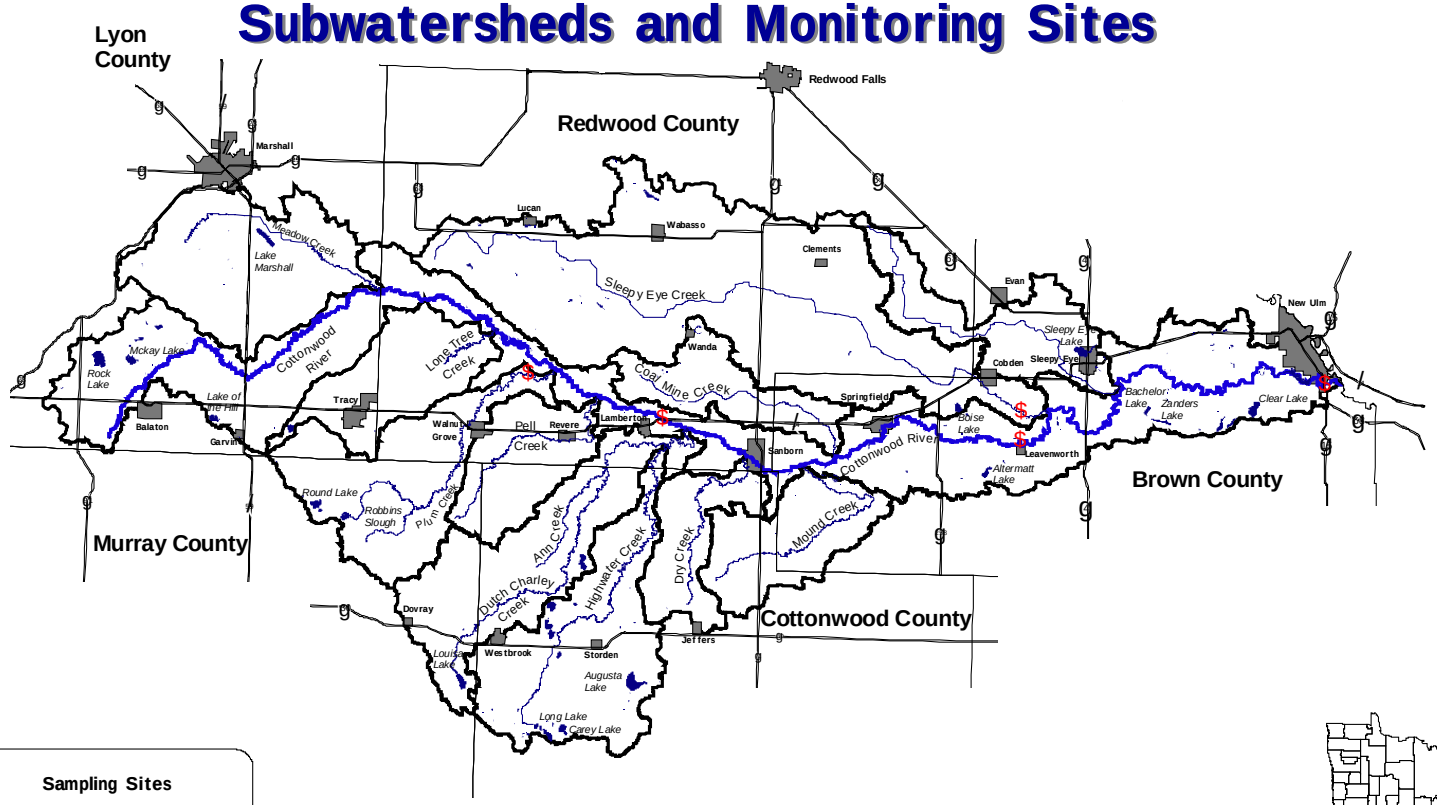
Major Tributaries

	Stream Length in miles	Subwatershed square miles	Subwatershed acreage
Coal Mine Creek	16.59	46	29,534
Dry Creek	21.67	41	26,213
Dutch Charley Creek	45.74	101	64,853
Highwater Creek	41.79	107	68,787
Judicial Ditch 30	27.54	58	37,419
Lone Tree Creek	13.24	58	37,091
Meadow Creek	20.96	97	62,425
Mound Creek	24.95	56	35,622
Pell Creek	23.16	51	32,551
Plum Creek	35.33	90	58,131
Sleepy Eye Creek	50.97	274	175,402


Cottonwood River Watershed
Map 1.01
Sampling Sites
1997 Sampling Locations
% 1997, 1998, and 1999 Sampling Locations
Lyon County
Redwood Falls
Minnesota River
Redwood County
Marshall
Wabasso
Sleepy Eye
New Ulm
Balaton
Springfield
Murray County
Brown County
Jeffers
Cottonwood County
Windom
Subwatershed Key
Subsheds
Coal Mine Creek
Cottonwood River
Dry Creek
Dutch Charley Creek
Highwater Creek
Judicial Ditch 30
Lone Tree Creek
Meadow Creek
Mound Creek
Pell Creek
Plum Creek
Sleepy Eye Creek
N
Scale
7 0 7 Miles
Created by RCRCA, June 4, 1999

Map 1.02

Cottonwood River Watershed
Subwatersheds and Monitoring Sites



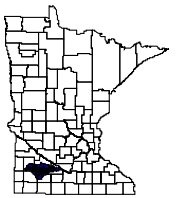
Sampling Sites

- 1997 Sampling Sites
- $ 1997, 1998, and 1999 Sampling Sites

N

Created by RCRCA, June 15, 1999

3 0 3 6 Miles



Index Map

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Project Milestones

May ’96	Grant agreement signed
Fall ’96	Investigate and select sampling sites Develop preliminary work plan
Spring ’97	Sampling initiated at nine stations
Spring/Summer ’97	Discharge curves developed
June ’97	Budget amendment
September ’97	Work plan approved
April ’98	Cottonwood River Restoration Week Public meetings
May ’98	Resume sampling TISWA survey
Winter/Spring ‘98-’99	Preliminary loading estimates calculated
February ’99	GIS layers completed
March ’99	Grant extension approved
May ’99	Mid-project review Resume sampling Finalize loading estimates
June ’99	Cottonwood River Restoration Week Public meetings, canoe trip Project signs installed Resurveyed TISWA sites
Summer ’99	Fishery survey Draft diagnostic study completed
Summer/Fall ’99	Prepare final report

Project Costs

Total Project costs amounted to $450,139. Funding sources included a Clean Water Partnership Resource Investigation Grant of $215,280 and a $50,000 contribution from Redwood-Cottonwood Rivers Control Area (RCRCA). Remaining costs were covered by in-kind contributions from contributing sponsors. Table 1.02 lists Project expenses by program element.

Table 1.02: Project Budget

Program Element	Cost
Work Plan Development	$ 17,000
Water Quality Monitoring	162,237
Watershed Assessment	102,588
Data Analysis	47,550
Implementation Plan Development	55,033
Information and Awareness Efforts	30,223
Administration	35,508
TOTAL	$450,139