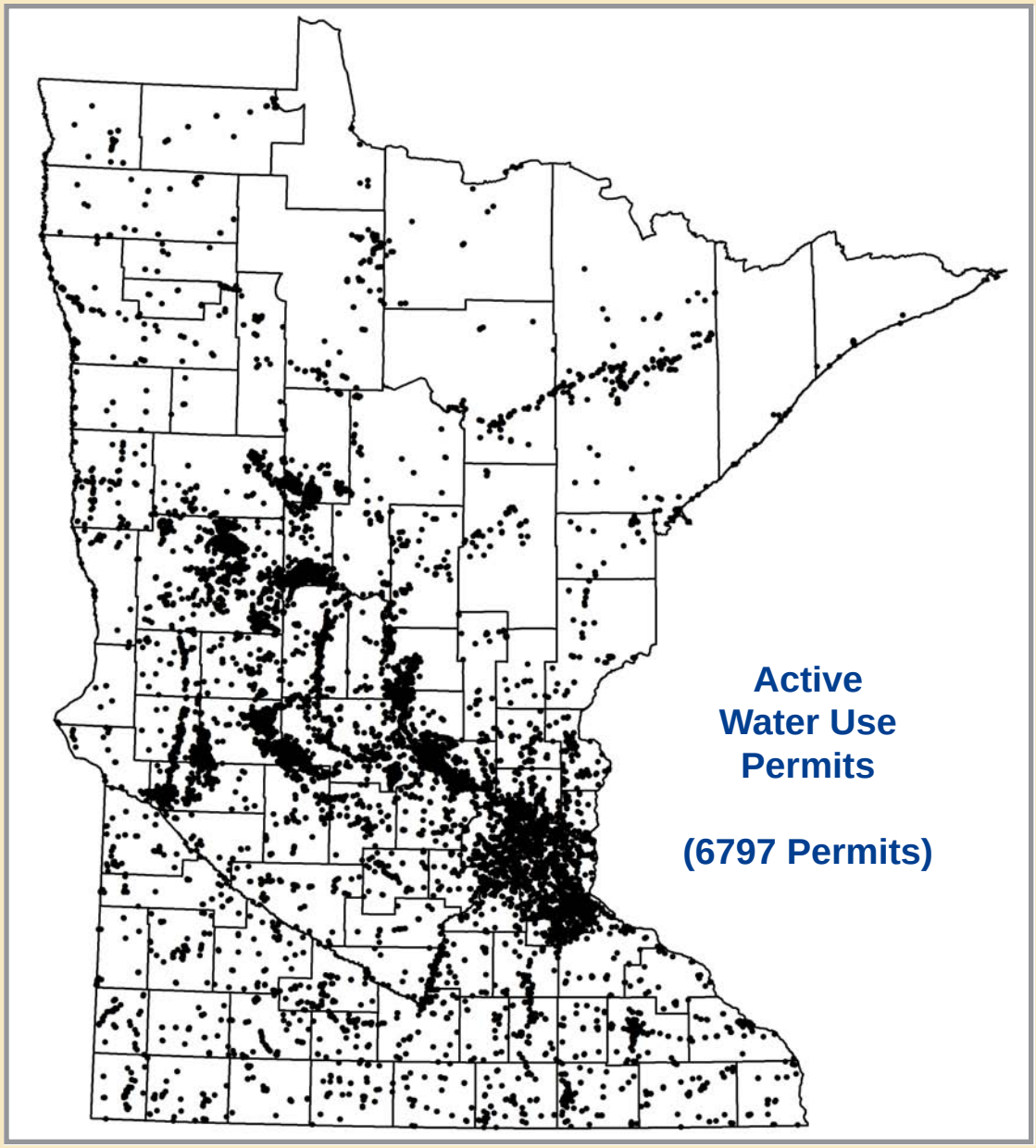
Water Use

Chapter 4



Car Wash photo by James Japs

Public Fountain photo by James Japs

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All permittees must use a flow meter or other approved method of measurement to determine the volume of water withdrawn and must submit an annual report of water use.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for many purposes, such as documenting water conflicts, understanding the hydrology of aquifers from which water is withdrawn, and evaluating existing water supplies by monitoring use and the impact of that use.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 2004 and 2005.

photo by DNR Waters

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 Thermoelectric power generation is primarily a nonconsumptive* use in that most of the water withdrawn is returned to its source.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 especially in mining activities, paper mill operations, and food processing, etc. Three-fourths or more of withdrawals are from surface water sources. Consumptive use varies, depending upon 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IRRIGATION - water withdrawn from both surface water and ground water sources for major crop and noncrop uses.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OTHER - large volumes of water withdrawn for activities including air conditioning, construction dewatering, water level maintenance and pollution confinement.

