The Cannon River

An overview of the physical characteristics and management of the watershed

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<table>
<thead>
<tr>
<th>Section</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.  Introduction</td>
<td>3</td>
</tr>
<tr>
<td>II. Historical Perspectives</td>
<td>4</td>
</tr>
<tr>
<td>Formation of the Watershed</td>
<td>4</td>
</tr>
<tr>
<td>History of People in the Watershed</td>
<td>5</td>
</tr>
<tr>
<td>Cannon River Flow</td>
<td>6</td>
</tr>
<tr>
<td>III. Organisms</td>
<td>7</td>
</tr>
<tr>
<td>Mussels</td>
<td>7</td>
</tr>
<tr>
<td>Fish as Biological Indicators</td>
<td>8</td>
</tr>
<tr>
<td>Fish Ecology Related to Physical Stream Characteristics</td>
<td>8</td>
</tr>
<tr>
<td>Fish Species Distribution</td>
<td>9</td>
</tr>
<tr>
<td>Dams</td>
<td>11</td>
</tr>
<tr>
<td>IV. Recreation</td>
<td>12</td>
</tr>
<tr>
<td>Introduction</td>
<td>12</td>
</tr>
<tr>
<td>Canoeing</td>
<td>12</td>
</tr>
<tr>
<td>Biking</td>
<td>13</td>
</tr>
<tr>
<td>Wildlife Refuges and Wilderness Parks</td>
<td>13</td>
</tr>
<tr>
<td>Fishing</td>
<td>14</td>
</tr>
<tr>
<td>Management Recommendations</td>
<td>16</td>
</tr>
<tr>
<td>V.  Regulations</td>
<td>17</td>
</tr>
<tr>
<td>Federal Laws</td>
<td>17</td>
</tr>
<tr>
<td>Minnesota Laws</td>
<td>18</td>
</tr>
<tr>
<td>Local and Regional Laws</td>
<td>20</td>
</tr>
<tr>
<td>VI. Local Management and Restoration Efforts</td>
<td>22</td>
</tr>
<tr>
<td>Management of Pollution Inputs</td>
<td>22</td>
</tr>
<tr>
<td>Current Initiatives and Future Possibilities</td>
<td>23</td>
</tr>
<tr>
<td>VII. Conclusion</td>
<td>24</td>
</tr>
<tr>
<td>VIII. Literature Cited</td>
<td>25</td>
</tr>
</tbody>
</table>
I. INTRODUCTION

Each of us is a citizen of a watershed. The world lines its riverbanks with riparian towns, which provide power, transportation, and drinking water to their people. The rain that falls on our roof will eventually become part of a river and influence the organisms that live in and use that water. Decisions made by friends and neighbors will eventually influence our lives by affecting the water quality downstream. Therefore, members of a watershed, the area that drains to a particular river segment, must work together to ensure a healthy water supply. They must work together to appreciate the services and beauty that the river supplies. A deeper knowledge about the size, extent, and land uses in the watershed can help us achieve this goal. Understanding who makes decisions about the watershed and what actions are already being taken to restore the watershed can spur each of us to get involved in the protection of the lifeblood of our communities.

This paper provides the reader with an overview of the biotic and social systems affecting the Cannon River watershed. We touch on the plants, animals, and people who call this watershed home. We also describe the complex levels of decision making taking place to restore, conserve, and manage the watershed. It is our hope that this document serves as both a basic guide for interested citizens and as a launching pad for water enthusiasts.
II. HISTORICAL PERSPECTIVES

Formation of the watershed
The formation of the Cannon River watershed was dictated by the strength and force of glaciers during the last glacial period, the Pleistocene, which ended 11-12,000 B.P. (before present). The glaciers, which covered most of Minnesota dug scores of lakes and carved the streams and rivers we see today.

The Cannon River Watershed drains 934,400 acres (1440 square miles) of land in southern Minnesota (Fig. 1). The Cannon originates in Shields Lake in Rice County and joins the Mississippi River 120 miles downstream (Sanocki and Winterstien 1999). Many smaller streams including Prairie, Wolf, Chub, Spring, and Heath Creek among others feed the Cannon. The river itself winds through 4 counties, but its collection basin extends into six counties all told (Dakotah, Goodhue, LeSeur, Rice, Steele, and Waseca). There are 14 riparian cities along the Cannon and its largest tributary is the Straight River (Table 1). The watershed also contains several smaller towns (pop. <1,000). The total watershed population is around 111,000 people.

![Cannon River Watershed Diagram](image-url)

Fig. 1. The Cannon River Watershed. Figure courtesy of the Cannon River Watershed Partnership.
The Cannon River watershed lies on an ecotone, a border between two ecosystems. The boundaries of ecosystems are subject to expansion and retreat as the abiotic environment changes. Due to this, the vegetation in the watershed has not been constant since the retreat of the glaciers, but changes as the climate fluctuates.

About 12,000 years ago, when the glaciers from the last ice age retreated, boreal forest flourished in south-central Minnesota. Slowly there was a shift to elm-hop hornbeam forest (10,000-9,000 years ago) followed by a warmer, drier climate, which allowed prairie and deciduous forest to move into the area (5,000-8,000 years ago). Finally, around 3,000-1,000 years ago, an oak-dominated savanna began, but on dry, open sites, prairie remained the dominant vegetation type (Camill, et. al 2003). Three to four hundred years ago the maple-basswood forests of the bigwoods began to take over what was oak woodlands.

Prior to European settlement, the watershed itself was a mixture of bigwoods (elm, basswood, ash, butternut, hickory, sugar maple and ironwood trees), aspen-oak land, oak openings, prairie, river bottom forest, brush prairie, and wet prairie. Prairie was maintained where fires were frequent, but woodland species flourished where fires were more rare because of local abiotic factors (Grimm 1984).

Currently, the watershed is dominated by cropland (90%) but also includes forest (5%), pasture (2%), urban (2%), and other uses (1%).

**History of People in the watershed**

Many groups of people have lived in the Cannon River watershed. After the most recent glaciers retreated (c. 10-12,000 years ago), people began living here. The only evidence we have of these people are mounds, village sites, and small artifacts (Bitner 1998). Though not much cultural information remains about these earliest people, we know a lot about the Dakota, who lived here before European settlement and whose descendants remain in the area today. The Dakota people would move west across the watershed on their way to the Dakotas from Red Wing, where they would fish on the Mississippi River. In the winter they would move into the bigwoods to camp. Their impact on the land was minimal (Bitner 1998).

