

University of Wisconsin–Extension and Wisconsin Department of Natural Resources. 2002. A guide to environmentally sound ownership. A publication of the Southeast Wisconsin Fox River Basin Partnership Team, University of Wisconsin–Extension, and Wisconsin Department of Natural Resources.

Section IV. Historical and Current Data

AITKIN COUNTY COMPREHENSIVE LOCAL WATER MANAGEMENT PLAN

As a task force decision this portion of our third generation Water Plan was retained as a section Note: A brief history of the plan follows. This information is included so that the reader understands how and when the Water Planning Process was started, as well as who was involved. It is interesting and a little sad to remember the Task Force members who are no longer with us. Recent losses from the Task Force membership are John (Barney) Janzen and Tom Sandberg who passed away since our 1995 update. Both Barney and Tom were active and knowledgeable members and are missed.

Introduction

The first generation Comprehensive Local Water Plan started in November 1987. Prior to that date, the Mississippi Headwaters Board (MHB) applied for a grant through the Legislative Commission on Minnesota Resources (LCMR), for all of the counties within their jurisdiction. These eight counties (including Aitkin) were approved for funding to assist with the preparation of the plan. MHB Administrator Molly MacGregor, contacted the Aitkin County Board of Commissioners and the Aitkin County Soil and Water Conservation District to encourage them to formulate a Water Plan. The manager of the Soil and Water Conservation District (SWCD), Steven Hughes, was asked by the County Board of Commissioners to attend informational meetings and report to the Commissioners.

The Aitkin County SWCD then proposed to the Board of Commissioners that a plan should be formulated for Aitkin County. At that time the District volunteered to be the coordinating agency for the plan. A Resolution dated November 1987 delegated the responsibility for the plan to the SWCD with a requirement that the District report quarterly as to their progress.

District Manager Hughes, became County Project Coordinator and began organizing a committee that would serve as the Water Planning Task Force. Approximately 25 persons were contacted by letter and by telephone and asked if they would be willing to serve on the task force. A list of task force members and whom they represented is included just before the goals and objectives section of this plan.

The first task force meeting was held November 20, 1987 for the purpose of introducing the planning process to the task force members. The discussion began with a summary of the

requirements of the plan as outlined in the Comprehensive Water Management Planning Handbook. Also stressed was the intention that the plan be as specific to Aitkin County as possible. The next planning meeting was set for December 17, 1987 for the purpose of identifying specific local concerns that task force members wanted to address in the plan. A list of 53 concerns was generated at this meeting and is listed in the goals and objectives portion of this plan.

Physical Environment

Aitkin County is located in the northeastern part of central Minnesota. The county seat, Aitkin, is approximately 126 miles north of Minneapolis-St. Paul and 87 miles west of Duluth. Aitkin County has an area of about 1.2 million acres of which 113,000 acres is surface water. Land ownership in the county is approximately 46 percent private, 34 percent state, 19 percent county, and 1 percent federal. The county's population is about 15,300 (2000 data).

LAND USE

Approximately 90,000 acres is currently in cropland of which the principal crops are hay, small grains and corn. Specialty crops such as potatoes, strawberries and wild rice are grown in the county; Aitkin is the largest wild rice producing area in the state with approximately 8,000 acres of paddies.

There are 580 farms (155,000 acres) in the county with an average size of 267 acres. Beef cattle and hay constitutes the largest single source of farm income. Of the 580 farms, approximately 51 are dairy farms, 225 beef, 17 hog, 16 sheep, and 24 poultry. These numbers represent about a 20% overall decline in agricultural activities since 1990. It is speculated that agricultural downturns may slow somewhat but that may be dependant on prices producers receive for their products.

Privately owned lands comprise 46 percent of Aitkin County, with approximately one-fourth in some form of agricultural usage (not including forestry activities). About 65 percent of the county is forestland. Of this forested area, approximately 40 percent are under-stocked cover types (marsh, bog, brush land). The other major cover types include: aspen-birch, northern and lowland hardwoods, and conifers.

ASSESSMENTS

Development trends: In the past 10 to 15 years, Aitkin County has experienced rapidly increasing residential development. Lakes and rivers are being developed for weekend cabins so quickly that demand for riparian lands has forced prices to more than double in the past ten years. (Woods and Shores Real Estate). The trend is toward larger homes and larger related buildings (i.e. garages, pole buildings) on existing lakeshore lots. To a much smaller degree, some small lots are being consolidated with adjacent lots to create a larger building and recreation area. Given current development rates, it is estimated that 90% of the available build able lakeshore properties will be developed by 2006. Second and third tier development will accelerate as well as development pressures increasing along rivers and wetlands.

The second major development trend applies to recreational acreages. These parcels typically vary between 10 and 100 acres with most parcels averaging about 40 acres in size. These parcels are usually used for seasonal cabins and outdoor recreation. Demand for this type of property has also increased dramatically as evidenced by approximately a doubling of recreational property values. It should be noted that accessibility, location, and other factors influence values.

Current trends are that demand and prices will continue to increase, however possibly at a slower rate than was experienced in the past ten years.

PHYSIOGRAPHY RELIEF AND DRAINAGE

Aitkin County encompasses diverse landforms with a variety of water bodies. This is the result of the continental glaciers, which advanced many times through the region in the past. The landforms include: large and small glacial lake plains and associated beach ridges; moraines (ground, terminal and recessional); drumlins; pitted outwash (ice-contact stratified drift); eskers and kames; outwash plains; ice-block depressions (modern lakes and bogs); and glacial river valleys. Glacial drift ranges 40 to 300 feet thick over bedrock throughout the county; but in a few places there are bedrock outcrops (e.g. Sec. 1, Seavey Township; Sec. 12, Idun Township).

Each landform type has a characteristic shape and size determined by the method of its deposition and volume of sediment. For example, lake-laid sediments are commonly 2 to 10 feet thick covering an area of 10 to 1000 acres for ice-block depressions or many thousands of acres as is the case for glacial lakes Aitkin and Upham. Relief in these areas ranges from 2 to 15 feet; slopes are generally plane, but there are undulating areas as well. Wave-washed till and beach ridges occur at the margins of lake plains or as islands within them.

By contrast, deposits of ablation till (which are laid down at a melting glacial front) are commonly 10 to 100 feet thick with up to 75 feet of relief. Also, slopes are mostly complex, i.e., they are concave or convex in both horizontal and vertical directions. The terminal moraine, which extends from the northwest corner of Mille Lacs Lake to the area north of Big Sandy Lake is an example of ablation till from several sources. Ablation till is characterized by its mixture of different-sized particles from large boulders (greater than 1 m. diameter) to clay (less than 0.002 mm diameter); in fact, boulder-clay is another, older term for this material.

The land in Aitkin County that is neither flat nor hilly can be classified as gently rolling ground moraine. Ground moraines are comprised of basal till, which is generally denser and more homogeneous than ablation till, ground moraines have relief of 5 to 50 feet. Often basal till, which is deposited at the base of a moving glacier, is molded into drumlins. Drumlins are cigar-shaped hills streamlined in the direction of the ice flow. The southeastern part of Aitkin County is ground moraine.

The abundance of lakes and rivers in the county is a benefit from the repeated glaciations. Deep-water lakes tend to be concentrated in the terminal moraine due to the mounding of till around stranded ice blocks which left large depressions upon melting. The melting ice also created great rivers that carved valleys now occupied by smaller streams. The deposits left by the glacial rivers are called outwash and are good sources of sand and gravel.

The present day drainage of surface water in Aitkin County is accomplished by several rivers (notably the Mississippi, Snake, Willow, Rice, Sandy, Swan, and Prairie Rivers) and many smaller creeks, brooks and ditches. The Mississippi River watershed is the most extensive; it drains the northern two-thirds of the county. Generally, surface drainage is impeded by numerous closed depressions or potholes that, over the course of time, fill with organic material (peat). In some low relief areas, peat has filled the original potholes and spread over the landscape in a process known as paludification.

AITKIN COUNTY PUBLIC DRAINAGE SYSTEM

Aitkin County consists of 1,215,760 acres, including 1,105,411 acres of land area and 110,349 acres of water area. This surface of Aitkin County is marked by several areas of morainic ridges, occupying nearly one-quarter of its area with the balance being level or gently undulating. About 50 percent of the County is wetland.

During the period around the turn of the century, following the logging era, there was much activity on “settling” the land with small and scattered family farms. As these farms were developed, a ditching program was instituted in an effort to reclaim and develop land suitable for farming, with most of the ditching being done in the years 1890 to 1930. Much of the land so ditched was developed for agriculture, although some of the land was drained without due regard as the highest and best use of that particular type of land. As a result some land was developed and some land was drained that should never have been drained.

Aitkin County drainage ditches were established under different statutes and methods creating four different names for ditches:

1. Fire Relief Commission Ditches
2. State Drainage Ditches
3. County Drainage Ditches
4. Judicial Drainage Ditches established by District Court action and usually located in two or more counties. All four types of ditches are the responsibility of the courts and under the jurisdiction of the County Board.

The method of paying for the drainage ditches was from the sale of bonds to be repaid by assessments against the property benefited by the ditching. This double taxation during a period of economic depression resulted in widespread tax delinquency and failure to collect the money necessary to retire the ditch bonds.

In Aitkin County the results were disastrous. The ditch bonds, defaulting, became general obligation bonds of the County. Those bonds, refunded many times over the years, were finally paid in full in 1962.

The payment of those obligations was helped in part by the passage of Chapter 407, Minnesota Laws of 1931, which created the so-called “reforestation and flood control areas”. Under this statute certain lands were placed under the ownership of the State upon forfeiture for non-payment

of taxes, instead of title remaining in trust for the taxing districts. In return for this, the State agreed to help pay outstanding ditch obligations with certain limits.

The amount paid to Aitkin County by the State under this arrangement was \$906,406.27. This created an area now known as the Consolidated Conservation Area, 457,395 acres of which 248,451 acres are forfeited with ownership vested in the State of Minnesota, and no longer subject to local control.

Many of the ditches are in various stages of disrepair due to many reasons such as little or no maintenance resulting from lack of funding due to diminished agricultural production.

Ditch laws allow for the payment of ditch maintenance programs through special assessments against the land benefited, regardless of ownership.

All the counties with public drainage ditches have programs to do maintenance work on the drainage system, usually with the costs of the repair or maintenance charged back to the benefited lands as a special assessment, in the same proportion as the original ditch costs were made.

Did the original drainage system work? Yes: It made land suitable for agricultural development, provided water control and availability for forestry practices and created water sources for fire control or protection. Ditch spoil banks were occasionally used for access roads or trails. In fact, many existing township and county roads are located on spoil banks. No: Lands that were not practical to drain were drained, ditches were not designed or dug properly and unnecessary facilities were established on ditches thus raising the cost of the project. Ditches needed maintenance, but no funds were available to maintain the system.

In most cases, the maintenance or clean out of these ditch systems is necessary to provide benefits.

Depending on its degree of decomposition, peat can hold water up to 30 times its own weight. An average peat bog of 100 acres, 10 feet deep, contains about 165 million gallons of water, which is 3 times more than mineral material could hold. Attempts to improve drainage of peatlands by ditching have been hindered by the lack of adequate outlets. This is significant because there are over 440,000 acres of organic soils in Aitkin County.

