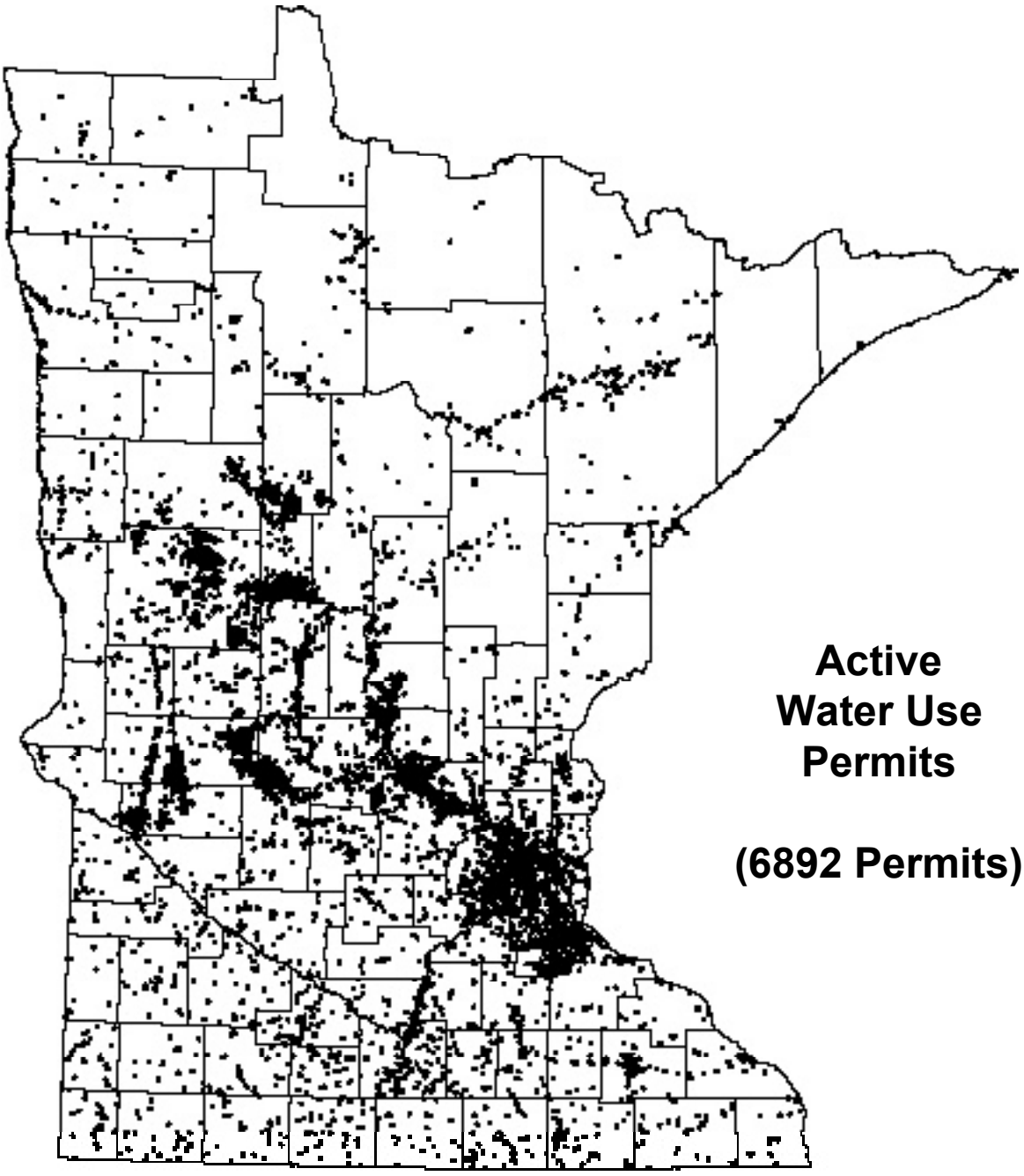
# chapter four
# water use



**Active Water Use Permits**

**(6892 Permits)**

## Introduction

DNR water appropriations permits are required for all users withdrawing surface or ground water in excess of ten thousand gallons per day or one million gallons per year. Uses less than this, such as rural domestic use, do not require a permit from the DNR and therefore are not included in this chapter.

All permittees must use a flow meter or other approved method of measurement to determine the volume of water withdrawn and must submit an annual report of water use. Reported water use data are used for many purposes, such as documenting water conflicts, understanding the hydrology of aquifers from which water is withdrawn and evaluating existing water supplies by monitoring use and the impact of that use. The data are reported on a calendar year basis. This chapter summarizes the reported water use data for calendar years (CY) 2000 and 2001.

### MAJOR WATER USE CATEGORIES

THERMOELECTRIC POWER GENERATION - water used to cool power generating plants. This is historically the largest volume use and relies almost entirely on surface water sources. Thermoelectric power generation is primarily a nonconsumptive* use in that most of the water withdrawn is returned to its source.

PUBLIC WATER SUPPLY - water distributed by community suppliers for domestic, commercial, industrial and public users. This category relies on both surface water and ground water sources.

INDUSTRIAL PROCESSING - water used in mining activities, paper mill operations, food processing, etc. Three-fourths or more of withdrawals are from surface water sources. Consumptive use varies depending on the type of industrial process.

IRRIGATION - water withdrawn from both surface water and ground water sources for major crop and noncrop uses. Nearly all irrigation is considered to be consumptive use.

OTHER - large volumes of water withdrawn for activities including air conditioning, construction dewatering, water level maintenance and pollution confinement.

*Consumptive use is defined as water that is withdrawn from its source and is not directly returned to the source (M.S. 103G.005, Subd.8). Under this definition, all ground water withdrawals are consumptive unless the water is returned to the same aquifer. Surface water withdrawals are considered consumptive if the water is not directly returned to the source so that it is available for immediate further use.

## Statewide Water Use Comparison for 2000 and 2001

Water use in 2000 was 1340.5 billion gallons (BG) and was the highest use ever reported. 2001 reported use represents a 5% decrease from the 2000 total and is closer to the values reported in 1998 and 1999. Figure 1 is a comparison of the two years showing use by major category and the volume and percent change between the years. The largest increase in use was for public supply, increasing by 14 BG or 7%. The largest decrease in use was for industrial processing, decreasing by 63 BG or 37%.

Figure 2 graphically shows the changes in use patterns for 4 main use categories (excluding power generation) from 1985 to 2001. Water use in 2001 for irrigation and public supply was the highest since the drought year 1988. The pattern seen in irrigation reflects low use in times of high precipitation and large use in times of drought. Industrial processing use is influenced by economic vitality. In 2001, water use for industrial processing decreased from past years mainly due to a decline in mine pit dewatering for hard rock mining.

