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# Saint Paul Sewer Separation Program



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# Saint Paul Sewer Separation Program

## Introduction

### The “Great River Celebration”

On May 17, 1996, the cities of Minneapolis, Saint Paul and South Saint Paul, the Metropolitan Council, the Minnesota Pollution Control Agency (MPCA), the Minnesota-Wisconsin Boundary Area Commission and others celebrated the completion of a ten-year, \$332 million sewer separation program for

Combined Sewer Overflow (CSO) elimination. This “Great River Celebration” was held on Harriet Island in downtown Saint Paul and drew more than 500 people.



*Opening remarks at the “Great River Celebration”.*



*Attendees enjoying the festivities.*

It included music, exhibits and comments by local, state and federal officials commemorating the CSO elimination program and the impact it has had on the water quality of the Mississippi River as it flows through the Minneapolis-Saint Paul metropolitan area.

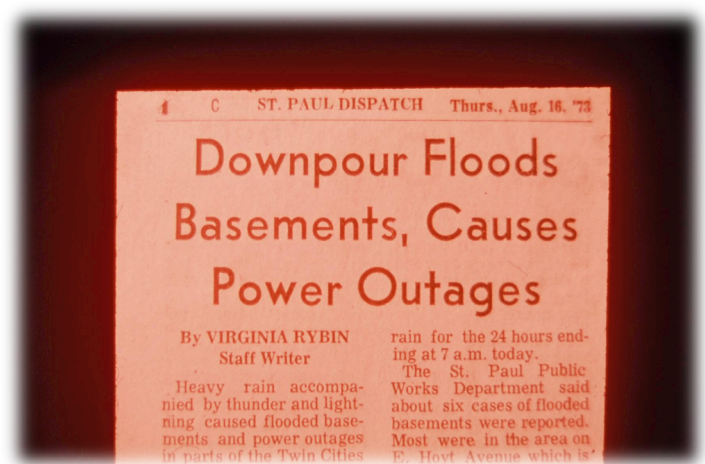
The Sewer Separation Program in the City of Saint Paul turned out to be a major, multi-purpose project, including not only the high priority sewer separation, but also:

- Sanitary sewer rehabilitation
- Neighborhood oiled street paving
- Historic street light installation
- Boulevard tree planting
- Lead water service and main replacement
- Gas pipe upgrade and gas meter installation and
- Other utility replacement as needed

Saint Paul began this ambitious and accelerated sewer separation program after years of a longer-term sewer construction program. Saint Paul's challenge was larger than Minneapolis' or South Saint Paul's because it had more areas to separate and more miles of storm sewer to build.

## History

To get a perspective on Saint Paul's part in this accomplishment, let us step back in time. It is the summer of 1973 and a thunderstorm has just passed over Saint Paul dropping heavy rains on the City. Immediately, phones at Public Works



Aug. 16, 1973: Saint Paul Dispatch



Sewer Maintenance begin to ring. There are several hundred basements flooded with combined sewage. In the streets, children are playing in the water that has bubbled up from catch basins. Toilet paper and other debris are sad reminders that this is more than storm water. In the Mississippi River, aquatic life is choking on raw sewage and industrial waste. Within hours, this mixture will be flowing past drinking water intakes of downstream communities.

To understand why this was happening, we have to step back even further in Saint Paul's history. Being a river town, the original sewers drained to the Mississippi River or to several natural streams draining to it.

The oldest sewer on record in Saint Paul was built in 1856. At the time, it was standard engineering practice throughout the country to convey both storm water and sanitary waste to rivers or lakes in one pipe. However, by the early 1920's it was becoming



*The Saint Paul Riverfront as it appeared in 1856.*

apparent that the Mississippi River was polluted and something had to be done. In response, the state created the Minneapolis-St. Paul Sanitary Sewer District and by 1938, the **first** sewage treatment facility on the entire Mississippi River went into operation. Minneapolis and Saint Paul each financed and built their own interceptor sewers and shared the cost of building the treatment plant. Dry weather flows were now being treated, but during rainstorms, when the flows exceeded the sewer's capacity, Combined Sewer Overflows (CSO) continued to pollute the river.