The range in elevation in the county is from a low of 1083 feet near Pine Lake in Wagner Township in the southeastern corner of the county, to a high of 1589 feet in Section 25 of Hill Lake Township, known as Quadna Mountain. The glacial lake plain that the Mississippi River flows through is about 1200 feet above sea level. The watershed divide between the tributaries of the Mississippi and those of the Snake River is at 1350 feet. The average elevation of the surface of Mille Lacs Lake, the second largest lake totally within the state, is about 1250 feet above sea level.

The Upper Mississippi River Drainage includes nearly two-thirds of Aitkin County. Its major tributaries are the Sandy, Willow, Rice and Prairie Rivers. Floods are unusual in areas of swamp and interrupted drainage patterns, but the low areas of the county, especially near Aitkin, have experienced periodic flooding of up to 30,000 acres. In 1951, a Federal Flood Control Project made possible the construction of a 6-mile bypass channel to divert high waters around the City of

Aitkin. This project was completed in 1957. A dike, 7,500 feet long, was constructed in 1969 around the northern part of the City of Aitkin. Since the completion of the bypass channel and the dike, flood frequency and severity in and near the city of Aitkin have been greatly reduced.

CLIMATE AND RAINFALL

The climate found in Aitkin County is considered the continental type that does not benefit from the moderating influences of the earth's oceans. Large annual temperature ranges characterize this type. Winters are most often long and cold. The warmer summer months are generally mild, but may contain periods of excessive heat and humidity.

Freezing temperatures usually prevail from mid-October to mid-April. The mean annual precipitation including melting snow is approximately 28 inches. Approximately 18 inches of this occurs during April through September. The prevailing winds are northwesterly.

The average temperature range is from 6 F in January to 67 F in July. This is a 61 f temperature difference. However, the range between the coldest and warmest recorded temperature of any given year may be 120 degrees or greater.

The growing season, or that length of time between the last frost in the spring to the first frost of the fall, is approximately 118 days. Crops are thus limited to those that can mature and be harvested during this period.

Precipitation is influenced by moisture from the Gulf of Mexico that combines with weather systems that generally come from the west. Precipitation occurs as rain, freezing rain, hail, and snow. Violent weather events often occur, but these are of short duration and affect relatively small areas. These events include tornadoes, severe thunderstorm, and hailstorms.

Sixteen precipitation-gauging stations are located throughout the county to measure precipitation and report to the SWCD.

The following table shows the average yearly precipitation recorded at the Spencer Township gauging station from 1992-2001.

YEAR	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
TOTAL PRECIP.	23.96	33.49	30.31	33.14	27.32	28.31	30.96	33.69	32.27	30.66

GEOLOGY-SURFACE AND BEDROCK

The surface geology of Aitkin County is predominantly of glacial origin. There are many different types of glacial deposits in the county.

The bedrock geology of Aitkin County is presumed to be much less variable than the surface deposits. The depth of glacial drift overlying the bedrock units varies in thickness from less than 15 feet to greater than 300 feet and commonly 150 to 250 feet. The average thickness of this drift allows for adequate non-bedrock aquifers (sands and gravels of variable thickness and water quality) over most of the county.

There are three major bedrock units currently recognized in Aitkin County. These are the Mcgrath gneiss in the southern one-third of the county (this area generally has the shallowest depth to bedrock), the Trommald Iron Formation which occurs as isolated bands in the west-central part of the county, and the Rabbit Lake and Mahnommen Formations of argillite (slate) and graywacke (fine-grained metasedimentary sandstone) in the northern two-thirds of the county. Metallic ore deposits exist within these formations. Exploratory drilling has occurred and mineral leases are available from the state.

WATERSHEDS

Aitkin County contains parts of six of the 81 major watersheds identified within the State.

ISSUES FOR SPECIFIC WATERSHEDS

These watersheds are:

- Snake River
- Upper Mississippi
- Lake Superior
- Pine
- Kettle
- Rum

A table showing the general priority by watershed is shown below, priorities of specific lakes, rivers or land uses within any given watershed may be higher or lower based on many factors.

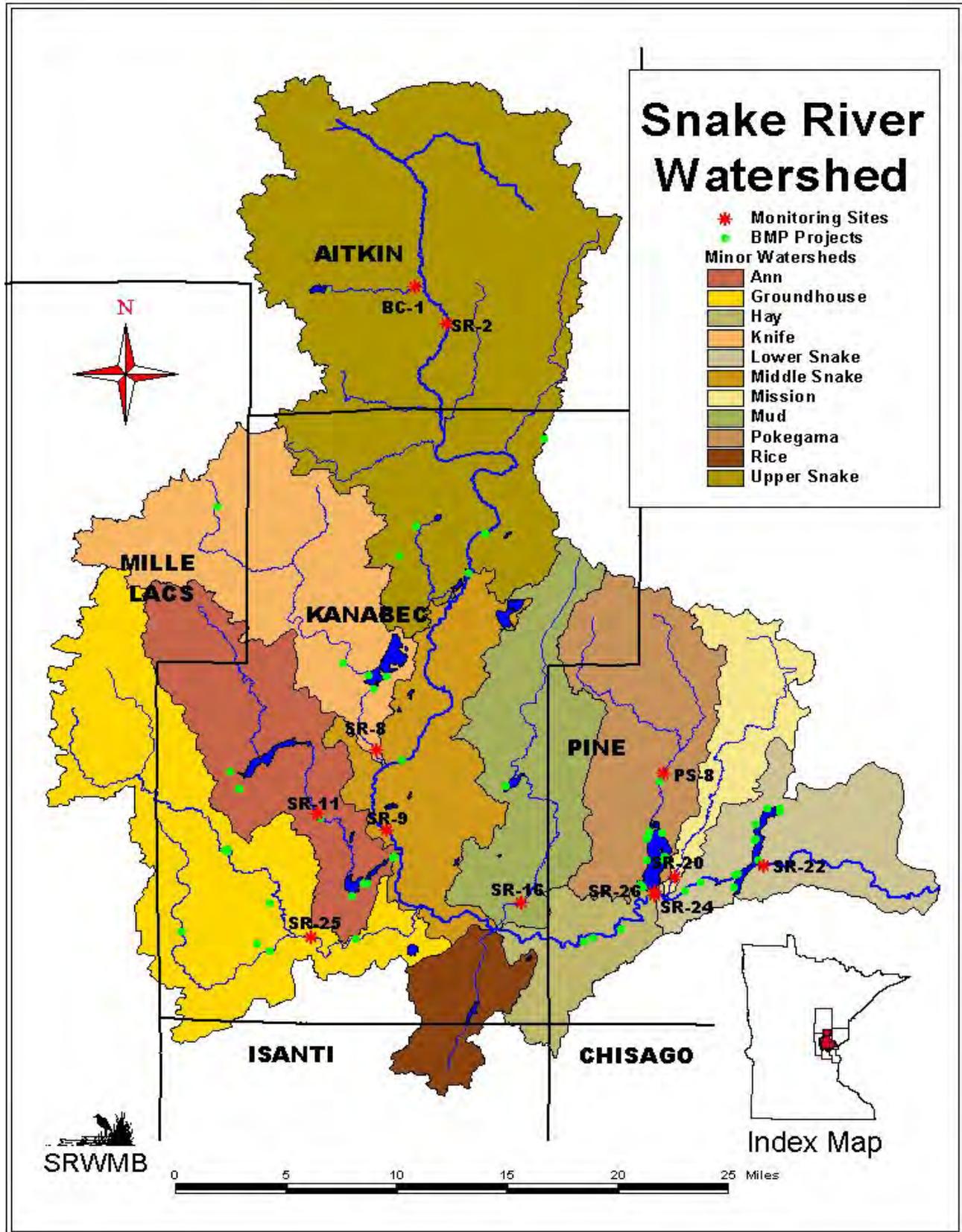
WATERSHED NAME	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
LAKE SUPERIOR	L	L	L	H	H	M	M	L	L	H	M	H	H	H	L	M	M	L
UPPER MISSISSISSIPPI	H	H	L	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H

Rice River	M	H	L	H	H	H	H	L	H	M	H	H	H	H	M	M	H	H
Moose/ Willow River	L	M	L	H	H	M	M	L	M	L	M	H	H	H	M	M	H	M
Ripple River	H	H	M	H	H	H	H	L	H	M	M	H	H	H	H	H	H	H
Big Sandy Watershed	H	H	M	H	H	H	H	L	H	H	H	H	H	H	H	H	H	H
PINE	M	M	L	H	H	H	H	L	M	H	M	H	H	H	M	M	M	M
KETTLE	L	L	L	H	H	H	H	L	M	H	M	H	H	H	M	M	M	M
SNAKE	M	M	L	H	H	H	H	L	M	H	M	H	H	H	M	H	H	H
RUM	M	L	M	H	H	H	H	L	H	H	M	H	H	H	H	H	H	H

H = HIGH PRIORITY
M = MODERATE PRIORITY
L = LOW PRIORITY

ASSESSMENTS:

- A) EXPECTED CHANGES TO PHYSICAL ENVIRONMENT, LAND USE, AND DEVELOPMENT
- B) SURFACE WATER QUANTITY INFO FOR PRESENT AND FUTURE USES
- C) GROUND WATER QUANTITY INFO FOR PRESENT AND FUTURE USES
- D) SURFACE WATER QUALITY INFO FOR PRESENT AND FUTURE USES
- E) GROUND WATER QUALITY INFO FOR PRESENT AND FUTURE USES
- F) SEDIMENTATION AND IMPACTS ON QUALITY AND QUANTITY OF SURFACE WATER
- G) AFFECT OF LAND USE AND COVER ON QUALITY AND QUANTITY OF RUNOFF (BY WATERSHED)
- H) IRRIGATIONS IMPACT FOR PRESENT AND FUTURE USES (OVER 1,000/TNSP.)
- I) EFFECTS OF DITCH SYSTEMS ON WATER QUALITY AND QUANTITY
- J) POLLUTANT SOURCES, RELATION TO PRESENT AND FUTURE WATER AND LAND USES
- K) SPEC. GEOLOGIC CONDITIONS AND RELATION TO PRESENT AND FUTURE WATER AND LAND USES
- L) WETLANDS AND RELATION TO PRESENT AND FUTURE WATER AND LAND USES
- M) ADEQUACY AND ENFORCEMENT OF EXISTING FLOODPLAIN ORDINANCES
- N) ADEQUACY AND ENFORCEMENT OF SHORELAND ORDINANCES
- O) IMPORTANCE OF WATER-BASED RECREATION LANDS FOR PRESENT AND FUTURE USES
- P) IMPORTANCE OF FISH AND WILDLIFE HABITAT FOR PRESENT AND FUTURE USES
- Q) UNIQUE FEATURES AND SCENIC AREAS RELATION TO PRESENT AND FUTURE WATER AND LAND USE
- R) EXPECTED CHANGES TO SURFACE OR GROUND WATER AND RELATED LAND RESOURCES



*The Snake River has "some of the wilder and more scenic river environment in Minnesota"
-Dr. Thomas Waters Professor of Fisheries University of Minnesota*

Snake River Watershed Facts

At 1,010 square miles or about 646,384 acres, the Snake River Watershed is one of the larger tributaries to the St. Croix River (see map of the Snake River Watershed see Figure 1). There are six counties with land and surface waters encompassed within the Snake River Watershed: Aitkin, Chisago, Isanti, Kanabec, Mille Lacs and Pine. (A breakdown of the watershed by county is shown in Table 1). For a length of about 100 miles, the Snake River drops over 500 feet from its original headwaters in Solana State Forest to where it empties into the St. Croix River in Chengwatana State Forest. The original headwaters in Solana State Forest has an elevation of about 1,360 feet above sea level and the mouth of the river drops to an elevation of 800 feet where it flows into the St. Croix River, however, much of that drop occurs at the upper and lower reaches, leaving the middle stretch as a relatively gentle stream (see Figure 2).