*Figure 1*

**Water Use Comparison by Major Category: 2000 & 2001**
(Billions of Gallons)

| | Water Use | | | | Change from 2000 to 2001 | |
|---|---|---|---|---|---|---|
| | 2000 | | 2001 | | | |
| Use Category | BG | % of Total | BG | % of Total | BG | % |
| Power Generation | 829.3 | 62% | 798.5 | 63% | -31 | -4% |
| Public Supply | 196.5 | 15% | 210.6 | 16% | 14 | 7% |
| Industrial Processing | 173.0 | 13% | 109.8 | 8% | -63 | -37% |
| Irrigation | 83.0 | 6% | 96.2 | 8% | 13 | 16% |
| Other | 58.7 | 4% | 58.2 | 5% | -1 | -1% |
| **Totals** | **1,340.5** | **100%** | **1,273.3** | **100%** | **-68** | **-5.0%** |

A comparison of surface water versus ground water use for 2001 (Figure 3) shows that the majority of appropriations are from surface water sources. However, if the non-consumptive water use for power generation is removed, uses of ground water and surface water are more even (non-consumptive use means water that is immediately returned to its source after use). Figure 4 shows the long-term trend of ground water versus surface water use. Ground water is the primary source for irrigation and public supply, categories that increase in dry years due to demands for crop irrigation and for lawn watering. In 2001, 80% of withdrawals in Minnesota were from surface water sources with 63% of the total use for power plant cooling, a relatively non-consumptive use.

Surface water use decreased from 2000 to 2001 due to decreased appropriation for power generation and industrial processing. Ground water use increased from 2000 to 2001 due to greater demand for irrigation.

*Figure 2*

## Minnesota Water Use - 1985 to 2001
### (Billions of Gallons)

| | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Power Generation | 508 | 539 | 637 | 663 | 664 | 698 | 694 | 679 | 722 | 765 | 748 | 710 | 701 | 785 | 812 | 829 | 798 |
| Public Supply | 171 | 170 | 192 | 203 | 174 | 164 | 170 | 175 | 164 | 178 | 180 | 189 | 185 | 192 | 184 | 197 | 211 |
| Industrial Processing | 109 | 76 | 69 | 94 | 120 | 102 | 115 | 158 | 127 | 120 | 160 | 147 | 159 | 169 | 166 | 173 | 110 |
| Irrigation | 49 | 30 | 67 | 103 | 86 | 71 | 60 | 63 | 30 | 56 | 62 | 80 | 58 | 77 | 72 | 83 | 96 |
| Other | 49 | 42 | 38 | 42 | 48 | 53 | 52 | 58 | 63 | 64 | 60 | 57 | 63 | 58 | 65 | 59 | 58 |
| | **886** | **857** | **1003** | **1105** | **1092** | **1088** | **1091** | **1133** | **1106** | **1183** | **1210** | **1183** | **1166** | **1281** | **1299** | **1341** | **1273** |

column totals may not sum due to independent rounding

## Minnesota Water Use
### (excluding Power Generation)
### in Billions of Gallons

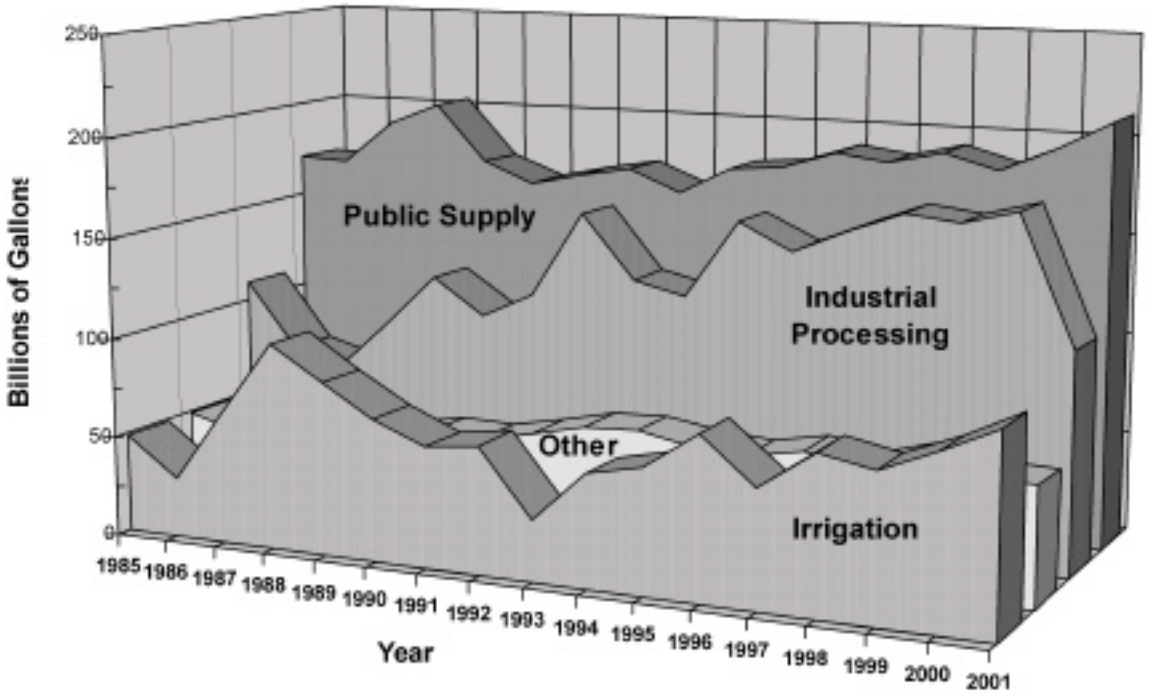
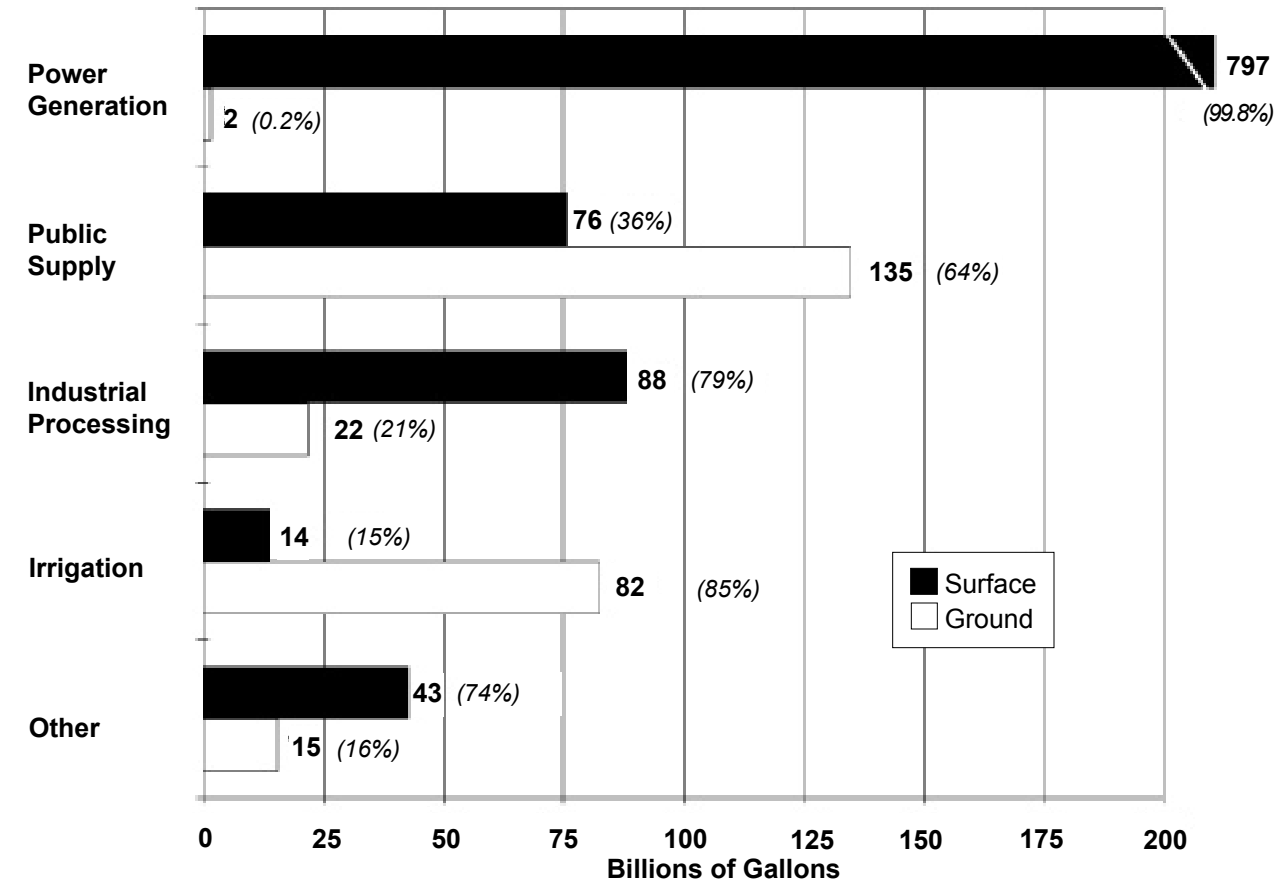