In the nineteenth century, Europeans set up fur trading stations. They hunted buffalo and beavers that lived in the area. Neither of these species has lived here since the mid 1880’s when the hunters brought them to local extinction. The Cannon River was originally named La Riviere aux Canots (“The river of canoes”) by the French fur trappers. A misreading of the word “Canots,” gave the river its current name, the Cannon River.

<table>
<thead>
<tr>
<th>City</th>
<th>July 1, 2002 Population Estimate</th>
<th>Census 2000 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owatonna</td>
<td>23,004</td>
<td>22,434</td>
</tr>
<tr>
<td>Faribault</td>
<td>21,340</td>
<td>20,818</td>
</tr>
<tr>
<td>Northfield</td>
<td>17,820</td>
<td>17,147</td>
</tr>
<tr>
<td>Red Wing</td>
<td>16,035</td>
<td>16,116</td>
</tr>
<tr>
<td>Waseca</td>
<td>9,602</td>
<td>8,493</td>
</tr>
<tr>
<td>Rogers</td>
<td>5,471</td>
<td>3,588</td>
</tr>
<tr>
<td>Cannon Falls</td>
<td>3,752</td>
<td>3,795</td>
</tr>
<tr>
<td>Waterville</td>
<td>1,840</td>
<td>1,833</td>
</tr>
<tr>
<td>Morristown</td>
<td>1,000</td>
<td>981</td>
</tr>
<tr>
<td>Dundas</td>
<td>650</td>
<td>547</td>
</tr>
<tr>
<td>Clinton</td>
<td>440</td>
<td>453</td>
</tr>
<tr>
<td>Randolph</td>
<td>320</td>
<td>318</td>
</tr>
<tr>
<td>Nerstrand</td>
<td>228</td>
<td>233</td>
</tr>
<tr>
<td>Kilkenny</td>
<td>147</td>
<td>148</td>
</tr>
</tbody>
</table>

Table 1. Cities along the Cannon and Straight Rivers, their 2000 population, and 2002 estimated population. Table adapted from the US Census Bureau Population Estimates 2003.
As settlers moved into the area, they found prosperity in harvesting timber and growing wheat and other crops. The wheat was ground to flour in mills along the river. The mills were powered by hydropower, available to mill owners by damming the river. John W. North, founder of the town of Northfield, settled where he did because he was “impressed by the water power resources of the Cannon River” (Berg 1959). He first arrived in January 1855 and had completed the dam and mill by December of that year. Most of these dams still stand and have become centerpieces for the towns along the river.

In the early 1890’s, settlers also collected mussels from the river to make pearl buttons. The Dakota people had always collected small numbers of mussels for food, however, the huge quantities that were removed by the “Pearl Rush” caused a sharp decline in mussel populations. The decline in mussel numbers and the creation of plastic buttons shut the industry down (Lawrence and Jones 1997).

The population the Cannon River watershed has grown intensely in the past 100 years. As the Twin Cities have quickly expanded (15.4% growth rate from 1990-2000), the northern parts of the watershed are becoming suburbs (Metropolitan Council). Many people commute from the Northfield area to Minneapolis and St. Paul. Growth rates are high and continue to rise. Agriculture has intensified, too, as large-scale farming techniques and manufactured fertilizers are put into use.

### Cannon River Flow

Traditionally, the Cannon River has been characterized by high flow in early spring, and low flow in the late summer, fall, and winter months. The United States Geological Survey has provided accurate flow data for the Cannon River near Welch, Minnesota since 1958. This data shows the Cannon’s average monthly flow to be highest in April (1430.5 cfs) and lowest in January (242.7 cfs)(Fig.2). The snowmelt and rain events that occur in late March and April cause the river to rise very rapidly and often result in flooding (Fig. 3).

![Flow Data](chart.png)

**Fig. 2.** The Average monthly flow of the Cannon River at Welch USGS gauge Station (1958-2002).

The highest annual peak streamflow ever recorded at the Welch USGS monitoring station was 35,500 cfs, in April of 1888 (USGS). The exact date of this event is unknown. The lowest
streamflow ever recorded at the Welch station is 62 cfs, on March 1, 1964. A little over a year after this extreme low flow event, the Cannon swelled to 27,800 cfs, the highest streamflow documented by the Welch USGS station from 1958-2002. Long-term statistics show that the river reaches bankfull stage about once every 2.3 years (Cannon Valley Trail).

![Flow graph](image)

Fig. 3. Average flow on 1st of the month from 1958-2002. The sharp rise in early spring and sharp decline in early summer is typical of Cannon River flow.

III. ORGANISMS

Mussels
In North America, 213 freshwater mussel species out of 297 are either endangered, threatened, or of special concern (Hove and Kapuscinski 1998). Mussels feed themselves by filtering water through their gills and removing tiny organisms, such as zooplankton. They are particularly vulnerable to contaminants in the water and increased siltation because it interferes with their ability to feed, blocks light, and, because they have limited ability to move around, can suffocate them if too much is washed down the river at once.

During a study conducted in 1987, Davis found fifteen species of mussels living in the Cannon River. During this survey, a species of mussels new to Minnesota was found, *Actinonaias ellipsiformis*. In this report, it is stated that evidence of massive disruption in the distribution and extirpations of mussel species was found in several areas.

Swift and Wagenbach (1999) conducted a mussel survey in the Cannon River during which they found 12 species. The greatest species richness was found at trunk stations. No correlation was found between physical and chemical parameters in terms of mussel distribution.

One important fact about all native North American freshwater mussels is their dependence upon specific fish species to act as hosts for mussel larvae, called glochidia. The glochidia are released from females after a period of incubation. They attach themselves to a fish’s gills or fins, are shortly encapsulated by the fish’s skin, and there reside until they metamorphose into juveniles, at which time they drop off the fish (Smith 2001). Correlating host fish and mussel
distribution could lead to greater understanding of this important relationship as well as guidelines for future conservation efforts. Below we look at the fish species found in the Cannon River, several of which were found to be hosts for some of the rare mussels studied by Hove and Kapuscinski (1998).

**Fish as Biological Indicators**

Fish are associated with healthy rivers and historically have been studied as biological indicators (Whitton 1975). An indicator species is defined by Primack (2001) as, “A species associated with an endangered biological community or set of unique ecosystem processes….?” He continues his description by noting that the goal of managing a site for an indicator species is to protect the range of species and ecosystem processes with the same distribution. In other words, by protecting fish in the Cannon River, we would be protecting a whole host of other organisms— including mussels—along with functionality of the ecosystem.

**Fish Ecology Related to Physical Stream Characteristics**

Hynes (1970) described numerous factors as being critical to fish distribution and abundance, including water volume, velocity, temperature, oxygen, and shelter. Whitton (1975) cited four factors as being the most important physical aspects of water where fishes are concerned: volume, velocity, temperature, and pH.