The Snake River varies in width from 20 to 250 feet. Some of the steepest gradients in the River are found between McGrath and the bridge east of Woodland in Kanabec County, where the River flows through two granite gorges known as the Upper and Lower Falls of the Snake River. The upper Snake, is dotted with rapids/falls ranging from Class I to Class IV depending on water levels.

Table 1			
% Area of Snake River by County		Acres of Snake River Watershed in each County	
Aitkin	20.33 %	Aitkin	130,200
Kanabec	48.00 %	Kanabec	307,360
Pine	20.33 %	Pine	130,160
Mille Lacs	9.90 %	Mille Lacs	63,400
Isanti	1.34 %	Isanti	8,562
Chisago	0.10 %	Chisago	600

Land Use in the Watershed

The upper half of the Snake River Watershed is still relatively wild and largely forest covered, with much of the lower half being cleared for agriculture, used for farming, pasture and forage production. With a high degree of variability in its topography, geology, and drainage capacities, the Snake River Watershed is very complex in terms of a common description or definition. This variability poses a challenge in determining or defining water quality conditions within the watershed, but also helps explain the range of existing conditions. About 47 percent of the watershed is forest covered. It is assumed, but not substantiated, that these areas are a relatively small source of nutrients, except where forest management BMP's are not implemented. Approximately, 35 percent of the land resource is used for farming. Farming is mainly concentrated in the southeastern third of the watershed, but is scattered throughout the rest of the watershed as topography and soils permit. Table 2 lists the percentage of area in the watershed with varying land use descriptions as determined by the Minnesota Land Management Information Center in 1969 and later in a period between 1990-1996. Figure 3 shows the results of the 1990-96 LMIC study graphically.

Table 2			
1969 Minnesota LMIC Land uses in the Snake River Watershed		1990's Minnesota LMIC Land uses in the Snake River Watershed	
Land Use Description	% Area	Land Use Description	% Area
Forested	56.63	Forested	47.27
Cultivated	13.87	Cultivated	12.43
Pasture	22.18	Pasture	22.45
Marsh	5.08	Marsh	14.02
Water	0.94	Water	1.77
Urban	0.61	Urban	0.92
Rural	0.54	Rural	1.01
Extractive	0.02	Extractive	0.11
Unclassified	0.14	Unclassified	0.02
Total	100.00	Total	100.00

Slope in the Watershed

The majority of the land surfaces in the Snake River Watershed are relatively flat in fact, 97 % of the Snake River Watershed has a slope less than 4 percent. As slope increases, so does the likelihood of erosion. In the Snake River Watershed, areas of highest slope are often within close proximity of a water body and are therefore, of high concern for protection against disturbances that would increase the rate of erosion. When considering the steepness of land within 1000 feet of a stream or river, 30 % of that area has a slope between 4-12 %. The percentage of area for varying classes of slope within 1000 feet of a stream or river in the Snake River Watershed is identified in Table 3. The calculations in Table 3 assume that an area within 1000 feet with a slope less than two percent is flood plain and therefore not used as part of the calculation. Figure 4 shows the topography of the Snake River Watershed.

Table 3	
Slope Class	Percent Area
2 - 4 %	69.38 %
4 - 6 %	20.11 %
6 - 8 %	7.03 %
8 - 10 %	2.48 %
10 - 12 %	0.77 %
12 - 14 %	0.19 %
14 - 17 %	0.03 %
17 - 19 %	0.005 %

Upper Snake River

The Upper Snake sub-watershed is the only minor watershed of the Snake River found in Aitkin County. Two small branches of the Snake River join together near the town of Pliny, to form the

main stem of the Snake River. Land in the upper watershed is predominately forested and undeveloped. Both headwater branched are narrow and shallow, and in the first half of this reach, each have low discharges. In the Upper Snake River, the first 30 miles of stream flow has variable width ranging from 3 to 85 feet wide, with its valley being from 25 to 600 feet wide. River bottom in the upper part is reported as ranging in size from ledge rock to cobbles and sand. The upper portion of the river is tea-stained due to the flowing from or through bog sources, making for relative lack of aquatic vegetation, believed due to the lack of light absorption through the dark water.

Sandy River Watershed

GENERAL INFORMATION

Big Sandy Lake is located approximately ten miles north of McGregor, Minnesota in Aitkin County. It is the largest body of water in the McGregor Lakes Region. Four main rivers feed the lake: the West Savanna River from the north, the Prairie and Tamarack Rivers from the east, and the Sandy River from the south. Of these rivers, the Prairie is the longest, traveling approximately 30 miles from its origin.

The Big Sandy Lake Watershed includes portions of Aitkin, Carlton, and St. Louis counties. It extends eastward from the Mississippi River approximately 26 miles, and is approximately 18 miles wide in the north-south direction. The watershed is large, about 260,000 acres relative to the surface area of the lake (4162 acres). The entire watershed is located within the northern lakes and forest ecoregion.

BIG SANDY LAKE-LOOKING BACK, LOOKING AHEAD

MAN'S IMPACT ON BIG SANDY LAKE

Big Sandy Lake is the largest body of water in the McGregor Lakes Region where over 200 lakes remain as relics of the glacial age. Except for a few islands, an area about 50 miles long by 25 miles wide was covered by the water of Lake Aitkin for about a thousand years. Soon after the glaciers melted, the Mississippi River eroded Lake Aitkin's banks and drained the water. Although a lake basin was located at the site many thousands of years earlier, the current shoreline of Big Sandy Lake was probably established by nature between 2,000 B.C. and the time of Christ.

THE SANDY LAKE DAM

The first major cultural alteration in the shoreland topography occurred when the dam was constructed on the Sandy River at the outlet of the lake on the northwest shore. The original dam was constructed of timbers. Construction started in 1892 and was completed in 1895. A navigation lock was finished in 1896. Reconstruction on the dam using concrete was started in 1908 and was completed in 1911.

When the government dam was built at the outlet to the Mississippi, it caused the high banks of the lake to become eroded and reduced many of them to their present sandy level.

Today the U.S. Army Corps of Engineers regulates the water level in the Big Sandy Lake reservoir. Records of the Corps of Engineers indicate that the reservoir at an elevation of 1216.31 feet has a surface area of 9,400 acres and a shoreline of 56.5 miles. The watershed drainage above the dam is about 410 square miles.

THE FIRST OCCUPANTS

LOGGING IN SANDY LAKE'S WATERSHED

Logging began in the late 1860's in the Big Sandy Lake region. Horses and oxen were used to move logs to the rivers draining into the lake. Floating logs were directed down river by breakers, men leaping back and forth on the bobbing mass. James E. Murphy and many other loggers cut timber in the lake region during the period 1888 to 1912. His operations extended from one end to the other of the Prairie, West Savanna and Tamarack Rivers. Small dams (two on the Sandy, one on Tamarack, one on the Prairie and one on the West Savanna Rivers) from 4-12 feet high were constructed in streams to insure water for drives.

With logging came another of the many changes in the shoreland and possibly the water quality of the lake. For example, Greer described the following: "Oxen were largely used at first in all logging camps. Providing summer pasture for hundreds of head of oxen was a problem. When the winter's logging was over, the oxen were driven down to Sandy Lake, where they were branded and turned loose for the summer. In the summer of Murphy's arrival, there were more than five hundred oxen pasturing about the shores of the lake".

For about 60 years (1860-1920) logging was the predominant industry in the Big Sandy Lake region. "The firm of Bonness and Howe which was one of the largest in logging and which operated camps around Sandy Lake and McGregor for many years reached an all time production peak for any one firm in the region. In one winter they cut about three million board feet of logs from one section of land. In the early 1890's, they cut and banked in a single season thirty million feet of pine from the vicinity of the Tamarack River." Logging continues to be an important industry to the Big Sandy Lake region; however, cut timber is no longer transported on the lake and its tributaries. Forestry operations are regulated to minimize the impact of timber harvesting on water quality by following the DNR's Best Management Practices.

Steamboats and railroads brought supplies to loggers. Steamboats and horses were used to move banks of logs in a boom of 4 to 5 million feet from the entrance of the rivers to the dam where the logs were floated over sluiceways to the Mississippi River.

In 1891 before the first log dam was built on the Sandy River at Libby, heavy rains in the upper Mississippi region caused the river to back into the lake, carrying with it floating logs. Almost the entire surface of the lake was covered with timber. Three steamboats were engaged for the entire summer to tow the logs back to the main channel of the Mississippi River. With construction of the dam, movement of water could be restricted from entering or leaving the lake at the dam site. The navigation lock at the dam was converted to spillway in 1958. Prior to that time boat traffic carried supplies and tourists between communities on the Mississippi River and the lake.

SETTLERS AND TOURISTS

Most of the first settlers in the region came after the railroad was built in 1870 because northern Minnesota was no longer chiefly dependent on river transportation. The recreational potential of northern Minnesota lakes was recognized in the late 1890's and in the early 1900's. The stern wheel steamboat "Oriole" built in Aitkin in 1907 and 1908 provided a vital link between Aitkin, Big Sandy Lake, and Grand Rapids. By 1918 the Oriole's hull became unserviceable and the steamer was dismantled. The hull was purchased by a local resort owner who towed it to the west shore of Big Sandy Lake. It was renamed the "Ark" and used as a summer hotel until 1941 when it was demolished.

The number of resorts on the lake reached a peak in the 1940's and 1950's. Visitors came in large numbers to enjoy the beautiful scenery and excellent fishing and hunting. In the last three decades (1962-1992) the number of resorts declined from a peak of over 25 in the 1950's and 1960's to 4. These four resorts have a total of about 30 cabins. The other resorts have been sold to individuals. Cabins have been upgraded or demolished to established new year-around houses.

Since that time, development of Big Sandy's shoreline has continued. Many former resort cabins have been sold to individual landowners. During the period 1930-1992, shoreland lots were sold to individuals and many seasonal cabins and year-around homes were built. In 1982, records indicated that there were 724 seasonal homes and 144 year-around homes on the lake. Development in the decade (1982-1992) has been very active. An estimation of 15 new homes per year, all in the year-around group, would increase that number. Also many property owners have converted their seasonal cabins and added more space, making seasonal cabins into larger year-around homes. Combining an estimated 50 conversions and 150 new year-around homes increases the year-around group to about 344 and reduces seasonal homes to 674 for a total of 1018 housing units." Conversion of seasonal homes to year-around homes continues. In addition undeveloped lots are being sold and developed for year-around homes or seasonal cabins. This continued development is of concern because the most desirable, and easily developed lots are already built upon. Lots with wetland areas or bluffs are now being developed for human use that may not be compatible with the landscape.

MISSISSIPPI RIVER WATERSHED

The Mississippi River flows through Aitkin County from northeast to southwest for a distance of approximately 100 miles.

Historically, culturally and economically the river plays an important role in defining the character of our north central Minnesota area. Native Americans and later European explorers knew and valued the river as a travel and trade route. Communities were established on the banks of this mighty river. Protection of this resource remains a high priority in Aitkin County's Comprehensive Local Water Management Plan and in the work plans of many groups and agencies referenced in this application.

A river inventory completed in 1999 by Aitkin County Soil & Water Conservation District identified numerous land uses that pose a threat to water quality and bank stability. Farmsteads and pasture areas have traditionally included unrestricted river access for livestock water and grazing of the riverbanks. Limited establishment of buffer areas has occurred during the past four years

Forestry makes up another significant land use in the Mississippi River corridor. Research has shown a link between improper forest management and degraded water quality.