*Consumptive use is defined as water that is withdrawn from its source and is not directly returned to the source (M.S. 103G.005, Subd. 8).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.

Comparison of 2004 and 2005 Statewide Water Use

Water use in calendar year 2005 was 1431.2 billion gallons (BG) and was the highest yearly recorded use since the advent of reporting. Reported use in 2004 was 4% less than the 2005 total and is nearly the same as the value reported in 2003. 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 the two-year period was for power generation, increasing by 19 BG or 3%. The smallest increase in use was for the category public water supply, increasing by 1 BG or 0.5%. No category showed a decrease in use.

Figure 2 graphically shows the changes in use patterns for four main use categories (excluding power generation) from 1985 to 2005. Water use in 2005 for irrigation and public supply remained relatively high, matching closely the amount used in 2001, a high-use year. The pattern seen in irrigation reflects low use in times of high precipitation and large use in times of lower precipitation. Industrial processing water use is generally influenced by overall economic vitality and can be heavily influenced by fluctuations in large mine processing and mine pit dewatering operations on the Minnesota Iron Range.

A comparison of surface water versus ground water use for 2005 (Figure 3) shows that the majority of appropriations are from surface water sources. However, if the nonconsumptive water use for power generation is removed, uses of ground water and surface water are more even (nonconsumptive use means water that is immediately returned to its source after use). Eighty-two percent of total 2005 use was from surface water sources. Sixty-three percent of total 2005 use was for power plant cooling, a relatively nonconsumptive use.

Surface water use increased from 2003 to 2005, due to increased demand for power generation (nuclear power cooling and steam power cooling). Ground water use decreased due to less demand for irrigation and public water supply.

Figure 1

Water Use Comparison by Major Use Category: 2004 & 2005

(Billions of Gallons)

	2004		2005		Change From 2004 to 2005	
Use Category	BG	% of Total	BG	% of Total	BG Change	% Change
Power Generation	872.5	63%	901.6	63%	29.1	3%
Public Supply	207.8	15%	208.8	15%	1.0	0.5%
Industrial Processing	159.2	12%	163.6	11%	4.4	3%
Irrigation	83.6	6%	88.9	6%	5.3	6%
Other	54.8	4%	68.3	5%	13.5	25%
Totals	**1,377.9**	**100%**	**1,431.2**	**100%**	**+53.3**	**+3.9%**

column totals may not sum due to independent rounding

Figure 2

Minnesota Water Use - 1985 to 2005

(Billions of Gallons)

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Power Generation	508	539	637	663	664	698	694	679	722	765	748	710	701	785	812	829	798	814	825	873	902
Public Supply	171	170	192	203	174	164	170	175	164	178	180	189	185	192	184	197	211	199	222	208	209
Industrial Processing	109	76	69	94	120	102	115	158	127	120	160	147	159	169	166	173	110	162	169	159	164
Irrigation	49	30	67	103	86	71	60	63	30	56	62	80	58	77	72	83	96	70	105	84	89
Other	49	42	38	42	48	53	52	58	63	64	60	57	63	58	65	59	58	53	54	55	68
Total	886	857	1003	1105	1092	1088	1091	1133	1106	1183	1209	1184	1167	1281	1300	1341	1273	1299	1374	1378	1431