In 1967, the Federal Water Pollution Control Agency convened a conference on the pollution of the upper Mississippi River. This was the first of many steps involving many Federal, state and local agencies and interest groups that would eventually lead to the sewer separation program in St. Paul nineteen years later.

In July 1975, the initial National Pollutant Discharge Elimination System (NPDES) permits, as required by federal and state law, were issued jointly to the cities of St. Paul, Minneapolis and the Metropolitan Waste Control Commission (MWCC) and to the City of South St. Paul for discharges of combined sewage to the Mississippi River.

These NPDES permits for CSO expired on June 30, 1977. The issuing of new permits however, were delayed until findings of the Metro 201 Facilities Plan and the Environmental Impact Statement (EIS), which were both under way, could be included.

The CSO portion of the Metro 201 Plan and EIS, initiated in 1977 and issued in 1981, proposed a hybrid plan of construction to improve river quality. With respect to St. Paul, the plan proposed certain areas of sewer separation, and in other areas, interception, storage and conveyance facilities.

After review of the Metro 201 documents and concerned comments regarding costs and plan components from Saint Paul and many others, the MPCA staff felt it was necessary to form the State Combined Sewer Overflow Advisory Task Force to help address the many concerns. The purpose of the group was to exchange information concerning the metropolitan area's CSO situation so that all parties' concerns could be considered in the MPCA's ultimate decision-making process and to achieve consensus on the best solutions for CSO abatement. The memberships of the task force were organizations that had a major interest in the Metropolitan CSO situation including federal agencies, State of Minnesota and Wisconsin governmental agencies, representatives from local and downstream governments, and environmental groups.

The Task Force began meeting in May 1983. As a result of the meetings, which were essentially monthly through October 1985, a general consensus on a method and implementation for CSO

abatement was reached. Sewer separation was determined to be the most economical method to abate combined sewer overflows to the Mississippi River and to meet federal and state water quality standards. In addition, separation would also solve local sewer system problems such as sewer backups and flooding.

As a result of the CSO Task Force recommendations, the MPCA directed each of the three cities to develop a new plan for CSO elimination and for the Metropolitan Waste Control Commission (MWCC) (now known as the Metropolitan Council Environmental Services) to incorporate each city's plan into an overall metro plan.

In response, Saint Paul developed the Comprehensive Sewer Plan for the City of Saint Paul.

The report concurred that sewer separation was the best approach.

The cost was estimated to be \$172 million (in 1984 dollars). With local

financing, separation was scheduled to be finished in

the year 2025. The plan, however, suggested a financial partnership involving the U.S. EPA, the State of Minnesota and Saint Paul.



*The Comprehensive Sewer Plan for the City of Saint Paul.*

In addition to identifying sewer separation as the most cost effective approach for CSO elimination, the Comprehensive Sewer Plan noted that separation would achieve the following objectives:

- Eliminate discharges of raw sewage to the Mississippi River.
- Eliminate sanitary sewer backups to properties in Saint Paul.
- Provide a storm water drainage system for a minimum of a five-year frequency storm (3.6 inches in 24 hours) for all developed areas of the city.
- Increase capacity for sanitary sewage in metro area facilities.
- Renew or extend the life of an aging sewer system.
- Eliminate problems associated with a combined sewer system, such as, rodent control and odors.
- Reduce sewer service charges by the Metropolitan Waste Control Commission by eliminating treatment of storm water.

Based on recommendations from the CSO Task Force that included an approval of the three city's plans, the EPA and the MPCA modified the NPDES permits for CSO elimination for the three cities. However, during this permit modification, the State of Wisconsin filed a petition for judicial review of the permits because their concerns could not be totally resolved. Following written briefs and oral arguments, the Court of Appeals in an opinion written March 18, 1985 affirmed the three permits as modified.

At the time the permits were being modified, Saint Paul engineers estimated that an average of 4.6 billion gallons of untreated sewage and storm water overflowed into the Mississippi River annually from the metro area, with discharges occurring an average of every three days. At the current rate of sewer separation, Saint Paul would not be completed until the year 2025 and Minneapolis would not be completed until 2005.