Volume of flow affects movement and migration of fishes, and where it refers to depth, it determines the number and size of fishes that can persist in any given area of a stream (Whitton 1975). Eddy and Underhill (1974) attribute low water levels in the 1930’s along with pollution to ending a previously successful introduction of rainbow trout into the Cannon River.

Current velocity is important to fishes because of the effect it has on grading the riverbed and in maintaining high levels of dissolved oxygen. The amount of available current may guide migratory movements (Whitton 1975) and affects the composition of species in any given area (Hynes 1970). Velocity and the amount of shelter available are related because fish accumulate lactic acid in their muscles quickly and thus must seek shelter rather often, even though they can swim well in short bursts. Thus shelter is a limiting factor in the number and size of fishes that can persist in any given area (Hynes 1970).

Temperature determines where certain species are found because it has important physical and physiological effects, such as changes in growth rates (Whitton 1975). Rainbow trout, for example, prefer cooler waters. However, fish may adapt to their surroundings, such as the strain of Missouri rainbow trout mentioned earlier that were able to persist in the Cannon River despite the warm summer temperatures (Eddy and Underhill 1974).

Light is another important factor in fish ecology as its presence or absence affects behavior and activities (Hynes 1970). For example, much of the breeding activity and acclimatization to winter and summer temperatures is associated with light. Heavy silt loads reduce the amount of light in lakes and deeper stretches of streams. Amount of light reaching a lake can also affect temperature. The clearing of trees around a stream could affect the fish fauna by changing the light characteristics and temperature in that locale.

Certain species, especially small benthic fishes, are associated with specific substrata such as rocky bottoms. Hynes (1970) states that for most fishes the nature of the substrata only becomes important in times of breeding, and that beds of gravel or sand are associated with the greatest numbers of specimens and species.
Most species of fish have a wide pH tolerance according to Hynes (1970) and hence to water hardness and specific conductivity. However, extremes of pH have been shown to stunt growth.

Oxygen is generally prevalent in running water, so that it is usually not a problem for stream fishes. Some species, however, are more susceptible to changes in dissolved oxygen, such as those in which the rate of metabolism rises rapidly with temperature changes (Hynes 1970). Dam impoundments may have low levels of dissolved oxygen for a variety of reasons. There is one reservoir on the Cannon River that could be subject to low levels of oxygen, Lake Byllesby, 12.3 miles upstream from Cannon Falls.

**Fish Species Distribution**

Fish surveys on the Cannon River were conducted by the DNR in 1970, 1977, 1983, 1984, and 2000. The method used was electo-fishing, a technique which stuns the fish temporarily, allowing them to be collected. The DNR undertakes these surveys every few summers at different sites along the river (Figs. 4, 5). We summarized the results and analyzed the species distribution in relation to dams.

Thirty-six species were found between Lake Byllesby and Northfield’s dam, which was the highest amount. The next highest numbers of species—thirty-one—were collected between Northfield and Faribault Woolen Mill dams. This data suggests that by removing the Northfield dam, a large number of fish populations would be able to interact once more.

Only ten different species were collected in the lakes region above Schmidtke’s dam near Waterville. Warm, shallow lakes connected by streams characterize this region. The DNR noted that water levels were low during the survey.

Nine species appear to be restricted to the Lower Cannon, below Lake Byllesby, including banded darter, brown trout, creek chub, emerald shiner, longnose gar, mooneye, muskellunge, rock bass, and slenderhead darter. In the Upper Cannon, species with the widest distribution included black bullhead, bluegill, common carp, freshwater drum, green sunfish, Johnny darter, logperch, northern pike, tadpole madtom, and walleye. It is possible that many of these fish, being of game interest, have been added to the river or their numbers augmented by the DNR.

Several fish species found in the Cannon River were found by Hove and Kapuscinski (1998) to act as hosts for glochidia of rare mussels, including yellow bullhead, blackside darter, and logperch. Yellow bullheads were collected at sites from Kings Mill dam in Faribault to the lakes region. Blackside darters were found only between Lake Byllesby and Northfield dam. Logperch were collected in every stretch of the river except above the Morristown dam and within the lakes region. Further studies will be needed to link mussel and host fish distribution.
on the Cannon River. Arguments for protecting the stretch of river above Faribault could be bolstered if it were found that rare mussels occur in these areas in conjunction with their host fishes.

**Dams**

Dams can have a tremendous impact on fish distribution and abundance. One effect is to limit fish movements, such as for migration, breeding, or colonization of new areas. Division of populations can lead to inbreeding depression and genetic drift (Primack 2002). If one area of the river is subject to a catastrophic natural or man-made disaster, individuals from other areas cannot repopulate that section. Since mussels depend upon fish to spread their populations, genetic diversity between populations of mussels could be impaired by restricted fish movement.

According to Minnesota Department of Natural Resources, the removal of the dam at Welch lead to muskellunge, flathead catfish, bowfin, longnose gar, mooneye, and gizzard shad being reported in the 12-mile stretch of the Cannon upstream of the former dam—where the fish had not been seen in numerous decades.

Dam removal is complicated by the fact that large amounts of silt, accumulating over decades, will be released downstream. Dams collect large pools of water behind them. When fast moving water slows down behind a dam, the silt that was being carried by the quick water is dropped by the water and collects behind the dam. The water flowing below the dam is therefore much clearer than above the dam. Dam removal releases the sediment that has been accumulating through time. Increased turbidity caused by dam removal can shock filter-feeding and photosynthetic organisms. A study done by Carleton students estimate that 122,980 m$^2$ of sediment are trapped behind the Northfield dam and that removal of the dam would cause decreases in mussel populations (Lawrence and Jones 1997).

There are currently nine concrete dams on the river. A concrete dam located at Welch was removed in 1994. Lake Byllesby Dam is used for hydropower; Northfield dam serves no purpose; and the remaining seven dams are used variously for lake elevation, flood control, and recreation (Table 3). All of the dams listed are fish barriers except the Rice Lake Dam and three others are do not act as barriers during high water—Shields Lake, Gorman Lake, and Schmidtke’s Dams.