column totals may not sum due to independent rounding

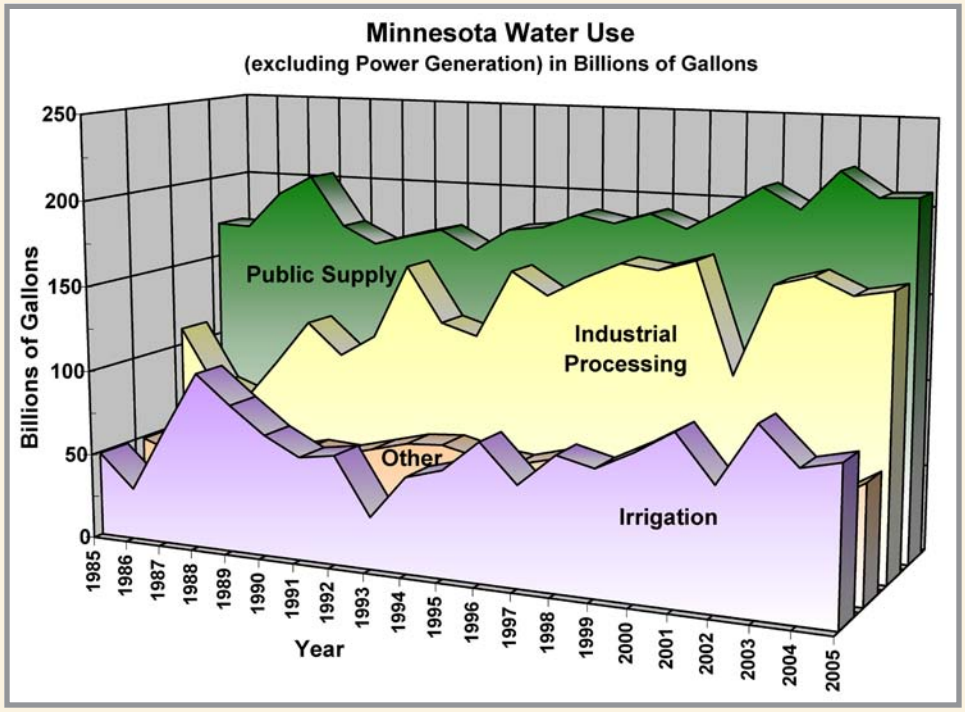
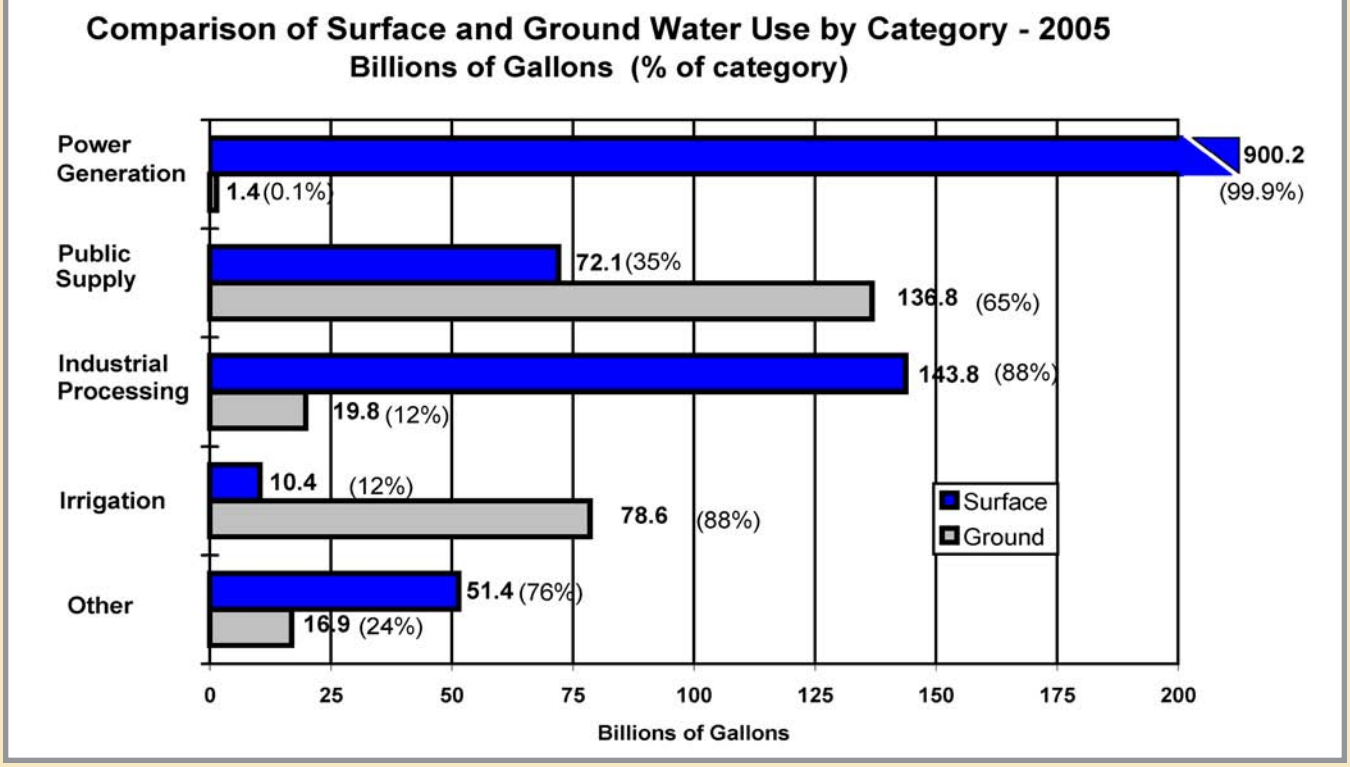



