

1. Reinvest in Minnesota (RIM): provides most wetland restorations at no cost to the landowner, payment for permanent easements based on average township market value of the land.
2. U.S. Fish and Wildlife Service: provides no-cost wetland restorations with fewer restrictions than RIM, payment for permanent easements.
3. Wetland Conservation Act Programs
4. Water Bank Program
5. Private Conservation Groups such as Ducks Unlimited: provide financial assistance to restore wetlands for creating wildlife habitat.
6. Wetland Banking- the wetland may be restored and credits deposited in a bank and sold for future use.

There may be some administrative and design costs associated with the restoration.

**Table 4. Wetland Restoration Project Administration Cost Estimates**

Limnologist	30 hours @ \$40	\$1200
Conservation Specialist	40 hours @ \$30	\$1200
Support	20 hours @ \$20	\$400
Supplies & Mileage	\$200	\$200
<b>TOTAL</b>		<b>\$3000</b> per wetland restoration

Funding Sources: MPCA, RIM, WCA, CFSA, USFWS, Conservation organizations, wetland banking.

The optional phosphorus inactivation would add substantial costs to the project and requires additional investigation. Additional costs would range from about \$200 - \$500 per acre.

## **5.0 NON-AGRICULTURAL PRACTICES**

### **5.1 Improvement Of Septic Systems/Maintenance**

Objective: Reduce pollutant loading from failing and poorly maintained septic systems.

#### **5.1.1 Strategy: Provide additional hookups for lakeshore properties**

Most of the homes on the Greenfield side of the lake are hooked up to the city sewer. The City of Independence had approximately 104 homes around the lake which currently have an on-site

provided within the last 2 years. The system in operation is a gray water system. Each home still has a septic tank for solids which must be pumped periodically depending upon use.

#### **5.1.1.1 Advantages and disadvantages**

The benefits of improving sewage treatment and disposal around the lake are two-fold, 1) removing failing septic systems from use and reducing the pollutant load to the lake from those systems, and 2) demonstrating that lakeshore property owners are willing to invest in reducing their impacts to the lake. Property owners will benefit by an increase in property value that is associated with having a city hookup rather than an individual septic system. The disadvantage is the high installation cost to the City and individuals.

This project has already been completed.

#### **5.1.2 Strategy: Provide education regarding maintenance of septic systems**

The survey results listed in Appendix 4 of the Diagnostic Study indicate the need for additional education on the proper maintenance of septic systems. Once the sewer hookups are obtained, maintenance needs will differ for individuals that have city sewer. However, throughout the watershed, the majority of the homes have on-site systems. Many homes are adjacent to creeks, ditches and drain tiles that flow to Lake Sarah. Education through media in the area will increase awareness of the need for maintenance of septic systems. Additional details are described under Homeowner BMPs.

In addition to the news media, a water quality workshop could be held on a weekend day or an evening. The workshop would include sessions on how to maintain your septic system. An expert from Minnesota Extension or another qualified individual would be contacted to conduct the session. Materials on this subject would be available for distribution.

#### **5.1.2.1 Advantages and disadvantages**

Education of these homeowners will result in some individuals that will recognize the need to maintain their septic system both to keep it operating properly and to avoid unnecessary costs associated with poor maintenance of the system. Disadvantages of the education program is the inability to reach every home and the unknown long term effectiveness of the education.

### **5.1.2.2 Estimated cost**

See Homeowner BMPs (5.4).

### **5.1.3 Strategy: Continue city programs to provide periodic pumping of septic tanks**

Presently the City of Greenfield completes an annual inspection of the home septic tanks to determine if they need pumping. The tanks are pumped as needed. The homeowner is responsible to pay sewer fees to cover these costs and the other disposal costs. The City of Independence does not have this program. This program should also be implemented in Independence.

#### **5.1.3.1 Advantages and disadvantages**

Pumping of the tanks will help ensure properly maintained and operating systems. This will reduce the chance of system failure resulting in pollution of surface or ground water. The disadvantages are additional work for the city and short term costs for individuals. (Long term it is a money saver compared to the cost to repair a plugged system.).

