

CITY OF THIEF RIVER FALLS

SOURCE WATER ASSESSMENT

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City Contact:

Mr. Don Mattson
Thief River Falls Water Department
P.O. Box 528
Thief River Falls, Minnesota 56701
Telephone 218-681-3809
Email address: watertrf@citytrf.net

Minnesota Department of Health Contact:

Beth Kluthe, Planner
Source Water Protection Unit
1819 Bemidji Avenue
Bemidji, Minnesota 56601
Telephone 218-755-4173
Email address: beth.kluthe@health.state.mn.us

PART I

INTRODUCTION

The 1996 amendments to the Federal Safe Drinking Water Act (SDWA) require the Minnesota Department of Health (MDH) to complete Source Water Assessments (SWA) for public water systems (PWS).

The requirements of the SDWA addressed herein are intended to provide Thief River Falls drinking water customers with 1) a general description of the area which supplies water to the Thief River Falls Water Department; 2) an overview of why this water supply is susceptible to potential contaminants; 3) a description of the contaminants of concern which may impact the users of the public water supply; and 4) to the extent practical, the origins of the contaminants of concern.

The MDH, with the assistance of the Thief River Falls Water Department, assembled a team that developed the information herein. The source water assessment team included resource persons representing the following agencies: Thief River Falls Water Department, City of Thief River Falls, East Grand Forks Water and Light Department, Pennington County Soil and Water Conservation District (SWCD) and Water Planning, Minnesota Pollution Control Agency, Red Lake Watershed District, Red Lake Tribe, Clearwater County SWCD and Water Planning, Marshall County Water Planning, United States Army Corp of Engineers, citizens and MDH.

STATUS OF THE SOURCE WATER PROTECTION PLAN

Although not a requirement of the SDWA, the city of Thief River Falls intends to use this source water assessment as the basis and framework for the development and implementation of a source water protection plan. Therefore, in conjunction with the other Red River Basin water suppliers, MDH, and other state and local government agencies, Thief River Falls will work to develop a source water protection strategy.

DESCRIPTION OF THE SOURCE WATER

The water supply for the City of Thief River Falls is the Red Lake River. The water intake line is located on the east side of the Red Lake River in Thief River Falls, upstream of the dam and approximately one mile downstream from its confluence with the Thief River.

The watershed for the Red Lake River above the city's water intake is approximately 3450 square miles. The major tributary is the Thief River. The Red Lake River flows out of Lower Red Lake, which is fed by Upper Red Lake. The Red Lakes are the remnants of Glacial Lake Aggasiz, and are two of the largest lakes in Minnesota by surface area. The Red Lake River travels 65 miles from its outlet to the city of Thief River Falls. Marshy wilderness, flat farmland, and wooded banks characterize the river. Above the dam, at river mile 181, the river flows through marshland in the Red Lake Indian Reservation. The Red Lake River was dredged and straightened between the Red Lake Nation boundary and Thief River Falls in the 1940's and 1950's. Trees are sparse and small on the low grassy banks. Near High Landing, the trees become larger and the river meanders through farmland. Stands of willow, elm and cottonwood are interspersed with open fields. Residential development is extensive along the banks at Thief River Falls.

The Corps of Engineers operates a dam (located at the outlet of Lower Red Lake) to control lake levels. The Operating Manual for Red Lake lists the year-round operational target level for Red Lake as 1174.0 feet MSL (1912 Adjustment). When the lake is above the elevation of 1174.0 feet, discharges of 1000 cfs and higher may be used to lower the lake as soon as practicable and the minimum outflow is 150 cfs. When the lake is below the elevation of 1174.0 feet, minimum outflows range between 10 and 100 cfs and maximum outflows range between 15 and 150 cfs. More detailed information and tables are available in the Reservoir Operating Plan.

Typical draw from the river by the Thief River Falls Water Department is 1.5 - 2 million gallons per day, with the plant rated to a 3 million gallon per day capacity. Current storage capacity is approximately 4.75 million gallons, which is adequate for 2-3 days use.

