



# **TOTAL MAXIMUM DAILY LOAD LAKE ST CROIX**

**Prepared in Partnership  
by  
Minnesota Pollution Control Agency  
Wisconsin Department of Natural Resources**

**With  
St Croix Basin Water Resources Planning Team  
Science Museum of Minnesota, St Croix Watershed Research Station  
Barr Engineering Company**

# Lake St. Croix Water Quality Minnesota and Wisconsin Standards

Water Quality Parameter	Minnesota	Wisconsin		St. Croix Basin Team Goals
	Lake Eutrophication	Lake Total Phosphorus	Lake St. Croix	
	Water Quality	Water Quality	Summer Average	
	(NCHF Ecoregion)	(deep & shallow reservoirs & lakes)	(1998-2006)	
Averaging Period	June-September		June-September	June-September
	mean	--	mean	median
Total Phosphorus	40 µg/L	30 & 40 µg/L	51 µg/L	40 µg/L
Chlorophyll- <i>a</i>	14 µg/L	--	20.5 µg/L	12 µg/L
Secchi disc depth	1.4 m	--	1.2 m	1.5 m

# Total Phosphorus Loads

	<b>Pre-1850</b>	<b>1940s</b>	<b>1990s</b>	<b>2020</b>	<i>Recommended Scenario</i>
<b>Total Phosphorus (µg/L)</b>	<b>30</b>	<b>40</b>	<b>50</b>	<b>56</b>	<b>40</b>
<b>Chlorophyll a (µg/L)</b>	<b>9</b>	<b>12</b>	<b>14</b>	<b>15</b>	<b>12</b>
<b>Secchi Disc Depth (meters)</b>	<b>1.7</b>	<b>1.5</b>	<b>1.4</b>	<b>1.4</b>	<b>1.5</b>
<i>Total Phosphorus Load (metric tons/yr)</i>	<b>170</b>	<b>360</b>	<b>460</b>	<b>540</b>	<b>360</b>

# Phosphorus Loading Study

- **Identified Sources of Phosphorus**
- **Addressed Phosphorus Loading on a Basin Scale**
- **Calculated Subwatershed Loads Using Land Use Categories**



**Minnesota Pollution  
Control Agency**

# Phosphorus Loading Framework (metric tons/yr)

<b>Component</b>	<b>Existing (1990s)</b>	<b>TMDL</b>
<b>Anthropogenic Load</b>	<b>294</b>	<b>194</b>
<b>Watershed Background Load</b>	<b>166</b>	<b>166</b>
<b><i>Total Phosphorus Load</i></b>	<b><i>460</i></b>	<b><i>360</i></b>

# **Non-Regulated Sources (Load Allocation)**

- **Watershed Background**
- **Watershed Land Use**
- **Internal Loading**
- **Atmospheric Loading**



**Minnesota Pollution  
Control Agency**

# **Regulated Sources (Waste Load Allocation)**

- **Wastewater Treatment Facilities**
- **Regulated Cities with Municipal Separate Storm Sewer System (MS4) Permits**
- **General Permits in Wisconsin**
- **Construction Runoff**
- **Industrial Runoff**



**Minnesota Pollution  
Control Agency**

# Lake St Croix TMDL Report

## *Section 1: Summary of Results*

### **Implementation Planning**

- ❖ **Water Quality Goals**
- ❖ **Allocations**
- ❖ **Implementation Strategies**

## *Section 2: Technical Analysis*

### **EPA Approval**

- ❖ **Description of St Croix Basin**
- ❖ **Calculation Methodology**
- ❖ **Reasonable Assurance**



