Chapter 1 - Basin Overview

Introduction

An Integrated Approach to Resource Management

The Wisconsin Department of Natural Resources (WDNR) is integrating its many programs and bringing together multiple agencies, interests and jurisdictions in an "ecosystem approach". All parts of the ecosystem are considered when addressing resource concerns - the land and land uses, surface and groundwater, and the plants, animals and people using it. Historically, natural resource programs tended to focus on single issues. The resource benefits of interaction between program areas were not fully appreciated. In recent years, the WDNR and the public have begun to recognize the importance of dealing with resource issues in the context of their natural and social environment. It is no longer practical to look at single issues without accounting for the whole.

The ecosystem approach maximizes the benefits of comprehensive management. For example, a quality fishery depends upon high-quality surface waters and groundwater. These qualities are conditional on responsible land and water use. Project success is enhanced since the focus is on a variety of objectives, creating complementary project benefits, and gaining broad internal and public support. Additionally, staff and fiscal resources are used more efficiently through integrated planning, implementation and long-term management of the environment (WDNR, 1994).

Purpose of the State of the Basin Report

The State of the Basin Report is the result of a collaborative effort of WDNR staff and the Lower Chippewa Partnership Team that represents the many interests of the citizens of the basin. It provides a vehicle for establishing a consistent process of identifying resource needs, priorities, and joint work plans for meeting those needs. It contains inventory information that "paints a picture" of the current status of natural resources within the basin and identifies the programmatic tools that we currently have available to address resource needs. It identifies the most important resource issues within the basin, and includes goals and objectives for meeting those issues.

It also includes lake and stream tables for each watershed, which contain a great detail of surface water resource information, as well as inventory and management activities and recommendations.

This report was developed locally, within the context of the Department's long-range resource goals. Key documents that were considered include the Department's Mission Statement, Strategic Plan, Strategic Implementation Plan and the Fisheries, Wildlife and Habitat Management Plan for Wisconsin for 2001 through 2007 (FWH).

This report is the first of its kind in this and the other basins of the state. In future years, we will broaden these plans to more fully include other resources, such as forests, prairies, endangered resources and recreation. The original focus partially fulfills federal requirements with respect to fish, wildlife and watersheds. *(Integrated Planning Guidance, 11/99).*

The 1996 Water Quality Management Plan

The Lower Chippewa River Water Quality Management Plan, written in 1996 (WDNR 1996), has been the basis for water resources management priorities and activities for the past five years. It focuses on water quality issues of the Lower Chippewa River basin, evaluates the controls needed for polluted runoff, and provides management and monitoring recommendations for lakes and streams.

The Water Quality Management Plan includes detailed discussions of each of the 23 watersheds within the Lower Chippewa River basin, as well as 30 basin-wide, 10 groundwater and over 250 watershed-specific management recommendations. These components of the 1996 Water Quality Management Plan will continue to be used as a basis for management decisions. As updated watershed discussions and recommendations are completed, they

will supersede the existing ones in the 1996 Water Quality Management Plan. The State of the Basin Report contains the most up-to-date lake and stream tables, and these supersede the tables found in the 1996 Water Quality Management Plan.

Other Resource Management Plans

Resource management planning is undertaken at many levels within the WDNR as well as by other agencies and partners. Several existing management plans have served as valuable resources in shaping this State of the Basin Report. These included:

- State Strategic Plan. WDNR 1999
- Strategic Implementation Plan. WDNR 1999
- Fisheries, Wildlife and Habitat Management Plan for Wisconsin 2001 through 2007 (FWH Plan). WDNR June 2000
- County Land and Water Conservation Plans for counties within the Basin, including Barron, Pepin, St. Croix, Taylor, Eau Claire, Dunn and Pierce counties. (See Appendix 1 - Summary of County Land and Water Conservation Plans)
- Nonpoint Source Program Priority Watershed Plans for priority watershed projects within the basin, including the Hay River, Lower Eau Claire River, Yellow River, Duncan Creek, Lowes Creek and South Fork Hay River.

Additional plans that should be considered when making resource management decisions include:

- Sewer Service Area plans
- Township land use plans
- Masterplans for state properties
- Department of Transportation plans
- Lower Chippewa Natural Area Feasibility Plan
- Western Prairie Habitat Restoration Area Plan
- Lake management plans
- Electrical utilities plans
- "Reversing the Loss", a Strategy for Protecting and Restoring Wetlands in Wisconsin. WDNR, 1999.
- WDNR Strategic Plan for Forestry