The Aitkin County Shoreland Management Ordinance requires new agricultural or residential developments to preserve vegetative cover in riparian areas. Other federal, state, and local programs provide educational materials and incentives to restore natural conditions to previously altered shorelines

The Mississippi River has no equal in North America in regard to its importance both past and present. It flows more than 2300 miles from northern Minnesota to the Gulf of Mexico. It has served as a travel and trade route for countless Native Americans, it has served as a dividing line between territories, it has served as a trade route and access for exploration. It continues to provide recreational opportunities, drinking water, wildlife habitat, shipping routes, and hydroelectric power. Countless towns and cities have been established on the river's banks. This resource is of local, state and national importance. Protecting water quality in the beginning reaches of this great river will help to ensure safe, clean water for everyone living downstream.

Moose/Willow Watershed – This watershed encompasses a large portion of northwest Aitkin County. It is characterized by two main river systems. The Moose and Willow Rivers outlet to the Mississippi River. The watershed also has numerous small lakes, and large areas of forest and wetlands. The watershed includes portions of Itasca and Cass counties.

St. Louis Watershed – This watershed contains a relatively small part of the county that is the headwaters of a large watershed that flows to Lake Superior. In Aitkin County this area is almost entirely publicly owned with extensive wetlands and a largely un-maintained drainage system.

Pine River Watershed – The Pine River Watershed begins in Aitkin County but includes only a small part of the county. Land use is primarily related to forestry and recreation with several lakes.

Assessments of Data

COMMUNITY

UTILITY

DISCHARGE TO

AITKIN	WATER AND SANITARY SYSTEM	MISSISSIPPI R.
HILL CITY	SANITARY SYSTEM	HILL LAKE
PALISADE	WATER SYSTEM	
MCGREGOR	SANITARY SYSTEM	
TAMARACK	SANITARY SYSTEM	

The lack of wastewater treatment across most areas of the County means that individual on-site sewage treatment systems and water supply wells are needed.

LAND OWNERSHIP

Land ownership is commonly categorized as public or private. Private ownership would include residential properties, industrial or commercially owned lands, or any land owned by a private individual or group. Public land is that land owned by a unit of government, whether it is the local city or township, the County, the State, or the Federal Government. Aitkin County contains large areas of public lands. A lower population density creates less private ownership demand on available lands. Private land ownership, however, is quite noticeable along the many lakeshores. Many small tracts of land can be found along these shorelines, also indicating a higher developmental density. Away from the lakes, parcels 40 to 120 acres in size are common.

Lands throughout the County are under the management control of one or more units of government. The success of water management efforts that involve, or are along, lakeshores may be greatly dependent on the cooperation of private lakeshore property owners. These property owners and any lakeshore associations can be valuable proponents of water management efforts.

HYDROLOGIC INVENTORY

Introduction

Aitkin County has over 340 lakes of 10 acres in size or greater.

Surface Water Quantity

High, Mean and Low Flows

The high and low flows of surface water can result in areas of flooding and areas of no surface water flow at all. The Minnesota Department of Natural Resources, maps of protected waters and wetlands show very few intermittent streams. This means that surface water flow in Aitkin County is not seasonal, but rather, constantly flowing.

Surface water flow is primarily a function of runoff, but groundwater seepage does contribute to stream flows as well as lake levels. The U.S. Geological Survey has estimated surface water runoff across the State. This runoff is expressed in inches for dry, normal, and wet years. These years were determined by the 75th, 50th, and 25th percentiles of mean annual daily flows.

Mille Lacs Lake

Historic High (1944)-1253.87 feet above sea level
Historic Low (1937)-1245.74 feet above sea level

Farm Island Lake

Historic High (1986)-1255.98 feet above sea level
(Historic Low (1987)-1254.54 feet above sea level

Pine Lake

Historic High (1986)-1256.03 feet above sea level
Historic Low (1987)-1254.63 feet above sea level

Rivers with established protected flows:

River name: Rice River Protected flow: 50 cfs

Insert table from surface water committee

(Attached as an appendix)

Permitted Surface Water Withdrawals

Within the county, 65 state permits are in effect allowing withdrawal of water from the Mississippi River. Much of this appropriated water is used for irrigation purposes. A total area of 8157 acres is permitted for irrigation in Aitkin County. Three townships have more than 1,000 irrigated acres within their boundaries. These townships are: Morrison, Jevne, and Fleming. In each of these townships, the irrigated acres are used for the production of wild rice. These rice paddies are typically located in areas of relatively low population and water demand. It does not appear that the quantity of water used poses a threat to present or future land and water uses in these areas. If the area of irrigated acres for rice production is significantly increased, or increased near residential areas, conflicts could arise.

A number of water control structures are located in Aitkin County. These control structures are used for a variety of purposes including flood control, and the creation or enhancement of wildlife habitat. Table III lists the lakes or streams with control structures and the owner of the structure.

**TABLE III
LIST OF DAMS IN AITKIN COUNTY:**

LAKE NAME	OWNER
RABBIT LAKE	STATE
DAM LAKE	STATE

PINE LAKE	STATE
HANGING KETTLE	STATE
RIPPLE LAKE	STATE
HILL LAKE	STATE
WAUKENABO	STATE
MOOSE-WILLOW 1	STATE
MOOSE-WILLOW 2	STATE
WASHBURN	STATE
THOMAS DIGMAN	RUSSELL BRIGAN
CARROL HEFT	CARROL HEFT
HAMMOND POND	HENRY HAMMOND
SANDY LAKE	A.C.O.E.
RICE RIVER POOL	U.S.F. & W.
RICE LAKE POOL	U.S.F. & W.
RICE LAKE DAM 2	S.S.F. & W.
LITTLE WILLOW RIVER	STATE
LITTLE WILLOW RIVER WILDLIFE AREA	STATE
JEWETT WMA IMPOUNDMENT DIKE 2	STATE
JEWETT WMA IMPOUNDMENT DIKE 1	STATE
LITTLE HILL WILDLIFE IMPOUND	STATE
CORNISH FLOWAGE	STATE
BIG PINE	AITKIN COUNTY

Water Use Conflicts

Aitkin County has an abundance of surface water. This fact creates less of a demand on specific water bodies to provide the many amenities of surface water. However, the perception of abundance may allow uses or exploitations of surface water that may not be allowed, or possible, elsewhere.

Surface water pumping is also commonly used for wild rice irrigation. The runoff and percolation of agricultural chemicals may be a cause of surface and groundwater concern. Also, gravel pit withdrawals may be a source of groundwater depletion if groundwater seepage into the pit is significant.

In other cases, the popularity and status of surface water, as one of the County's most valuable resources, may itself cause conflicts as attempts are made to control or limit certain uses.

Groundwater Quantity

Observation Wells

Six groundwater observation wells administered by the Department of Natural Resources - Division of Waters, are located in Aitkin County.

Water levels have since rebounded from drought years in 1987 and 1988 and are relatively stable.

Water Quality

Surface Water

As previously stated, Aitkin County contains over 340 surface water basins over 10 acres in size. Any attempt to discuss the water quality of each significant water body would be overwhelming. This discussion will therefore provide a generalized overview of the factors that influence surface water quality, such as trophic status and nutrient levels, sedimentation, and acidity. When the available data provides additional information regarding other common surface water pollutants, these will also be included.

The Minnesota Department of Natural Resources has compiled water color and cause of color information for approximately 15 percent of these lakes. The color of a water body can be an indicator of numerous events that influence water quality. Among these, water color can indicate sedimentation, nutrification, and the impacts of specific land uses.

The term 'trophic status' refers to the nutrient content of a lake and the level to which these nutrients have resulted in biological growth, such as algal blooms.

Trophic status is commonly based on the three parameters of total phosphorus levels, secchi disk measurements, and chlorophyll-a. Phosphorus is often the limiting nutrient determining aquatic plant growths; therefore, an estimate of likely aquatic plant growth can be based on phosphorus levels. Secchi disks measure the clarity of the water that is a function of algal populations. Chlorophyll-a is a pigment produced by algae and is then a direct measure of the algae actually present in a water body. The trophic status is given as a value derived from the Carlson Trophic State Index (TSI). The greater the TSI value, the greater the trophic level. In general, a TSI value from 0 to 40 indicates an oligotrophic lake (low nutrients and low algae production), 41 to 50, a mesotrophic condition (medium nutrients and algae production), and greater than 50, a eutrophic lake (high nutrient levels and algae production).

MINNESOTA FISH CONSUMPTION ADVISORY

A Minnesota Fish Consumption Advisory is available for review on the MN Department of Health website. In May 1987

the report included 12 Aitkin County lakes and rivers. Almost exclusively, the contaminant found in certain fish tissue is mercury. The exact source of this mercury contamination is not known, but may have resulted from past water and land uses of cities and manufacturing facilities located upstream. Six of these advisories caution against long-term consumption of more than one meal per month. The fish species involved are most often northern pike, walleye, largemouth bass, and smallmouth bass. In addition to the lakes and streams listed, other lakes and tributaries connected could also be included in the advisory.

Additional water quality data does not comprehensively cover the County, but some is available from the STORET system through the Water Quality Management Program by the Minnesota Pollution Control Agency. This data pertains to fecal coliform and dissolved oxygen, contents, and ph (acidity) levels in selected stream locations.

Fecal coliform data has been measured along the Mississippi River at the City of Jacobson in Aitkin, County. These bacteriological contaminant indicators have been found in extreme ranges, particularly at Jacobson, where they have gone from 10 to 5,400 parts/100 ml. No explanation is given for such extremes in measurements. In all these locations, however, their median measurements have only been from 20 to 35, with ranges from 4 to 390 along the Mississippi in Aitkin County.

Dissolved oxygen has been measured in similar locations along the Mississippi River.

Lake basins begin to thermally stratify by late spring, which tends to inhibit complete water circulation. This deprives the cooler bottom waters of the oxygen provided by surface water mixing and vegetative photosynthesis. The upper lake waters often contain much more dissolved oxygen than the deeper waters.

At this time, no reports or other information available has described concerns over water quality due to fish kills, chemical spillage, or other specific events or continuous conditions.

Groundwater

In Aitkin County, some limited groundwater quality information has been compiled by the testing of private wells throughout the County. The tests were made to determine nitrate-nitrogen levels and to detect the presence of coliform bacteria. High nitrate levels in drinking water can be a health threat, especially to infants, and young livestock. The presence of any coliform bacteria is considered to be unsafe.

Generally, the most commonly found pesticide in groundwater throughout the state was atrazine. Alachlor was the next most commonly occurring compound. The report also notes that while pesticides were often found in groundwater, their concentrations were usually low.

In summary, the contamination of shallow and unconfined aquifers that provide local and potable water supply often originates from surface land uses. These include the use of pesticides and fertilizers in geologically sensitive areas, leachate from improperly designed or installed septic systems, and the pollution of surface waters. Aitkin County does not appear to have a serious groundwater quality problem. However, available data is limited and definite conclusions should not be drawn without further groundwater monitoring.

SPECIAL LAND USES AND CONDITIONS

Erodible Soils and Sedimentation

Virtually every soil in Aitkin County exhibits at least a medium susceptibility to either wind or water erosion, and the potential of wind erosion would appear to be the most obvious concern. However, wind erosion is less often a source of water body sedimentation than is water runoff. Runoff carries the silt and sediment picked up directly to surface water bodies. Also, Aitkin County is well covered by woodlands and other natural vegetation, and wind erosion is more of a problem in highly cultivated or other areas where soils are often exposed. The extent of sedimentation occurring in the County is then more likely a result of surface water runoff.