Estimated Cost: \$100 per pumping for each septic tank  
city inspector time

Funding Sources: City, Individual

## **5.2 Shoreline And Streambank Erosion Control**

Many shorelines on the lake are eroding due to runoff, high water and wave action. Erosion also occurs along the streams flowing to the lake. Several erosion control options may be used to reduce shoreline erosion. They may be categorized as structural and non-structural. Rock riprap is a commonly used structural method of stabilizing shorelines.

Aquascaping, or shoreline landscaping, is a spin-off of the buffer strip concept. It not only includes planting on land, but also into the water. Aquascaping can be combined with bioengineering to provide semi-structural controls for shoreline stabilization.

### 5.2.1 Advantages and disadvantages

These plantings have multiple purposes, 1) filter strips for water quality 2) erosion control from land runoff and from wave action 3) wildlife habitat 4) shoreline naturalization and 5) reduced maintenance (Dindorf, 1993).

### 5.2.2 Estimated cost

Rough cost estimates for various do-it-yourself shoreline stabilization methods are presented in Table 5. (Dindorf, 1993). Professional installation may double or triple the cost. The costs listed for riprap include installation.

**Table 5. Cost Estimates for Shoreline Stabilization**

<b>Method</b>	<b>Materials Cost per foot</b>	<b>Labor &amp; Equipment Cost per foot</b>	<b>Total</b>
Willow Posts	\$1 - \$2	\$5 - \$13	\$7 - 15
Lunker with vegetation			\$25 - 50
A-jacks w/ willows	\$25	\$20 - \$25	\$45 - 50
Tree Revetment			\$17
Coconut fiber rolls	\$10 - \$25	\$6-\$10	\$16 - \$35
Plant carpets or pallets (sq.ft.)	\$4 - \$7	\$5 - \$10	\$9 - \$17
Brush Mattress w/ live stakes	\$1 - \$2	\$5 - \$10	\$6 -\$12
Fascines (wattles)	\$1 - \$2	\$5 - \$12	\$6 - \$14
Plants & Plant Plugs	\$0 - \$6	\$1 - 2	\$1 - \$8
Riprap with geofabric			\$30 - \$52

### 5.3 Phosphorus Inactivation

Phosphorus inactivation is the use of chemicals to precipitate and inactivate phosphorus in the lake. These treatments are normally done when internal loading is determined to be a major source of phosphorus to the lake. Aluminum sulfate, sodium aluminate or both are commonly used for phosphorus inactivation. Ferric chloride is also used. When spread on the lake, the chemicals create a floc which settles to the bottom. Phosphorus is removed from the water column by precipitation and remains at the bottom of the lake. The aluminum phosphate and colloidal aluminum hydroxide floc settles to the bottom and retards the release of phosphorus

from lake sediments. It continues to sorb and retain phosphorus. These treatments have been shown to be effective for 7 - 10 years or so, depending upon pollutant loading from the watershed (Cooke et. al., 1993). The in-lake treatments should only be considered when pollutant loading from the watershed is controlled. Precautions must be taken to use the proper dose of alum so as to maintain the pH between 6-8. At low pH's, dissolved aluminum may be toxic to aquatic life.

**5.3.1 Advantages and disadvantages**

Phosphorus inactivation is usually effective in removing phosphorus from the water column. Dramatic effects in the clarity of the lake can be observed. The major disadvantage of the treatment is its cost.

**5.3.2 Estimated cost**

**Table 6. Phosphorus Inactivation Cost Estimates**

Treatment	\$700 - 1300/ha * 120 ha (\$280 - \$525/ac)	\$84,000 - 156,000
Administration	40 hours @ \$20, 40 @ \$40 , misc.	\$4000
Testing		\$3000
<b>TOTAL</b>		\$91,000 -163,000

**5.4 Homeowner BMPs**

1. Fertilizer Use
2. Yard Waste Management
3. Septic System Maintenance
4. Geese Control
5. Erosion Control
6. Shoreland Buffer

There are many aspects of day to day living that can be altered to reduce the negative affect on the environment.

