

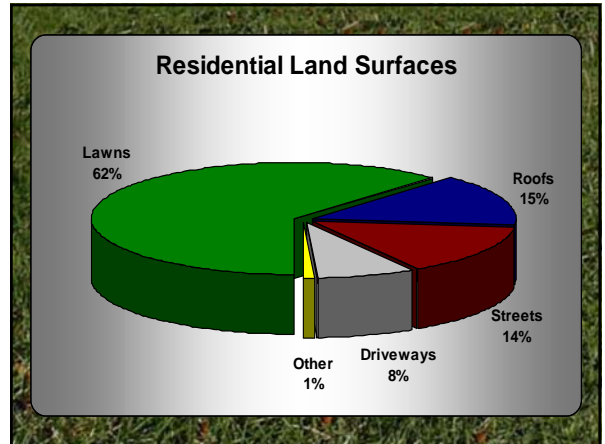
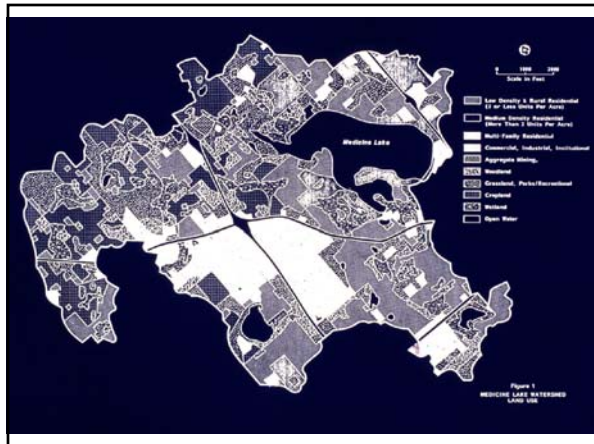
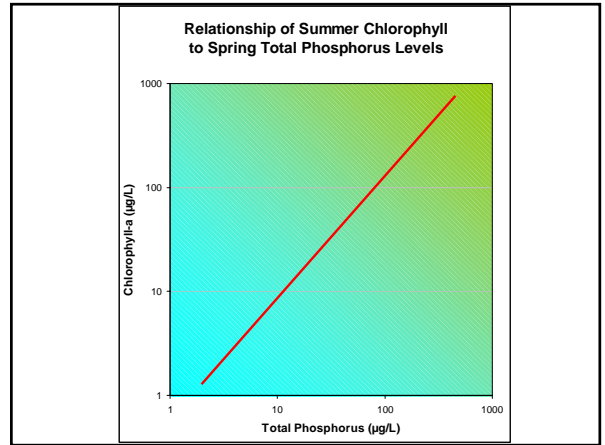
## Effect of a Phosphorus Fertilizer Ordinance on Runoff Water Quality