SOURCE WATER SENSITIVITY

In determining the sensitivity of a source water, the intrinsic physical properties of the geologic setting or landscape within the watershed must be considered. The last glaciation shaped a very flat landscape over much of the watershed area supplying water to the city of Thief River Falls.

As a result, the area has been identified as prone to substantial flooding. In addition, extensive ditching has altered natural flows substantially. The concentration of contaminants and their movement to the public water supply system are attenuated by the significant quantity and rate of flow within the Red Lake River. In times of drought the flows can diminish to a point where this dilution effect is compromised. However, the reservoir does provide settling of contaminants during low flow. The variability of flow accents variability of water chemistry and contaminants. The dam at the outlet of Lower Red Lake does moderate this variability.

Seasonal changes also influence the sensitivity of the river to contamination. Other factors influencing the sensitivity of a surface water body include topography, hydrology, geology, vegetation and the distribution of various soil types within the sub-watersheds of the Red Lake River.

The closer the source of contamination is to the intake, the greater the impact will be on the quality of the water used by the city of Thief River Falls, based on the factors listed in this section. As the distance of the contaminant from the intake increases, the impact will lessen based on the factors described in this section which help attenuate the movement of contaminants to the intake.

SOURCE WATER ASSESSMENT AREAS

The source water assessment area for the city of Thief River Falls includes three distinct nested areas. The **inner-emergency response area** is designated to help the city of Thief River Falls address contaminant releases which present an immediate (**acute**) health concern to water users. This geographic area is defined by the amount of time the city of Thief River Falls needs to be notified, shut off the surface water intake and a “buffer” to accommodate unanticipated delays in notification and shut down. The **outer source water management area** is designated to protect water users from long-term (**chronic**) effects related to low levels of chemical contamination or the periodic presence of contaminants at low levels in the surface water used by the city of Thief River Falls. Also, this area should protect users from contaminants such as pathogens which may be 1) usually found at treatable levels in the source water and, 2) occasionally present an acute health concern under certain conditions, such as the low stage of the Red Lake River. The **entire watershed** is designated to provide the water supplier with a broad perspective in which to prioritize specific types of lands uses that may impact the water quality of the source water used by them.

The **inner-emergency response area**, as shown in Figure 1, includes areas along both the Red Lake River and the Thief River. The area can be described as beginning at the public water supply intake and following sub-watershed boundaries easterly along the Red Lake River on the south side of the river to the “Kratka Bridge,” which is approximately 22 miles upstream. The boundary then heads northeasterly, following sub-watershed boundaries and ditches for both the Red Lake River and the Thief River, including the east end of Judicial Ditch No. 13/18 and extending due north along Highway 89 until its intersection with County Ditch 27. From there the boundary goes westerly, following drainage ditches and sub-watershed boundaries to the Thief River, traveling northwesterly to State Highway 32 and turning southerly and traveling

back to the intake in Thief River Falls. Outer boundaries were adjusted slightly to accommodate ditching along the river. In some instances, instead of including an entire minor watershed, the area was defined by a specific land use or potential contaminant source. An example of land use or potential contaminant source determining where the boundary line lies compared to a watershed boundary would be using a major highway, railway or pipeline crossing a river or stream and defining the area downstream from the crossing as part of the inner emergency response area. It is important to note that the emergency response capability is heightened because there is a direct control between the City of Thief River Falls Law Enforcement Center and the water treatment plant's water intake shut-off valve.

The **outer source water management area**, also shown in Figure 1, can be described as the Red Lake River Watershed upstream of the intake to the river's outlet from Red Lake, and the Thief River Watershed westerly of a line following Highways 219 and 89 from south to north.

The third area is the **entire watershed**, as shown in Figure 2, and is called the Red Lake Major Sub-Basin. The Red Lake Major Sub-Basin includes the Red Lake River Watershed upstream of the intake, the Thief River Watershed, and the Upper and Lower Red Lake Watershed.