Table 3. Dams on the Cannon River. Fish barriers with * are not a barrier during high water. Source: Minnesota DNR, 1984

<table>
<thead>
<tr>
<th>Name/Location</th>
<th>Miles from Mouth</th>
<th>Use</th>
<th>Length (feet)</th>
<th>Type</th>
<th>Fish Barrier</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shields Lake</td>
<td>111.8</td>
<td>Lake Elevation</td>
<td>20</td>
<td>Concrete</td>
<td>Yes*</td>
<td>State</td>
</tr>
<tr>
<td>Rice Lake</td>
<td>106.1</td>
<td>Lake Elevation</td>
<td>35</td>
<td>Concrete</td>
<td>No</td>
<td>State</td>
</tr>
<tr>
<td>Gorman Lake</td>
<td>91.9</td>
<td>Lake Elevation</td>
<td>50</td>
<td>Concrete</td>
<td>Yes*</td>
<td>State</td>
</tr>
<tr>
<td>Schmidtke’s/Waterville</td>
<td>73.9</td>
<td>Flood Control &amp; Lake Elevation</td>
<td>119</td>
<td>Concrete</td>
<td>Yes*</td>
<td>State</td>
</tr>
<tr>
<td>Morristown</td>
<td>70.6</td>
<td>Lake Elevation</td>
<td>66</td>
<td>Concrete</td>
<td>Yes</td>
<td>Village of Morris-town</td>
</tr>
<tr>
<td>King’s Mill/Faribault</td>
<td>59.5</td>
<td>Lake Elevation</td>
<td>110</td>
<td>Concrete</td>
<td>Yes</td>
<td>City of Faribault</td>
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</tbody>
</table>
Removing dams can have positive effects on fish abundance as many in the case of the Welch Dam removal. Currently Northfield’s dam is the most likely to be removed because it serves no purpose and its destruction would connect two previously separated stretches of the river for fish movements and recreation purposes. The Dam is owned by the Malt-O-Meal Corporation, which bought it from the Ames Mill in 1927. The city council recently considered the topic of removing Northfield’s dam, but there was resistance from local residents who maintained that the dam has historical value (D. Bond, personal communication, January 2004).

### IV. RECREATION

The management of the Cannon River for recreational purposes is vital for sustaining the economies and livelihoods of the communities within its watershed. Although nearly 90% of the land within the Cannon River watershed is farmland, there are numerous protected areas established to preserve some of the natural features of the region (CRWP). Recreation on the Cannon River has increased the quality of life in the watershed and has lured tourists from all over the Midwest. Future management practices in the Cannon River watershed should protect and improve upon the recreational resources the river provides. The following is an overview of the recreational opportunities in the Cannon River watershed and best the places to enjoy them.

**Canoeing**

The Cannon River is one of Minnesota’s most popular canoe routes. Although most sections of the river provide paddlers with a relaxing and leisurely experience, there are scattered sections of rapids that are easy navigable by beginners. The width of the Cannon spans from 50 feet to 200 feet, which makes navigation of its channel quite simple. Sporadic logjams and down trees present a small challenge to those at the helm of the canoe.

Paddlers are drawn to the Cannon River largely due to the scenic quality of its river basin. The vistas offered to canoeists along this historic river are very diverse. Rolling hills and farmlands line the upper portion of the Cannon, but as it nears its confluence with the Mississippi, the scenery shifts to broad gorges protected by 300-foot bluffs on either side of the channel. Two popular stretches among canoeists are the Faribault to Northfield leg (16 miles), and the float from Cannon Falls to Red Wing (26 miles).

The Minnesota DNR lists the Cannon River as a “state canoe route.” This designation has prompted the establishment of many well-maintained canoe landings along the river, and portages around the Cannon’s numerous dams. There are also five individual campsites and one campground that provide easily accessible camping opportunities for those interested in overnight paddling trips.

<table>
<thead>
<tr>
<th>Location</th>
<th>Elevation</th>
<th>Recreation</th>
<th>Concrete</th>
<th>Ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woolen Mill/Faribault</td>
<td>58.3</td>
<td>115</td>
<td>Yes</td>
<td>Faribault</td>
</tr>
<tr>
<td>Northfield</td>
<td>41.7</td>
<td>None</td>
<td>164</td>
<td>Concrete</td>
</tr>
<tr>
<td>Lake Byllesby</td>
<td>25.0</td>
<td>Hydropower</td>
<td>--</td>
<td>Concrete</td>
</tr>
<tr>
<td>Cannon Falls</td>
<td>12.7</td>
<td>Removed 2000?</td>
<td>115</td>
<td>Concrete</td>
</tr>
<tr>
<td>Welch Dam/Welch</td>
<td>--</td>
<td>Removed 1994</td>
<td>120</td>
<td>Concrete</td>
</tr>
</tbody>
</table>
The DNR has also enhanced the canoeing experiences on the Cannon by designating some stretches as “Wild and Scenic River” in 1980. The Minnesota State Wild & Scenic Rivers Program was established in 1973 in order to protect rivers that have outstanding natural, scenic, geographic, historic, cultural, and recreational values. Only six Minnesota rivers have segments protected under this program. The Cannon River is protected under the Wild and Scenic Rivers classification for recreational uses and scenic qualities (MN DNR).

**Biking**

The picturesque Cannon River Valley has a lot to offer to those looking to explore the river on foot or bicycle. The Cannon Valley Trail is one of the Midwest’s premier “rails to trails” bike trails. The 19.7-mile trail was dedicated in 1986 and since then has attracted more than 100,000 users annually. In the winter months, the trail provides cross-country skiers a chance to ski along the Cannon.

**Wildlife Refuges and Wilderness Parks**

Although its watershed is highly agricultural, the Cannon River and its basin provide habitat for species that are diminishing in other areas of the state. As a result, there are several wildlife refuges and established natural areas along the Cannon. Proper management of the valuable riparian habitats on the Cannon River is certainly a priority for regional DNR offices and county planners. The following are a few examples of popular natural resource management areas along the Cannon River.

The wood turtle is a state-threatened species that nests on the sand bars of the Cannon and finds good habitat among the silver maple and cottonwood trees that dominate its floodplain (MN DNR). Recognizing that the river was a viable habitat for the wood turtle, the DNR established the Cannon River Turtle Preserve Scientific and Natural Area (SNA). Located in Goodhue County, the turtle preserve spans 836 acres. The best time to visit the turtle preserve is during the spring and fall seasons.

Another DNR Scientific and Natural Area was established along the Cannon to protect one of Minnesota’s most rare flowers, the dwarf trout lily. The dwarf trout lily is Minnesota’s only federally endangered species (MN DNR). This rare flower grows only in Minnesota, with the greatest reproductive success occurring in Rice and Goodhue Counties. The riparian zone of the Cannon River provides the dwarf trout lily the moist conditions necessary for growth. The trout lily SNA, located near Faribault, contains about one-quarter of the total number of plants in existence. Expect to see the dwarf trout lilies bloom in early spring before the forest canopy develops.