The Lower Chippewa River Basin - An Overview

The Lower Chippewa River Basin in the Wisconsin Landscape

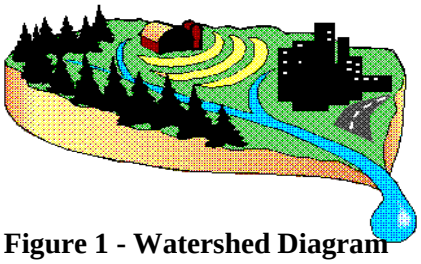


Figure 1 - Watershed Diagram

The Big Picture

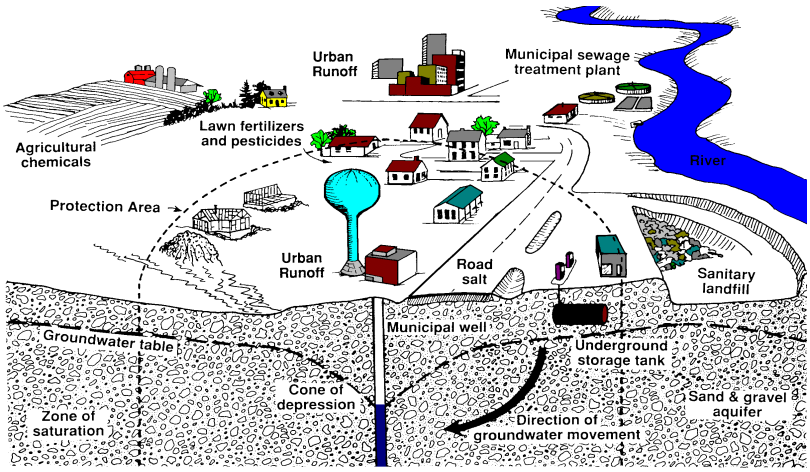
What is a watershed?

A watershed is an area of land that drains to a lake, river or stream. Watersheds can be defined on scales ranging from very small to huge. Each small tributary has its own "watershed" which drains to a larger stream, or sometimes, a lake. The watershed of the larger stream includes all the watersheds of its tributary streams. A ***basin*** consists of the entire tract of land drained by a river and its tributaries, and includes associated lake watersheds as well. Wisconsin is made up of 21 basins based on the major rivers in the state. The Lower Chippewa River Basin encompasses 15 counties and is divided into 24 watersheds with a total land area of 5,300 square miles. All rivers and streams that drain into the Chippewa River below the Holcombe Flowage dam in northern Chippewa County are included in this basin. Major tributaries include the Eau Claire River and the Red Cedar River. Also, included in this basin are the Rush River, Isabelle Creek, the Trimbelle River, and their tributaries, all of which flow into the Mississippi River. See Map 1 - Lower Chippewa River Basin.

Want to know more about watersheds?
http://www.dnr.state.wi.us/org/water/wm/education.html
Check out the EPA's Surf Your Watershed page:
http://www.epa.gov/surf3/hucs/07050005/index.html

Figure 2 - Watershed Pollution Sources

Almost all land uses and human activities directly or indirectly affect a watershed in some way. Everything from washing your car to using lawn fertilizers and pesticides, to runoff from cropland and effluent from wastewater treatment plants are examples of actions that may affect a watershed and its resources.



Geology

The Lower Chippewa Basin lies on the west edge of the Wisconsin Dome – a large regional structure that extends across northern Wisconsin. It is composed of Precambrian age igneous and metamorphic crystalline bedrock. The Precambrian surface dips gently to the south, east and west from the domes highest point in northeast Wisconsin. In the Lower Chippewa Basin the surface of Precambrian igneous and metamorphic crystalline bedrock surface dip in a west to southwest direction at roughly 10 feet per mile (John Tinker, pers. comm.) The Precambrian igneous and metamorphic rocks are age dated at 1.6 billion years before present and older.

Precambrian igneous and metamorphic rock is the surficial bedrock type in the northeastern portion of the Lower Chippewa Basin. The southwestern-most exposures of Precambrian igneous and metamorphic rock are in the Chippewa River valley at Chippewa Falls and the Eau Claire River valley midway between Fall Creek and Eau Claire (WI Geologic & Natural History Survey 1988). The Precambrian bedrock surface is at elevation 1050 to

1100 feet above sea level in the northeastern portion of the Lower Chippewa Basin and 0-100 feet above sea level in the western edge of the basin in Pepin and Pierce Counties.

Precambrian rocks are overlain by Paleozoic sedimentary bedrock of Cambrian and Ordovician age which were deposited from 523 million years to 468 million years before present. The Paleozoic bedrock is primarily sandstone but does contain dolomite, siltstone and shaley units. The (lowermost) formations are sandstone. Sandstone is absent in the northeastern portion of the Lower Chippewa Basin and gradually becomes thicker to the west and southwest in the basin (WI Geologic & Natural History Survey 1988). The maximum thickness of the lower sandstone is 600 -700 feet and occurs in southeast Pierce County and northwest Buffalo County (Trotta 1983). Up to 150 feet of Ordovician aged Prairie du Chien dolomite overlies the sandstone in central Pierce County and southern St. Croix County. In portions of western Pierce and St. Croix counties, up to 66 feet of Ordovician aged St. Peter Sandstone overlies the Prairie du Chien dolomite.