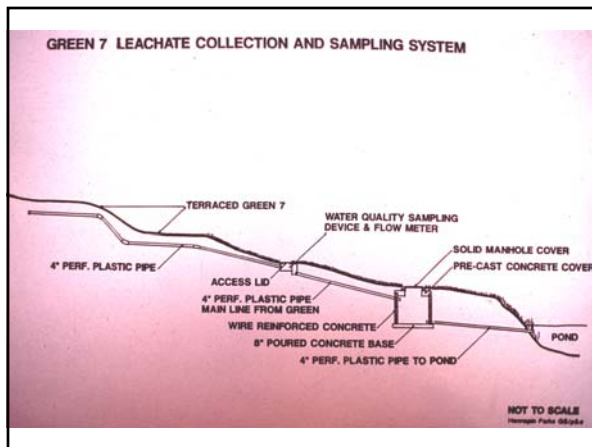
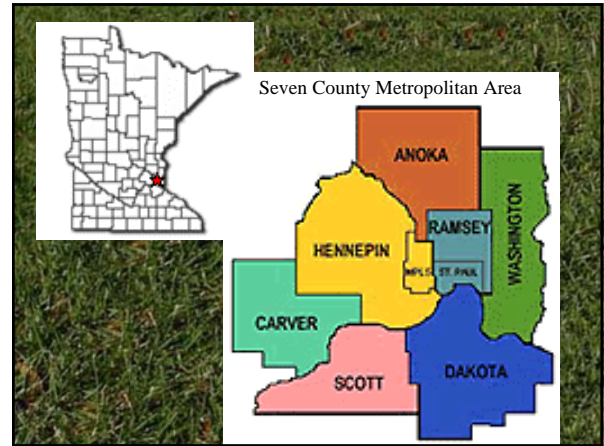
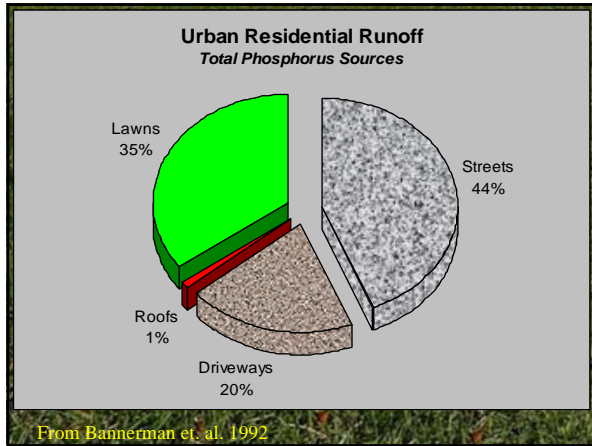