Source Water Assessment Area For the City of Thief River Falls

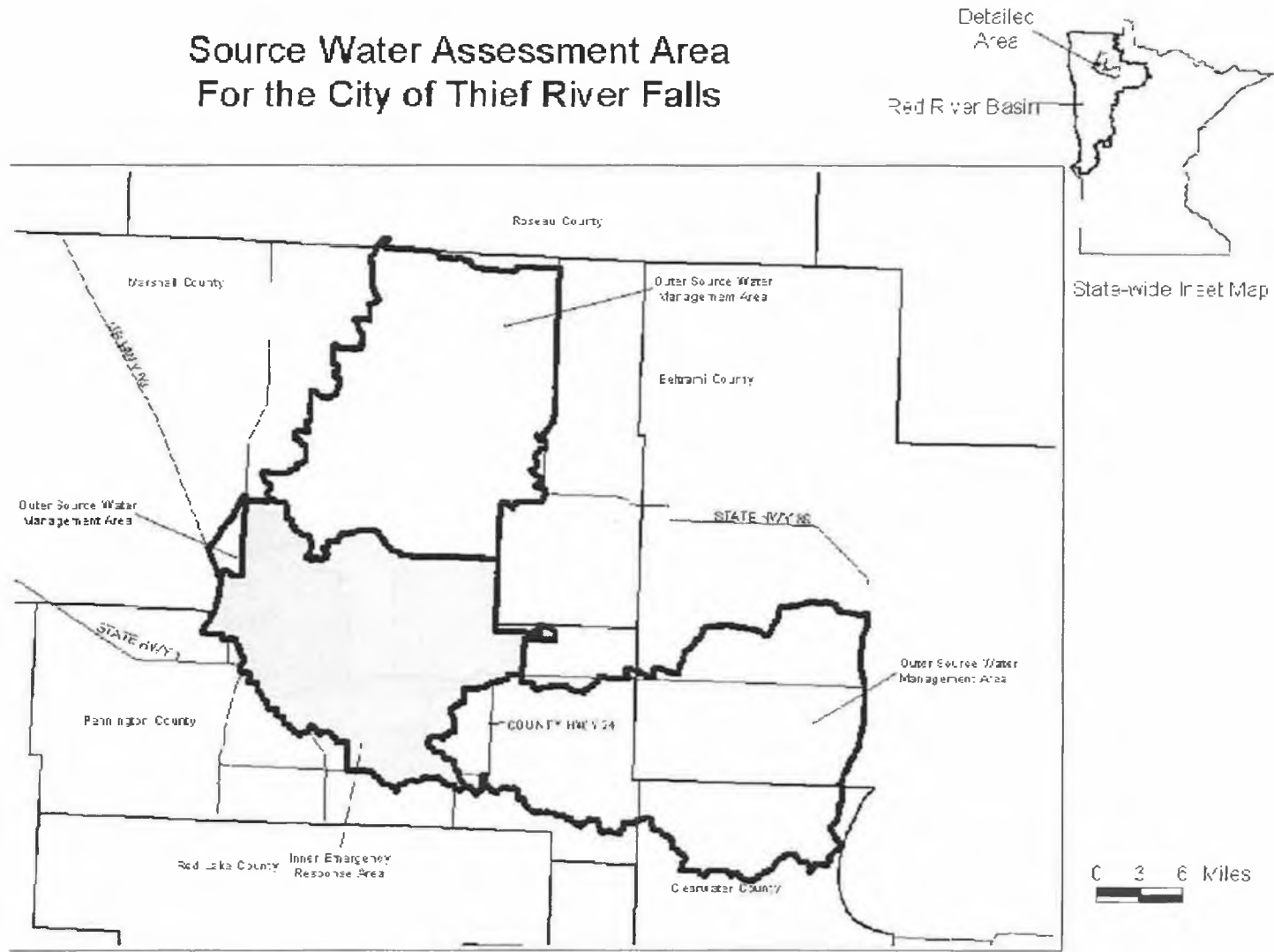


FIGURE 1
SOURCE WATER ASSESSMENT AREA

Source Water Assesment Area for the City of Thief River falls
 Plus the Thief River Watershed and
 The Upper and Lower Red Lakes Watershed