Glacial Deposits

Much of the Precambrian and Paleozoic bedrock in the Lower Chippewa Basin is covered by unconsolidated sediment of glacial origin. The glacial sediments in the Basin are the result of multiple episodes of continental glaciation. Many examples of the geologic features created by glaciers are preserved in the Chippewa Morraine Unit of the Ice Age National Scientific Reserve located in northern Chippewa County. The property also includes an Interpretive Center (See Appendix 8 - Public Lands in the Lower Chippewa Basin).

Sediment of glacial origin includes material deposited directly by glaciers such as tills (sediments deposited by ice) and end moraines (sediments deposited at the retreating end of a glacier), glacial lake deposits that were deposited when glaciers dammed major drainages and glacial outwash which is material deposited by glacial meltwaters. Some loess (soil of varying proportions of sand, silt, and clay) deposits are associated with glacial activity.

The most extensive glacial-lake deposit in the Lower Chippewa basin consists of interlayered silts and clays in the Chippewa and Red Cedar River valleys that were deposited when the margin of a glacier located in Minnesota and Iowa blocked drainages in western Wisconsin roughly 460,000 – 770,000 years ago. Other less extensive glacial lake deposits exist in the basin as well. An example is the ice-walled lake plains in the Chippewa moraine.

Glacial outwash in the Lower Chippewa basin consists of sand and gravel deposits with very little silt and clay due to the energy of the meltwaters that deposited them. Outwash extends from the Chippewa moraine in northern Chippewa County to the Mississippi River in the Chippewa River valley. Outwash is also present in the Red Cedar valley. Generally the gravel size and content in the outwash decreases as one moves from north to south away from the area of the glacier. See Appendix 8 - Public Lands in the Lower Chippewa Basin.

Groundwater

Groundwater occurs in all of the bedrock and unconsolidated glacier-related deposits in the Lower Chippewa Basin. The volume of water available and the aesthetic quality of the water vary widely across the basin. Generally, the Precambrian igneous and metamorphic crystalline rock produces little water except for fracture zones and at the weathered surface of these rock types. The thick sandstones and outwash deposits in the middle to western portion of the basin can yield large volumes of water for irrigation and potable use. Glacial lake deposits are fine-grained and therefore yield little water to wells. They can serve as an aquitard (a layer of impermeable soil or rock) if extensive enough. The volume of water that glacial tills yield depends on the source area of the till material and the resulting grain size distribution in the till material. Tills with a high clay content produce little or no water and can serve as aquitards. Tills that are primarily sand and gravel with little fine sediment can produce significant quantities of water.

Surface waters

The Lower Chippewa Basin is blessed with an abundance and variety of surface waters ranging from large and small lakes to spring fed cool water streams, meandering warm water creeks, and large rushing rivers. The glacial history, underlying geology and groundwater of the basin all affect the types, quality, and quantity of our surface water resources.

Ice-walled lake plains (evident in the Chippewa Moraine) created small lakes intermingled throughout the forests of Chippewa County. These lake plains were formed at an end moraine of the last glaciation. The underlying bedrock of the basin created the spectacular waterfalls in the Eau Claire River and the basin that underlies Lake Wissota, as well as the meandering streams of the western portion of the basin.

Brief History of the Lower Chippewa River Basin

The Early Period

Prior to European settlement in the Americas, Santee Sioux inhabited much of the area now called the Chippewa River Valley. Eventually the area would become Ojibwa or, "Chippewa". In 1615 French explorer Samuel de Champlain arrived at Lake Huron; he and his men made contact with Ojibwa groups farther west as they explored Lake Superior. During the seventeenth and eighteenth centuries, the French and British established trading posts in Ojibwa country to draw them into the fur trade, exchanging European goods such as guns, metal tools, beads, cloth and alcohol for furs.

The expansion of the Ojibwa into Wisconsin and Minnesota brought them into contact with the Eastern, or Santee Dakota (commonly known as the Sioux). Despite a series of fur trading wars with other tribes, the Ojibwa were generally successful, and began to move inland into Wisconsin, with their first permanent village at Lac Courte Oreilles at the headwaters of the Chippewa River.

Fur traders kept up their lucrative trade until 1754 when the French and Indian War commenced and traders for France were called east to fight the British. The American Revolution further complicated the trade in fur, now carried on by French-Canadians and English fur traders. The Treaty of Versailles ended the American Revolution and British dominion over the land that one day would be Wisconsin.