The public demanded a faster fix for the entire region. Governors Rudy Perpich of Minnesota, and Anthony Earl of



Wisconsin conferred on the CSO issue in response to calls for action from agencies, public interest groups, legislators and citizens. At a July 1984 riverfront news conference at Prescott, Wisconsin, Governor Perpich announced a proposal to accelerate the

remaining work and committed state financial participation. After conferring with the three cities and the Metropolitan Council, the accelerated schedule was set at ten years.

## The Accelerated Ten-Year CSO Control Program in Saint Paul

Saint Paul’s Comprehensive Sewer Plan for storm water management, mentioned previously, detailed the city’s storm water management needs. The plan outlined \$172 million worth of projects. The City had already begun separating its combined sewers in 1960. By 1985, the year before the start of the accelerated sewer separation program, over half of the City was served by separate sanitary and storm sewer systems. Given the progress to date, the ten-year program would still be a massive undertaking.



## **Project Priorities**

The following criteria were used to determine the ten-year sewer separation project priorities:

- Remove the most CSO for the least dollars expended.
- Eliminate localized flooding with a system designed for the 5-year rainstorm (with low areas designed for the 100-year storm)
- Eliminate basement sewer backups.
- Coordinate with MNDOT's construction program in St. Paul.
- Coordinate with MWCC's CSO and Lake Overflow projects.
- Coordinate utility work, including Water, NSP, Bell Telephone, District Heating and Cable TV.
- Minimize traffic congestion and utility disruption by spreading out construction throughout the city; and
- Coordinate neighborhood-street paving with sewer installation.

## **Coordination With Other Construction**

During the formulation of the sewer separation program, it became evident that great opportunities existed to improve public and private infrastructure throughout the city during construction. In particular, it was an opportunity to complete the paving of the city's oiled streets. The City Council approved and joined a 20-year street paving and lighting program with the sewer program.

Prior to construction, existing sanitary sewers in project areas were televised to identify sewers in need of repair. These repairs were completed during sewer and street construction at a significant cost savings.

Construction projects required numerous utility offsets and relocations, which greatly increased

the utility’s workload. However, the program also gave utility companies a chance to upgrade their facilities where needed at a lower cost than usual, since many streets were being restored or repaved. NSP Gas replaced their old low-pressure cast iron lines and services with medium pressure plastic lines. They also reinstalled meters to the outside of homes.

## Social Benefits

One of the social benefits of the program in Saint Paul has been a virtual transformation of some neighborhoods. The following photos show some before and after transformations:



*Before*



*After*



*Before*



*After*

Because the separation projects were combined with other public and private construction, neighborhoods received a renovated infrastructure at a considerable savings.

## **Infrastructure Improvements Summary**

The ten-year sewer separation program resulted in the following improvements to Saint Paul's infrastructure:

- 189.1 miles of storm sewer installed
- 11.9 miles of sanitary sewer installed
- 168 miles of oiled streets paved along with new curbs
- Over 8,200 handicap ramps placed into sidewalks
- 6,806 new street lights installed
- Over 11,000 trees planted in boulevards to replace trees lost to Dutch Elm disease
- 21,900 residential properties disconnected their rainleaders
- 6,140 non residential properties disconnected their rainleaders
- 238 miles of gas mains installed
- 25,000 gas services were either upgraded or replaced
- Over 3,500 lead water services were replaced with copper pipe
- 26 miles of water main replaced

## **Project Management and Use of Consultants**

Public Works engineering staff were responsible for preliminary engineering and overall program management. In addition, they designed and inspected 40% of the projects. Consultants designed and inspected the remaining 60%. Public Works decided to utilize consultants because of the heavy workload, short time lines and questionable long term financing.