Non-government organizations have also played a large role in establishing protected green space along the banks of the Cannon River. The River Bend Nature Center near Faribault was created on July 25, 1978 as an independent, membership supported organization. The park is now a 700+ acre site that serves nearly 18,000 people a year through educational programs and public use for hiking and wildlife viewing. An interactive interpretive center built in 1979 provides visitors with background information on the natural history of the area and its ecological importance to the region. The highlights of the park include a 40-acre section of restored prairie and a population of over 200 species of birds.
The Cannon River Wilderness Park protects two of the region’s most precious natural attractions, the Cannon River and the Big Woods deciduous forest. This Rice county-owned park boasts 850 acres of wooded Cannon River valley lined with hiking trails, four backcountry campsites, and numerous picnic areas. Within the park, the Cannon meanders along under 300-foot bluffs and towering stands of oak and maple.

**Fishing**

The Cannon River supports a wide variety of fish species, but only a few stretches of the river are considered good fishing waters. The popular game fish of the Cannon include smallmouth bass, walleye, channel catfish, and flatheads (Fig. 7). Sections of the Cannon closer to the Mississippi are known to hold various panfish, largemouth bass, and even northern pike (Johnson, 2001). Fisherman of the Cannon consider the best fishing to be the stretch of river from city of Cannon Falls to the Mississippi.

**Fishing Cannon River Tributaries**

In addition to the fishing opportunities on the Cannon, many of the river’s tributaries are designated trout streams. The introduction of the non-native brown trout into Southeast Minnesota streams has turned this portion of the state into a very respectable trout fishery, generating tourism dollars for the region’s communities. A Minnesota DNR report found that Minnesotan’s who fish spend more than $1.8 billion on fishing recreation in the state each year (Gartner et al., 2002). In addition to the brown trout, a few Cannon tributaries support brook trout, a species native to Minnesota. “Brookies” are less abundant in southeast Minnesota trout streams, but are found in Cannon tributaries such as Spring Brook (Dundas, MN). Spring brook is one of the regions only naturally reproducing trout streams, and it often provides the brook trout necessary to stock other streams around the area. Other designated trout stream tributaries are Trout Brook and Little Cannon River, both near the community of Cannon Falls.

The numerous spring-fed tributaries of the Cannon River have proven to be prime habitat for the much sought after brown trout, but these trout fisheries are threatened, mostly by agriculture. Fence-to-fence grain farming on the uplands and cattle pasturing of the river bottoms has contributed to sedimentation of streambeds (MN DNR). The sedimentation covers rocky bottoms, which are needed to create the runs and riffles that trout need to spawn and invertebrates need to survive. In addition, the clearing of trees along streams for farmland reduces the underwater root wads and fallen trees used for cover, while also decreasing shady areas of the stream necessary for trout, a cool-water fish.

The good news is that southeast Minnesota trout have responded well to most habitat improvement efforts. The use of planks and boulders to build artificial overhanging banks increases the cover available for big fish. Placing boulders in the stream channel has provided similar cover-enhancing improvements. Sedimentation has been reduced using “rip-rapping” to prevent bank erosion, and small wing-dams and other current deflectors have kept silt away from important spawning grounds (MN DNR) (Fig. 6)
Fig. 6. Picture on the left shows rip-rap installed as erosion control. Photo on the rights shows how prairie grasses eventually grow to cover unsightly concrete rip-rap.
Source: “The lowdown on Rip-rap”, www.forester.net/ec.html

**Popular Cannon River Fishing Accesses:**

Cannon Falls:
- Riverside Park near confluence with Little Cannon River
- Hannah’s Bend Park off of US 52
- CR 17 east out of Cannon Falls
- North on SR 20 from Cannon Falls 3 miles to 280th street east

Welch:
- Highway 7
- Off of Highway 61 to Mississippi
Gamefish of the Cannon River and Tributaries

Cannon River

Walleye
Bluegill
Largemouth Bass
Smallmouth Bass
Channel Catfish
Northern Pike

Tributaries

Brown Trout
Brook Trout

Fig. 7. Sportfish of the Cannon River and tributaries. Source: Minnesota Department of Natural Resources
Management Recommendations

If managed properly, the Cannon River and its tributaries will remain a great source of outdoor recreation and tourist dollars. Unfortunately, many of the environmental problems surfacing within the Cannon River watershed pose a serious threat to many forms of recreation. Even recreation itself is a serious threat to the health of the river if mismanaged. It is important that we minimize our recreational impacts on the Cannon River using leave-no-trace approaches. Future management of the Cannon River for recreational purposes should focus on the following objectives:

- Minimize agricultural runoff, especially near trout tributaries or popular fishing holes
- Expand and improve current camping opportunities to encourage overnight canoe trips on the Cannon.
- Expand educational programs that use the various parks and wildlife refuges along the river
- Consider removal of Northfield dam to improve fishing opportunities
- Use “Wild and Scenic River” designation to foster community involvement in management plans
- Stress low-impact recreation principles to ensure proper balance between human use and ecosystem health

V. REGULATIONS

Water systems in the United States are managed through a number of different ways by a number of different agencies. In general, federal regulations overrule state regulations, which are above county laws, which supercede individual city and township rulings. It is beyond the scope of this document to do justice to the entire water management system that governs our water use. The following section of the paper will attempt to briefly review some of the more important guidelines for water usage beginning at the federal level. In this way, the reader may gather a general notion of the ways in which Cannon River and Rice County waters fit into a larger context of the U.S. and Greater Minnesota. A focus on wetlands has developed in legislation because they mitigate flooding and filter out pollution, which are each important in a healthy watershed. We will also briefly discuss the county’s direct impacts on the Cannon River Watershed.

Federal Laws

Clean Water Act
Section 404
33 United States Code 1344

The Clean Water Act (CWA) was enacted in 1972 with the goal of restoring and maintaining “the chemical, physical and biological integrity of the nation’s waters.” As a part of this it also regulates the discharge of dredged or fill material into wetlands. Current regulations only address dredging, removal of vegetation or excavation when earth-moving equipment is used or a discharge occurs.

The Environmental Protection Agency (EPA) has overall responsibility for implementation of the CWA. The Corps of Engineers, which is part of the United States Department of the Army, has primary responsibility for reviewing permit application, issuing permits and enforcement
actions. Permits are required in order to develop lands on or near bodies of water. The EPA sets
guidelines known as the 404(b)(1) guidelines that the Corps must follow in evaluating permit
applications; it may also veto a Corps decision to issue a permit. Besides the EPA, the Corps
must consult with the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries
Service (NMFS) concerning harm to endangered species before proceeding.