U. S. Control Begins in Wisconsin

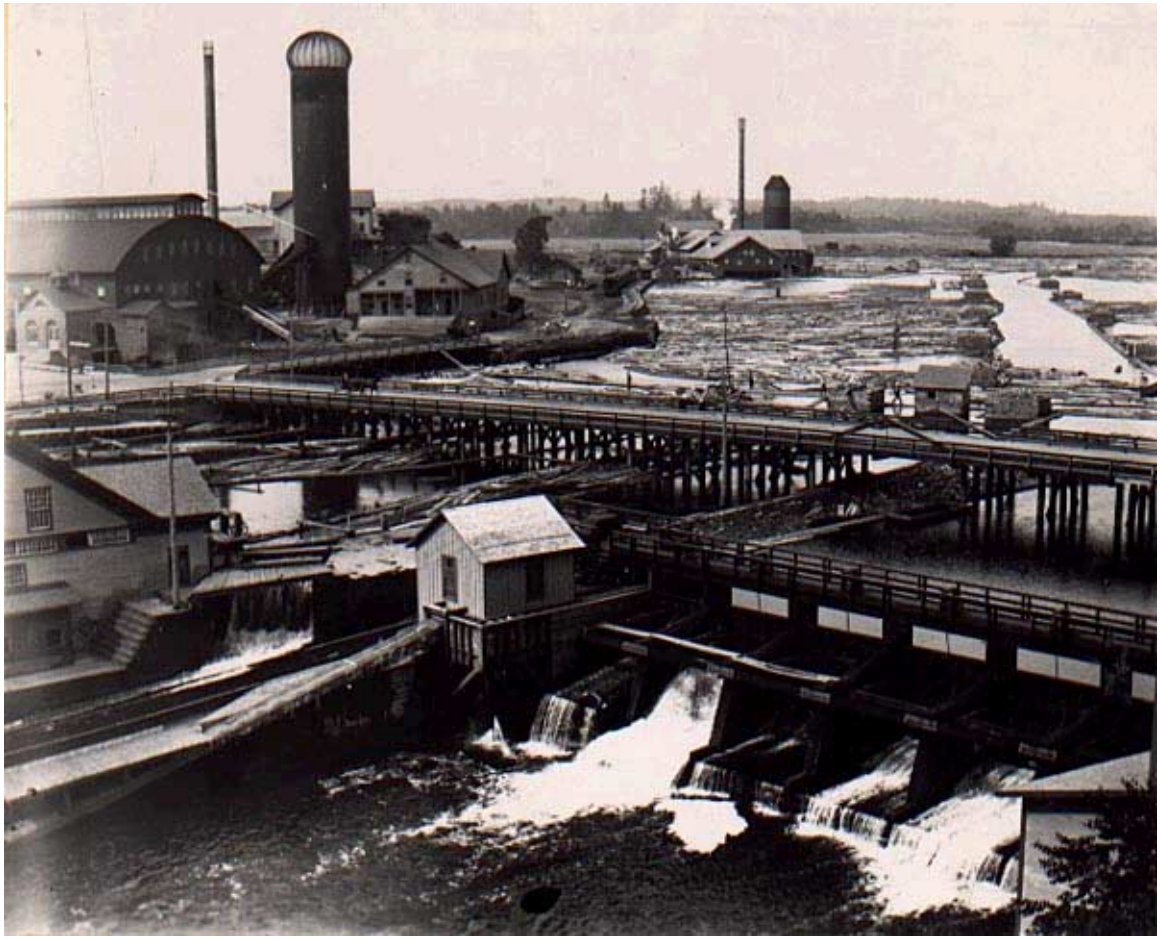
In 1787 the U.S. Congress approved an Ordinance for Lands North West of the Ohio River, affecting public policy for the area now called Wisconsin. The ordinance included landmark public policy for the waterways - highways of commerce and habitat for treasured furs. It said:

> *"The navigable waters leading into the Mississippi and St. Lawrence, and the carrying places between the same shall be common highways, and forever free, as well to the inhabitants of the said territory, as to the citizens of the United States…"*

This language, which became part of the Wisconsin Constitution when the state was admitted to the Union in 1848, establishes that all the waters of the state shall be forever held in trust for all the people of the state and nation. By the 1800s the fur economy was in decline and the lumbering economy was starting to rise. The rivers, having served as highways for travel and for the fur trade, would become essential to the logging that would take place during the 19th Century in the pine forests and the Chippewa River basin.

Eau Claire, strategically located at the junction of the Chippewa and Eau Claire rivers, became a busy lumber town. Lumberjacks and mill hands had their homes here, along with businesses, serving the prosperous lumbering industry. Half Moon Lake and Dells Pond were two important timber-holding ponds. The Dells Pond capacity was increased by the construction of a dam in the late 1870's. In 1880 the pond was connected by a log flume to Half Moon Lake to provide storage space for logs, which fed what might have been the largest concentration of sawmills in the world at that time. These mills gave Eau Claire the nickname of "Saw Dust City."

Figure 3 - Knapp Stout Company



Chippewa Falls and Eau Claire, the two major sawmill towns on the Chippewa River milled most of the pine logs cut in the Chippewa Valley. Soon after the spring thaw, as the logs reached the booms or storage areas near the mills, sawing began.