photo by Molly Shodeen


photo by Molly Shodeen

Figure 3



Power Generation

Figure 4 shows that power generation was the primary use in 8 of the 11 counties with the highest total use in 2005. Power generation accounted for 63% of all use reported in Minnesota for the year. Power generation in Dakota and Wright counties alone accounted for 26% of all reported use in 2005, largely due to power plant cooling. Surface water sources supply almost all of the water used for power generation. Most of the water is used for cooling purposes and is returned to the surface water source.


photo by Julie Ekman

Public Water Supply

Public supply water use gradually increased from 1990 to 1999 due to population increases, higher demand for outdoor uses such as lawn watering and demands by industrial customers. After some fluctuations from 2001 to 2004, use in this category has leveled off for the past two years at about 2001 levels. Sixty-five percent of public water supply use came from ground water in 2005, compared to 37% nationally (USGS, *Estimated Use of Water in the United States in 2000*).

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 supply 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.

Irrigation

Annual variations in the amount and distribution of rainfall greatly affect the demand for irrigation water. Combined irrigation water use for calendar years 2004-05 was relatively stable increasing only slightly.

Irrigation accounts for only a small amount (6%) of total water use in Minnesota. However, this use is significant because it is almost entirely consumptive and the majority is from ground water sources (88% in 2005). The timing of irrigation water use can be significant when evaluating regional water supplies and the potential for well interferences. Almost all irrigation water use is compacted into the five-month period from May to September of each year.

Industrial Processing

Industrial processing use maintained at a fairly stable level from 2002 to 2005 averaging 164 BG over the 4 year period. Mine processing and pulp and paper processing accounted for the majority of water use reported for industrial processing.

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 5% of Minnesota's total water use.

Summary

Total water use in 2005 increased to a new high of 1431 billion gallons. Power generation continues to account for the majority of use totaling 901.6 BG (or 63%) in 2005. Surface water accounts for 82% of all appropriations.


Making Snow

Figure 4

Appropriations by the Counties with the Greatest Use in CY 2005
Billions of Gallons

	County	Surface Water	Ground Water	Total	Primary Use
1)	Goodhue	223.2	2.0	225.2	Nuclear Power Cooling
2)	Dakota	113.6	30.7	144.3	Steam Power Cooling
3)	Washington	120.4	12.1	132.5	Steam Power Cooling
4)	Wright	116.4	4.0	120.4	Nuclear Power Cooling
5)	Hennepin	81.3	36.1	117.4	Steam Power Cooling
6)	St. Louis	107.5	1.9	109.4	Steam Power Cooling
7)	Ramsey	63.5	12.3	75.8	Steam Power Cooling
8)	Itasca	69.7	1.0	70.7	Steam Power Cooling
9)	Cook	62.4	0.0	62.4	Mine Processing
10)	Lake	47.7	0.0	47.7	Mine Processing
11)	Anoka	34.2	12.0	46.2	Municipal Waterworks
Billions of gallons		*88% of all* surface water use	*40% of all* ground water use	*80% of* total use	

Reported Water Use by County
2004 - 2005 (Millions of Gallons)