*Figure 3*




## Power Generation

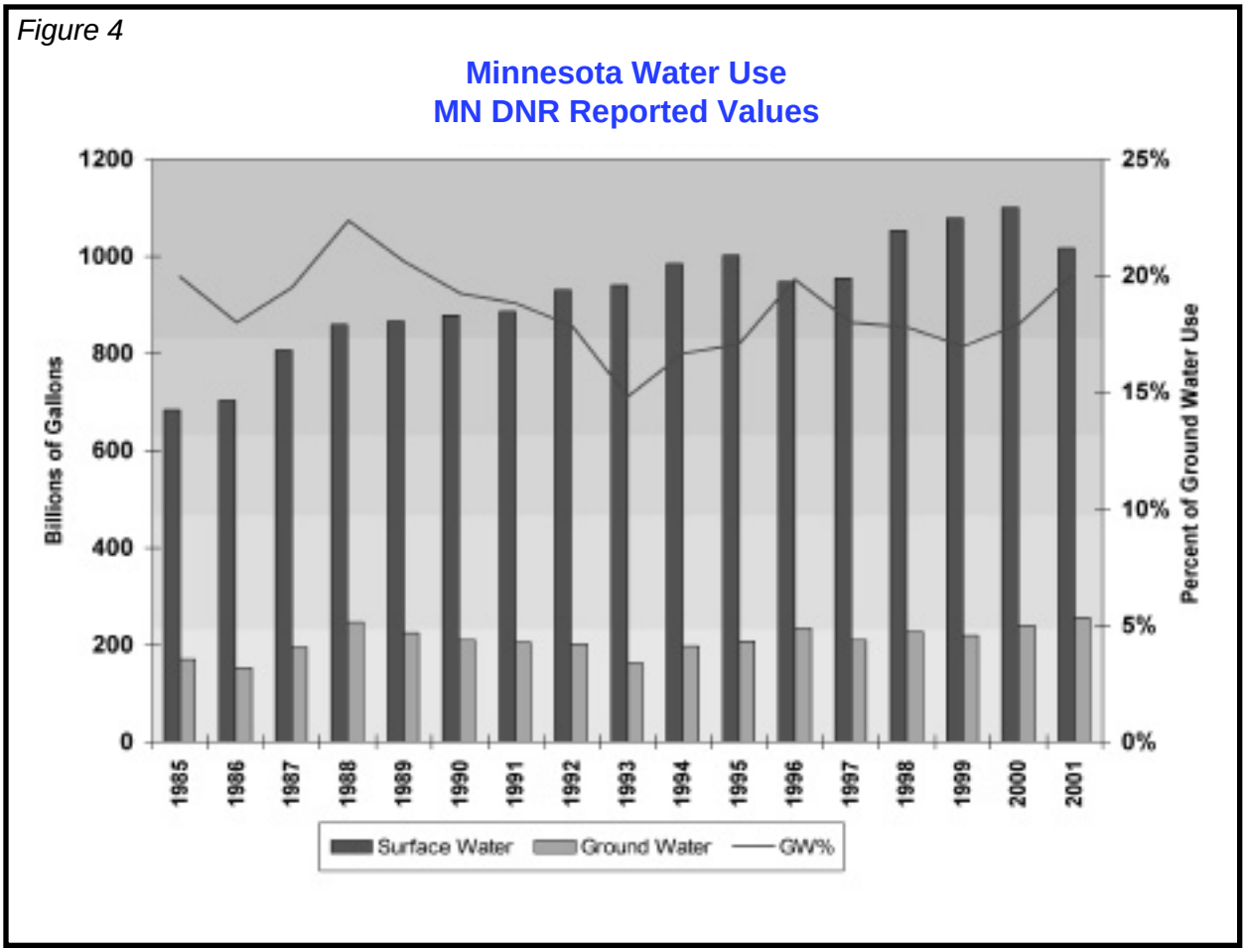
Figure 5 shows that power generation (nuclear power cooling and steam power cooling) was the primary use in nine of the 10 counties with the highest total use in 2001. Power generation accounted for 63% of all use reported in Minnesota for the year. Power generation in Goodhue and Wright Counties alone accounted for 26% of all reported use in 2001, largely due to nuclear power plant cooling. Surface water sources supply almost all of the water used for power generation. Most of the water is for cooling purposes, which is then returned to the surface water source.