Public Works initially selected six firms - four local and two from other states. For the

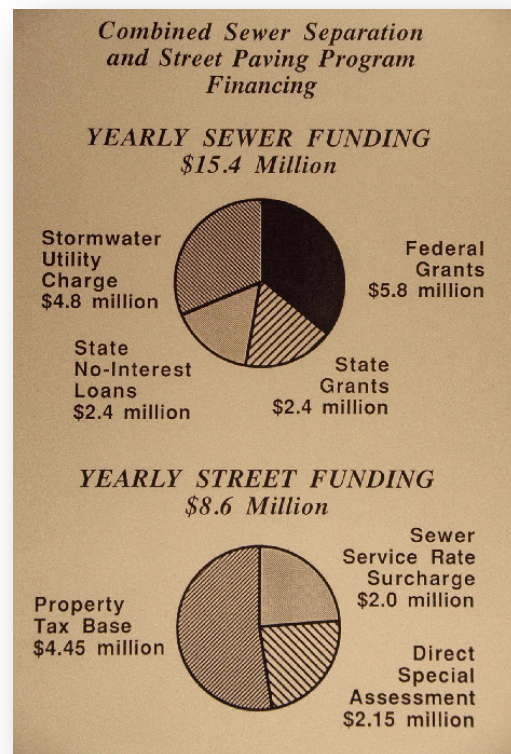
first year, all six firms were awarded a project, but later that number was reduced to the four local firms based on experiences of the early years. This reduction in consultants was primarily dictated by workload, however, local consulting firms had a much greater feel for Saint Paul neighborhood and business' concerns and, of course, are more readily available.

## Financing

The Minnesota Legislature approved state funding assistance for the accelerated sewer separation plan in 1985, in conjunction with the MPCA's statutory ten-year deadline for completion of the work. The initial financing partnership for each of the three city's work was approximately one-third city, one third-state and one-third federal.

Saint Paul started with a "pay-as-you-go" program with the city's portion coming from assessments and a newly created storm water utility charge. However, after two years of the program, the "pay-as-you-go" method burdened existing users through increasing sewer charges. In 1988, the city sold 20-year sewer revenue bonds to finance the program. By 1991, the EPA's grants program ended. This loss of federal participation forced the other financial partners to reassess the program's funding ability.

The state was faced with a hard choice. Five years earlier, it had set a statutory ten-year deadline for CSO elimination, based on a joint Federal-State-City funding arrangement. The state legislature met the challenge by agreeing to increase their funding to cover one-half of the





federal shortfall. Saint Paul also met the challenge and increased their funding responsibility for the other half.

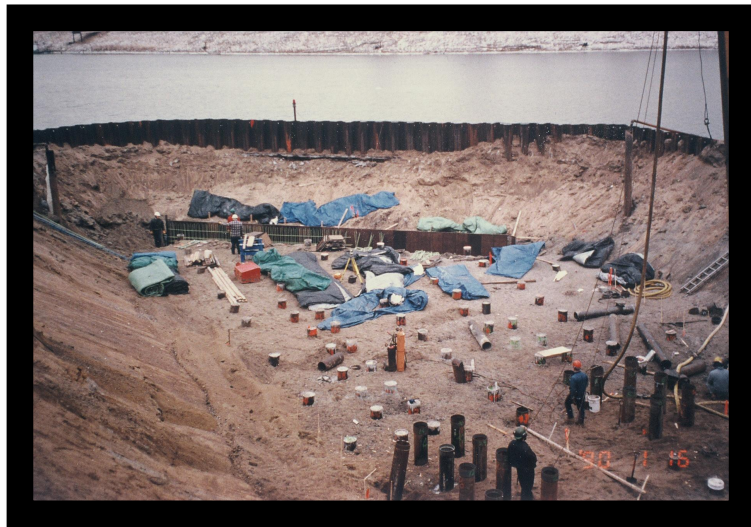
In 1984, the Saint Paul Comprehensive Sewer Plan estimated the cost of the ten-year separation effort to be 172 million (in 1984 dollars). By the end of the program in 1995, the total sewer cost was \$217 million. The program was not only completed on time but also, allowing for inflation, it was also completed within budget.