About 1870 Chippewa Valley lumbermen built flooding dams to more efficiently bring the logs to the mills. The dams held back the water, which could be released as needed when low water was a threat. Millions of logs were floated beyond Eau Claire to the mouth of the Chippewa at Beef Slough where they were formed into rafts and floated or towed to sawmill centers along the Mississippi River. (American Life Histories: Manuscripts from the Federal Writers' Project, 1936-1940)

Despite original visions of an infinite supply of timber, the pinery was depleted in just four decades. By 1910 the great stands of white pine in the Chippewa River territory were, with the exception of two tracts, virtually exhausted. Billions of board feet of lumber had been cut, dragged to the Flambeau River and floated to the Chippewa River and downstream.

Farming Takes Over

Most Chippewa Valley mills closed down in the period between 1891 and 1911. As the lumbering boom faded, Central and Northern Europeans immigrated to Wisconsin. In 1895 the Wisconsin Legislature directed the Dean of the College of Agriculture at the University of Wisconsin, W. A. Henry, to prepare a handbook for prospective settlers interested in Wisconsin's cut over timber lands. The purpose of the Handbook was to promote the advantages of northern Wisconsin for farming purposes. Henry was clear in his objective. It was to help in

"…bringing to us an intelligent, worthy class of people who are posted in advance on the kind of country they are coming to and who, knowing this, are not likely to leave us disappointed…".

In the Chippewa Valley and like areas, timothy hay was the recommended crop. "When a piece of land has been 'chopped off' and the brush and logs removed, the stumps are too thick for the cultivation of crops requiring annual plowing of the soil and frequent cultivation. The dairy industry also will be rewarding in the future for Wisconsin settlers, with cheese and butter benefiting from the fine water supplies," Henry said. But he warned settlers not to be overly optimistic.

> *"First of all, let it be distinctly understood that clearing up and farming a wooded country is an undertaking requiring much hard labor extending over a period of years; the amount of material in the shape of trees, living and dead, together with the brush, stumps and undergrowth, is often sufficient to make one's heart grow faint…."*

There were plenty of settlers who were not faint of heart. In 1910 there were 13,820 farms in Barron, Chippewa, Eau Claire, Dunn, Rusk, Buffalo and Pepin counties. By 1930 there were 18,978 farms (Figures 5 and 6).

Energy and Industry

In the late 1800's and early 1900's the rivers, once a highway for fur traders and then dammed for the transport of white pine timber from the northland, were put to another use. They were harnessed to produce power for industry in the growing settlements along the Chippewa, Red Cedar, and Flambeau rivers. The Chippewa River drops nearly 700 feet in elevation along its length, providing opportunities for hydroelectric generation.

In 1882, the City of Eau Claire installed an electric generator at the original logging dam at Dells Pond. In 1924, the present dam was completed just downstream. The Wissota hydropower dam was completed in 1918 by over 700 workers who lived in a small town built at the site. When the project was flooded, it created the 6,300-acre Lake Wissota at the confluence of Paint Creek and the Chippewa and Yellow Rivers. The Chippewa Falls hydropower dam was completed in 1928 at the site of an old lumber mill. The Jim Falls hydropower project, originally completed in 1922, was redeveloped in the mid-1980's making it the largest hydropower facility in Wisconsin (57,000 kilowatts).

The original Cedar Falls timber dam was replaced with a concrete structure in 1910, with new generators added in 1912 and 1915. Since then, the plant has operated largely unchanged. The dam created Tainter Lake, an 1800-acre flowage formed by the impoundment of the Red Cedar and Hay Rivers. A short distance downstream, the original Menomonie Dam was constructed in 1848 and subsequently equipped with electric generation equipment in 1907. The dam was raised by 12 feet in 1950 after being damaged by floodwaters and created the present day 1,400-acre impoundment known as Lake Menomin.

Xcel Energy (formerly Northern States Power Company) has generating facilities at Holcome, Cornell, Jim Falls, Chippewa Falls, Wissota and Dells. The combined capacity of the power plants is 188,900 kilowatts which represents over one-third of the hydro capacity in the State. Two hydropower plants, the Cedar Falls and Menomonie Hydros, are located on the Red Cedar River which joins the Chippewa River about 20 miles southwest of Eau Claire.

The major population centers in the Lower Chippewa River Basin, including the cities of Chippewa Falls, Eau Claire, Menomonie and Rice Lake, are all located on rivers.