## Public Water Supply

Water use for public supply slowly increased from 1990 to 1999 due to population increases and industrial demands (Figure 2), but increased more dramatically in 2000 and 2001. Reported use for 2000 and 2001 was 197 BG and 211 BG respectively. 2001 use surpassed the spike in 1988, which was a result of drought conditions. 64% of public water supply use came from ground water in 2001, compared to 37% nationally (USGS, *Estimated Use of Water in the United States in 1995*).

Local water conservation programs that implement measures to improve water use efficiencies and promote the wise use of water can help communities reduce the need for expensive new municipal wells and water/wastewater treatment plants. Public water suppliers that serve more than 1,000 people are required to develop water emergency and conservation plans and also implement demand management measures before requesting approvals for new municipal wells. These efforts can help water customers and communities save money while helping to protect Minnesota's valuable water resources for future domestic and economic uses.

*Figure 4*



## Irrigation

Annual variations in the amount and distribution of rainfall greatly affect the demand for irrigation water. Combined irrigation use for calendar years 2000-2001 was 20% higher compared to the previous two-year period.

Irrigation accounts for only a small amount (8%) of total use in Minnesota. However, this use is significant because it is almost entirely consumptive and the majority is from ground water sources (86%). The timing of irrigation use can be significant when evaluating regional water supplies and the potential for well interferences. Almost all irrigation use is compacted into the five-month period from May to September of each year.

Otter Tail and Sherburne Counties reported the highest water use for irrigation in 2001, using 20.7 BG and 17.7 BG respectively. Roseau County was the only county that reported no use for irrigation in 2001, while Lake and Traverse Counties each reported less than 10 million gallons for the year.

## Industrial Processing

Industrial processing use decreased 36% from 2000 to 2001, a very large drop. Mining use decreased by 50%, accounting for most of the decline. Pulp and paper processing and agricultural processing accounted for 23% and 9%, respectively, of the total volume reported in this category.

*Figure 5*

**Appropriations by the Counties with the Greatest Use in CY 2001**

| | County | Surface Water | Ground Water | Total | Primary Use |
|---|---|---|---|---|---|
| 1) | Goodhue | 221.0 | 2.6 | 223.6 | Nuclear Power Cooling |
| 2) | Washington | 100.9 | 12.3 | 113.2 | Steam Power Cooling |
| 3) | Hennepin | 75.3 | 36.9 | 112.2 | Steam Power Cooling |
| 4) | Wright | 107.6 | 3.2 | 110.7 | Nuclear Power Cooling |
| 5) | St. Louis | 107.1 | 2.0 | 109.1 | Steam Power Cooling |
| 6) | Ramsey | 64.7 | 13.7 | 78.4 | Steam Power Cooling |
| 7) | Dakota | 48.6 | 26.8 | 75.4 | Steam Power Cooling |
| 8) | Itasca | 70.4 | 1.3 | 71.7 | Steam Power Cooling |
| 9) | Anoka | 38.2 | 12.0 | 50.1 | Municipal Waterworks |
| 10) | Lake | 47.6 | 0.0 | 47.6 | Steam Power Cooling |
| | **Total** | **881.4** | **110.8** | **992.0** | |
| | millions of gallons | *87% of* SW Use | *43% of* GW Use | *78% of* Total Use | |

## Other Uses

Other uses include air conditioning, water level maintenance, fisheries, temporary construction dewatering, pollution confinement, snow making and other specialty uses that represent about 4% of Minnesota's total water use.

## Irrigation-Precipitation Connection

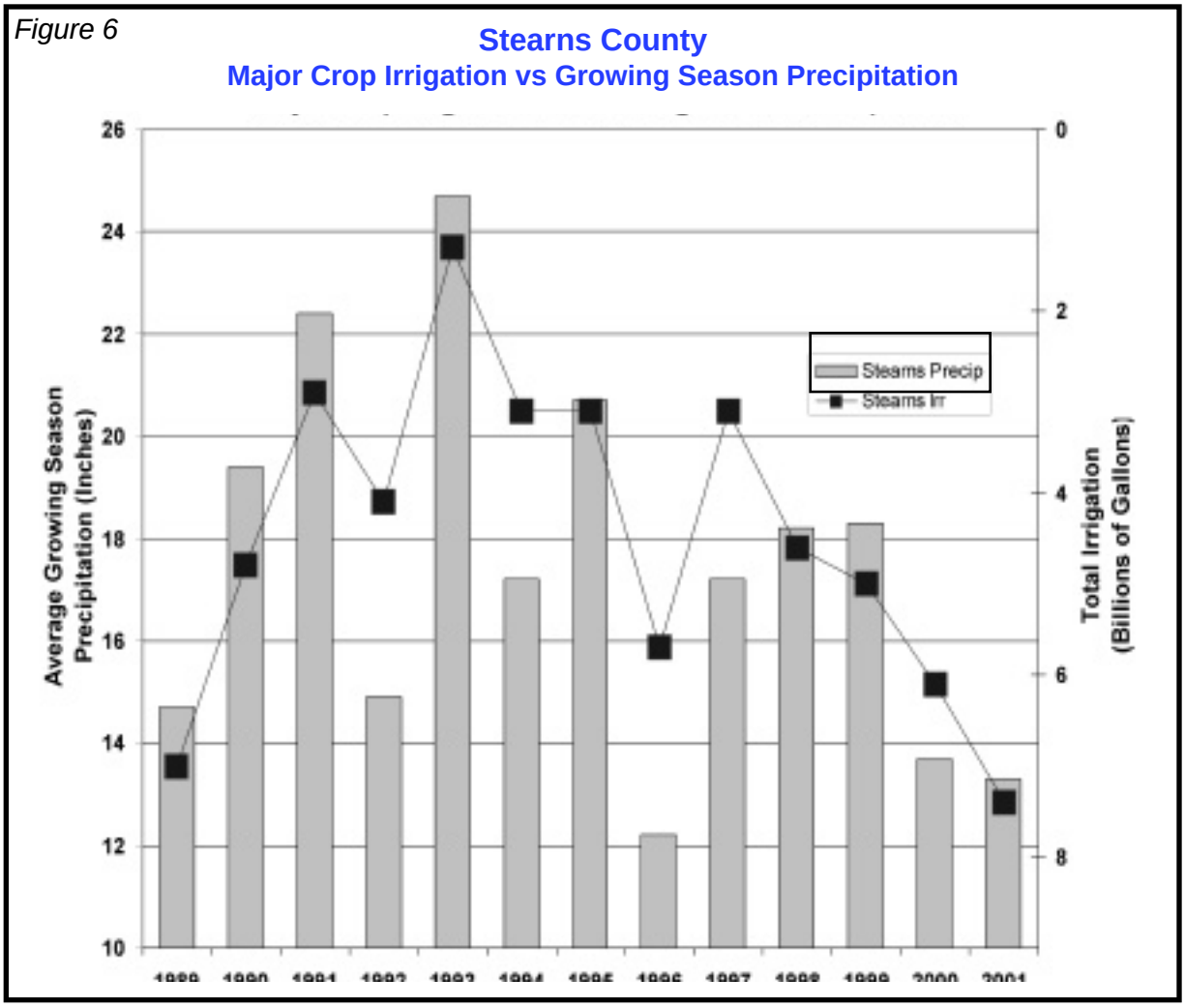
A strong correlation exists between precipitation and irrigation water demand for a given area: the higher the amount of precipitation received, the lower the need to add moisture to the soil to ensure vigorous plant growth. To demonstrate this relationship, total crop irrigation use for Stearns County was compared to the average growing season precipitation (May-September) recorded for the county (Figure 6). Note that the data axis for irrigation (on the right side of the graph) is reversed to visually show a positive correlation.