Image courtesy of the Washington State Water Quality Consortium

### EMPACT: Lake Access 2

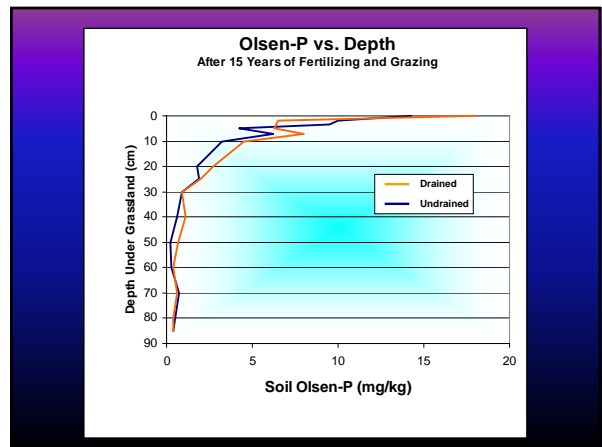
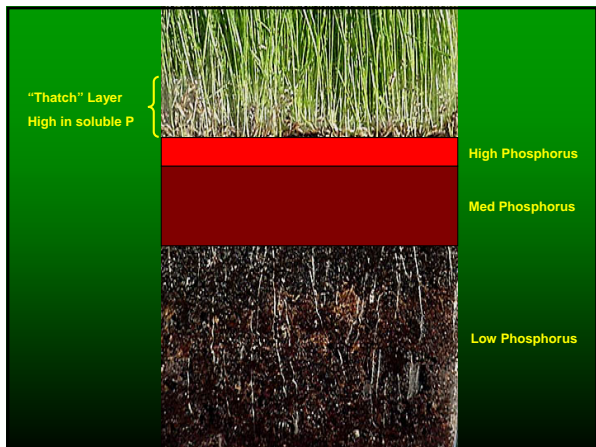
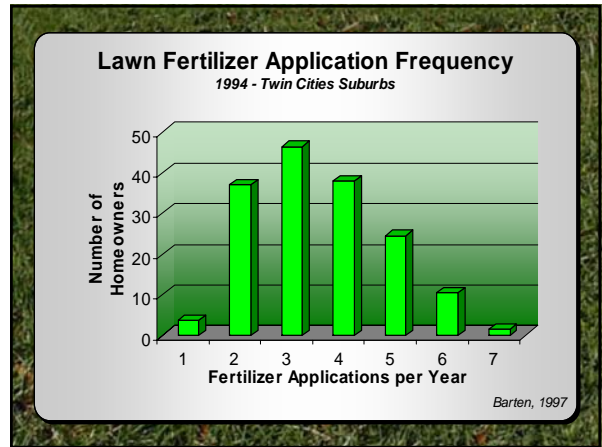
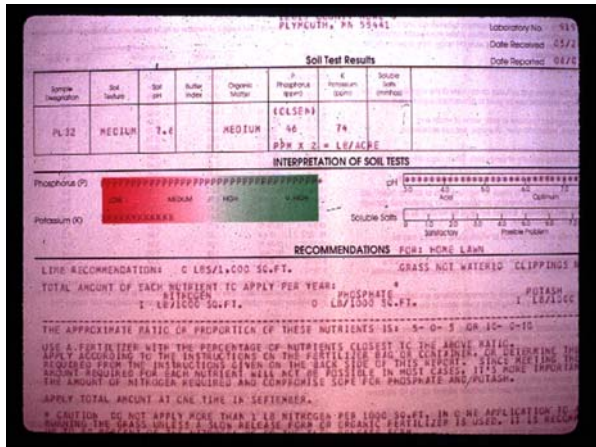
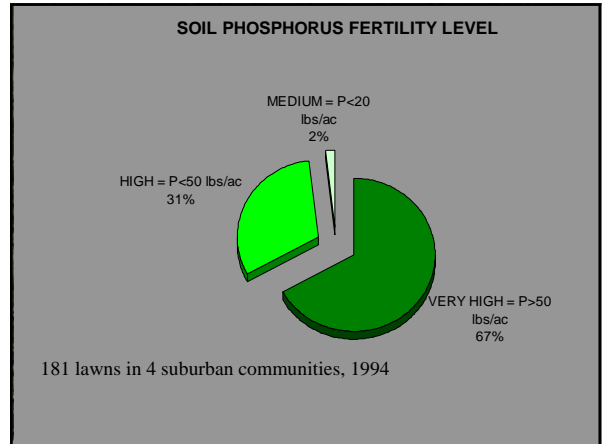
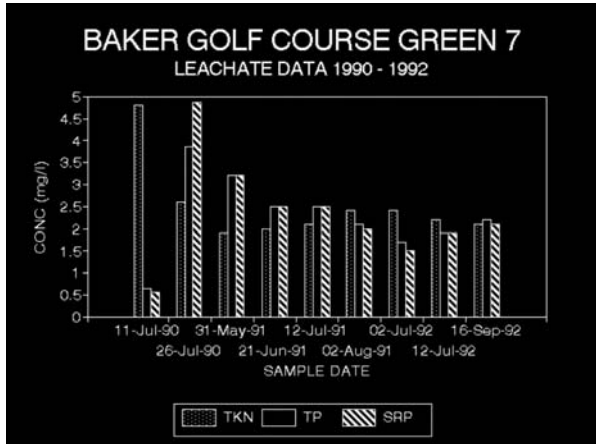
Three Rivers Park District (formerly Hennepin Parks)  
 University of Minnesota: Natural Resources Research Institute  
 Minnesota Sea Grant  
 Minnehaha Creek Watershed District