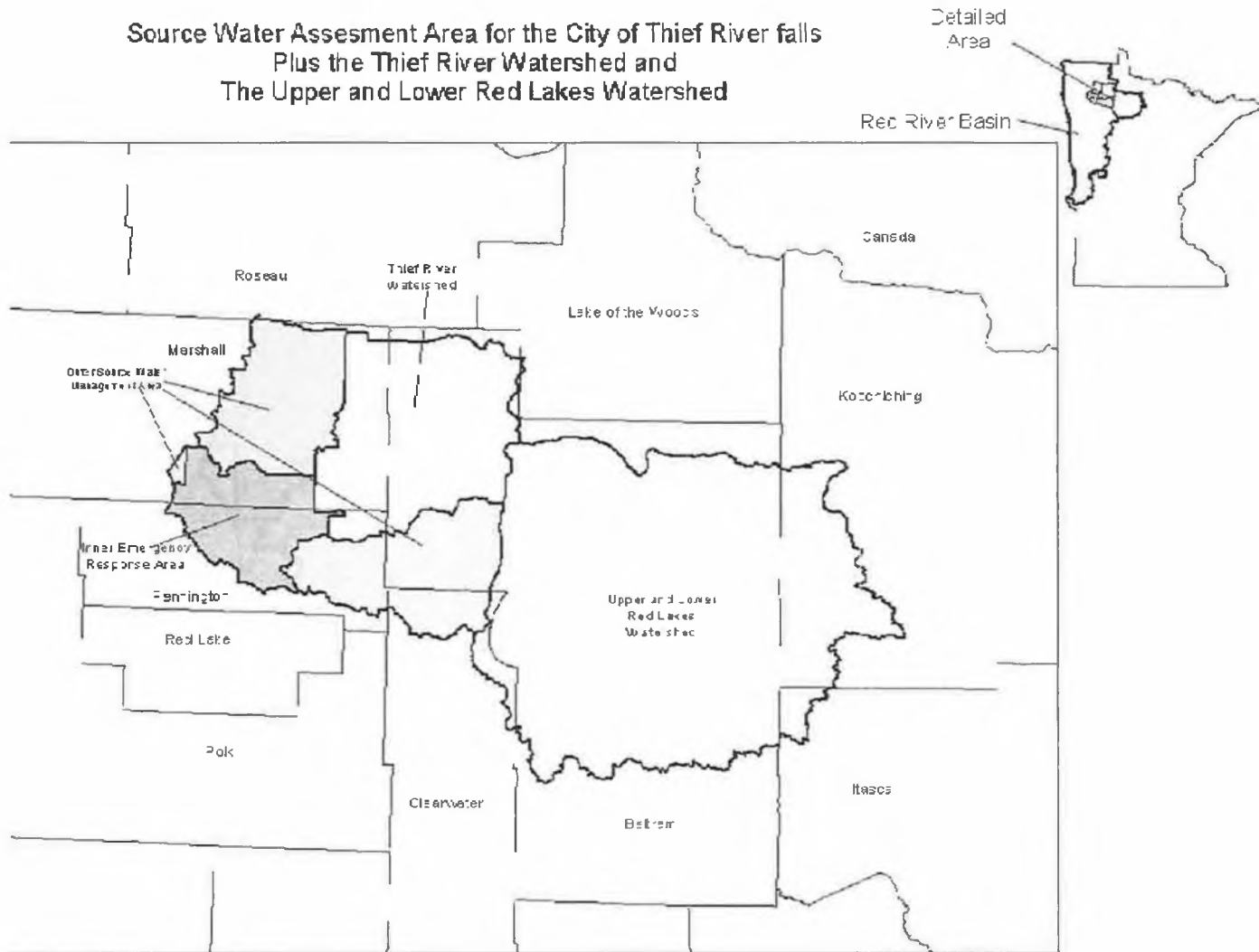


FIGURE 2
WATERSHED AREA UPSTREAM FROM THE INNER EMERGENCY RESPONSE AND
OUTER SOURCE WATER MANAGEMENT AREAS

PART II

POTENTIAL CONTAMINANTS OF CONCERN

The contaminants of concern are the contaminants regulated under the federal SDWA. They are divided into organic chemicals, inorganic chemicals, radionuclides and micro-organisms. A listing can be found at: <http://www.epa.gov/safewater>. Of greatest concern are naturally occurring organics, sediment, micro-organisms, hydrogen sulfide and turbidity.