The public may typically review and comment on individual permit applications within 15 to 30
days of a public notice. It may also notify the Corps or the EPA of suspected unauthorized
activity.

**Swampbuster**

Food Security Act (FSA) of 1985
Food, Agriculture, Conservation and Trade Act (FACTA) of 1990
16 U.S.C. 3821 to 3824

Swampbuster is a program of FSA and FACTA that discourages the alteration of wetlands for
agricultural use. It prohibits farmers or producers who receive federal subsidies from draining
wetlands on their land. A farmer or producer who converts a wetland is ineligible for
government price and income support programs unless he pays a fine and restores the wetland.
The U.S. Department of Agriculture - Soil Conservation Service has outlined the majority of
wetlands under Swampbuster on cropland in Minnesota. Maps identifying these lands are
available at county USDA-ASCS offices. The public is encouraged to report suspected
violations to the ASCS county office or the state office at (612) 290-3651.

**Executive Orders 11990 and 11988**

In 1977, President Carter issued Executive Orders 11990 and 11988 to provide guidance to
federal agencies. E.O. 11990 is an overall wetland policy that requires agencies to consider
mitigation and public involvement before proposing new construction in wetlands. Also, it
prohibits federally owned wetlands to be leased or sold to nonfederal parties. E.O. 11988
provides floodplain wetlands with a degree of protection. It requires each federal agency to take
action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health,
and welfare, and to restore and preserve the natural and beneficial values served by floodplains.

**National Environmental Policy Act (NEPA)**
42 U.S.C. 4321

The NEPA requires the preparation of environmental impact statements (EIS) assessing the
impact of federal projects (before construction) for all federally funded, authorized or permitted
activities that would have significant environmental effects. The Minnesota Environmental
Policy Act, described later, is modeled after NEPA.

**Minnesota Laws**

Public Water Law
Minnesota Statute 103G
Minnesota Regulation 6115

Minnesota Public Water Law regulates all activities that may alter the course, current or cross-
section of waters of the state. Included in the definition of wetlands are certain bodies that are 10
or more acres in size in unincorporated areas or 2.5 or more acres in size in incorporated areas. The DNR has inventoried and mapped these “public waters wetlands,” some of which fall within the boundaries of Rice County. The DNR has authority to issue development permits and enforces the statute. There is usually no public notice of permit applications and no formal public comment period. In order to best oversee Minnesota’s waters, the DNR solicits recommendations from soil and water conservation districts, watershed districts, counties, or cities, as well as its Division of Fish and Wildlife and the Army Corps of Engineers before issuing any permits. Violations should be reported to the DNR state Violations Coordinator at (612) 296-4800.

**Wetlands Conservation Act of 1991 (WCA)**

This act amends and supplements several Minnesota statutes. The WCA of 1991 is the most comprehensive wetland protection policy ever attempted by Minnesota legislature. It extends protection to wetlands not covered under former state law and follows a “no net loss” policy - the draining or filling of wetlands is prohibited unless wetland areas of equal public value are restored or created. The WCA defines wetlands as lands that have a predominance of hydric soils, are generally inundated or saturated above or below the surface, and support a prevalence of hydrophytic vegetation. Under the permanent program, local units of government and Soil and Water Conservation Districts (SWCD) consider applications for replacement plan approval. In metropolitan areas, this responsibility is assumed by a city councils, town boards, or watershed management organizations. DNR conservation officers are primarily responsible for enforcement of this act.

**State Water Quality Standards**

State Water Quality Standards are used to protect the chemical, physical, and biological integrity of waters within the state under the authority and direction of Section 401 of the federal Clean Water Act. With respect to wetlands, the application of water quality is triggered by an application for a federal permit. If an applicant seeks a permit under Section 401 that will result in the discharge of materials into waters or wetlands, Minnesota must certify that the proposed activity conforms to state water quality standards. If it does not, Minnesota can refuse certification and a permit will not be issued. Public notification of an application for Section 401 certification is required, although the MPCA can rely on the Army Corps of Engineers’ notice of a dredge and fill permit application to fulfill this requirement. The U.S. EPA has overall responsibility for implementing these standards.

**Minnesota Environmental Policy Act (MEPA)**

The MEPA establishes a formal process for reviewing the environmental impacts of major development projects that require some type of government action, such as permits or grants. The purpose is to provide information on environmental impacts before necessary approvals and permits are issued. MEPA applies to many proposed development projects, whether they affect water bodies or not.
Two types of review exist: the Environmental Assessment Worksheet (EAW) is a condensed worksheet that screens a project for significant environmental effects. The Environmental Impact Statement (EIS), which is less frequently done, is a thorough study of the environmental impacts of a project; comparative environmental, economic, and sociological impacts; reasonable alternatives; and mitigation measures.

The state Environmental Quality Board (EQB) has prepared rules governing the environmental review process. In most cases, these rules identify a particular governmental unit (either local or state) called the Responsible Governmental Unit (RGU), which provides assistance in interpreting the required procedures. Citizens can review or comment on EAWs and EISs. They can also petition for preparation of an EAW when one is not mandatory. (A petition requires signatures by 25 citizens; there is no residency requirement.) Citizens may also make suggestions for issues to be studied in an EIS during the EIS “scoping” process. If an EAW or EIS is required for a project or if a petition for an EAW is filed, the project may not be started and no final governmental decision may be made to grant a permit until the petition for an EAW is dismissed, a negative declaration on the need for an EIS is made, the EIS is deemed adequate, or a variance is granted. Contact the Environmental Quality Board at (612) 296-8253 or (800) 657-3794 for more information on petitioning.

Minnesota Environmental Rights Act (MERA)
Minnesota Statutes 116B

The MERA allows citizens to bring actions in court or to intervene in agency proceedings to challenge any conduct that may result in “pollution, impairment, or destruction” of the environment. The court or agency must prevent the proposed conduct if a “feasible and prudent alternative exists.” MERA can be used to challenge government actions or the conduct of private citizens and corporations. One of its limitations is the potential cost of the legal proceedings and required bonds. In one of the early cases under MERA, a wetlands owner successfully protected a wetland from being destroyed for a proposed highway route because a feasible alternate route around the wetland existed (Minnesota Board of Water Resources).