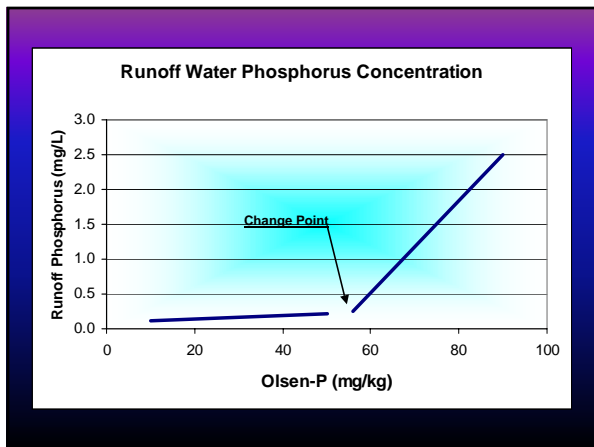
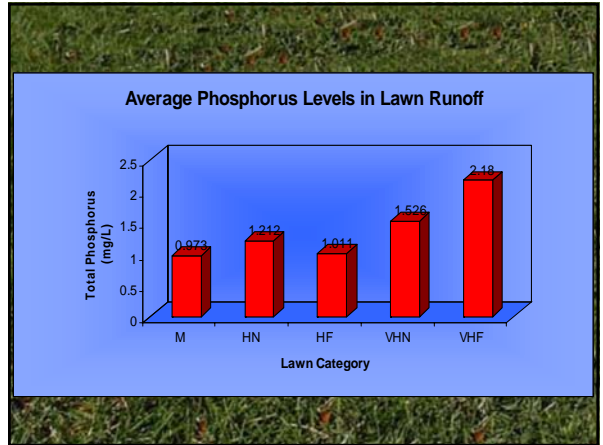
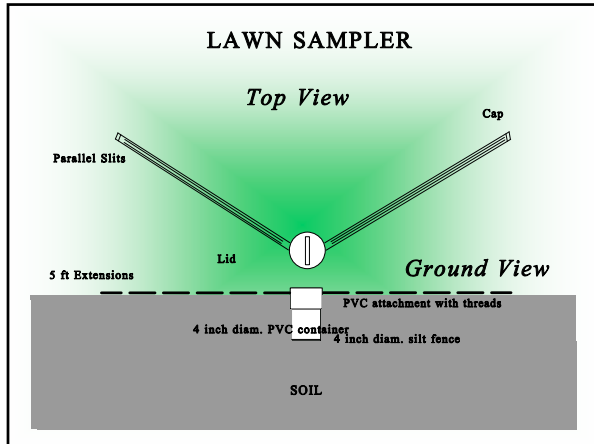