Irrigation

The total permitted acreage of irrigated land in Aitkin County is 8157 acres. County-wide, 63 water appropriation permits have been issued for irrigation. Of these 63, 10 have been terminated, 1 has been abandoned, and 1 is active not under permit.

Drainage Ditches

There are about 600 miles of public drainage ditches in Aitkin County shown on Map 6. These are briefly discussed in the Geology and Water Resources section of this report. In addition to these ditches, the County is drained by its extensive system of lakes and streams.

OPEN DUMPS AND SANITARY LANDFILLS

Aitkin County has many closed or discontinued open dumps and has no operating sanitary landfills. The two landfills that were previously in operation are currently closed. Aitkin is now sending its waste to landfills in the surrounding counties. Aitkin County has no hazardous waste disposal site.

Without proper cover materials and monitoring, leaching and groundwater pollution can continue even after closure of a dump. The management practices and pollution by these dumps may be a continued source of concern. Many dumps do not have monitoring wells to detect any groundwater contamination.

MPCA Feedlot Registration

About 50 landowners registered under the MPCA Feedlot rules in 2001 and early 2002. It is likely that less than 50 properties will meet the feedlot criteria. This information will become available upon completion of the county feedlot inventory.

Feedlots may pose a water quality threat to both surface and groundwater. Runoff can carry nutrient and bacteriological pollutants to nearby surface water bodies. Groundwater pollution can occur from the percolation of these pollutants through the soil.

UNDERGROUND STORAGE TANKS

Underground storage tanks may be significant contributors of groundwater contaminants if they are leaking into surrounding soils. A list of underground storage tanks in Aitkin County, larger than 1100 gallons, is available from the MPCA.

Abandoned wells

A water planning cost share program to seal abandoned wells has been in place since 1999. A state licensed driller seals the well and the landowner submits vouchers to the SWCD for cost share.

Hazardous Waste Generators

A list of hazardous waste generators is available from the MPCA.

Special Geologic Conditions

There do not appear to be noteworthy areas of environmentally sensitive geology (Karst areas, caves, etc.) although local or site-specific sensitive areas may exist. Sensitive areas previously discussed would include the sandy outwash plain in the southern and southeastern areas of the county, and the artesian areas north of the city of Aitkin. Much of the County is overlain by glacial drift material of varying depths.

FORESTRY

Timber harvesting has been a large part of Aitkin County's history since before 1900 and has had significant impacts on our economy and environment since that time. Early logging was based on "taming the wilderness" and producing maximum economic benefits to the timber industry enabling the growth of the County and the Nation. In the past several decades, forestry has taken a management approach considering current and future timber supplies to promote our economy while recognizing other forest values such as water quality, wildlife habitat, and recreation.

Over 60% of the land in Aitkin County is considered "commercial forest land", which is forestland capable of producing commercial forest products. Virtually all forest management activities, including timber harvesting, occur on this type of land...

Potential impacts to water quality through forest management were outlined in the original water plan citing information from documents published by Leon S. Very, Principal Forest Hydrologist USDA North Central Forest Experiment Station, it was stated in the original water plan, that “Data does not exist for Aitkin County to predict if these (forest management) impacts have had a positive or negative impact on specific water resources.” In the years since the original plan was developed, several factors have contributed to the information base to allow us to better qualify what impacts forest management may have on water quality in Aitkin County, including.....

- a. implementation of BMP’s to protect riparian zones
- b. the percent of the watershed harvested
- c. the harvest intensity (clearcuts vs. selective cut)
- d. season of harvest
- e. soil characteristics of the harvested site
- f. regeneration of the site

Using these guidelines we can begin to assess the impacts of forest management in Aitkin County on public forest lands that comprise 64% of the commercial forestland in the County.

A. Best management practices (BMP’s) have been routinely implemented on public lands in Aitkin County, to protect water quality. Field audits have indicated an 87% compliance rate during the first three years, with over a 90% rate for filter strips which are areas adjacent to water bodies designed to trap sedimentation from a timber harvest area. The areas needing improvement are water crossings and drainage, depositing a 20% to 40% increase is expected.) These figures are county wide covering several watersheds, but because of slash and forest road rehabilitation, the majority of deviations were minor and through better education and understanding of the guidelines, these categories should improve in future years.

B. On public lands, 16% of the upland forests are age 15 or younger, an average rate of 1.1% clearcut acres per year. This percentage is well below the limit of 60% listed previously and the clearcut rate would have to more than triple in the next 15 years to approach the limits outlined by Mr. Verry, which is unlikely (with the current and proposed timber industry expansions about of the disbursed nature of timber harvesting sites, none of the major watersheds in Aitkin County should be at or near the 60% level of young forest.

C. Clearcutting upland forests such as aspen, birch or jackpine is necessary to regenerate these forests because of their need for nearly full sunlight for growth. Because of their relatively short life span, (40-60 years) and current imbalances in the age classes of these forests, an accelerated harvest has been required to maintain these important forest types. Wide spread clearcutting has the potential to increase runoff and sedimentation if too much of the watershed is harvested over a given period. Aitkin County is fortunate to have a significant area of forest types in hardwoods (maple, basswood, oak) that have long rotation ages (80-120 years) and may be managed selectively. These forests make up about 30% of the upland acreage and may be harvested selectively maintaining greater than 75% of the forestry canopy intact, and harvests can occur every 10-20 years throughout the life of the forest stand. Selectively harvested forest stands, because of the closed forest canopy, and the fact that they are generally harvested in winter, don’t experience the dramatic increases in runoff as do clearcut stands. Due to increased demand for forest products

from these stands and increased expertise by foresters on managing these forests, selective harvesting has shown a steady increase in application, for example in 1990, on county lands, selective harvests accounted for 18% of the total harvested acres. In 1994, they accounted for 31% of the total harvested acres (an increase of 260% in upland hardwood acres selectively harvested) this trend should continue into the future.

D. Harvesting timber during the winter months (Nov-March) has advantages to maintaining water quality, because frozen ground conditions and snow cover protects soil from damage by logging equipment and allows access to forest stands across wetland areas without damaging them. Approximately 60% of the timber harvest in Aitkin County occurs during winter months, while less than 10% occurs during the saturated soil period of April through June. The balance of harvesting occurs in late summer and early fall when precipitation that does occur is evapotranspired by trees in the forest drying out the soil fairly rapidly. On public land, timber sale regulations may (and often do) restrict the seasons where active harvesting may take place to protect sensitive soils and the residual stand, enhance regeneration and other values (eagle nest, etc.).

E. Harvest sites are selected to a large degree by general soil characteristics. Organic soils or soils with a high water table are harvested in winter and well-drained soils may be harvested in the summer months. This general rule works well most of the time, however some soil types are difficult to judge in the field and sometimes soil damage can occur on certain soils during unusually wet periods or winters without deep frost. These instances are fairly rare and the damage is usually a small portion of the harvest area. Computerizing the soil survey data into a mapping system would be a great benefit to foresters planning harvest activities, giving them a tool to better identify soil types. Greater flexibility in wood procurement by the forest industry would allow loggers to “shut down” during unusually wet periods without loss of income.

F. On public lands in Aitkin County virtually every acre harvested is regenerated either naturally or artificially (seeding or planting). Damage to the soil from timber harvesting not only can affect water quality, but the forests ability to regenerate, so foresters on public land make sure that soil damage is kept to a minimum. In some cases harvested stands are converted to another species that may be more valuable or rare in the area, and is suitable for the soil type. Much of this conversion is done through tree planting, and a site must be prepared to give the seedlings a head start against competing vegetation. There are two types of site preparation-chemical and mechanical. Although sometimes controversial, chemical site preparation using herbicides may be the best system when looking at water quality. Applicators must be annually licensed by MDA and the herbicides approved for use in forestry with detailed instructions for use and disposal on the label. Application rates are generally much lower than for agricultural uses and are applied to the site only once or twice every 50 to 100 years. Mechanical site preparation is a useful and proven method, but tends to expose large areas of mineral soil, increasing erosion and sedimentation potential for a number of years. Both practices are addressed in the BMP's for water quality with specific guidelines to protect water quality. Mechanical site preparation such as rock raking, and disking do tend to expose large areas of mineral soils, but other methods like patch scarification, and disc trenching expose a smaller amount of mineral soil, thus lessening the chance for soil erosion. These methods also leave woody debris and most of the ground cover intact, which aids in erosion control.

Public forest management agencies have made great strides to incorporate practices that protect water quality in the past several years. This water plan should encourage continuing improvements on specific practices to protect water quality and promote the use of tools to enable agencies to accomplish more detailed watershed and soil type analysis when planning forest management activities.

Over one third of the commercial forestland in Aitkin County is in private ownership and there has been a noticeable increase in timber harvesting on these private lands in recent years. The majority of the land is owned by non industrial private forestland owners (NIPF) and consists of relatively small parcels of 40 to 120 acres. Although BMP compliance on NIPF lands has been fairly good, it is below that of public or industry lands. Several agencies and groups have held workshops and field tours promoting BMP's for landowners and loggers, and have shown some success, but more has to be done. The Water Plan should support agencies and groups such as Department of Natural Resources, Mississippi Headwaters Board, Private Woodlands Committee, Forest Advisory Committee, and lake associations to promote and educate NIPF owners on appropriate practices such as BMP's and encourage workable incentives for landowners to apply these practices. Private forest inventory data should be periodically updated and incorporated in a computerized mapping system that is compatible with public forest inventory data so private and public forestland owners have the ability to work together on planning forest management activities to promote water quality and other forest values.

FOREST HARVEST IMPACT ON WATER QUALITY

Timber harvesting is, by nature, a disturbance to the forest and the landscape. As such, it could affect sedimentation, nutrient loading, changes to key aspects of the aquatic environment, and the amount, duration, and timing of runoff. The degree to which a given disturbance represents an impact is a matter of scale. For example, few if any landscape modifications associated with timber harvest will be detectable in large rivers such as the Mississippi. As one progresses further upstream, the probability of detecting impacts increases as changes outside of the identified standards and tolerances become more noticeable.

Application of the study significance criteria to the impacts identified indicates that the effects of timber harvest at the ecoregion level will not cause significant impacts. However, there will be a series of changes in the landscape and water resource. Most of these changes will be relatively local and short-term. Timber harvest that complies with Minnesota BMP's will have significantly fewer local water resource impacts than timber harvest carried out in the absence of such practices.

Draft wetland goals

1. Project Summary

Develop and implement a wetland plan that would protect Aitkin's 544,000 acres of wetlands. Our first goal is to organize and synthesize a myriad of data and put it into a format that can be used by resource managers and policy makers. Secondly, utilize this data to create a function and value assessment model to guide implementation of the wetland plan and ordinance.

Components of the Aitkin County Wetland Plan are directly related to the Aitkin County Comprehensive Land Use Management Plan (April 2000,p. 30-32) and the Aitkin County Comprehensive Local Water Management Plan (December 13, 1995, p. 56-57):

- the County should adopt a wetland comprehensive plan that would provide a standard method of ranking each wetland for each of the functions and benefits it can provide under state law
- the County should adopt an official wetland map
- the management goals and policies of each zoning district shall guide the wetland management goals and management priorities of each wetland in each zoning district
- this wetland management process shall be administered as part of the zoning and subdivision process
- A representative sample of each wetland type needs to be protected as a museum for future generations.