Reported Water Use

	County	2004 Surface	2004 Ground	2004 Total	2005 Surface	2005 Ground	2005 Total	Primary Use	% of 2005 Total
1	Aitkin	1,063.1	112.0	1,175.1	1,026.5	118.8	1,145.3	Wild Rice Irrigation	86
2	Anoka	34,949.6	11,998.4	46,948.0	34,188.5	11,950.9	46,139.4	Municipal Waterworks	95
3	Becker	9.4	2,969.5	2,978.9	51.2	3,256.4	3,307.6	Major Crop Irrigation	66
4	Beltrami	1,141.6	685.0	1,826.6	1,088.6	712.1	1,800.7	Wild Rice Irrigation	60
5	Benton	3,663.6	3,806.5	7,470.1	3,722.0	4,347.7	8,069.7	Pulp/Paper Processing	45
6	Big Stone	12.4	443.5	455.9	119.4	501.1	620.5	Major Crop Irrigation	44
7	Blue Earth	8,032.0	3,589.1	11,621.1	7,118.0	3,864.1	10,982.1	Steam Power Cooling	64
8	Brown	127.2	876.1	1,003.3	99.8	962.2	1,062.0	Municipal Waterworks	47
9	Carlton	2,144.1	751.4	2,895.5	2,373.3	696.7	3,070.0	Pulp/Paper Processing	69
10	Carver	42.3	3,237.2	3,279.5	37.1	3,364.3	3,401.4	Municipal Waterworks	84
11	Cass	19.9	1,059.3	1,079.2	48.0	1,131.8	1,179.8	Major Crop Irrigation	37
12	Chippewa	13.9	555.6	569.5	44.6	569.3	613.9	Municipal Waterworks	77
13	Chisago	144.6	1,151.9	1,296.5	210.2	1,249.7	1,459.9	Municipal Waterworks	55
14	Clay	1,615.4	865.9	2,481.3	1,641.5	786.8	2,428.3	Municipal Waterworks	79
15	Clearwater	3,511.8	125.9	3,637.7	1,694.0	113.4	1,807.4	Wild Rice Irrigation	92
16	Cook	57,684.1	8.5	57,692.6	62,445.8	8.8	62,454.6	Mine Processing	99.7
17	Cottonwood	132.9	1,103.3	1,236.2	176.0	1,135.5	1,311.5	Municipal Waterworks	42
18	Crow Wing	209.8	2,012.0	2,221.8	939.0	2,144.4	3,083.4	Municipal Waterworks	42
19	Dakota	112,113.5	29,083.5	141,197.0	113,580.8	30,693.3	144,274.1	Steam Power Cooling	76
20	Dodge	39.9	552.1	592.0	16.1	571.6	587.7	Municipal Waterworks	62
21	Douglas	119.4	1,635.1	1,754.5	89.4	1,714.8	1,804.2	Major Crop Irrigation	42
22	Faribault	0.0	658.8	658.8	0.0	703.1	703.1	Municipal Waterworks	58
23	Fillmore	3,315.9	625.6	3,941.5	3,822.0	640.8	4,462.8	Hatcheries & Fisheries	85
24	Freeborn	20.2	1,418.1	1,438.3	6.6	1,437.4	1,444.0	Municipal Waterworks	77
25	Goodhue	201,239.9	2,068.2	203,308.1	223,243.3	1,992.3	225,235.6	Nuclear Power Cooling	92
26	Grant	0.0	592.2	592.2	0.0	504.7	504.7	Major Crop Irrigation	71
27	Hennepin	77,193.5	35,672.5	112,866.0	81,348.8	36,123.4	117,472.2	Steam Power Cooling	69
28	Houston	9.0	516.9	525.9	17.1	545.2	562.3	Municipal Waterworks	76
29	Hubbard	51.6	4,613.5	4,665.1	72.6	4,523.8	4,596.4	Major Crop Irrigation	75
30	Isanti	2.6	760.6	763.2	5.6	945.2	950.8	Municipal Waterworks	54
31	Itasca	70,834.0	959.7	71,793.7	69,735.6	980.6	70,716.2	Steam Power Cooling	85
32	Jackson	71.7	332.2	403.9	28.0	348.2	376.2	Municipal Waterworks	63
33	Kanabec	9.4	186.6	196.0	9.5	198.5	208.0	Municipal Waterworks	68
34	Kandiyohi	460.0	2,724.3	3,184.3	513.8	3,329.3	3,843.1	Municipal Waterworks	46
35	Kittson	74.5	362.7	437.2	116.5	283.1	399.6	Rural Waterworks	40
36	Koochiching	17,572.6	42.2	17,614.8	17,146.6	40.2	17,186.8	Pulp/Paper Processing	97
37	Lac Qui Parle	40.8	1,293.7	1,334.5	43.8	1,306.0	1,349.8	Major Crop Irrigation	41
38	Lake	48,762.5	0.4	48,762.9	47,691.0	0.4	47,691.4	Mine Processing	99
39	Lake of the Woods	292.4	65.2	357.6	313.9	65.5	379.4	Wild Rice Irrigation	81
40	Le Sueur	5,264.0	1,280.9	6,544.9	5,375.3	1,382.6	6,757.9	Quarry/Mine Dewatering	79
41	Lincoln	15.2	452.9	468.1	12.2	415.2	427.4	Rural Waterworks	77
42	Lyon	96.7	1,507.9	1,604.6	148.5	1,631.9	1,780.4	Municipal Waterworks	70
43	McLeod	153.8	1,905.7	2,059.5	283.3	1,953.8	2,237.1	Municipal Waterworks	52
44	Mahnomen	10.5	79.9	90.4	0.0	83.8	83.8	Municipal Waterworks	95