### Baker National Golf Course 7th Green Fertilization Record

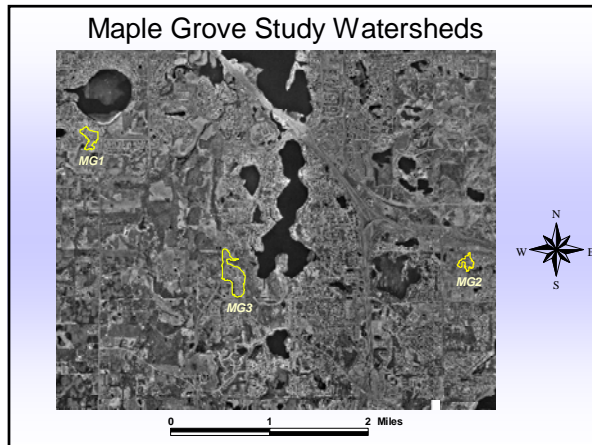
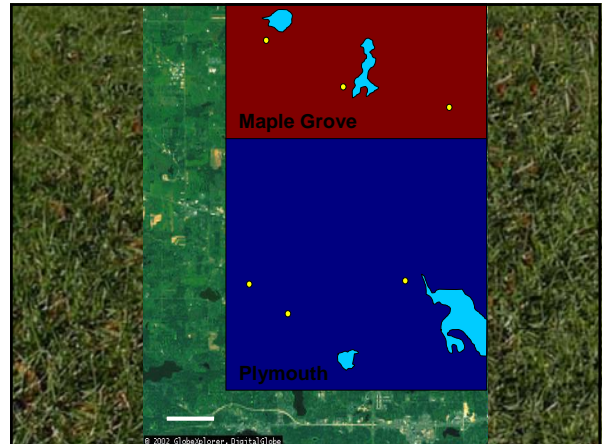
DATE	AMOUNT APPLIED (LBS)	FERTILIZER MIX	NITROGEN APPLIED (LBS)	PHOSPHORUS APPLIED (LBS)
23-May-90	45	10-18-22	4.5	8.1
05-Jun-90	45	5-2-4	2.3	0.9
13-Jun-90	45	10-18-22	4.5	8.1
09-Jul-90	45	10-18-22	4.5	8.1
13-Jul-90	45	10-20-30	4.5	9
24-Jul-90	45	10-20-30	4.5	9
25-Jul-90	45	10-18-22	4.5	8.1
07-Aug-90	45	10-18-22	4.5	8.1
13-Aug-90	45	10-20-30	4.5	9
20-Aug-90	45	10-18-22	4.5	8.1
06-Sep-90	45	10-18-22	4.5	8.1
25-Sep-90	45	10-20-30	4.5	9
28-Sep-90	45	10-18-22	4.5	8.1
<b>TOTAL APPLIED 1990</b>			<b>56.3</b>	<b>101.7</b>
22-May-91	20	18-0-18	3.6	0
13-May-91	20	18-0-18	3.6	0
10-Jun-91	20	18-0-18	3.6	0
08-Jul-91	20	18-0-18	3.6	0
22-Jul-91	27	16-0-24	4.3	0
29-Jul-91	23	16-0-24	3.6	0
22-Aug-91	16	22-0-12	3.6	0
11-Sep-91	35	10-18-22	3.6	6.5
23-Sep-91	35	10-18-22	3.6	6.5
<b>TOTAL APPLIED 1991</b>			<b>33.1</b>	<b>13</b>
27-Apr-92	20	18-0-18	3.6	0
18-May-92	20	18-0-18	3.6	0
01-Jun-92	20	18-0-18	3.6	0
15-Jun-92	20	18-0-18	3.6	0
29-Jun-92	20	18-0-18	3.6	0
20-Jul-92	20	18-0-18	3.6	0
03-Aug-92	16	22-0-12	3.6	0
17-Aug-92	20	18-0-18	3.6	0
31-Aug-92	20	18-0-18	3.6	0
21-Sep-92	20	18-0-18	3.6	0
11-Nov-92	60	6-2-0	3.6	1.2
<b>TOTAL APPLIED 1992</b>			<b>39.6</b>	<b>1.2</b>