## Construction

During the ten-year program, 90 individual construction contracts were let. Street paving and sewer contracts varied in size from approximately \$0.5 million to \$9 million, with the average contract being in the \$2 million to \$3 million range. Projects varied from simple sewer projects to very complex projects - all with many utility and access conflicts. A sampling of some of the more interesting projects include:

### Troutbrook Outlet:

Twin 12-foot diameter pipes were tunneled using the soft ground technique and jacked beneath railroad trackage and beneath the main metropolitan sanitary interceptor sewer serving the Pigs Eye Treatment Plant. A large outlet structure was constructed on piling at the river with the pipe's crown at the normal river elevation. Near the outlet, a river overlook





was constructed in conjunction with the Warner Road bike and pedestrian path construction.





## Jackson-Nebraska:



This was a large separation project in a residential area, with twin 6-foot diameter pipes discharging into a storm-water pond with a 5-foot diameter pipe outlet. The storm water pond was incorporated into an existing wetland area

and now serves as a 30-acre wildlife area. This pond, and others like it in St. Paul, are very successful and are well received by the neighborhoods. During the 10-year program, the city constructed fourteen storm water ponds.



**Davern Outlet "A":**

A 7-foot diameter tunnel, 8,000 feet long, was excavated in sand rock with an outlet to the Mississippi River.



The sand rock was of a hardness that allowed the rock to be cut with water lances.





The sandrock cuttings were then suspended in water and pumped through a 12-inch diameter PVC pipe to a settling basin.



### Goodrich-Smith:

This project was in a predominately residential area with limestone overlaid with one to four feet of granular overburden. Similar soil conditions exist along West Seventh Street from downtown all the way to the River.



Construction in this area is very difficult and time

consuming. Rock had to be removed by using one of three methods: pneumatic hammers mounted on backhoes, blasting with explosives, or grinding with large rock grinding machines.



Sanitizing Construction



All three methods were used on this project. Construction in rock areas is slow and more noisy and dusty than typical sewer construction. The patience of the residents was severely tested and good public relations were critical.



#### Seventh-Cedar:

This was a large sewer separation project in downtown Saint Paul. It consisted of both open cut construction and sand rock tunnel construction.





Because of traffic issues and commercial concerns, construction in the downtown area is always a challenge. Good public relations and information distribution efforts averted most, but not all, controversy.

A coffee shop owner made headlines when she threw muffins at construction workers in front of her shop.



In addition to the huge increase in annual construction work due to the sewer separation program, other projects were completed too. During this time, for example, the City constructed a new Warner Road, made major improvements to the downtown floodwall, completed the design of the Wabasha Bridge and survived the reconstruction of the I-35E - I-94 interchange in downtown Saint Paul.

# Innovative Aspects of Saint Paul's Sewer Separation Program

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The Saint Paul sewer separation program included a number of innovations and non-traditional program aspects, which were integral to its overall success.

**Rainleader Removal Program** - The City of Saint Paul estimated that as much as 20% of its CSO volume was caused by private area drains and roof rainleaders connected to the sanitary sewer system. It was clear that a rainleader disconnect program would require considerable effort since it involved direct impact on individual homeowners. In 1986, the City began an intensive two-year voluntary rainleader disconnect program focusing on residential property. The residential disconnect program included the following elements:

- A \$40.00 rebate to homeowners who voluntarily disconnected.
- Public service announcements on cable and local broadcast stations.
- Presentation to neighborhood groups by City staff.
- Program posters in bus shelters.
- Free evening classes for homeowners on the disconnect program and instructions on proper methods.
- In 1987, the McKnight Foundation awarded the city a grant for a special program to employ twenty-three chronically unemployed individuals to disconnect rainleaders for low-income homeowners. Nine hundred homeowners participated in this program.
- A neighborhood district developed its own program and hired college students to disconnect rainleaders. They also lent tools to homeowners who wanted to do their own disconnection.