2. *Desired Outcomes*

Products include:

- a) A digital spatial database of wetlands, hydric soils, archaeological sites, and sensitive wildlife areas to be overlaid on color infrared photography (DNR 1999).
- b) A resource protection model based on the above listed spatial data and resource criteria rankings established by a 27-member citizen's group and interagency panel.
- c) The Aitkin County Comprehensive Wetland Protection and Management Plan and County Ordinance that works with the goals established by the MN Wetland Conservation Act but is tailored to the resources and situations found within Aitkin Co.
- d) Identification and evaluation of potential Wetland Protection Areas (WPAs) within Aitkin. Note: Currently, no WPAs have been established in Minnesota.

3. *Actions*

Inventory: Complete a comprehensive inventory of wetlands by classification type integrating field data from countywide ecological research. Geo-reference 1999 color infrared photography to provide resource managers with a spatially corrected GIS layer. Existing digital aerial coverage to be corrected by Pro-West & Assoc., Inc. Additional spatial database of resources will to be collected and compiled by the Aitkin County Land Office and GIS coordinator.

Analysis: Using ArcView software, the Aitkin County GIS Coordinator will integrate elements of the digital database into layers that may be used to develop a practical resource model.

Public Discussion: A panel of citizens and interagency personnel are currently meeting monthly to determine the goals, priorities, and ranking of factors to be placed in the model. Parameters are to be extrapolated from digital data sources include aerial photographs and spatial data sources.

Policy and Ordinance: Under the lead of Environmental Services, an ordinance will be drafted incorporating policy discussion, resource modeling, and spatial data information.

Wetland Protection Areas: Aitkin County Soil and Water Conservation District and Environmental Services will identify potential priority areas and potential sites that may become part of a Wetland Protection Area.

Floodplains

Areas of the base (100-year) flood have been identified by the National Flood Insurance Program. These floodplain areas are represented on Flood Insurance Rate Maps (F.I.R.M.) as of March 15, 1982.

It should be noted that areas of periodic soil saturation and flooding are likely in numerous locations in addition to those identified on the Flood Insurance Rate Maps. Along virtually any drainage course there will be high water levels that may extend beyond the established drainage channel and onto adjacent lands.

The presence of floodplain alone does not create a flooding problem. Such a problem is created when the periodic flooding represents a threat to people or property. Aitkin County operates under a Flood Plain Management Ordinance that is administered by the Aitkin County Zoning Department. Copies are available from the Zoning office at the County Courthouse. A copy of the Flood Insurance Rate Map is available for examination at the Zoning Office at the Aitkin County Courthouse.

Shoreland Classification

The Minnesota Department of Natural Resources has given many of the State protected waters a shoreland classification that reflects the developmental sensitivity of the water bodies. The three shoreland classifications have State established standards for development and land use along the shorelines. These standards are implemented at the local level by adopted shoreland ordinances that must be at least as strict as the State standards. These classifications are termed Natural Environment (NE), Recreational Development (RD), and General Development (GD). Natural Environment waters are the most restrictive to shoreland development because they must protect the quality and resources of the lake or stream. Recreational development waters are less restrictive and can accommodate higher density developments. General development waters are the least restrictive and allow more intensive developments. In general, the standards established encourage low density residential, agricultural, and recreational development and discourage commercial, industrial, or high density residential developments.

In Aitkin County there are 184 water basins given a shoreland classification. There are 134 Natural Environment lakes, 46 Recreational Development lakes, and 4 General Development lakes. Appendix A 'Table of Lake Information' includes the shoreland classification for county lakes.

LIST OF DESIGNATED TROUT LAKES AND STREAMS

LAKES		T	R	S
BLUE	46,47	27	(3-4-33-34)	
TAYLOR	52	25	16	
TOWNLINE	50 22	(7-12-13)		

STREAMS

LONG LAKE CREEK (DAM BROOK)	46	25	(10-14-15)
MORRISON BROOK	52	26	(4-9-10-15)
TWO RIVER SPRINGS	51	24	(24-25-26)

Recreational Resources and Public Access

Outdoor recreational facilities and the many natural amenities of the County are important components of the tourism industry and local lifestyles. County, State, and Federal forest land is predominant. These naturally managed areas provide for wide areas of recreational opportunity. Sightseeing, camping, picnicking, hiking, hunting, fishing, trapping, snowmobiling, and cross-country skiing are all forms of recreation that can take advantage of these natural areas. The many surface water lakes and streams provide an abundance of areas for water-based recreation. Appendix A ‘Table of Lake Information’ indicates which lakes have public access.

In order to promote and provide water-based recreation, public access to County lakes and streams has been provided at 49 locations. These access sites are well distributed throughout the County and appear to provide access to most significantly sized water bodies. There are two types of public water accesses found. The first are carry-in accesses that allow canoes and other smaller boats to launch but have no facility for trailers to launch larger boats that cannot be carried. These access sites are often along streams and smaller lakes that may only be able to accommodate smaller boats. The second type of access is for boats and trailers. These access sites accommodate larger boats that must be launched from a trailer and are generally located on larger lakes. The ramps constructed may be made of different materials.

ASSESSMENT OF UNIQUE FEATURES AND SCENIC AREAS

Aitkin County has hundreds of lakes, streams, and wetlands. The county also has thousands of acres of forested land much of which is open to the public for recreation. Unique features and scenic areas would include hundreds of miles of maintained snowmobile and cross-country ski trails, many county and state parks, almost unlimited opportunities for fishing, hunting, bird watching, etc. Some specific scenic areas are: the Rice Lake Refuge, the Savanna portage, the continental divide, Mille Lacs lake, the Mississippi River, and many other features and areas too numerous to mention. Increased promotion and use of these natural resources would benefit the residents of the county by bringing in tourism dollars, and could be accomplished without a negative impact on the resources.

A list of rare plants, animals, and natural features found in the county has been compiled by the Department of Natural Resources and is provided below.

- Colonial Waterbird Nesting Site
- Sandhill Crane
- Bald Eagle
- Osprey

Blanding's Turtle
Red-Shouldered Hawk
Vasey's Pondweed
Sharp-Tailed Sparrow
Yellow Rail
Wilson's Phalarope
Small Yellow Water Crowfoot
Bog Copper
Upland Sandpiper
Great Gray Owl
Dragon's-Mouth
Ram's-Head Lady's Slipper
Frigga Fritillary
Dorcas Copper
Jutta Arctic
Club-Spur Orchid

EXPECTED CHANGES TO PHYSICAL ENVIRONMENT, LAND USE AND DEVELOPMENT

The agricultural industry has declined somewhat and it is anticipated that current levels will continue. Most farms will continue to have livestock as the main source of income for the farm.

Tourism is an important economic component of Aitkin County. It is anticipated that the tourism industry will grow and will continue to be an important component of the economy of Aitkin County. Development pressure on Mille Lacs Lake is anticipated to continue with increasing pressures on the demand for good water quality on this lake.

With the increasing population rate, we do anticipate higher demands on municipal water or wastewater systems that are currently located within the County. It may be anticipated that with lakeshore development, there may be an increase in the need for community wastewater treatment systems in the long-term future.

IMPLICATIONS AND ASSESSMENTS OF WATER AND LAND USES

Surface Water Quantity Assessment

The abundance and availability of surface water is a major asset to Aitkin County. With nearly 300 water bodies over 10 acres in size, the County has an enormous amount of available surface water supplies. The natural drainage pattern is extensive and most streams are permanently flowing. Currently, the highest water use is located in the central and southern parts of the County, specifically, in relation to the production of agricultural crops with the predominant water using crop being wild rice. No water use or water quantity conflicts have been identified within the

County; however, concerns have been raised about the quality of water for wild rice production being discharged into area lakes and streams.

High water level problems have been documented in certain lakes in the southwest part of the County, as well as in the Big Sandy Reservoir that is controlled by the Army Corps of Engineers. Flooding has been a major problem within the County and has been primarily restricted to the Mississippi River watershed. As identified in the inventory, approximately 30,000 acres of land were inundated by floodwaters in the 1950s. It is not anticipated, however, that increases in floodwater levels would occur as a result of land use changes in the County.

GROUNDWATER QUANTITY ASSESSMENT IMPLICATIONS

Aitkin County has adequate amounts of groundwater available for use throughout the entire County. An extensive supply of surficial aquifer water for municipal and agricultural uses is available. Recharge of these systems is extensive throughout the County but is most predominant in the areas of outwash plains and the peat bogs located in the central part of the County. Crystalline bedrock underlies this surface material and cannot be depended upon for adequate supplies of either municipal water sources or agricultural production purposes.

The primary use of groundwater is for public water supplies and to a lesser extent, agricultural production. These uses are located in the major developed areas of the County that will include Aitkin, McGregor, Hill City and other municipalities.

There have been no documented groundwater use conflicts within the County. Because of the abundance of surficial aquifer water, well interference problems have not been noted. Areas highly susceptible to groundwater contamination include those areas located immediately south of Aitkin, near McGrath, north of McGregor, and immediately south of the Big Sandy Reservoir. It should also be noted that the area immediately north of Aitkin is a major groundwater discharge area where springs and artesian wells are very common. It does appear that if specific municipal water supplies do become contaminated, there would be alternative water sources available within the immediate vicinities of each community.

SURFACE WATER QUALITY ASSESSMENT

Separate land uses can be identified as predominant contributors to water quality degradation in different parts of the County. Lakeshore and municipal developments may provide a source of nutrients through either wastewater treatment systems or individual septic systems.

In the central portion of the County, in the Upper Mississippi River Basin, wild rice production has possibly contributed nutrient and sediment loading to several area lakes. Also located in this section, lakeshore development has contributed to this increase in eutrophication.

In the southwest corner of the County again in the Upper Mississippi River Basin, eutrophication of specific lakes is in direct relation to lakeshore development and improperly functioning septic systems, as well as to a lesser extent, agricultural production activities.

Sampling, secchi disc readings and lakeshore owners surveys have been taken on approximately 15 percent of the County's lakes.

Based on the land use information received to date, water quality changes may be expected if anticipated lakeshore developments are not carefully planned and septic systems properly installed. Set backs from the shoreline should be enforced and variances granted rarely, if at all. The soils of a particular building site should be evaluated for suitability for septic tanks and drain fields, and based on the soils information, proper systems should be installed. Another possible water quality impact may be the increase in forestland harvesting which will affect the entire county. The majority of surface water pollutants from forest harvested land are primarily nutrients or sediments. These pollutants alone do not pose public health concerns but byproducts of these nutrients, i.e., algae, are a public health concern. Bacterial contamination has been limited to septic or feedlot sources, and in one instance, a municipal wastewater discharge source, and caused very localized problems but of no major areal extent.

Sixteen lakes do have fish consumption advisories on them relative

to mercury levels found in fish tissue. Sources of this mercury are currently unknown. These fish consumption advisories are a public health concern.

Local economic growth and tourism are potentially impacted by water quality. Tourism is an important industry in Aitkin County and its future is directly related to the condition of its surface water resources.

GROUNDWATER QUALITY ASSESSMENTS AND IMPLICATIONS

Generally, the quality of groundwater in the County is very good. Tests conducted by the Aitkin County Environmental Services indicate that less than 2 percent of all wells tested show nitrate concentrations in excess of 10 milligrams per liter (mg/l). Of concern is that nearly 13 percent of all wells tested did indicate the presence of coliform bacteria. Although pesticides were identified in two of the three municipal wells tested, no information was presented as to the concentration of these materials nor how those concentrations relate to the Recommended Allowable Levels established by the State. Locations of these wells were also not provided. No indication was given relative to the source of these materials. Sources may include agricultural operations; commercial suppliers or dealers of these products, or possibly lawn care products as well. It is assumed that the sources for nitrate contamination are either improperly functioning septic systems or possibly well head contamination sources.