**Minnesota Pollution  
Control Agency**

# Total Maximum Daily Load (TMDL)

$$\text{TMDL} = \text{WLA} + \text{LA} + \text{MOS} + \text{RC} + \text{TL}$$

Lake  
Loading  
Capacity

Regulated

- Wastewater
- MS4
- Other

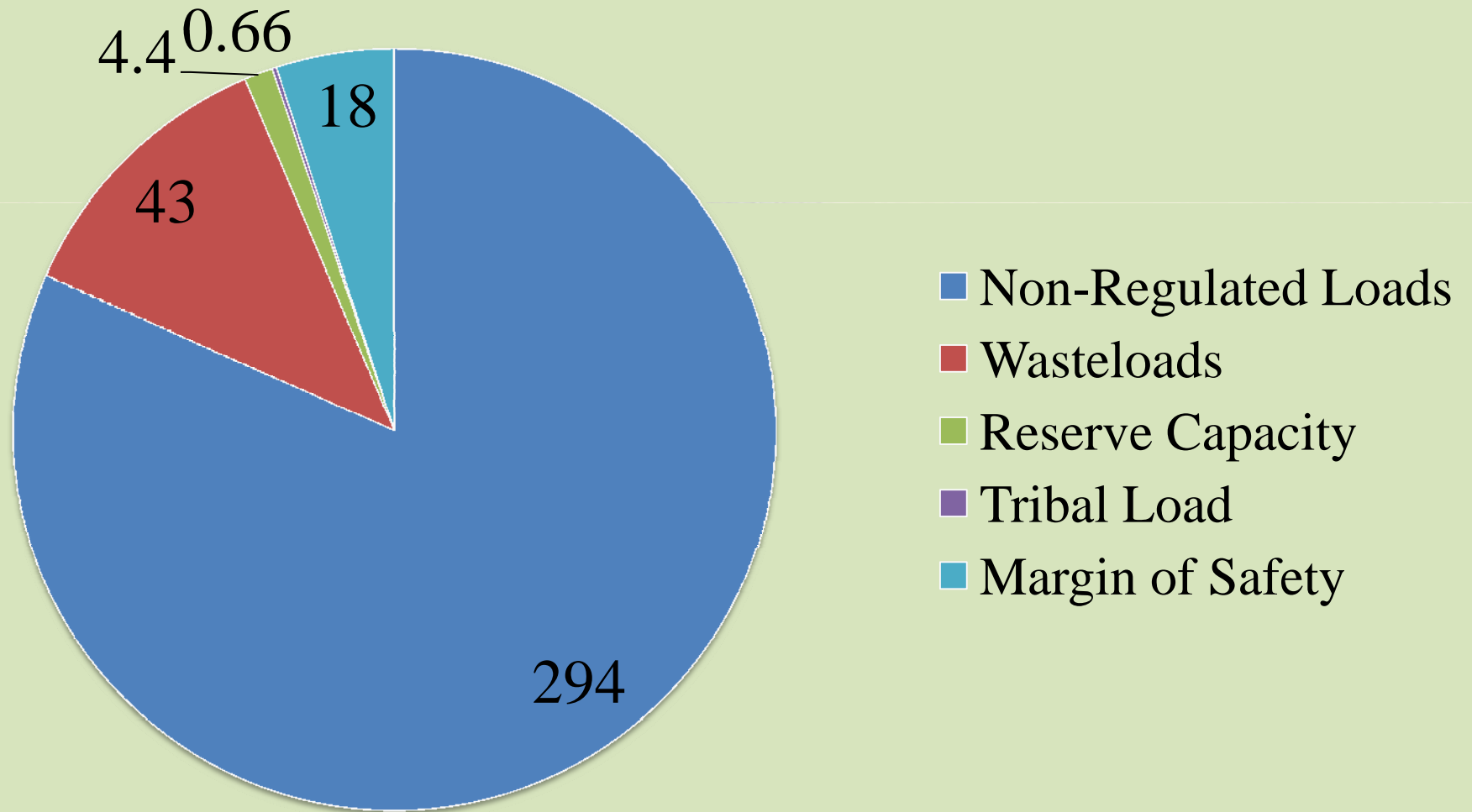
Non-Regulated

- Watershed Background
- Watershed Land Use
- Other

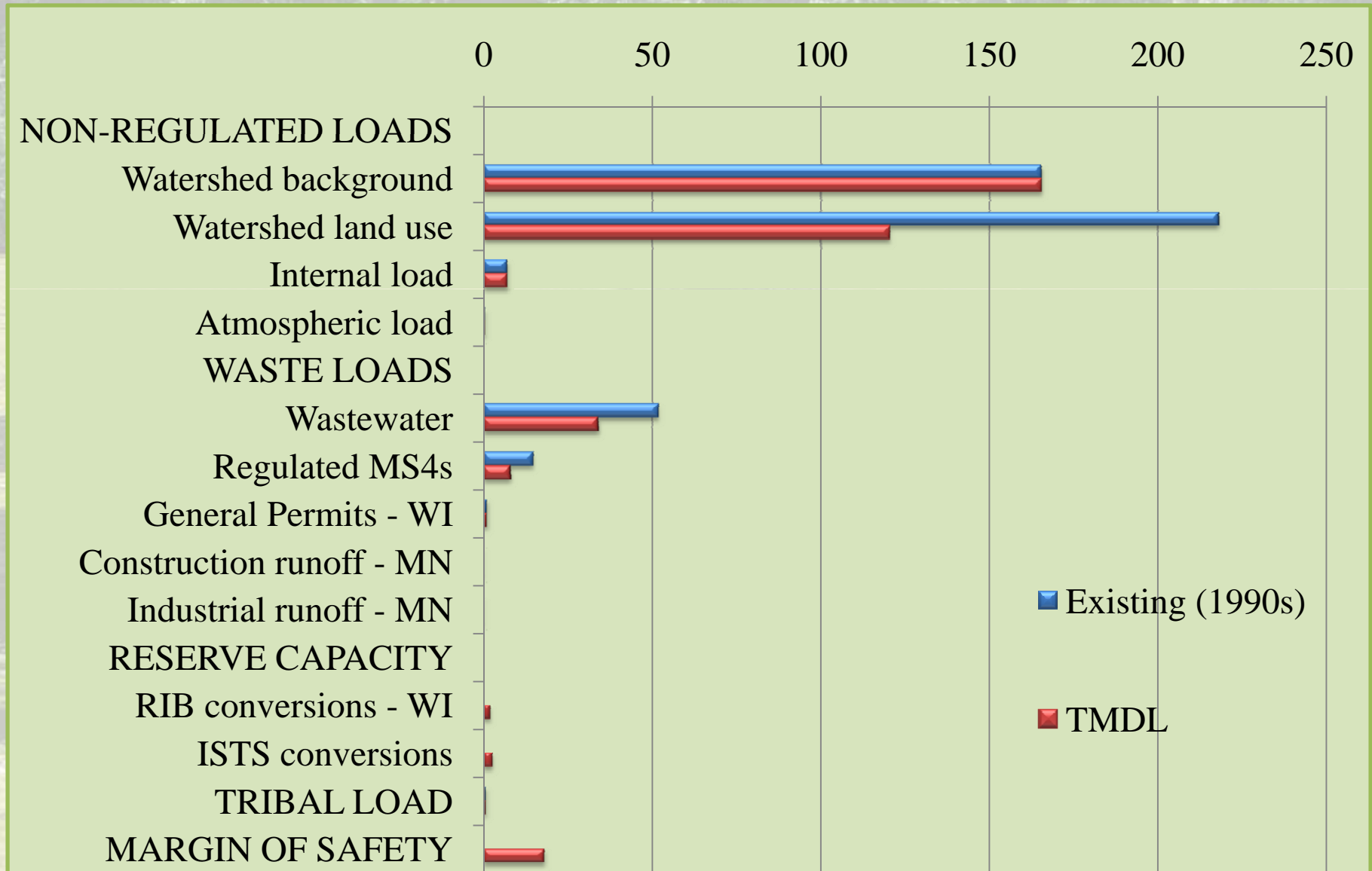


Minnesota Pollution  