Local and Regional Laws

Metropolitan Surface Water Management Act
Minnesota Statute 103B.201 to 103B.251
Minnesota Regulations 8410
Comprehensive Local Water Management Act
Minnesota Statute 110B

The Metropolitan Surface Water Management Act was enacted in 1982 to require planning for surface water management in metropolitan areas and setup a governmental framework to achieve it. It led to the implementation of the Comprehensive Local Water Management Act, which centers on county rather than metropolitan borders. These acts caused the formation of 46 watershed management organizations (WMOs) that adopted comprehensive plans to manage water resources. After adopting such plans, cities and towns within the watershed must prepare local water management plans consistent with the WMO plan and implement the plans through land use controls. Citizens can use these designs as a basis to challenge planned development and wetland alterations. They are encouraged to contact city halls or town managers to find out which watershed management organization has jurisdiction in their own areas.
Watershed plans and regulations
Minnesota Statute 103D and local watershed legislation

Watershed districts implement plans and regulations. Watershed districts are special purpose local units of government whose boundaries follow those of a natural watershed. A watershed is an area of land in which all water drains into one outlet. There are 41 districts in Minnesota; each is established under the authority of the Minnesota Watershed Act. This act empowers districts to regulate activities affecting water resources, develop long-range plans, acquire property rights, construct and finance improvement projects, and adopt water management rules. They may develop and maintain detailed surveys and hydrological data that can be helpful in opposing alterations of wetlands.

Each watershed district is governed by a board of managers appointed by the board of county commissioners. Watershed district meetings are open to the public. Violations of district regulations can be enforced through the civil or criminal process. The Board of Water and Soil Resources can be reached at (612) 296-3786.

Designation of Cannon River as a Wild River
Minnesota Statutes 6105.1550–6105.1680

Under these provisions, the Cannon River, from the northern city limits of Faribault to the Mississippi River, is designated to be part of the Minnesota wild, scenic and recreational rivers system. Cannon Falls, Dundas and Northfield were required to adapt special rules for all land that was not previously being developed when the amendment was issued. Sand and gravel extraction, a major industry in the area, is allowed to continue with additional restrictions. The DNR has responsibility for allocating funds for maintenance of recreational facilities with the Cannon River land use district. It also enforces the scenic river user rules (part 6105.0210), which, among other things, designates restrictions on litter, fires and hunting. Specific duties were given to each township along the river as to how local zoning authorities shall conduct their specific responsibilities. Every five years the DNR is required to conduct public informational meetings to determine “the effectiveness, the progress, and the opportunities for improvement” of these parts.

Townships also make use of municipal zoning, storm water, wastewater and wetlands ordinances to provide guidelines for the use of land and water resources in their protection. Rice County, in fulfillment Minnesota Rule 8410, has a water management plan that addresses their water system’s goals. While too expansive to fully explain here, Rice County’s complete list of goals and implementation plans can be found online at: http://www.co.rice.mn.us/planning/Water%20Management%20Plan.pdf.

The county has determined the following issues to be of highest priority: animal agriculture, erosion & sediment control, groundwater, storm water management, surface water and wetland management. The following agencies, among others, are responsible for implementation of the plan: Rice County Planning and Zoning, the University of Minnesota Extension, Minnesota Pollution Control Agency, the Minnesota Department of Agriculture, the Minnesota Department of Natural Resources, The Board of Water and Soil Resources, The Minnesota Department of Agriculture, the DNR, and the Minnesota Department of Health.
VI. LOCAL MANAGEMENT AND RESTORATION EFFORTS

Management of Pollution Inputs
Rivers receive pollution in two distinct ways: point source and non-point source pollution. Point-source pollution is usually industrial pollution or sewage. This pollution comes from a particular pipe or factory. Non-point source pollution comes from a larger area, such as a stretch of farmland or city run off. Non-point source pollution is harder to remedy, because the source must be eliminated, rather than remedied at the point outlet.

For many years the wastewater from cities along the river was dumped directly into the river. These and other origins of point-source pollution have been identified over the years (Table 4). This pollution negatively affected the level of bacteria and nutrients in the Cannon River. In the 1950’s Northfield and Faribault built wastewater treatment plants, which greatly increased the water quality. Now, the bacteria levels leaving the plants is <1% of that in the river (Ganske, et al. 2002).

Table 4. Sources of Pollution in the Cannon River. Source: Minnesota DNR Electro-fishing survey, 1977-84.

<table>
<thead>
<tr>
<th>Source</th>
<th>Miles from Mouth</th>
<th>Substance Discharged</th>
<th>Date reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cannon River</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Welch</td>
<td>12.7</td>
<td>Domestic wastewater</td>
<td>1977</td>
</tr>
<tr>
<td>Mineral Springs Center</td>
<td>19.0</td>
<td>Domestic wastewater</td>
<td>1977</td>
</tr>
<tr>
<td>Cannon Falls Wastewater Treatment Facility</td>
<td>24.0</td>
<td>Municipal sewage</td>
<td>1977</td>
</tr>
<tr>
<td>MN Malting Company</td>
<td>24.0</td>
<td>Untreated barley germination</td>
<td>1977</td>
</tr>
<tr>
<td>Agricultural</td>
<td>Entire stream</td>
<td>Farm chemicals and feedlot runoff</td>
<td>1984</td>
</tr>
<tr>
<td>Waterville</td>
<td>77.5</td>
<td>Effluent from sewage treatment plant</td>
<td>1984</td>
</tr>
<tr>
<td>Morristown</td>
<td>70.2</td>
<td>Effluent from sewage treatment plant</td>
<td>1984</td>
</tr>
<tr>
<td>Northfield Waste Treatment</td>
<td>40.0</td>
<td>Treated sewage</td>
<td>1984</td>
</tr>
<tr>
<td>G.T. Sheldahl Co.</td>
<td>41.2</td>
<td>Non-contact cooling water</td>
<td>1984</td>
</tr>
<tr>
<td>Jerome Faribo Foods</td>
<td>58.2</td>
<td>Non-contact cooling water</td>
<td>1984</td>
</tr>
<tr>
<td>Faribault Woolen Mills</td>
<td>58.3</td>
<td>Non-contact cooling water</td>
<td>1984</td>
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<tr>
<td>Straight River</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faribault Waste Treatment</td>
<td>0.1</td>
<td>Sewage</td>
<td>1984</td>
</tr>
<tr>
<td>Quarry</td>
<td>21.6</td>
<td>Limed water from crushed rock operation</td>
<td>1984</td>
</tr>
<tr>
<td>Cannery ponds</td>
<td>22.1</td>
<td>Organic byproducts of canning</td>
<td>1984</td>
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<tr>
<td>Owatonna Waste Treatment</td>
<td>23.9</td>
<td>Sewage</td>
<td>1984</td>
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<tr>
<td>Owatonna Manufacturing Co.</td>
<td>25.0</td>
<td>Process waste</td>
<td>1984</td>
</tr>
<tr>
<td>Dept. of Transportation-Rest Area</td>
<td>26.1</td>
<td>Sewage</td>
<td>1984</td>
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<tr>
<td>Hope Coop Creamery</td>
<td>43.5</td>
<td>Process waste and cooling water</td>
<td>1984</td>
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<td>Prairie Creek</td>
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<tr>
<td>Feedlot</td>
<td>4.6</td>
<td>Livestock waste</td>
<td>1982</td>
</tr>
<tr>
<td>Feedlot</td>
<td>9.9</td>
<td>Livestock waste</td>
<td>1982</td>
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<tr>
<td>Agricultural</td>
<td>Entire stream</td>
<td>Chemicals, animal waste, and silt</td>
<td>1982</td>
</tr>
</tbody>
</table>