Local County representatives and residents have indicated that the areas between Big Sandy and Lake Minnewawa may have ground water-related problems in relation to nonconforming septic systems. This is informal information and no specific data has been provided.

Most urbanizing areas in the County have been evaluated for problems with wastewater treatment in a 1975 MPCA report. Communities with identified wastewater problems have installed or updated their wastewater treatment facilities. Other possible sources of contamination will be discussed in the Implications of Pollutant Sources and following sections.

Lakeshore development impacts groundwater quality primarily from the standpoint of septic systems. Lakeshore properties in the past have typically been small acreages with private wells and septic systems. Many of the old systems were dry wells or undersized drain fields. With current Individual Sewage Treatment System (ISTS) standards adopted by the State and County, groundwater contamination is being prevented in new developments. Upgrading of old nonconforming systems is proceeding. Overall impacts are seen as being reduced as the old systems are upgraded.

Most of the domestic water supplies in the County are derived from glacial outwash or till plains, and are medium to highly susceptible to contamination. Little is currently known regarding the extent of groundwater quality degradation. It is generally thought that groundwater quality is acceptable, but specific sources, i.e., underground tank spills, etc., could cause widespread problems if introduced into the groundwater systems. This is especially true in the town or municipal areas within the County.

ASSESSMENT OF LAND USE AND LAND COVER'S INFLUENCE ON RUNOFF QUALITY AND QUANTITY

In assessing land use and cover's influence on runoff, we will look at the predominant land uses in the County and discuss in detail the current or potential impacts on surface water.

URBAN DEVELOPMENT (COMMUNITIES)

With community development, water resources are primarily impacted from three areas: increased surface water runoff; increased nutrient loadings from the change in land use; and increased nutrient, and possibly coliform loadings, from wastewaters.

Surface water runoff from a site converted from forested to urban can increase up to four times the volume depending upon the impervious percentage of land and the type of water conveyance system. With installed storm sewer systems, this change in land use may increase phosphorus annual loadings by 10 to over 200 times.

Wastewater generated from communities can have a dramatic negative impact on water resources. Installation or upgrading of municipal wastewater treatment facilities has greatly reduced municipal wastewater as a problem nutrient source for Aitkin County lakes.

URBAN DEVELOPMENT (LAKESHORE)

As with community development in incorporated villages, lakeshore development in Aitkin County impacts surface waters. Site-specific problems with sediment from active construction areas have the potential for significant loadings. Over-fertilizing of lawns for turf establishment and maintenance purposes may result in nutrient loadings. A third problem is that of accelerated lakeshore erosion caused by site accesses or changing of drainage characteristics. The most significant problem in relation to lakeshore development pollutant sources is septic systems.

In a lake assessment report conducted by the Minnesota Pollution Control Agency, phosphorus loading values of 1.1 to 2.2 pounds per capita per year were utilized. The amount of phosphorus generated from septic systems will vary greatly depending on a range of variables (depth to groundwater, groundwater flow direction, soils, distance from water body, etc.). The combined impact may represent 10 to 25 percent of the total phosphorus load in a given lake. For installation of new septic systems, the County requires installation by a County-certified contractor. All systems installed must be inspected by a representative of the County prior to soil backfilling of the system. This process ensures that new systems will meet County and State Codes. Non-conforming septic systems are another issue, however. The County has conducted efforts to identify non-conforming systems. Because of the extensive number of lakes involved, key lakes were identified and work was focused on these lakes.

RUNOFF FROM IMPERVIOUS SURFACE

AGRICULTURE

Agriculture as defined in the land-use inventory section, has a substantial effect on the quality or quantity of water in Aitkin County. With over 150,000 acres of land tilled, the potential for significant sediment damage from erosion is high.

For land under production, the Aitkin SWCD, USDA-NRCS and Extension, are currently doing a good job in assisting landowners in controlling erosion and minimizing sediment damage on pasture, and cropland.

ASSESSMENT OF POLLUTANT SOURCES

Special pollutant sources occurring in Aitkin County do have the potential to affect water quality. This is specifically true in the area south of Aitkin and areas adjacent to McGrath and McGregor. These areas are sandy outwash plain areas and are primary recharge for the surficial aquifers that supply municipal water. Pollutant sources of concern include leaking underground storage tanks and hazardous waste generators.

WETLAND CONDITION IMPLICATIONS AND ASSESSMENTS

Two different types of wetlands are located extensively in Aitkin County. The first is primarily a depressional-type wetland in the moraine areas throughout the County. These wetland bodies are relatively small in size, have no well defined outlet, and are located primarily south of Aitkin in the Culver Moraine Association, they also are quite extensive north of McGregor to the Swan River outlet. These wetlands generally have a very small drainage area and have very poor outlets. These wetlands generally do not provide large amounts of floodwater protection and provide limited water quality treatment because of their poor drainage characteristics.

The second major wetland class in Aitkin County is that associated with peatlands. Peatlands are extensive throughout the County primarily in the areas north of Aitkin near McGregor, north of Palisade to the northern Aitkin County border. The majority of these deposits are located in the Upper Mississippi River basin. These peatlands provide an extensive amount of floodwater attenuation as flows go out of bank on the Mississippi River. These peatlands also provide an extensive amount of water quality treatment, as by their nature they have extremely flat grades and slow water movement through them.

During the initial development of Aitkin County, peatlands and other wetland areas were drained via open ditch drainage systems. These systems were generally in place prior to 1970. These wetlands were originally developed for agricultural production purposes but because of severe drainage problems, few of these originally drained areas are currently under agricultural production. In the area between Aitkin and Palisade, an extensive amount of these peatlands were developed for wild rice production. Wild rice production in these peatlands accelerated into the 1970s but since then, has leveled off due to economic considerations. Records indicate that very few wetlands have been converted to agricultural production or other development since the early 1980s.

One potential opportunity for peat land use is the improvement in water quality. Many concerns have been raised in relation to potential surface water contamination of waters as a result of discharges from wild rice paddies. Because of these paddies' location near peat land areas, the discharge waters from the paddies may be filtered through peat land areas to improve downstream water quality.

As indicated by the inventory, flooding has historically been an extensive problem in Aitkin County. Significant measures were taken in the 1960s to provide floodwater control of cropland areas by the creation of the diversion channel north of Aitkin. Flood studies and Flood Insurance evaluations have been conducted on the main branch of the Mississippi River and have been incorporated into County-regulated floodplain zoning ordinances. Areas exhibiting flooding in the past are covered by these existing ordinances. It should be noted that since the installation of the diversion channel, the floodplain has not been re-evaluated for a 100-year flood event.

The Planning and Zoning Office in Aitkin County has done an adequate job in administering existing floodplain ordinances. Beside the re-evaluation of the floodplain areas in the Upper Mississippi River Basin, no other changes to these existing ordinances should be necessary.

As previously mentioned, Aitkin County has extensive areas of wetland within its boundaries. In general, Aitkin has an abundance of types 6, 7, and 8 wetlands, and a relative few wetlands of types 3, 4, and 5. See Appendix D 'Description of Wetland Types'.

Birds and animals that depend on shallow open water areas and the vegetation associated with these areas, are not found in the abundance that might be expected. There are some programs available through the US Fish and Wildlife Service and the County Agricultural Stabilization and Conservation Service, to create open water areas for wildlife habitat. This open water habitat appears to be quite valuable for waterfowl nesting, and as habitat for numerous other birds and animals.

ASSESSMENT OF THE ADEQUACY AND ENFORCEMENT OF SHORELAND ORDINANCES

Currently, all shoreland areas within Aitkin County are regulated through the Aitkin County Shoreland Management Ordinance. This 71 page document was adopted January 21, 1992 and amended May 22, 2001. All aspects of land use zoning are intended to be included in the ordinance. Sections included in the ordinance are:

Statutory Authorization
Policy

Jurisdiction
Compliance
Enforcement
Interpretation
Severability
Abrogation and Greater Restrictions
Definitions

Permits Required
Certificates of Zoning Compliance
Variances
Conditional Use Permit
Notifications to DNR and MHB
Conditional Uses

Shoreland Classification System
Land Use District Descriptions

Lot Area and Width Standards
Placement, Design, and Height of Structures
Shoreland Alterations
Placement and Design of Roads, Driveways and Parking Areas
Storm water Management

Special Provisions for:

- Commercial, Industrial, Public and Semipublic Uses
- Agricultural Uses
- Forestry
- Extractive Uses
- Mining of Metallic Minerals and Peat
- Rice and Cranberry Farms

Water Supply and Sewage Treatment

Construction of Nonconforming Lots of Record

Minimum Lot Area and Width Standards for Nonconforming Lots

Additions/Expansions to Nonconforming Structures

Nonconforming Sewage Treatment Systems

Types of Planned Unit Developments Permissible

Processing of PUD's

Application of PUD

Sites "Suitable Area" Evaluation

Residential and Commercial PUD Density Evaluation

Special Provisions: Mobile Home and Mobile Home Parks

Travel Trailer Park and Campground

Maintenance and Design Criteria

Conversions

Appendix I – Bluff Illustration

Appendix II – Shoreline Averaging Illustration

Aitkin County Planning and Zoning administers the ordinance and the Soil and Water Conservation District assists with field visits prior to development to assist landowners and ensure compliance with ordinances.

WATER-BASED RECREATION IMPLICATIONS AND ASSESSMENTS

Water-based recreational opportunities appear to be adequate for servicing the local population in heavy tourism periods. There are 49 public water accesses on Aitkin County lakes and rivers. These accesses are well distributed throughout the County and provide access to the most significantly sized water bodies. In the development of this document, there has been no public concern raised concerning a lack of water-based recreation or the need for additional public water accesses in the County.

The recreational lands and resources of Aitkin County are closely related to the natural environment and amenities found in much of the County. Management efforts to protect or improve these natural conditions also serve to improve their recreational value.

It is recognized that outdoor and water-based recreation is one reason to maintain or improve water-related land resources. The most obvious measure taken to protect these resources is through the present land use regulations and zoning designations of land throughout the County.

ASSESSMENT OF FISH AND WILDLIFE HABITAT

Aitkin County has abundant fish and wildlife habitat resources. Extensive efforts are being taken by State and Federal governments to manage fisheries and protect fish and wildlife habitat and populations for the future.

EXPECTED CHANGES TO SURFACE WATER, GROUNDWATER AND RELATED LAND RESOURCES

As identified in the Physical and Hydrologic Inventories of this plan, Aitkin County has more than 300 lakes and vast areas of wetlands. Demands upon these water resources for commercial/industrial usage is minimal. Agricultural production uses some water for the production of wild rice and other irrigated crop land. The forestry industry has virtually no surface water demands for production.

Many major issues relating to water quantity are present in the County. The first is the extent of areas subject to flooding and their impacts upon agricultural production. Because of the location and surface geology conditions of these areas, it is anticipated that flooding from major storm and snow melt events will continue to occur in Aitkin County. Existing floodplain zoning regulations should continue to be administered with special considerations given to re-identifying the 100-year floodplain elevation in the Upper Mississippi River Basin.

The public drainage ditch system is also of major concern in the County. Maintenance problems are extensive while the necessary capital and public interest to maintain them is limited. Special efforts on the part of the County will be necessary to manage these systems.