Reported Water Use by County
2004 - 2005 (Millions of Gallons)

Reported Water Use

	County	2004 Surface	2004 Ground	2004 Total	2005 Surface	2005 Ground	2005 Total	Primary Use	% of 2005 Total
45	Marshall	116.7	204.3	321.0	100.9	192.2	293.1	Municipal Waterworks	34
46	Martin	3,842.5	295.1	4,137.6	5,380.6	291.9	5,672.5	Steam Power Cooling	85
47	Meeker	13.4	1,343.4	1,356.8	33.6	1,604.1	1,637.7	Major Crop Irrigation	58
48	Mille Lacs	19.2	499.7	518.9	27.6	587.2	614.8	Municipal Waterworks	64
49	Morrison	113.6	4,318.1	4,431.7	205.1	4,829.6	5,034.7	Major Crop Irrigation	78
50	Mower	60.5	2,388.4	2,448.9	69.6	2,686.2	2,755.8	Municipal Waterworks	47
51	Murray	81.7	229.4	311.1	83.3	201.7	285.0	Municipal Waterworks	68
52	Nicollet	116.4	1,900.1	2,016.5	119.4	1,847.5	1,966.9	Municipal Waterworks	83
53	Nobles	62.5	1,104.8	1,167.3	59.7	1,121.2	1,180.9	Municipal Waterworks	94
54	Norman	9.8	145.1	154.9	0.0	144.9	144.9	Municipal Waterworks	89
55	Olmsted	9,879.9	6,124.4	16,004.3	10,862.5	6,079.6	16,942.1	Steam Power Cooling	61
56	Ottertail	20,670.7	12,064.1	32,734.8	30,179.5	12,273.0	42,452.5	Steam Power Cooling	69
57	Pennington	801.3	24.8	826.1	760.6	44.6	805.2	Municipal Waterworks	58
58	Pine	29.0	511.5	540.5	28.7	521.1	549.8	Municipal Waterworks	58
59	Pipestone	56.8	833.1	889.9	44.9	885.5	930.4	Rural Waterworks	57
60	Polk	4,526.4	644.1	5,170.5	4,608.4	477.3	5,085.7	Municipal Waterworks	61
61	Pope	35.4	6,226.9	6,262.3	28.7	7,434.5	7,463.2	Major Crop Irrigation	95
62	Ramsey	66,080.3	11,267.7	77,348.0	63,472.3	12,253.4	75,725.7	Steam Power Cooling	61
63	Red Lake	376.2	357.5	733.7	202.3	296.4	498.7	Municipal Waterworks	59
64	Redwood	60.1	433.6	493.7	133.1	423.5	556.6	Municipal Waterworks	68
65	Renville	43.2	840.1	883.3	61.6	833.0	894.6	Municipal Waterworks	50
66	Rice	144.5	2,617.6	2,762.1	375.6	2,681.2	3,056.8	Municipal Waterworks	73
67	Rock	50.6	561.2	611.8	27.6	575.6	603.2	Municipal Waterworks	51
68	Roseau	6.3	313.7	320.0	7.4	283.2	290.6	Municipal Waterworks	88
69	St. Louis	102,479.7	1,901.7	104,381.4	107,485.8	1,876.5	109,362.3	Steam Power Cooling	63
70	Scott	181.6	5,523.2	5,704.8	177.5	5,446.8	5,624.3	Municipal Waterworks	71
71	Sherburne	19,805.3	9,685.5	29,490.8	30,150.7	10,565.3	40,716.0	Steam Power Cooling	35
72	Sibley	11.3	693.1	704.4	23.0	693.2	716.2	Municipal Waterworks	75
73	Stearns	3,263.1	8,588.1	11,851.2	3,277.3	10,428.1	13,705.4	Major Crop Irrigation	49
74	Steele	1,170.0	1,700.0	2,870.0	374.3	1,881.0	2,255.3	Municipal Waterworks	79
75	Stevens	69.1	1,912.2	1,981.3	72.3	2,032.4	2,104.7	Major Crop Irrigation	71
76	Swift	22.8	4,144.3	4,167.1	24.7	4,254.9	4,279.6	Major Crop Irrigation	87
77	Todd	127.0	2,774.5	2,901.5	189.7	2,973.0	3,162.7	Major Crop Irrigation	73
78	Traverse	2.7	88.6	91.3	1.6	81.2	82.8	Municipal Waterworks	98
79	Wabasha	72.7	1,022.9	1,095.6	21.4	1,130.9	1,152.3	Municipal Waterworks	80
80	Wadena	487.3	3,099.9	3,587.2	542.2	3,073.0	3,615.2	Major Crop Irrigation	89
81	Waseca	33.3	661.2	694.5	29.3	689.8	719.1	Municipal Waterworks	91
82	Washington	121,236.6	12,124.5	133,361.1	120,358.6	12,078.8	132,437.4	Steam Power Cooling	89
83	Watonwan	0.7	1,126.2	1,126.9	9.8	1,048.6	1,058.4	Municipal Waterworks	69
84	Wilkin	80.6	146.3	226.9	41.0	156.8	197.8	Municipal Waterworks	68
85	Winona	1,004.3	2,356.2	3,360.5	996.7	2,445.9	3,442.6	Municipal Waterworks	42
86	Wright	126,608.2	3,666.9	130,275.1	116,409.1	4,025.6	120,434.7	Nuclear Power Cooling	97
87	Yellow Medicine	64.1	742.7	806.8	83.8	765.3	849.1	Rural Waterworks	54
	Total			1,378,148			1,431,330		