Little Cannon, Turtle Creek, and Maple Creek

Agricultural                         | Entire stream    | Chemicals, animal waste, and silt                  | 1982          |
Despite the creation of wastewater treatment plants, bacteria (fecal coliform) levels remain high in many areas in the watershed. Other problems also persist, such as high turbidity and phosphorus levels. This pollution is coming from non-point sources. Land use in the watershed, which is 90% agricultural, is partly to blame. Exposed soil, present when farmland is tilled, is more vulnerable to erosion than vegetated soil (Cushing and Allan, 2001.) Farming to the stream bank and fall ploughing also contribute to high erosion rates. According to studies of data published by the EPA, siltation is the major pollutant nationwide and agriculture the leading source of reported impaired rivers nationwide (Cushing and Allan, 2001). Along with the soil, pesticides and fertilizers are washed into the watershed. The most problematic inputs are phosphorus and nitrogen from fertilizers and harmful bacteria such as E. Coli from livestock and other domestic animals, including urban pets.

Section 303(d) of the Clean Water Act addresses non-point source pollution by establishing a process to identify “impaired waters.” The Environmental Protection Agency (EPA) allows states to designate waters “impaired” when “technology-based controls are not adequate to maintain water quality standards” (United States EPA). States establish a priority ranking of the sites and for high priority cites, total daily maximum loads (TDML) are set. A TMDL identifies the amount of a specific pollutant from point, non-point, and natural background sources, including a margin of safety, that may be discharged to a water body and still ensure that the water body attains water quality standards (United States EPA).

There are 7 sites that were designated in 2002 within the CRW. They are distributed along the Cannon River, the Straight River, and Prairie Creek. One site is impaired due to turbidity, the others because of fecal coliform contamination. Each site will have a TMDL set individually, with completion dates ranging from 2003-2007. After a TMDL is established a management plan must be developed.

The Cannon River Watershed Partnership (CRWP), a citizen non-profit organization founded in 1990, works with many organizations, government agencies, and local citizens “to protect and improve the water and natural resources of the watershed.” Projects to monitor, study, and restore the watershed are undertaken by this group. The CRWP, in conjunction with the MN Pollution Control Agency, the MN Center for Environmental Advocacy, and Steele County, measured water quality and stream flow at several sites on the Straight River in 2000. This information, along with land use data, was used to complete a Total Maximum Daily Load (TMDL) project for the Straight River. Project such as this will be completed in the following years for the remaining sites.

**Current Initiatives and Future Possibilities**

The Cannon River Watershed Partnership, as part of The Minnesota Environmental Partnership (MEP), has made protecting Minnesota waters a top 2004 legislative priority. MEP has articulated many recommendations to the legislature called Protect Our Water 2004. Protect Our Water 2004 includes many recommendations that will influence CRWPs work and the Cannon River watershed health.

MEP is encouraging the state government to apply for a new Conservation Reserve Enhancement Program (CREP) grant. CREP is a federal program that states individually apply to receive money to help create easements. Easements are pieces of land that cannot be developed or farmed and are restored to natural vegetation. Local farmers, in exchange for money and a tax break, give up the land. Easements can be either permanent or set aside for a given period of
A CREP plan already exists to protect land along the Minnesota River. The 2004 recommendation is to create a plan for 100,000 acres in the Red River watershed, lower Mississippi, and the Missouri River watershed in MN. The Canon River, as part of the lower Mississippi watershed, would be included in this plan. As currently proposed by Governor Pawlenty, the easements would be divided into at least 33,000 acres of permanent easements, at least 33,000 acres of 35-year easements, and the remaining 33,000 acres would be reserved for either permanent or 35-year easements.

MEP is also hoping to get $75 million dollars a year from the state government to clean up Minnesota’s most polluted rivers, lakes, and streams. Under the Clean Water Act, states can designate waters as “impaired” (for more information see page 23). However, there has been no meaningful action taken to clean up water on the impaired list. With the $75 million being proposed, the state government and local environmental organizations will make a new commitment to cleaning up these areas. There are close to 32 impaired lakes or stretches of rivers in Minnesota. The Straight River in the Cannon River watershed account for around 7 of the 32. Part of this money would go toward developing total daily maximum loads (TDML) and management plans to lower fecal coliform levels in the Cannon.

Other issues being brought forth by the Protect Our Water 2004 initiative are less specific to the Cannon River watershed. They will improve the health of waters throughout the state. There are two in particular that the CRWP has chosen to focus on. One of these is the passage of legislation for phosphorus-free dishwasher detergent and phosphorus-free lawn fertilizer (Minnesota already supports phosphorus-free dish soap and laundry detergent). Too much phosphorus in our water clogs the river with algae, discourages recreational activity, and spoils fishing. The second is protecting community and township rights. When state laws aren’t strict enough, or aren’t being enforced at a local level, local communities can protect their environment through local planning and zoning ordinances. Keeping this law intact allows local citizens, who are connected to their watershed, to protect their home.

All of these initiatives give hope to the Cannon’s citizens, and to those working to help clean up the watershed. Though each initiative dependant upon approval at the state level, it is important to remember that the possibilities held in these bills can only come from local action. Farmers willing to apply for land easements, local citizens demanding that community laws protect local water, and non-profit organizations such as the CRWP, are all examples of behavior at a local level benefiting the watershed.

VII. CONCLUSION

As you become more aware of the issues your watershed faces, your thinking will become oriented around that place. Your backyard will become more than your property, but part of a larger watershed. Your neighbors will become more than friends—they will be partners in watershed management. The reorientation of thought that accompanies the appreciation of a watershed is often as important as the specific knowledge gained from reading a document such as this.

This paper has only touched some of the many issues the Cannon River watershed faces. Additional information is available on scores of topics—including dam removal, city planning, fish diversity, endangered species, and agricultural practices. We encourage you to identify topics that excite you and pursue those further.
VIII. LITERATURE CITED