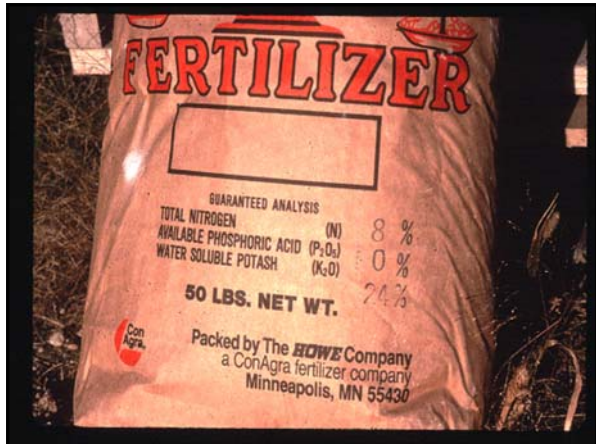
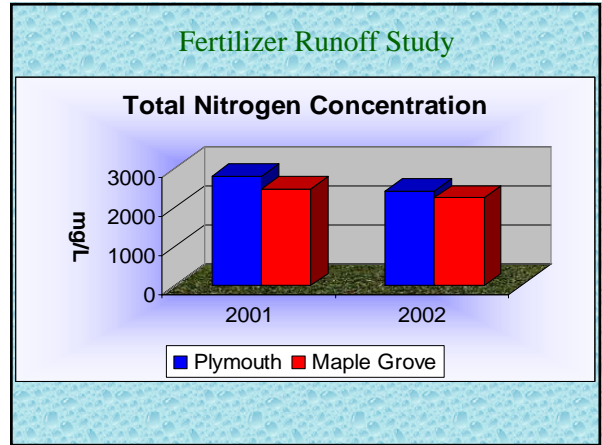
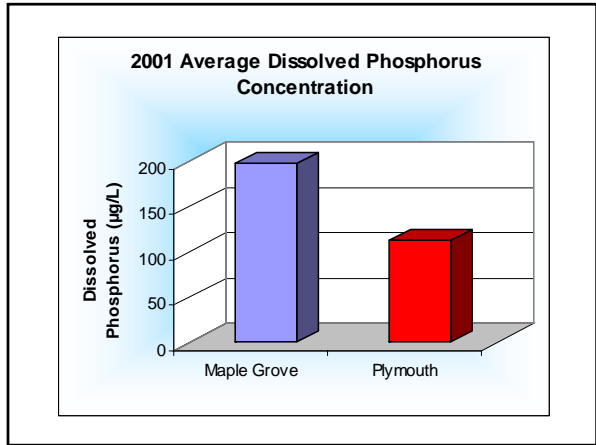
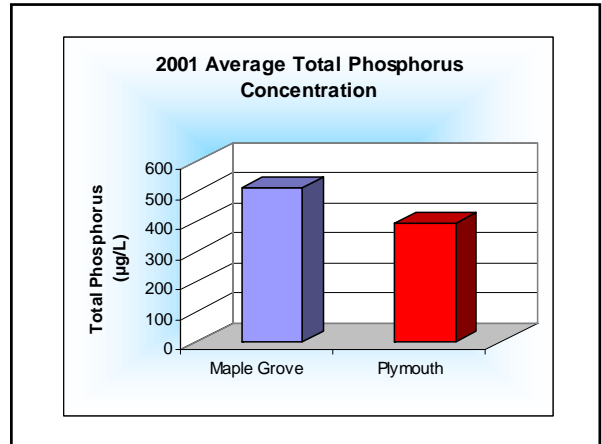
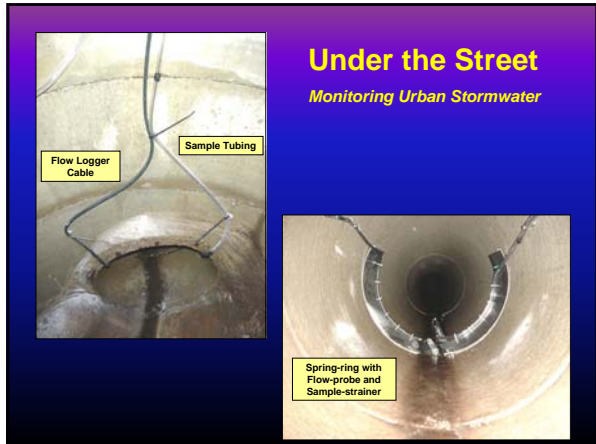
## Plymouth P-fertilizer Ordinance

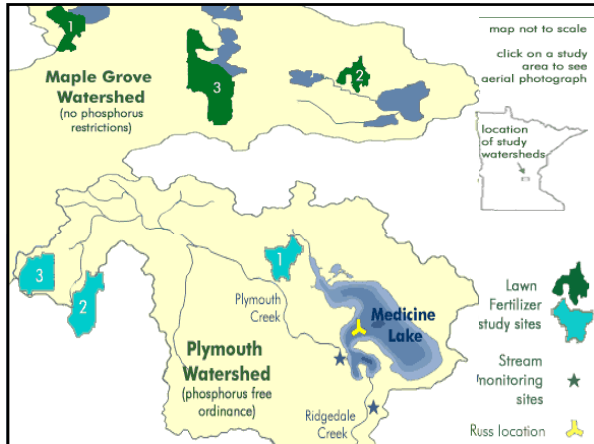
- 1996: Commercial applicators restricted
  - Use only P-free fertilizer (some exceptions)
  - Require license to apply in Plymouth
  - Education of self-applicators
- 2000: Home-owner application restricted
  - Use only P-free fertilizer (some exceptions)
  - Additional rules prohibit application to impervious areas, waterways, and shorelines.
- \* 2002: Sales Restriction
  - Sell only P-free fertilizer unless soil test indicates a need for phosphorus