Minnesota Reported Water Use

Category	2004	2005
Power Generation		(Millions of Gallons)
Nuclear Power		
surface	311,140.1	323,949.6
ground	54.4	66.2
Steam Power Cooling		
surface	437,025.2	454,380.3
ground	659.1	554.5
Other Power		
surface	122,869.4	121,843.7
ground	831.0	821.2
Subtotal	872,579.2	901,615.5
Percent of Total	63%	63%
surface	871,034.7	900,173.6
ground	1,544.5	1,441.9
Public Supply		
Municipal Water Works		
surface	73,454.1	72,053.4
ground	130,527.1	132,815.9
Private Water Works		
surface	10.4	9.6
ground	719.6	768.0
Comercial & Institutional		
surface	0.0	0.0
ground	1,136.5	1,155.9
Cooperative Water Works		
surface	0.0	0.0
ground	1.7	2.2
Fire Protection		
surface	0.0	0.0
ground	18.5	17.4
State Parks, Waysides, Rest Areas		
surface	0.0	0.0
ground	37.4	47.3
Rural Water Districts		
surface	0.0	0.0
ground	1,907.9	1,977.5
Subtotal	207,813.2	208,847.2
Percent of Total	15%	15%
surface	73,464.5	72,063.0
ground	134,348.7	136,784.2