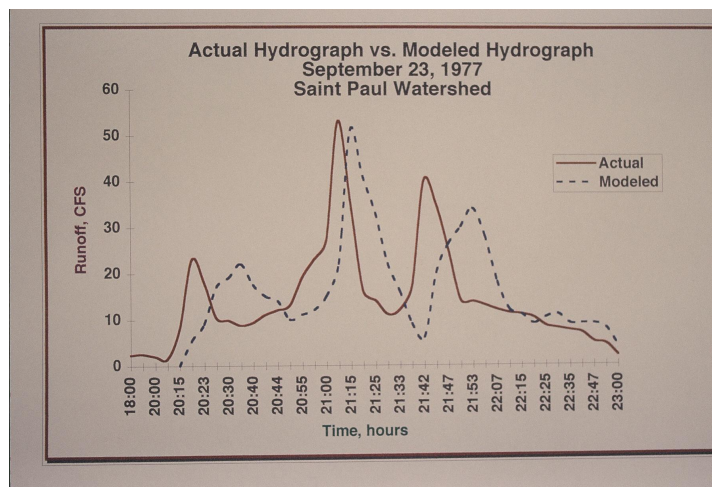
In less than three years, more than 18,000 homes had disconnected their rainleaders, and currently 99% of all properties are disconnected.

**Community outreach** - In 1993, Saint Paul was working on a major project on the east side of the city. A large number of residents there are Southeast Asian immigrants. In order to explain the activities of the project, with its inconvenience, noise, and dust, an outreach campaign was conducted in the Hmong language. For these immigrants who came from primarily rural areas, the urban environment was unsettling enough without the noise of heavy equipment and the destruction of streets by their new homes.

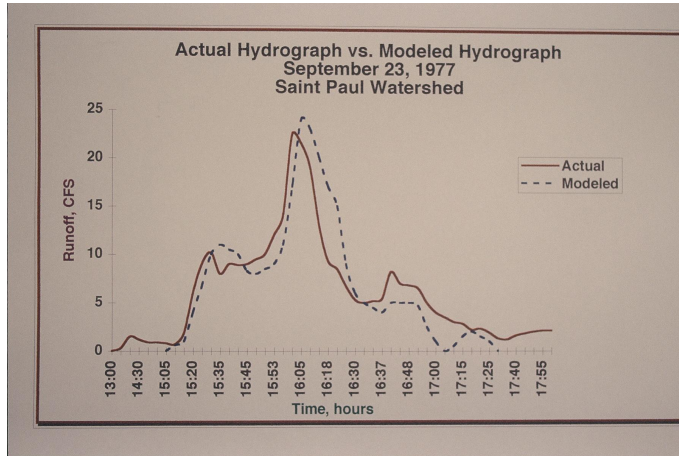
**Reforestation** - Public Works requested and financed a Parks Department employee to design and coordinate tree-planting efforts for the projects. As there were many tree conflicts during the sewer trench excavation, this employee was invaluable in resolving these issues between contractors and citizens.

**Directional Signs** – These were implemented for local businesses that lost direct access due to construction were used for the first time on detoured routes.

**Computer Programs** - Just prior to the accelerated separation program, design staff in the Sewer Division changed from the long-used empirical “Rational Method” to use of the very sophisticated hydrograph method based on the U.S. Soil Conservation Service TR 20 computer program.



Since that program was too large for the Department of Public Works computer system, an



adaption of the concepts used in that program was developed for our use. Calibration and verification of the adapted model was performed using rainfall and runoff collected by the MWCC during the summer of 1977. This computer program allowed a much more precise and faster design of storm sewers.

**Teamwork** – The teamwork involved in the program was among the most gratifying features. Staff from the Minnesota Pollution Control Agency acted more like a partner than as an enforcer, working seamlessly with Public Works staff to ensure the program’s success. The interdivisional cooperation within Public Works was also extraordinary. The work of our engineering consultants, TKDA, SEH, HNTB and BRA was outstanding. Construction bids often came in significantly under our estimates because of this teamwork.

**Communications** - Citizens, businesses, environmental groups and regulatory agencies were kept up to date with regular newsletters and annual program updates.