Watershed Characteristics			
Site	Area (ha)	Impervious Area (%)	# Homes
MG1	5.5	43%	49
MG2	3.5	40.40%	36
MG3	16	35.20%	108
P1	5.1	44.60%	43
P2	6.8	43.50%	47
P3	5.6	28.40%	37

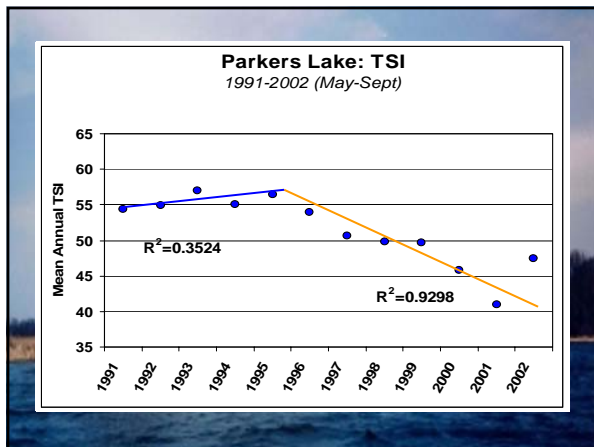
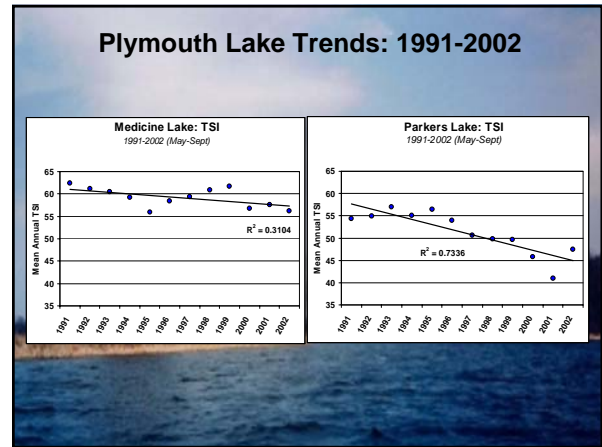
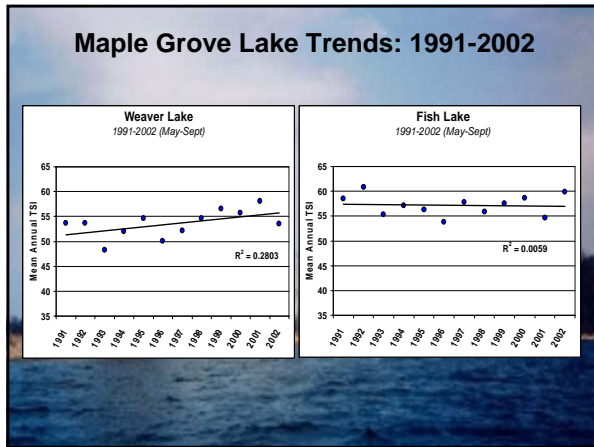






### Lake Physical Characteristics

	Size (ha)	W.S. Area (ha)	Mean Depth (m)	Max Depth (m)
Fish	97	748	5.8	14.6
Weaver	67	223	6.4	17
Medicine	374	4430	5.1	14.9
Parkers	39	467	3.7	11.3



### Minnesota Phosphorus Fertilizer Legislation

**Support from local units of government:**

- League of Minnesota Cities
- Minnesota Association of Counties
- MN Association of Soil and Water Districts
- Association of Watershed Districts

**Support from State Agencies**

- Department of Agriculture
- State Planning Office

**Opposition from fertilizer industry**

- RISE, Scotts Company

## Minnesota Phosphorus Fertilizer Legislation

- \* Zero phosphorus Fertilizer Use Required in Seven County Metropolitan Area
- \* Maximum 3% phosphorus in Fertilizer in Greater Minnesota Counties
  - Local Units of Government may adopt Zero Phosphorus Restrictions by Majority Vote
- \* Application of Fertilizer to Impervious Surface is Prohibited