Further development of lakeshore properties through Aitkin County is anticipated in the future. This type of development can have major impacts on specific lakes if existing programs are not augmented with additional erosion and sediment control and nutrient control measures.

Forestry operations are expected to increase which may provide a continued increase of sediments and nutrients.

Groundwater issues in relation to use and quality have been relatively minor concerns in Aitkin County. No major increase in groundwater use is projected. Groundwater quality is good at the present time; however, most municipal sources of water come from surficial buried drift aquifers. These aquifers are highly susceptible to contamination from a wide range of possible contaminants. Sources may include above and below ground storage tanks, hazardous waste generators, landfills, abandoned dumps and other sources.

VII. TASK FORCE MEMBERSHIP

Following is a list of 1990 Task Force members and a current membership list:

1990 MEMBER	REPRESENTING
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STEVE GORECKY	USDA-SCS
LESTER KACHINSKE	AITKIN CO. PUBLIC HEALTH
GERALD WAMBACH	MN DEPT. OF HEALTH
JIM SAYRE	AITKIN CO. PUBLIC HEALTH
ROBERT KRUEGER	AITKIN CO. SWCD
RUSS RUUD	AITKIN CO. SWCD
GLEN NYLANDER	AITKIN CO. SWCD
JOHN B. (BARNEY)	JANZEN AITKIN CO. SWCD
CARROLL JANZEN	AITKIN DRAINAGE & CONSERVANCY DISTRICT
JOHN WALKUP	AITKIN CO. ENGINEER
GLEN CHAMBERS	AITKIN CO. EXTENSION
CHESTER BETLEY	AITKIN CO. SURVEYOR
MARGARET SHERMAN	AITKIN CO. COMMISSIONER
RAY BARTON	VERDON TWSP
RICHARD LEWIS	LEE TWSP
TOM HENDERSON	AITKIN CO. LAKES ASSN.
HOWARD CHRISTMAN	DNR-DIV. OF WATERS
ARTHUR HALPIN	BIG PINE LAKE
MARK KRUPINSKI	AITKIN CO. SOIL SURVEY
FRANK TURNOCK	AITKIN CO. SWCD
STEVE HUGHES	AITKIN CO. SWCD
GEORGE AMUNDSON	MCGREGOR TWSP
CHUCK ANDERSON	USDA-ASCS
CHARLES BONNEVILLE	AITKIN ZONING ADMIN.
BRIAN CHRISTENSEN	E.A.HICKOK & ASSOC.
DAVE DICKEY	DNR-WILDLIFE
JIM HODGSON	MPCA
ROGER HOWARD	AITKIN LAND COMMISS.
MIKE JOHNSON	JOHNSON SEWER SERVICE
FRANKLIN KOSBAU	KOSBAU BROS. INC.
JOHN LINDELL	US FISH & WILDLIFE
FRITZ LUECK	ASSESSOR'S OFFICE
MOLLY MACGREGOR	MISS. HEADWATERS BOARD
KIT NELSON	DNR-FISHERIES
RON RITTER	RITTER & RITTER SEWER SER
DAN STEWARD	BOARD OF WATER & SOIL RESOURCES
LEROY STUNEK	AITKIN CO. LAKES ASSN.

A list of 53 concerns was generated at this meeting and is listed below.

1. SEDIMENTATION OF LAKES
2. GROUNDWATER QUALITY AND QUANTITY
3. NON-POINT POLLUTION
4. FLOODING PROBLEMS-MISSISSIPPI R.

5. AG & INDUSTRIAL USE
6. GROUNDWATER RECHARGE
7. SOIL LIMITATIONS BECAUSE OF WETNESS
8. PUBLIC DRAINAGE SYSTEMS
9. WATER WELLS-INTERFERENCE
10. ABANDONED WATER WELLS
11. POLLUTION FROM NON-EXISTING CITY SEWAGE TREATMENT
12. FLOODING-POLLUTION & DEBRIS
13. CONTROL OF SURFACE WATER INTO MISSISSIPPI AND TRIBUTARIES
14. COUNTY DITCH SYSTEM IMPROVEMENTS
15. WATER IMPOUNDMENTS & REDIRECTION OF WATER-FLOODING
16. GRAYLING MARSH REGULATION
17. BEAVER CONTROL & FLOODING (I.D. PROBLEM AREAS)
18. GROUNDWATER CONTAMINATION FROM WELLS
19. DUMPING INTO ABANDONED WELLS
20. UNDERGROUND STORAGE TANKS
21. LAKE LEVEL CONTROL
22. WILD RICE WATER CONTROLS
23. SEPTIC SYSTEMS-MALFUNCTIONS
24. LAKESHORE EROSION/RIP-RAP
25. NITRATES IN DRINKING WATER
26. EUTROPHICATION OF LAKES
27. DISPOSAL OF HAZARDOUS SUBSTANCES
28. WASTE OIL ON ROADS
29. AG-DEVELOPMENT & DRAINAGE SYSTEM DESIGN
30. LAKESHORE DEVELOPMENT/PLAT DEVELOPMENT
31. AG-FEEDLOT CONTROLS
32. SETBACK OF AG OPERATIONS FROM LAKES AND STREAMS
33. I.D. OF EROSION SITES ON MISSISSIPPI-STREAMBANK EROSION
34. I.D. OF DEBRIS ON MISSISSIPPI RIVER BANKS
35. DATABASE OF WATER AND LAND RESOURCES
36. ROAD SALT INTO LAKES AND STREAMS
37. MEDIATION OF WATER PROBLEMS
38. MONITORING OF LAKES AND STREAMS
39. IMPLEMENTATION & ENFORCEMENT OF ORDINANCES
40. IMPACT OF RECREATIONAL USES
41. IMPACT OF FISH HOUSES AND USE
42. STATUS AND QUALITY OF FISH POPULATIONS
43. SEDIMENTATION IMPACT OF CONSTRUCTION ACTIVITIES
44. ROADSIDE EROSION
45. PUBLIC INVOLVEMENT/VOLUNTEERS
46. LANDFILLS
47. LAKE SURVEYS/DATABASE IMPROVEMENT
48. DISPOSAL OF WASTE OIL
49. PUBLIC EDUCATION (ADULTS, SCHOOL SYSTEM)
50. I.D. HAZARDOUS DISPOSAL SITES

- 51. I.D.CRITICAL AREAS-HISTORICAL, WETLANDS, ENDANGERED SPECIES
- 52. PEATLAND DEVELOPMENT-EXISTING AND PROPOSED
- 53. PIPELINES & UTILITIES

The Task Force then began the process of gathering information for the plan. The task force membership, stayed at about 25, so the group was split into four sub-committees and each was assigned specific information to gather.

This task force is responsible for the content of the plan and for editing, holding public informational meetings, etc.

The Water Planning Task Force has remained active for many years and has accomplished educational and “earth-moving” projects each year. We continue working on the original concerns and have added or removed issues as appropriate.

2009 TASK FORCE MEMBERS

Arthur Halpin	Ron Ritter
Bob Greifzu	Brian Napstad
John Welle	Gordon Prickett
Franklin Turnock	Jim Carlson
Michael Lentz	Joyce Fulton
Robert Krueger	Russ Ruud
Margaret Sherman	Pat McGinn
Lonnie Thomas	Calvin Mattson
Dave Dickey	Bill Reed
Dick Lewis	Jerry Pawlak

Concerns:

EDUCATION

- Document individual projects--qualitative and quantitative (accomplishments leads to support)
- Publish lakes and river facts-lake by lake plans
- Continue to support Riverwatch
- Tours of successful projects
- Support Lake Associations--establish--help fund
- Sign-STOP-Purple Loosestrife and Eurasian Water Milfoil pictures. Signs identifying lakes
- ACLA and individual lake associations
- Information sheet in tax statement
- Direct link to high schools (education, river watch, Internet)
- Continue Shoreland Steward Real Estate certification
- Continue lakescaping workshops
- Education so folks understand water issues-high volume media campaign
- Tax statement mailing to all property owners
- Create an active Rivers & Lakes network--get information to lakes--several times per year to most lakes not 1/2 dozen

- Educate County Commissioners on Water Planning activities
- Develop updated BMP's for education
- Seek at least one contact on each lake
- Property changes hands continuous education
- Support Rivers & Lakes Fair
- Get kids more involved/contests/committee involvement

DRAINAGE/FLOODING

- Drainage relating to surface water quality
- Control of dams on Mississippi to minimize flooding and improve water quality
- Construct reservoir for runoff
- Tie Water Plan to cities (storm water management plans)
- State Drought Task Force--Plan for water level ups and downs
- Drought-dam regulation-lake levels
- Sandy Lake dam-water levels-limit flooding to extent possible
- Educate Sandy Lake property owners re: lake levels

ADMINISTRATIVE/ORDINANCES

- Board of Adjustment variances/Review ordinances especially shoreland
- Coordinate SWCD/P&Z/LCWP etc. info. given re: setbacks, ordinances, etc.
- Protect ice ridges from destruction
- Support and participate in planning efforts/townships/cities
- More active role by task force members at meetings/Riverwatch/projects
- Convene a lakes council
- Establish county ditch system accounts county wide
- Participate in city planning efforts
- RV Park concern-Aitkin
- CUP's and variances-if variance granted do some environmental mitigation
- MHB Ordinance-cities need to adopt (Palisade has)
- Tax schedule to encourage lower density development on shoreland
- Tax incentives for lakescaping--increased setbacks
- Wetland Plan for county
- Conservation areas on shoreland--tax incentive
- BOA Chair attend LCWP meetings to hear concerns, etc.
- MN 86B Water Statute--revision--Task Force become familiar with and develop a position (esp. Water Quality Provisions)
- Tax on marine gas to fund water quality
- Summarize these issues--state, county, federal--also group and prioritize by topic
- Water Plan will be something of a compromise
- Sign that says "Shoreland Ordinance Enforced" with phone #.
- Planning & Zoning to make compromises in the field/flexibility
- Task Force be informed on existing regulations and enforcement

GROUNDWATER

- Septage management

- Mille Lacs central sewers/cluster systems
- MN Dept. of Health well location project

ON-THE-GROUND RESULTS

- Support scenic drives for some roadways
- In lakeshore developments retain some public areas

INVENTORY/MONITORING

- Document current shoreline conditions
- How to identify lake property owners--who owns what
- Questionnaire for landowners on lakes > 300 acres
- Update Water Plan maps (landuse)
- Monitor inputs to lakes and streams in selected watersheds-
baseline info.

MISCELLANEOUS

- Apparent decrease in natural wild rice
- Prioritize goals on a watershed basis
- Aerial reconnaissance for pollution discharges
- Identify task force members--do invitations
- Rice Lake Watershed
- Surface water use (overuse) especially shallow productive areas
- Land rights-Takings/enforcement-high property tax
- Water temps (high) in low water
- Encourage Lake Improvement Districts
- COLA--assist/revitalize
- DNR--good involvement
- DNR's new "Greenways"--"Connecting land types"
- Road salt use or misuse

Section V. Plan of Action

1. The Water Planning Task Force has identified the following priorities for the implementation of the Aitkin County Comprehensive Water Management Plan. Listed below in order of priority are these issues and action items:

I. GROUNDWATER QUALITY Page 40

- 1.increase inspections of existing sewage systems
- 2.county licensing of septage haulers
- 3.determination of non-conforming septic systems
- 4.hazardous waste management /oil/paint/etc.
- 5.fertilizer and pesticide management
- 6.new well construction
- 7.identify abandoned wells