POTENTIAL SOURCES OF CONTAMINANTS

To the extent practical the table below is a listing of point sources of contamination and an **estimate** of the numbers of each type located in the **inner-emergency response area** and the **outer source water management area**.

POTENTIAL CONTAMINANT SOURCES	INNER AREA	OUTER AREA
Agricultural Chemical Storage Sites	12	1
Agricultural Feed Storage Sites	2	0
Agricultural Seed Storage Sites	6	1
Agricultural Sites Unknown	22	2
Air Release Points	8	1
Airfields	0	3
Airports	0	3
Bridges	55	46
Cemeteries	4	5
Dams	0	2
Dump	1	0
Golf Courses	2	0
Gravel Pits	10	17
Hazardous Waste Generators	88	3
Leaking Underground Storage Tanks	43	0
National Discharge Sites	4	1
No further remedial action planned	1	0
Registered Storage Tanks	39	5
Resource Management Plans	3	1
Salvage Yards	4	0
Solid Waste Permit Site	1	0
Tower	3	0
Toxic Release Site	1	0
Voluntary investigative clean-ups	3	0
TOTAL	312	91

The potential sources of contamination listed in the table above represent data collected from a number of state and federal data bases. Editing the data sets for duplication and the accuracy of the locations for potential contamination sources was not possible to perform as part of the preparation of the source water assessment.

To the extent practical, the table below is an estimate of percentages of land use found within the city of Thief River Falls source water assessment area (**inner-emergency response area and outer source water management area**) reflecting nonpoint sources of potential contamination.

**Land Use Within the Thief River Falls
Source Water Assessment Area**

LAND USE/COVER	INNER AREA ACRES	OUTER AREA ACRES
Open Water	462.6	13706.4
Low Intensity Residential	750.4	0.0
High Intensity Residential	306.9	0.0
Commercial/Industrial/Transportation	683.0	650.3
Quarries/Strip Mines/Gravel Pits	26.9	44.3
Barren Transitional	81.2	273.3
Deciduous Forest	7127.3	22902.2
Evergreen Forest	8.5	164.6
Mixed Forest	1.6	80.3
Shrubland	14.9	1144.7
Pasture/Hay	10373.8	20215.0
Row Crops	96551.8	92053.0
Small Grains	36017.1	34031.5
Urban/Recreational Grasses	355.6	162.6
Woody Wetlands	6665.8	96761.3
Emergent Herbaceous Wetlands	6638.7	144050.9
TOTAL ACRES	166066.0	426240.4

Both point sources (such as industrial and wastewater treatment plant discharges) and nonpoint sources (such as runoff from agricultural and urban areas) are present in the **inner emergency response area** and the **outer source water management area**.

Historically, land use in the watershed was primarily wetland, forest, prairie/grassland and brush. Currently, land use has become dominated by cultivated land, wetland, and forest. Agricultural cropland is the predominant land use throughout most of the Red Lake Major Sub-Basin. A portion of cropland has been enrolled in the Conservation Reserve Program (CRP). For example, the maximum number of acres permitted by federal guidelines are currently enrolled in Pennington County. Marshall County is also very close to the maximum number of acres allowed. The southern and west-central portions of the watershed are increasingly influenced by urban land uses. Thief River Falls is the first city on the stretch of Red Lake River from its headwaters. Public ownership of land is more predominant in the northern reaches, and private

ownership more predominant in the southern reaches. The eastern portions of the sub-basin are included within the boundaries of the Red Lake Indian Reservation and managed by the Red Lake Band.