The Lower Chippewa River Basin Today

Vegetation Changes

The dramatic loss of the forests in the logging days of the late 1800's is evident even today. When comparing maps of vegetative cover from the mid-1800's with land cover and land use in the late 1970's and early 1980's we see a dramatic shift in vegetation types (See Map 3, Historical and Current Vegetative Cover). Forested lands,

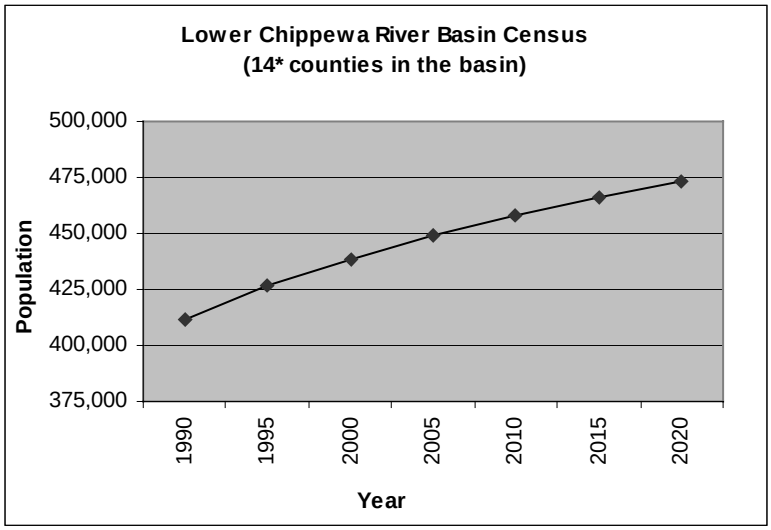
which historically covered over 90% of the basin, now cover less than 50%. Native grasslands covered almost 10% of the basin, but have now been almost fully converted to agricultural lands. Currently agricultural lands cover over 40% of the basin.

Population Changes

The projected population in the basin for the 2000 census is 438,567 people. Statewide the projected population is 5,287,825. Projections estimate the population in the basin to reach 475,000 by the year 2020 (State of Wisconsin DOA webpage). Along with an increased population in the basin, comes greater pressure on our environment, reducing the number of undeveloped areas and fragmenting existing tracts of land.

Want to know more about populations?
http://www.doa.state.wi.us/dhir/boir/demographic/pop_proj.asp

Figure 4 - Population Projections



*Counties used to calculate the increase in population in the basin:

Barron	Pierce
Buffalo	Polk
Chippewa	Rusk
Clark	Sawyer
Dunn	St. Croix
Eau Claire	Taylor
Pepin	Washburn

Agricultural Changes

Agricultural statistics are available on a county-by-county basis. In this section, data from the following counties were included: Barron, Rusk, Chippewa, Dunn, Eau Claire, Buffalo and Pepin. The number of acres of farmland reached a peak in the 1920's and 1930's, topping out at over 2.4 million acres. In the 1980's and 1990's, that number had declined from 2.2 million to 2.0 million acres, approximately a 9% decrease.

Want to know more about changes in agriculture?
http://www.farmland.org
http://www.nass.usda.gov/census/census97/highlights/wi/wi.htm

The number of farms in these counties reached 18,978 in the mid-1930's. Between the late 1970's and 1998, the number of farms declined from 10,370 to 8,590, a decrease of approximately 17%. (Statistical Reporting Service of the WDATCP/USDA)

Figure 5 - Number of Farms in 7 Counties

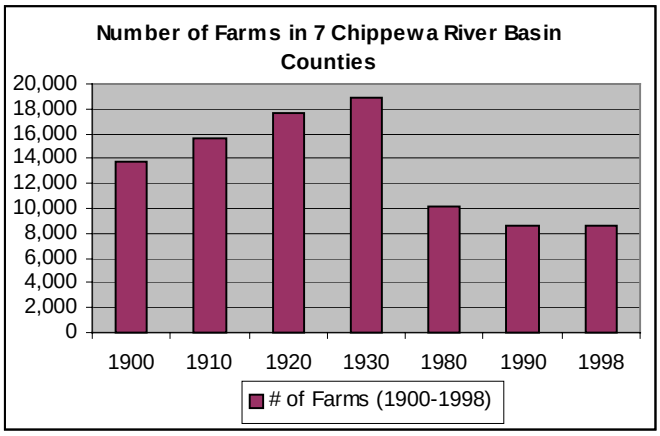
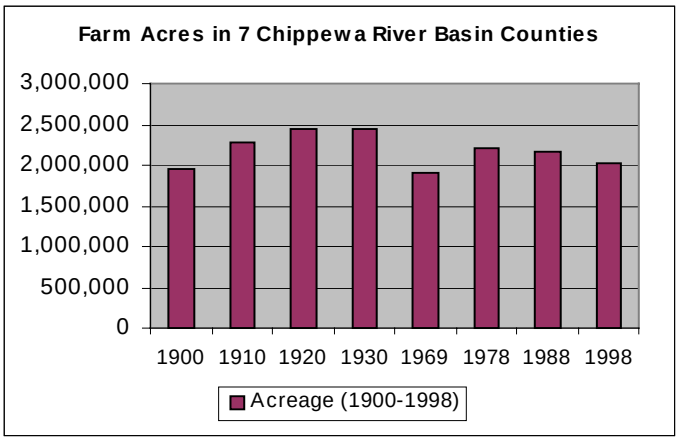


Figure 6 - Number of Farm Acres in 7 Counties



Urban and Rural Land Development

Rapid urban and rural residential land development is common in the Lower Chippewa River Basin. Between 1960 and 1999, the City of Eau Claire grew from almost 38,000 to nearly 63,000. The number of housing units more than doubled, from over 12,000 to almost 25,000. The land area covered by the city went from 19.3 square miles to over 32 square miles (City of Eau Claire Planning Division). Many historically rural townships surrounding urban areas are experiencing rapid growth of rural residential homes and subdivisions, putting pressure on local governments for increased support services, such as fire protection and road maintenance.