In addition to amounts and distribution of precipitation, irrigation demand is also influenced by the soil moisture conditions that exist before the growing season starts, temperatures during the growing season and the water demands of the various crops grown.

## Summary

Total water use in 2001 decreased from the record water use reported in 2000. Power generation continues to account for the majority of use, totaling 798.5 BG of the 1273.3 BG reported for 2001 (63%). Surface water accounts for 80% of all appropriations.

*Figure 6*



# Reported Water Use by County 2000 - 2001 (Millions of Gallons)

## Reported Water Use

| | County | 2000 Surface | 2000 Ground | 2000 Total | 2001 Surface | 2001 Ground | 2001 Total | Primary Use | % of 2001 Total |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Aitkin | 1,255.8 | 89.1 | 1,344.9 | 971.7 | 93.2 | 1,064.9 | Wild Rice Irrigation | 86 |
| 2 | Anoka | 38,801.0 | 12,181.4 | 50,982.4 | 38,152.0 | 11,961.7 | 50,113.7 | Municipal Waterworks | 95 |
| 3 | Becker | 23.2 | 2,749.1 | 2,772.3 | 34.1 | 3,150.6 | 3,184.7 | Major Crop Irrigation | 68 |
| 4 | Beltrami | 1,131.3 | 690.2 | 1,821.5 | 1,465.9 | 762.0 | 2,227.9 | Wild Rice Irrigation | 63 |
| 5 | Benton | 3,572.6 | 3,752.8 | 7,325.4 | 3,635.0 | 4,485.9 | 8,120.9 | Industrial Processing | 43 |
| 6 | Big Stone | 16.2 | 373.0 | 389.2 | 11.6 | 488.8 | 500.4 | Major Crop Irrigation | 55 |
| 7 | Blue Earth | 7,686.2 | 3,731.2 | 11,417.4 | 8,765.0 | 3,768.9 | 12,533.9 | Steam Power Cooling | 69 |
| 8 | Brown | 113.8 | 1,009.1 | 1,122.9 | 107.5 | 999.6 | 1,107.1 | Major Crop Irrigation | 44 |
| 9 | Carlton | 2,961.9 | 657.3 | 3,619.2 | 2,915.2 | 744.5 | 3,659.7 | Pulp/Paper Processing | 74 |
| 10 | Carver | 48.1 | 3,161.8 | 3,209.9 | 27.4 | 3,171.7 | 3,199.1 | Municipal Waterworks | 83 |
| 11 | Cass | 23.8 | 1,026.0 | 1,049.8 | 38.4 | 1,198.0 | 1,236.4 | Major Crop Irrigation | 35 |
| 12 | Chippewa | 131.6 | 570.9 | 702.5 | 56.1 | 584.1 | 640.2 | Municipal Waterworks | 75 |
| 13 | Chisago | 270.7 | 1,187.1 | 1,457.8 | 128.6 | 1,096.4 | 1,225.0 | Municipal Waterworks | 58 |
| 14 | Clay | 1,589.1 | 901.5 | 2,490.6 | 1,717.0 | 1,047.1 | 2,764.1 | Municipal Waterworks | 69 |
| 15 | Clearwater | 3,980.4 | 117.7 | 4,098.1 | 3,537.3 | 118.3 | 3,655.6 | Wild Rice Irrigation | 96 |
| 16 | Cook | 54,084.5 | 10.9 | 54,095.4 | 3,892.0 | 8.8 | 3,900.8 | Mine Processing | 96 |
| 17 | Cottonwood | 186.9 | 997.4 | 1,184.3 | 270.9 | 1,101.1 | 1,372.0 | Municipal Waterworks | 38 |
| 18 | Crow Wing | 1,359.9 | 2,012.1 | 3,372.0 | 1,303.6 | 2,036.9 | 3,340.5 | Municipal Waterworks | 36 |
| 19 | Dakota | 66,259.3 | 23,827.4 | 90,086.7 | 48,564.0 | 26,827.8 | 75,391.8 | Steam Power Cooling | 58 |
| 20 | Dodge | 64.5 | 434.7 | 499.2 | 14.0 | 459.4 | 473.4 | Municipal Waterworks | 75 |
| 21 | Douglas | 123.2 | 1,489.2 | 1,612.4 | 140.7 | 1,700.3 | 1,841.0 | Municipal Waterworks | 36 |
| 22 | Faribault | 0.0 | 743.3 | 743.3 | 0.0 | 702.5 | 702.5 | Municipal Waterworks | 72 |
| 23 | Fillmore | 3,883.2 | 671.8 | 4,555.0 | 3,836.5 | 632.6 | 4,469.1 | Hatcheries & Fisheries | 85 |
| 24 | Freeborn | 23.0 | 1,847.1 | 1,870.1 | 25.9 | 1,858.1 | 1,884.0 | Municipal Waterworks | 82 |
| 25 | Goodhue | 227,210.4 | 2,329.3 | 229,539.7 | 221,022.6 | 2,610.9 | 223,633.5 | Nuclear Power Cooling | 92 |
| 26 | Grant | 0.0 | 660.1 | 660.1 | 0.0 | 815.5 | 815.5 | Major Crop Irrigation | 78 |
| 27 | Hennepin | 74,100.8 | 36,976.6 | 111,077.4 | 75,346.2 | 36,898.0 | 112,244.2 | Steam Power Cooling | 67 |
| 28 | Houston | 79.8 | 524.8 | 604.6 | 26.4 | 543.2 | 569.6 | Municipal Waterworks | 74 |
| 29 | Hubbard | 28.3 | 4,536.7 | 4,565.0 | 61.7 | 5,711.0 | 5,772.7 | Major Crop Irrigation | 81 |
| 30 | Isanti | 4.4 | 736.3 | 740.7 | 3.2 | 691.3 | 694.5 | Municipal Waterworks | 51 |
| 31 | Itasca | 71,446.0 | 1,397.5 | 72,843.5 | 70,406.8 | 1,336.9 | 71,743.7 | Steam Power Cooling | 87 |
| 32 | Jackson | 17.4 | 283.6 | 301.0 | 78.1 | 293.9 | 372.0 | Municipal Waterworks | 64 |
| 33 | Kanabec | 13.2 | 193.7 | 206.9 | 40.3 | 147.7 | 188.0 | Municipal Waterworks | 76 |
| 34 | Kandiyohi | 663.3 | 3,209.7 | 3,873.0 | 650.9 | 3,139.7 | 3,790.6 | Municipal Waterworks | 44 |
| 35 | Kittson | 101.2 | 424.0 | 525.2 | 20.3 | 312.7 | 333.0 | Rural Waterworks | 50 |
| 36 | Koochiching | 19,262.3 | 32.1 | 19,294.4 | 16,748.5 | 43.9 | 16,792.4 | Pulp/Paper Processing | 97 |
| 37 | Lac Qui Parle | 44.2 | 1,331.4 | 1,375.6 | 46.2 | 1,403.6 | 1,449.8 | Agricultural Processing | 44 |
| 38 | Lake | 49,415.2 | 0.1 | 49,415.3 | 47,556.8 | 1.2 | 47,558.0 | Mine Processing | 99 |
| 39 | Lake of the Woods | 333.2 | 63.2 | 396.4 | 337.1 | 73.4 | 410.5 | Wild Rice Irrigation | 80 |
| 40 | Le Sueur | 3,469.2 | 1,087.3 | 4,556.5 | 5,750.2 | 1,319.3 | 7,069.5 | Quarry/Mine Dewatering | 65 |
| 41 | Lincoln | 10.0 | 517.6 | 527.6 | 11.4 | 561.1 | 572.5 | Rural Waterworks | 74 |
| 42 | Lyon | 132.4 | 1,639.3 | 1,771.7 | 133.9 | 1,638.5 | 1,772.4 | Municipal Waterworks | 66 |
| 43 | McLeod | 120.7 | 2,039.9 | 2,160.6 | 207.9 | 1,867.8 | 2,075.7 | Municipal Waterworks | 56 |
| 44 | Mahnomen | 2.0 | 93.1 | 95.1 | 0.0 | 104.9 | 104.9 | Municipal Waterworks | 89 |