#### **5.4.1 Fertilizer use**

Many soils in Hennepin County are high in phosphorus and therefore do not require additional phosphorus to maintain a lawn. Homeowners throughout the watershed, especially those adjacent to a lake, wetland or stream, including intermittent streams, should use a soil test to determine the appropriate fertilizer needs for the lawn. A soil testing kit is available from the University of Minnesota. Its very simple and inexpensive to take a soil sample and send it in for analysis. The University will provide the test results along with a recommendation for fertilizer application. In most cases, phosphorus in the soil is high. Fertilizers with no phosphorus should be used. In areas adjacent to water, a strip of unfertilized vegetation (minimum 10 feet) should be maintained to prevent any runoff or accidental spill or application of fertilizer into the water.

#### **5.4.2 Yard waste management- leaf disposal**

In the fall when the leaves drop from the trees, they should be picked up as soon as possible to prevent them from blowing into the lake. Collected leaves should never be disposed of in a stream, lake or wetland.

#### **5.4.3 Yard waste management- grass clippings**

If a homeowner chooses to mow down to the lake, rather than the more environmentally friendly practice of maintaining a buffer strip, the mowing should be conducted so as to avoid blowing grass clippings into the lake. The mower should be directed so that the grass clippings blow up on land. Grass clippings should never be disposed of in a stream, lake or wetland.

#### **5.4.4 Geese control**

Geese can become a nuisance when attracted in large quantities. Geese waste is high in phosphorus. Five geese/ducks are roughly equivalent in manure production to a 1000 lb. cow (MPCA,1991). Geese can be a substantial source of phosphorus. Estimates indicate that each goose can contribute approximately 0.23 lbs. of phosphorus per year (MPCA 1988, Barten 1985). Feed should not be placed along the shoreline to attract geese. An aquascaped shoreline will deter geese which prefer mowed lawns.

### 5.4.5 Strategy 1: Education through local newspaper, lake association newsletters

Education seems to work best when the message is repeated several times. An ongoing education program is needed. Several media are available to use for the education program, including the local newspapers, annual newsletter of the watershed, the Lake Sarah Association newsletter. Articles will be submitted to the local newspaper for publishing. Studies have shown that the most effective media for reaching people is through television, newspaper or mailed newsletters and brochures. These will be the primary focus of the education program. In addition, education should also be provided through the schools in the area. Sponsoring some teachers in the DNR's Project WET with some specific training about the Lake Sarah area may help promote best management practices to the families in the watershed through the children.

#### 5.4.5.1 Estimated cost

##### Newsletter (5):

Writer: 25 hours @ \$30/hour = \$750

Clerical: 10 hours @ \$20/hour = \$200

Printing: 600 copies \$200

Postage: 600 @ 29¢ = \$200

TOTAL: \$1350 + \$1390 + \$1430 + \$1475 + \$1519 = \$7164\*

\*adjusted for inflation at a rate of 3%

##### Brochure (1):

Writer: 20 hours @ \$30 = \$600

Clerical: 8 hours @ \$20 = \$160

Printing: 500 copies \$150

TOTAL: \$910

##### Water Quality Workshop (1):

Advertisement:

Staff: 5 hours @ \$30/hour = \$150

Clerical: 5 hours @ \$20 /hour = \$100

Copies: 100 copies @ 10¢ = \$10.00

Speakers/booths:

Presenters: 15 @ \$20/hour \* 4 hours = \$1200

Mileage: 400 miles @ 30¢/mile = \$120

Materials: 1000 copies @ 10¢ = \$100

Refreshments: \$300

TOTAL: \$1980

### Newspaper Articles (10):

Writer: 2 hours @ \$30 = \$60  
Clerical: .5 hour @ \$20 = \$10  
Postage and Supplies: \$10  
TOTAL: \$80 ea. x 10 = \$800

Project WET sponsorship  
3 teachers @ \$50 = \$150  
Mileage: \$100  
Other: \$200

### **5.4.6 Strategy 2: Soil testing days**

A survey of Lake Sarah homeowners showed that very few have had their soil tested to determine fertilizer needs. Several days would be arranged where individuals would be mailed a soil testing kit and instructions from the University of Minnesota. The soils samples could be dropped off at a designated convenient location, such as the public access. Making soil testing more convenient would accomplish two things, 1) provide data to homeowners so that they apply fertilizers correctly and 2) educate homeowners on the importance of environmentally sound yard management. This would be coordinated through the Lake Association.