Land uses and the social fabric of rural communities is changing from an agricultural base to rural residential, creating challenging planning issues for local units of government.

Impacts to Lakes and Stream Resources

Population growth in the Basin has created intense development pressure along lakes, rivers and streams. In some areas, most of the available shoreland frontage has been developed. Many counties within the state have taken steps to protect sensitive shoreland habitat and surface water quality through a process of classifying water bodies according to their protection needs, and county ordinances have been updated to reflect these needs. Within the Lower Chippewa Basin, Chippewa County is undertaking Lake Classification and drafting associated ordinances. Barron County completed lakes classification in November, 2000.

Along with a robust economy comes added pressure to use our resources for recreational purposes. Increased recreation often creates conflicts between users and the environment as well as between different recreational groups. On a summer weekend on Lake Holcombe or Wissota, water-skiers and anglers may find themselves competing for use of the same water resource. On some lakes, turbulence created by outboard motors disturbs shallow aquatic plant beds, harming important fish spawning areas. Many area lake associations and protection groups work diligently to find and support solutions to these conflicts.

Additional pressure is also put on groundwater with increased development. The Basin relies on groundwater for domestic, commercial, agricultural and industrial use. Development also leads to a decrease in permeable areas needed for replenishing groundwater to the basin. If groundwater is not replenished or recharged, it can cause a decrease in stream baseflow and degradation of fisheries.

The Lower Chippewa River Basin Tomorrow

Creating a Sense of Place and Stewardship

Education

The UW-Extension is leading an interagency commitment to citizen-based watershed programs. Basin Educator positions support a statewide educational network administered along river basin lines. In the Lower Chippewa Basin, the Basin Educator has assisted in the formation of the Lower Chippewa Basin Partner Team. This has increased the opportunity for discussion and sharing of ideas concerning the natural resources within the Lower Chippewa River Basin. Members of the Partner Team have the opportunity to identify critical resource issues in the basin, recommend management projects and/or solutions, and suggest common implementation plans to address those issues. A goal of the Basin Partnership Initiative is to increase the coordination among partners as they work together towards addressing common resource management priorities in the Lower Chippewa River Basin.

The WDNR has also developed a wide array of educational materials and initiatives for the public, and support services for teachers. Through *EE News*, a publication produced quarterly by the WDNR, teachers can keep up-to-date on what's happening in the environmental education field in Wisconsin, learn more about natural resources in Wisconsin, receive activities to help them teach their students about the environment, and find out about workshop opportunities.

EEK! Environmental Education for Kids! , an electronic magazine for kids in grades 4-8, is a web site produced by the WDNR. It provides current and accurate information on natural resources, along with career information. It offers students the opportunity to take part in activities, make seasonal observations, and share stories and artwork.

Want to know more about educational opportunities?
http://clean-water.uwex.edu/
http://www.dnr.state.wi.us/org/caer/ce/bureau/education/education.htm
http://www.dnr.state.wi.us/org/caer/ce/eek/

Understanding local resources - Half Moon Lake

Half Moon Lake, an oxbow of the Chippewa River, has been the subject of intense management and study for the past 25 years. The lake was used as a log holding area for several sawmills in the late 1800's and early 1900's, leaving huge amounts of organic and nutrient pollutants in the sediment of the lake. Stormwater discharges from the City of Eau Claire contributed additional pollutants until the early 1980's, when most stormwater was rerouted to the Chippewa River. The City installed and operates high capacity wells near the Chippewa River to bring water to Half Moon Lake to maintain its water levels.

Frequent algal blooms have historically plagued the lake. The city initiated an extensive aquatic plant-harvesting program in the late 1980's, which has alleviated some of the nuisance aquatic plant and algae conditions. Several studies were conducted on the lake throughout the 1990's, including an extensive water quality and watershed assessment in 1999. Results show that nutrients, from the watershed, in the lake bottom sediments and the aquatic plants continue to be a major contributor of excessive phosphorus, a nutrient that causes nuisance algae and plant growth. Local water ski team practices and shows contribute to the problem by mixing stratified water layers in the lake during the summer. This mixing action promotes unwanted algae growth.