# Reported Water Use by County 2000 - 2001 (Millions of Gallons)

## Reported Water Use

| County | 2000 Surface | 2000 Ground | 2000 Total | 2001 Surface | 2001 Ground | 2001 Total | Primary Use | % of 2001 Total |
|---|---|---|---|---|---|---|---|---|
| 45 Marshall | 124.3 | 219.2 | 343.5 | 150.7 | 236.5 | 387.2 | Municipal Waterworks | 28 |
| 46 Martin | 6,545.3 | 316.7 | 6,862.0 | 6,232.7 | 314.6 | 6,547.3 | Steam Power Cooling | 87 |
| 47 Meeker | 14.4 | 1,677.2 | 1,691.6 | 13.9 | 1,827.2 | 1,841.1 | Major Crop Irrigation | 62 |
| 48 Mille Lacs | 34.0 | 614.1 | 648.1 | 76.2 | 565.1 | 641.3 | Municipal Waterworks | 59 |
| 49 Morrison | 57.3 | 4,124.9 | 4,182.2 | 72.5 | 4,230.4 | 4,302.9 | Major Crop Irrigation | 80 |
| 50 Mower | 173.2 | 2,630.0 | 2,803.2 | 144.1 | 2,756.4 | 2,900.5 | Municipal Waterworks | 44 |
| 51 Murray | 36.9 | 228.7 | 265.6 | 77.1 | 232.8 | 309.9 | Municipal Waterworks | 73 |
| 52 Nicollet | 56.6 | 1,781.7 | 1,838.3 | 49.8 | 1,985.0 | 2,034.8 | Municipal Waterworks | 85 |
| 53 Nobles | 47.8 | 1,094.3 | 1,142.1 | 53.5 | 1,143.1 | 1,196.6 | Municipal Waterworks | 94 |
| 54 Norman | 5.0 | 146.4 | 151.4 | 0.0 | 144.2 | 144.2 | Municipal Waterworks | 90 |
| 55 Olmsted | 8,010.1 | 6,599.9 | 14,610.0 | 9,314.8 | 6,542.8 | 15,857.6 | Steam Power Cooling | 58 |
| 56 Ottertail | 26,856.9 | 10,361.5 | 37,218.4 | 27,392.2 | 12,441.0 | 39,833.2 | Steam Power Cooling | 66 |
| 57 Pennington | 728.1 | 28.1 | 756.2 | 827.0 | 32.0 | 859.0 | Municipal Waterworks | 50 |
| 58 Pine | 20.2 | 496.2 | 516.4 | 20.9 | 475.7 | 496.6 | Municipal Waterworks | 64 |
| 59 Pipestone | 55.9 | 981.3 | 1,037.2 | 26.8 | 938.0 | 964.8 | Rural Waterworks | 46 |
| 60 Polk | 4,674.5 | 1,113.7 | 5,788.2 | 4,159.4 | 1,055.2 | 5,214.6 | Municipal Waterworks | 66 |
| 61 Pope | 108.0 | 6,199.0 | 6,307.0 | 124.9 | 7,490.0 | 7,614.9 | Major Crop Irrigation | 95 |
| 62 Ramsey | 50,946.9 | 14,409.3 | 65,356.2 | 64,720.8 | 13,654.0 | 78,374.8 | Steam Power Cooling | 61 |
| 63 Red Lake | 843.2 | 381.1 | 1,224.3 | 603.8 | 388.5 | 992.3 | Wild Rice Irrigation | 59 |
| 64 Redwood | 72.1 | 521.1 | 593.2 | 161.6 | 485.3 | 646.9 | Municipal Waterworks | 64 |
| 65 Renville | 111.7 | 950.7 | 1,062.4 | 55.9 | 908.4 | 964.3 | Municipal Waterworks | 47 |
| 66 Rice | 289.3 | 2,432.8 | 2,722.1 | 95.5 | 2,654.2 | 2,749.7 | Municipal Waterworks | 78 |
| 67 Rock | 53.3 | 611.3 | 664.6 | 41.1 | 630.1 | 671.2 | Municipal Waterworks | 53 |
| 68 Roseau | 0.0 | 330.8 | 330.8 | 0.0 | 330.5 | 330.5 | Municipal Waterworks | 92 |
| 69 St. Louis | 106,905.3 | 3,001.6 | 109,906.9 | 105,940.0 | 3,208.9 | 109,148.9 | Steam Power Cooling | 63 |
| 70 Scott | 323.8 | 4,479.8 | 4,803.6 | 164.1 | 5,488.7 | 5,652.8 | Municipal Waterworks | 64 |
| 71 Sherburne | 25,186.5 | 10,193.9 | 35,380.4 | 21,050.9 | 10,938.3 | 31,989.2 | Steam Power Cooling | 40 |
| 72 Sibley | 0.4 | 701.5 | 701.9 | 6.8 | 689.0 | 695.8 | Municipal Waterworks | 80 |