## Minnesota Phosphorus Fertilizer Legislation

### Exemptions:

- \* Phosphorus can be applied by Homeowners if a soil test indicates a need.
- \* Phosphorus can be applied to establish turf - seed or sod during first growing season
- \* Phosphorus can be applied to golf courses by certified or licensed operator

## Minnesota Phosphorus Fertilizer Legislation

### Enforcement:

- Bill becomes effective in 2004
- Petty Misdemeanor
- Enforced by Local Units of Government
- Legislation allowed LGU's to adopt sales restrictions until August 2002.
- Sales restrictions typically prohibit sale of P-fertilizer unless soil test indicates need - Burden is on Retail Industry.



Minikahda Golf Course Fertilizer Application Record: 1994					
DATE	APPLICATION RATE (lbs/1000 sq.ft.)	FERTILIZER MIX	LOCATION	NITROGEN (LBS)	PHOSPHORUS (LBS)
15-Nov-93	2.5 as N	16-8-12	Greens	326.5	163.3
15-Nov-93	2.0 as K	0-0-45	Greens	0.0	0.0
15-Nov-93	2.0 as K	0-0-45	Tees	0.0	0.0
15-Nov-93	4.0 as N	16-8-12	Tees	522.4	261.2
<b>14-Apr-94</b>	<b>2.0 as K</b>	<b>0-0-47</b>	<b>Fairway</b>	<b>0.0</b>	<b>0.0</b>
<b>02-May-94</b>	<b>1.0 as K</b>	<b>20-0-20</b>	<b>Fairway</b>	<b>1132.6</b>	<b>0.0</b>
<b>23-Jun-94</b>	<b>1.0 as K</b>	<b>20-0-20</b>	<b>Fairway</b>	<b>1132.6</b>	<b>0.0</b>
07-Jul-94	0.43 as N	5-2-94	Tees	37.5	15.0
16-Jul-94	0.22 as N	5-2-95	Tees	19.2	7.7
19-Jul-94	0.15 as N	20-5-30	Greens	19.6	4.9
05-Aug-94	0.1 as N	20-5-30	Greens	13.1	3.3
12-Aug-94	0.6 as N	18-4-10	Tees	52.3	11.6
17-Aug-94	0.1 as N	20-5-30	Greens	13.1	3.3
22-Aug-94	0.65 as N	6-2-12	Greens	84.9	26.3
<b>23-Aug-94</b>	<b>0.5 as N</b>	<b>15-0-30</b>	<b>Fairway</b>	<b>566.3</b>	<b>0.0</b>
26-Sep-94	0.5 as N	15-4-10	Tees	78.4	17.4
<b>05-Oct-94</b>	<b>0.76 as N</b>	<b>8-1-10</b>	<b>Fairway</b>	<b>860.8</b>	<b>107.6</b>
10-Oct-94	0.15 as N	20-5-30	Greens	19.6	4.9
<b>TOTAL APPLIED TO FAIRWAYS (27 Acres)</b>				<b>3692.3</b>	<b>107.6</b>
<b>TOTAL APPLIED TO WHOLE COURSE</b>				<b>4878.9</b>	<b>628.5</b>

## How Much Water Runs off of Lawns?

### Turf plot studies (Penn State, Univ. of Minnesota)

- Infrequent runoff, less than 2% of total rainfall volume

### "Real Lawn" studies (USGS, Wisc-DNR, Hennepin Parks)

- More frequent lawn runoff, likely much more than 2% of rainfall

### Factors that affect lawn runoff

- Rain Intensity and Frequency
- Lawn Slope
- Overflow from impervious surfaces (rain gutters, etc.)
- Soil Compaction and Soil Water-repellency ???