# Environmental Benefits

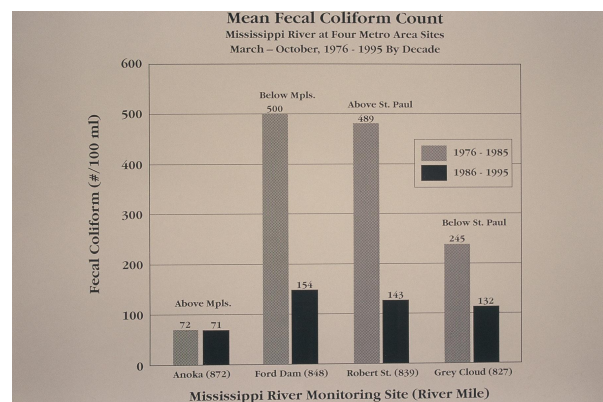
For generations, people who not only considered it a resource of poor water quality, but who had hundreds of other attractive lakes and rivers to use in water-rich Minnesota had avoided the Mississippi River in the Twin Cities and downstream. Residents and visitors flocked to the many urban lakes or went “up north” to find good fishing, water sports and other recreational activities. Until recently, the riverbanks were mostly left for industrial development. The parks that did line its shores were often underused.

The Combined Sewer Separation Program has brought about significant improvement in the quality of the region’s most accessible waters - the 72-mile metropolitan stretch of the Mississippi River. The following are viewed as indicators of the improved water quality:

- Pollution-sensitive Hexagenia mayflies have returned to Twin Cities’ stretch of river after a 30-year absence.
- Metropolitan Council Environmental Services’ monitoring data shows a significant drop in fecal bacteria levels in the river because of sewer separation.
- Bald eagles have returned to the Twin Cities’ stretch of river.
- Fish population and diversity have recovered from 3 species to over 25 species.
- Minnesota Department of Natural Resources has established catch and release fishing regulations to protect trophy-sized walleyes that are being caught from the metropolitan stretch of Mississippi River.

The public’s perception of the river as a cleaner and more desirable area for recreation has been demonstrated repeatedly during the past few years. The river has become more of a focus with new parkways and parks, a marina, a powerboat

Saint Paul Sewer Separation Program

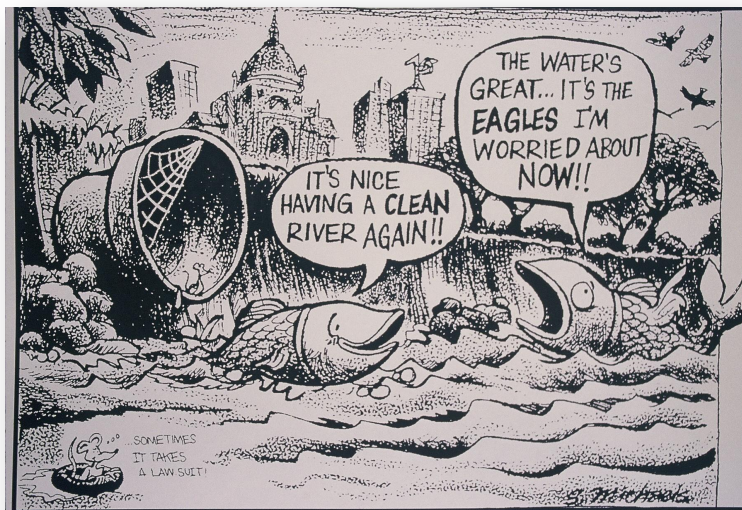




race, a fishing tournament, the planning of a new Science Museum, and the \$2.2 million refurbishing of the University of Minnesota Showboat, which will be docked at Harriet Island in downtown Saint Paul. The activities and development have reminded residents of the importance of the river in the growth of the area and assuring its continued vitality.

## Conclusion

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The completion of Saint Paul's sewer separation program has achieved the overall purpose of cleaning up the river, demonstrating that Saint Paul is a consistently good steward of the environment. An equally important program goal for Saint Paul was to improve the environment in neighborhoods by eliminating basement and intersection flooding. The project has met the goals that were expected of it and more. We now have two completely separate sewer systems, one carrying surface water runoff and the other one carrying sanitary sewage. Nevertheless, the work of protecting and restoring the Mississippi River goes on. The partners involved in this project will continue to deal with the issues that affect the Mississippi and our environment.