Control Agency

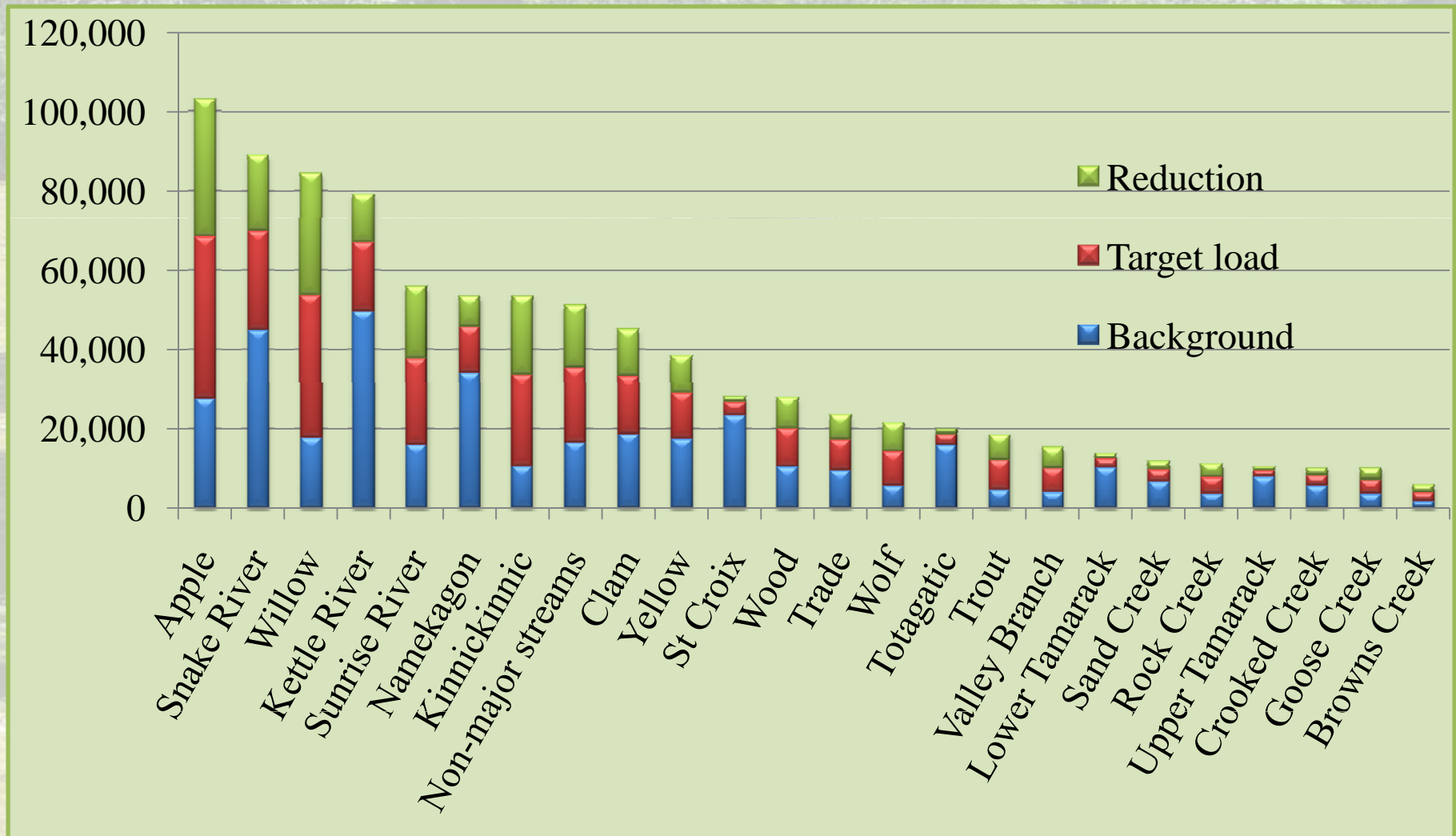
# TMDL Equation (metric tons/yr)



# Basin-Wide TMDL Allocations



# Subwatershed Phosphorus Loading and TMDL Reductions (lb/yr)



# Process Milestones/Next Steps

Draft TMDL

- Basin Team Approval
- Schedule Final Stakeholder Meeting
- Implementation Planning Begins

EPA Preliminary Approval

- Revise Draft TMDL
- 30-day Public Notice period

Final EPA Approval

- Respond to Comments
- Revise Draft TMDL
- Submit to EPA for Final Approval

# Implementation Planning

## ❖ Phase 1: Work with MPCA/WDNR/Basin Team

- ✓ Develop a Stakeholder Engagement Strategy
- ✓ Develop a Communication Plan

## ❖ Phase 2:

- ✓ Implement the Strategy
- ✓ Gather Data for Developing a Targeted Messaging Strategy