The source water assessment team identified various sources of potential contaminants. Forms of pollution in the Red Lake River and Thief River, and many of their tributaries, include suspended solids, nutrients, oxygen-using materials, hydrogen sulfide, metals, pathogenic microorganisms, and several organic and inorganic chemical constituents. Nonpoint sources of contamination include agricultural activities, erosion and runoff, pesticide application, silviculture, urbanization, solid waste disposal sites, leaking underground storage tanks, dams, rice paddies, wildlife impoundments, stormwater, and drainage ditches. The Thief River Falls source water assessment team has identified unbuffered drainage systems and stream bank erosion as contributing potential contaminants to source waters.

RESULTS OF MONITORING THE SOURCE WATER

Source water monitoring results can be found in the various programs present in the Red Lake River Basin. Some of those programs include: Red Lake River Watershed District water quality program, Minnesota Pollution Control Agency's TMDL program, Riverwatch, County Water Planning, Minnesota Department of Natural Resources fisheries monitoring, Red Lake Tribe Department of Natural Resources water quality program, Department of Health's Fish Consumption Advisory Handbook and Clean Water Partnership diagnostic studies.

The United States Geological Survey conducted extensive monitoring of the entire Red Lake River main stem during the period 1992-1995 and published its findings in Circular 1169, "Water Quality in the Red River of the North Basin."

The public water suppliers provide a continuous monitoring program for raw and finished water. For example, the Thief River Falls Water Department monitors total organic carbon in cooperation with the Pennington County Water Plan. The levels of total organic carbon found in the river are a concern to the public water supply systems because of resultant disinfection byproducts produced by treatment processes.

The Red Lake Watershed District has nine long-term monitoring sites located within the source water assessment area. Chemical water analysis occurs on a quarterly basis (once each season). Data has been collected since 1984. The purpose of the monitoring is to develop water quality status on nonpoint parameters such as nutrients and sediment, and to determine ranges or trends in water quality throughout the watershed district.

The Pennington County Water Plan has four long-term monitoring sites within the source water assessment area. Chemical water analysis occurs monthly and data has been collected since 1998.

Monitoring conducted in the Upper Red Lake River Basin (including areas outside of the source water protection areas) by the Minnesota Pollution Control Agency determined that a small percentage of locations monitored or surveyed had water quality fully supporting the designated

uses for the water body being monitored or surveyed. Some of the sites had threatened water quality or did not support the designated use. However, within the source water assessment area, the Red Lake River and the Thief River did not have any section listed for impairment. Most monitoring upstream of the public water supply system intake is generally related to swimmable and fishable goals. A greater emphasis on drinking water standards in the future would be beneficial.

SUSCEPTIBILITY OF THE SOURCE WATER TO CONTAMINATION

Susceptibility is defined as the likelihood that a contaminant will enter a public water supply at a level that may result in an adverse human health impact. The determination of susceptibility is on a scale of low, medium and high. The overall susceptibility of any surface water is determined to be high because there are no practical means of preventing all potential contaminant releases into surface waters. Based on a comparison of the sensitivity of the surface water intake to the presence of potential contaminant sources, the susceptibility of the city of Thief River Falls is considered to be high for a surface water based public water supply system.

While it has been determined that the city of Thief River Falls source water is highly susceptible to the source water's potential contaminant sources, it is noted that historically the city of Thief River Falls has effectively treated this source water to meet drinking water standards.

USING THIS ASSESSMENT

Protecting the drinking water source is a wise and relatively inexpensive investment in the community's future. The overall intent of this assessment is to provide background information for the community to use in developing a local drinking water protection program. The assessment benefits the community by providing the following:

- ***A basis for focusing limited resources within the community to protect the drinking water source.***
The assessment provides the community with information regarding activities within the **source water assessment area** that may directly affect the water supply.
- ***A basis for informed decision-making regarding land use within the community.***
The assessment provides the community with a significant amount of information regarding where the drinking water comes from (the source) and what the risks are to the quality of that source. Knowing where the resource is allows community planning authorities to make informed decisions regarding proposed land uses within the source water assessment area that are compatible with both the drinking water resource and the vision of growth embraced by the community.