#### **5.4.6.1 Estimated cost**

Cost per participant: \$7-\$10  
Staff: 10 hours @ \$20/hour = \$200  
Mileage: 200 miles @ 30¢ = \$60  
Staff: 8 hours @ \$9/hour = \$72  
TOTAL: \$332 + \$7-\$10 per test

## **6.0 EXISTING OFFICIAL CONTROLS**

### **6.1 Pioneer-Sarah Creek Watershed Management Commission**

#### **6.1.1 Critical lake drainage basins**

This rule requires submission to and approval by the watershed of plans for drainage proposals, road or channel crossings and all new platting applications and site plans in designated lake drainage basins (including Lake Sarah). Plans must include BMPs for erosion and sediment



control and storm water management (depending upon size). Storm water is required to receive treatment prior to discharge to a lake in a critical lake drainage basin. NURP Ponds are required for all new residential development of 5 acres or more with a density equal to or greater than 1 unit/acre and for commercial and industrial development greater than 1 acre. Development in the watershed cannot alter the peak discharge and timing of runoff resulting from a 100 year rainfall event of the critical duration for the subwatershed.

### **6.1.2 Critical shorelands**

This rule requires submission to and approval by the watershed of plans for development or land disturbing activities in designated shoreland areas. This rule was based on model ordinances developed by the DNR and the DNR classification of shorelands.

### **6.1.3 Critical construction site erosion**

This rule requires submission to and approval by the Commission of plans for road or channel crossings and all new platting applications and site plans in designated critical construction site erosion areas. Plans must include BMPs for erosion and sediment control.

### **6.1.4 Critical cropland erosion**

This rule requires implementation of agricultural best management practices on cropland that is causing sedimentation problems off site.

### **6.1.5 Wetland Conservation Act**

The Commission is the local governmental unit responsible for implementing the Wetland Conservation Act rules for the cities of Independence, Greenfield and Loretto. These rules act to protect Lake Sarah by protecting the wetlands in the watershed.

## **6.2 City of Independence**

Ordinance prohibiting the deposit of waste and regulating of fill on land or water.

This ordinance acts to reduce non-point pollution by requiring conditional use permits for all excavation, filling, etc. activities exceeding 100 cubic yards. Conditions of the permit require erosion and sediment control measures and prohibits filling of wetlands without compensatory measures.

## **6.3 City of Greenfield**

### **6.3.1 Stormwater management ordinance**

This ordinance requires the use of stormwater management practices such as NURP Ponds for new developments.

### **6.3.2 Shoreland ordinance**

This ordinance helps reduce nonpoint source pollution by requiring setbacks and minimizing land disturbing activities between land and the water resource.

## **6.4 Potential Official Controls**

### **6.4.1 Ordinances**

The city of Independence should update its shoreland ordinance to the most recent DNR recommendations. Presently the city is operating under an older version of the shoreland ordinance.

#### **6.4.1.1 Advantages and disadvantages**

The benefits of the updated ordinance would help ensure that the shorelands would be developed in a more environmentally sound manner. This includes leaving the vegetation intact, setback requirements, and structure limitations.

#### **6.4.1.2 Estimated cost**

The cost to update the ordinance would include items such as attorney fees, city staff or consultant time, conducting public hearing, publishing notices.

### **6.4.2 Conservation easements**

In October 1993, the Pioneer-Sarah Watershed Management Commission adopted a policy to ask the cities to require conservation easements on wetlands and along streams that are tributary to a critical lake as defined in the watershed plan. Lake Sarah is a critical lake. These conservation easements require buffer strips along the wetland, lake or creek. The buffer should be an average of 50 feet wide with a minimum of 20 feet in width, but is to be determined on an individual basis and described in an attachment to the easement. For example, on lakeshore, there would be