## ❖ Phase 3:

- ✓ Test Messaging Strategy



Minnesota Pollution  
Control Agency



**Thanks!**

**Denise Leezer  
Minnesota Pollution Control Agency  
520 Lafayette Road North  
St. Paul, MN 55155-4194**

**651-757-2523/1-800-657-3864 (toll free)**

**E-mail: [Denise.Leezer@state.mn.us](mailto:Denise.Leezer@state.mn.us)**

**Webpage: [www.pca.state.mn.us](http://www.pca.state.mn.us)**

<b>Component</b>	<b>Existing (1990s)</b>	<b>TMDL</b>
	<b>(t/yr)</b>	<b>(t/yr)</b>
<b>Non-Regulated Loads</b>	<b>391</b>	<b>294</b>
Watershed background	166	166
Watershed land use*	218	121
Internal	7	7
Atmospheric	0.4	0.4
<b>Wasteloads</b>	<b>68</b>	<b>43</b>
Wastewater (App. B)	51.9	34.0
Regulated MS4s (App. D)	14.8	7.95
General Permits - WI	1.0	1.0
Construction runoff - MN	0.16	0.12
Industrial runoff - MN	0.16	0.12
<b>Reserve Capacity</b>	<b>--</b>	<b>4.4</b>
<b>RIB conversions - WI</b>	<b>--</b>	<b>1.9</b>
<b>SSTS conversions</b>	<b>--</b>	<b>2.5</b>
<b>Tribal Load</b>	<b>0.66</b>	<b>0.66</b>
<b>Margin of Safety</b>	<b>--</b>	<b>18</b>
<b>Total Load</b>	<b>460</b>	<b>360</b>

<b>Subwatershed</b>	<b>(lb/yr)</b>	<b>(%)</b>
small streams	<b>722</b>	<b>34%</b>
Trout Brook	<b>1,404</b>	<b>35%</b>
Valley Branch	<b>5,272</b>	<b>34%</b>
small streams	<b>6,389</b>	<b>33%</b>
Browns Creek	<b>1,954</b>	<b>33%</b>
Silver Creek	<b>452</b>	<b>34%</b>
Lawrence Creek	<b>1,172</b>	<b>34%</b>
Sunrise River	<b>18,163</b>	<b>33%</b>
Dry Creek	<b>1,763</b>	<b>33%</b>
small streams	<b>413</b>	<b>32%</b>
Goose Creek	<b>2,946</b>	<b>30%</b>
Rush Creek	<b>2,421</b>	<b>30%</b>
Rock Creek	<b>3,477</b>	<b>31%</b>
Snake River	<b>19,307</b>	<b>22%</b>
Kettle River	<b>12,270</b>	<b>16%</b>
Redhorse Creek	<b>13</b>	<b>2%</b>
Bear Creek	<b>922</b>	<b>18%</b>
Sand Creek	<b>2,170</b>	<b>18%</b>
Crooked Creek	<b>1,873</b>	<b>19%</b>
Lower Tamarack	<b>1,284</b>	<b>10%</b>
Upper Tamarack	<b>141</b>	<b>16%</b>
<b>MN Totals</b>	<b>84,529</b>	<b>24%</b>

	<b>Reductions</b>	<b>Reductions</b>
<b>Subwatershed</b>	<b>(lb/yr)</b>	<b>(%)</b>
Apple	<b>34,694</b>	<b>34%</b>
Clam	<b>11,788</b>	<b>26%</b>
Kinnickinnic	<b>19,867</b>	<b>37%</b>
Namekagon	<b>7,873</b>	<b>15%</b>
St Croix	<b>1,394</b>	<b>5%</b>
Totagatic	<b>1,352</b>	<b>7%</b>
Trade	<b>6,280</b>	<b>27%</b>
Trout	<b>6,428</b>	<b>35%</b>
Willow	<b>30,976</b>	<b>37%</b>
Wolf	<b>7,325</b>	<b>34%</b>
Wood	<b>7,971</b>	<b>28%</b>
Yellow	<b>9,134</b>	<b>24%</b>
Upper Tamarack	<b>775</b>	<b>8%</b>
Lower Tamarack	<b>22</b>	<b>4%</b>
<b>WI Totals</b>	<b>145,880</b>	<b>28%</b>