| 73 Stearns | 3,027.0 | 9,231.9 | 12,258.9 | 3,291.3 | 10,556.0 | 13,847.3 | Major Crop Irrigation | 54 |
| 74 Steele | 1,069.5 | 1,790.7 | 2,860.2 | 1,642.2 | 1,884.7 | 3,526.9 | Municipal Waterworks | 50 |
| 75 Stevens | 80.6 | 1,724.0 | 1,804.6 | 71.6 | 2,296.6 | 2,368.2 | Major Crop Irrigation | 76 |
| 76 Swift | 45.9 | 3,528.4 | 3,574.3 | 37.0 | 4,733.6 | 4,770.6 | Major Crop Irrigation | 89 |
| 77 Todd | 200.1 | 2,715.5 | 2,915.6 | 228.6 | 2,994.5 | 3,223.1 | Major Crop Irrigation | 73 |
| 78 Traverse | 6.0 | 120.1 | 126.1 | 3.1 | 105.2 | 108.3 | Municipal Waterworks | 97 |
| 79 Wabasha | 2.7 | 1,097.4 | 1,100.1 | 0.9 | 1,004.2 | 1,005.1 | Municipal Waterworks | 85 |
| 80 Wadena | 618.4 | 3,155.5 | 3,773.9 | 670.3 | 3,553.7 | 4,224.0 | Major Crop Irrigation | 91 |
| 81 Waseca | 29.4 | 801.2 | 830.7 | 30.4 | 759.7 | 790.1 | Municipal Waterworks | 88 |
| 82 Washington | 108,022.1 | 11,911.6 | 119,933.7 | 100,897.7 | 12,277.5 | 113,175.2 | Steam Power Cooling | 87 |
| 83 Watonwan | 109.5 | 1,062.4 | 1,171.9 | 17.3 | 1,106.5 | 1,123.8 | Municipal Waterworks | 61 |
| 84 Wilkin | 38.5 | 155.6 | 194.1 | 89.8 | 161.8 | 251.6 | Municipal Waterworks | 50 |
| 85 Winona | 1,070.5 | 2,119.7 | 3,190.2 | 1,085.0 | 2,231.4 | 3,316.4 | Municipal Waterworks | 38 |
| 86 Wright | 117,864.5 | 2,944.1 | 120,808.6 | 107,557.5 | 3,169.4 | 110,726.9 | Nuclear Power Cooling | 97 |
| 87 Yellow Medicine | 67.5 | 658.5 | 726.0 | 72.0 | 813.1 | 885.1 | Rural Waterworks | 48 |
| **Total** | | | **1,340,530** | | | **1,273,277** | | |

# Minnesota Reported Water Use

| Category | 2000 | 2001 |
|---|---|---|
| **Power Generation** | | (Millions of Gallons) |
| **Nuclear Power** | | |
| surface | 328,887.5 | 313,032.8 |
| ground | 0.0 | 0.0 |
| **Steam Power Cooling** | | |
| surface | 392,919.1 | 382,537.0 |
| ground | 988.3 | 756.0 |
| **Other Power** | | |
| surface | 105,610.3 | 101,289.0 |
| ground | 855.7 | 867.9 |
| **Subtotal** | **829,260.9** | **798,482.7** |
| Percent of Total | **62%** | **63%** |
| surface | 827,416.9 | 796,858.8 |
| ground | 1,844.0 | 1,623.9 |
| **Public Supply** | | |
| **Municipal Water Works** | | |
| surface | 63,107.2 | 75,857.0 |
| ground | 129,163.7 | 130,572.1 |
| **Private Water Works** | | |
| surface | 9.3 | 11.5 |
| ground | 820.2 | 800.4 |
| **Comercial & Institutional** | | |
| surface | 0.0 | 0.0 |
| ground | 1,493.1 | 1,446.2 |
| **Cooperative Water Works** | | |
| surface | 0.0 | 0.0 |
| ground | 1.6 | 1.5 |
| **Fire Protection** | | |
| surface | 0.0 | 0.0 |
| ground | 20.3 | 15.5 |
| **State Parks, Waysides, Rest Areas** | | |
| surface | 0.0 | 0.0 |
| ground | 24.2 | 25.6 |
| **Rural Water Districts** | | |
| surface | 0.0 | 0.0 |
| ground | 1,908.2 | 1,912.6 |
| **Subtotal** | **196,547.8** | **210,642.4** |
| Percent of Total | **15%** | **17%** |
| surface | 63,116.5 | 75,868.5 |
| ground | 133,431.3 | 134,773.9 |