Minnesota Reported Water Use

Category	2004	2005
Irrigation		(Millions of Gallons)
Golf Course		
surface	1,602.2	1,587.7
ground	5,950.2	5,657.9
Cemetary		
surface	3.2	3.7
ground	56.3	57.1
Landscaping		
surface	60.9	59.9
ground	690.6	699.6
Sod		
surface	26.1	20.7
ground	136.8	205.2
Nursery		
surface	188.8	161.4
ground	526.7	565.4
Orchard		
surface	6.9	10.6
ground	6.9	7.0
Non Crop		
surface	3.1	0.0
ground	22.4	5.7
Temporary		
surface	0.6	0.0
ground	13.6	33.2
Major Crop		
surface	1,727.5	2,042.4
ground	64,018.5	71,343.7
Wild Rice		
surface	8,410.6	6,480.9
ground	215.2	3.0
Subtotal	83,667.1	88,945.1
Percent of Total	6%	6%
surface	12,029.9	10,367.3
ground	71,637.2	78,577.8

Minnesota Reported Water Use

Category	2004	2005
Industrial Processing	(Millions of Gallons)	
Agricultural		
surface	33.2	46.5
ground	9,127.8	8,790.4
Pulp and Paper		
surface	25,232.1	25,864.9
ground 835.5 838.0		
Mine		
surface	110,308.0	114,951.7
ground	163.9	118.9
Sand and Gravel Washing		
surface	2,726.8	2,583.9
ground	1,434.9	1,275.2
Industrial Process Cooling Once-through		
surface	189.2	191.6
ground	2,091.6	1,964.8
Petroleum or Chemical		
surface	156.7	126.4
ground	4,038.8	4,128.5
Metal		
surface	0.0	0.0
ground	1,407.9	1,281.7
Non-Metal		
surface	0.4	0.1
ground	1,089.9	1,078.5
Other		
surface	0.0	0.0
ground	383.0	367.7
Subtotal	159,219.7	163,608.8
Percent of Total	12%	11%
surface	138,646.4	143,765.1
ground	20,573.3	19,843.7
Other		
Air Conditioning		
Commercial & Institutional Building AC		
surface	248.8	244.7
ground	59.8	68.3

Minnesota Reported Water Use

Category	2004	2005
	(Millions of Gallons)	
Heat Pumps & Coolant Pumps		
surface	54.6	90.9
ground 0.0 0.0		
District Heating		
surface	0.0	0.0
ground	87.7	116.6
Once Through Heating or AC		
surface	0.0	0.0
ground	1,768.3	1,863.3
Other AC		
surface	0.0	0.0
ground	0.0	0.0
Temporary		
Temporary Construction Non-Dewatering		
surface	14.9	28.5
ground	1.9	15.3
Temporary Construction Dewatering		
surface	183.2	350.5
ground	2,946.6	5,447.4
Temporary Pipeline and Tank Testing		
surface	0.0	1.6
ground	1.9	0.0
Other Temporary		
surface	156.6	55.9
ground	13.5	9.0
Water Level Maintenance		
Basin (Lake) Level Maintenance		
surface	358.3	9,221.9
ground	209.8	236.3
Mine Dewatering		
surface	21,963.9	21,664.7
ground	7.0	7.2
Quarry Dewatering		
surface	11,791.2	12,259.2
ground	0.0	0.0
Sand/Gravel Pit Dewatering		
surface	636.3	972.9
ground	74.5	42.4

Minnesota Reported Water Use

Category	2004	2005
Tile Drainage & Pumped Sumps		(Millions of Gallons)
surface	35.5	41.2
ground	134.3	32.1
Other Water Level Maintenance		
surface	37.4	55.9
ground	1,551.9	1,555.4
Special Categories		
Pollution Confinement		
surface	0.0	0.0
ground	4,646.0	4,687.9
Hatcheries & Fisheries		
surface	5,109.5	5,650.6
ground	475.0	577.9
Snow Making		
surface	203.9	200.2
ground	258.0	232.5
Peat Fire Control		
surface	0.0	0.0
ground	0.0	0.0
Livestock Watering		
surface	0.0	0.0
ground	779.1	821.3
Other Special Categories		
surface	228.8	578.1
ground	830.7	1,183.9
Subtotal	54,868.9	68,313.6
Percent of Total	4%	5%
surface	41,022.9	51,416.8
ground	13,846.0	16,896.8
Grand Total (Millions of Gallons)	1,378,148	1,431,330
surface	1,136,198	1,177,786
ground	241,950	253,544

DNR Information Center

Twin Cities: (651) 296-6157
Minnesota Toll Free: 1-888-646-6367 (or 888-MINNDNR)
Telecommunication Device for the Deaf: (TDD): (651) 296-5484
TDD Toll Free: 1-800-657-3929

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