# Minnesota Reported Water Use

| Category | 2000 | 2001 |
|---|---|---|
| **Irrigation** | | |
| **Golf Course** | | |
| surface | 1,441.5 | 1,503.0 |
| ground | 5,591.3 | 5,531.8 |
| **Cemetary** | | |
| surface | 0.0 | 0.0 |
| ground | 55.0 | 53.2 |
| **Landscaping** | | |
| surface | 54.4 | 65.5 |
| ground | 584.2 | 747.2 |
| **Sod** | | |
| surface | 146.3 | 99.1 |
| ground | 265.5 | 270.6 |
| **Nursery** | | |
| surface | 24.1 | 152.9 |
| ground | 447.4 | 427.1 |
| **Orchard** | | |
| surface | 1.7 | 1.2 |
| ground | 3.7 | 7.9 |
| **Non Crop** | | |
| surface | 10.8 | 9.4 |
| ground | 50.9 | 47.4 |
| **Temporary** | | |
| surface | 0.0 | 0.0 |
| ground | 0.0 | 38.7 |
| **Major Crop** | | |
| surface | 2,426.1 | 2,848.0 |
| ground | 61,900.9 | 75,342.5 |
| **Wild Rice** | | |
| surface | 9,920.9 | 9,014.3 |
| ground | 49.7 | 0.3 |
| **Subtotal** | **82,974.4** | **96,160.1** |
| Percent of Total | **6%** | **8%** |
| surface | 14,025.8 | 13,693.4 |
| ground | 68,948.6 | 82,466.7 |

# Minnesota Reported Water Use

| Category | 2000 | 2001 |
|---|---|---|
| **Industrial Processing** | | |
| **Agricultural** | | |
| surface | 287.7 | 272.7 |
| ground | 9,981.6 | 10,365.5 |
| **Pulp and Paper** | | |
| surface | 34,954.7 | 28,327.1 |
| ground | 845.5 | 888.2 |
| **Mine** | | |
| surface | 112,731.5 | 56,649.5 |
| ground | 28.9 | 24.7 |
| **Sand and Gravel Washing** | | |
| surface | 2,631.6 | 2,406.8 |
| ground | 1,403.3 | 1,440.6 |
| **Industrial Process Cooling Once-through** | | |
| surface | 235.0 | 197.1 |
| ground | 1,730.4 | 1,774.7 |
| **Petroleum or Chemical** | | |
| surface | 203.4 | 221.4 |
| ground | 3,845.0 | 3,900.0 |
| **Metal** | | |
| surface | 0.0 | 0.0 |
| ground | 1,323.0 | 1,458.5 |
| **Non-Metal** | | |
| surface | 0.8 | 0.6 |
| ground | 1,680.0 | 1,557.8 |
| **Other** | | |
| surface | 0.0 | 0.0 |
| ground | 1,137.8 | 343.5 |
| **Subtotal** | **173,020.2** | **109,828.7** |
| Percent of Total | **13%** | **9%** |
| surface | 151,044.7 | 88,075.2 |
| ground | 21,975.5 | 21,753.5 |
| **Other** | | |
| **Air Conditioning** | | |
| **Commercial & Institutional Building AC** | | |
| surface | 79.7 | 199.3 |
| ground | 119.3 | 181.2 |

# Minnesota Reported Water Use

| Category | 2000 | 2001 |
|---|---|---|
| **Heat Pumps & Coolant Pumps** | | |
| surface | 74.2 | 96.8 |
| ground | 0.0 | 0.0 |
| **District Heating** | | |
| surface | 0.0 | 0.0 |
| ground | 0.0 | 1.6 |
| **Once Through Heating or AC** | | |
| surface | 0.0 | 0.0 |
| ground | 2,912.5 | 2,806.3 |
| **Other AC** | | |
| surface | 67.2 | 67.6 |
| ground | 0.0 | 0.0 |
| **Temporary** | | |
| **Temporary Construction Non-Dewatering** | | |
| surface | 13.9 | 24.1 |
| ground | 9.1 | 0.3 |
| **Temporary Construction Dewatering** | | |
| surface | 22.2 | 352.5 |
| ground | 1,965.3 | 2,786.7 |
| **Temporary Pipeline and Tank Testing** | | |
| surface | 27.3 | 10.6 |
| ground | 2.8 | 14.5 |
| **Other Temporary** | | |
| surface | 212.2 | 18.0 |
| ground | 0.0 | 0.0 |
| **Water Level Maintenance** | | |
| **Basin (Lake) Level Maintenance** | | |
| surface | 3,384.3 | 1,099.3 |
| ground | 216.9 | 311.5 |
| **Mine Dewatering** | | |
| surface | 24,445.6 | 21,582.5 |
| ground | 13.0 | 51.3 |
| **Quarry Dewatering** | | |
| surface | 9,702.1 | 12,588.1 |
| ground | 0.0 | 0.0 |
| **Sand/Gravel Pit Dewatering** | | |
| surface | 566.4 | 420.3 |
| ground | 0.0 | 0.0 |

# Minnesota Reported Water Use

| Category | 2000 | 2001 |
|---|---|---|
| **Tile Drainage & Pumped Sumps** | | |
| surface | 17.8 | 29.7 |
| ground | 175.4 | 183.7 |
| **Other Water Level Maintenance** | | |
| surface | 6.4 | 63.1 |
| ground | 1,160.9 | 1,128.6 |
| **Special Categories** | | |
| **Pollution Confinement** | | |
| surface | 2.1 | 4.7 |
| ground | 4,763.1 | 4,571.6 |
| **Hatcheries & Fisheries** | | |
| surface | 6,028.1 | 5,929.9 |
| ground | 675.1 | 643.7 |
| **Snow Making** | | |
| surface | 127.6 | 178.1 |
| ground | 315.7 | 267.4 |
| **Peat Fire Control** | | |
| surface | 0.0 | 0.0 |
| ground | 0.3 | 0.1 |
| **Livestock Watering** | | |
| surface | 0.0 | 0.0 |
| ground | 786.6 | 947.8 |
| **Other Special Categories** | | |
| surface | 7.9 | 3.3 |
| ground | 825.8 | 1,599.2 |
| **Subtotal** | **58,726.8** | **58,163.4** |
| Percent of Total | **4%** | **5%** |
| surface | 44,785.0 | 42,667.9 |
| ground | 13,941.8 | 15,495.5 |
| **Grand Total (Millions of Gallons)** | **1,340,530** | **1,273,277** |
| surface | **1,100,389** | **1,017,164** |
| ground | **240,141** | **256,113** |

**This document is also available on our web site at www.dnr.state.mn.us/waters**