The water quality study documented extremely high levels of algae growth, and found that water quality standards were exceeded in the lake for dissolved oxygen and pH during the summer growing season. The study concluded that if the amounts of phosphorus reaching the lake are reduced, algae levels can be expected to decrease and water clarity will improve. The next step in managing Half Moon Lake will be to establish goals for lake water quality, and a specific plan for reducing the amount of nutrients reaching the lake.

Community leaders, students and citizens have participated in studying Half Moon Lake and its watershed. They realize the sense of place that the lake provides to the people of Eau Claire and surrounding communities and therefore understand the need to protect it.

Understanding Local Resources - Duncan Creek Water Quality Monitoring Project
The Duncan Creek Stream Quality Monitoring Project is a collaborative effort of three of the four high schools in the Duncan Creek watershed, the Chippewa County Land Conservation Department, the WDNR and the UW-Extension.

Samples are collected in the spring and the fall each year at approximately 13 sampling sites on Duncan Creek and its tributaries. Samples are tested for a variety of physical, biological and chemical parameters to measure water quality. Students do all of the sampling at the sites selected by their school. Data has been collected since 1996.

The key reason for developing a high school stream quality monitoring effort was to raise awareness for environmental stewardship among future decision-makers. The local citizen advisory group believes that this is a critical component of long term protection and preservation of our streams. Further, the group contends that collecting and analyzing data at local stream sites and collaborating with others in the watershed will increase students understanding and connection to their local resources and will develop a more concerned and knowledgeable citizenry.

Empowering People with Tools Needed to Make a Difference
Resource protection can often be accomplished when citizens learn new techniques and approaches to accomplishing familiar tasks. Stormwater quality improvement has resulted from UW-Extension education programs. After special training, youth groups have stenciled storm drains with the phrase "Dump no waste - drains to lake or river". Coupled with the distribution of educational materials, citizens have changed how they dispose of waste oil, soapy water from washing cars and excess fertilizer from lawns.

The WDNR has developed a shoreland vegetation restoration and management demonstration project at Lake Wissota State Park. Several techniques for restoring native vegetation along shorelines are being tested. Brochures, presentations and educational signs at the site are promoting these new shoreland stewardship techniques to many citizens.

Want to know more about shoreland restoration projects?
http://www.wnrmag.com/stories/2000/apr00/shore.htm

Making Sound Land Use Decisions

Lower Chippewa State Natural Area
The Lower Chippewa River State Natural Area feasibility study identified 125 species listed as endangered, threatened or special concern. The project area is also known to contain 25% of the total native prairie lands in the state. This is the largest concentration of rare species in any area of comparable size in the state. Here are just a few of the endangered and threatened species:

Want to know more about the Lower Chippewa State Natural Area?
http://www.dnr.state.wi.us/org/gmu/lowerchip/index.htm

Endangered Species	Threatened Species
Pecatonica Mayfly* (federally)	Wing Snaggletooth Snail
Higgin's–eye Pearly Mussel (federally)	Cerulean Warbler
Dotted Blazing Star	Yellowish Gentian
Loggerhead Shrike	Paddlefish
American Peregrine Falcon	Eastern Massasauga

(WDNR-Feasibility Study 1999)

*This is one of only three known populations in the world for the Pecatonica River mayfly

In recognition of these unique natural resources, the Natural Resources Board and the Governor approved the establishment of the Lower Chippewa River State Natural Area, extending from Eau Claire to Nelson along the Chippewa and Red Cedar Rivers. The goal of the project is to preserve and protect the most unique and sensitive areas with outright acquisition, easements or voluntary management. The biological diversity remaining in the area is a testament to the land stewardship that has been a tradition for generations. As land changes hands, this project will help assure that this land stewardship continues on select sites.

Conservation Buffer Project

A buffer is a strip of land in permanent vegetation. Buffers serve many purposes including trapping sediment by slowing runoff, thereby minimizing the chances of fertilizers, pesticides, and excess nutrients reaching surface water. Sediment from the Chippewa River continues to fill the river backwaters of the Upper Mississippi River Wildlife Refuge. This has led to a decline of wetland vegetation on the Refuge. Fish and wildlife dependent upon these plant beds for food and shelter have suffered accordingly. Buffers would reduce the amount of sediment reaching these delicate backwaters, by minimizing the amount of sediment coming into tributary streams. Buffers also provide a natural habitat for wildlife, improve fish habitat, and increase the diversity of native vegetation. Currently, 60% of the basin is in cropland and pasture. The pre-settlement prairie component was 13%. Today, however, it comprises less than 1% of the basin. Installing buffers alongside stream corridors would increase the amount of native prairie grasses in the basin, while benefiting wildlife as well.

The Lower Chippewa Conservation Buffer Project is a grassroots effort to encourage buffer establishment along sensitive streambanks in the basin. With grants from supporting agencies and donations from conservation clubs and organizations, the Lower Chippewa River Basin Partnership Team proposes to hire a Conservation Buffer Specialist in 2001. The Specialist will train and coordinate a large cadre of volunteers to promote installation of conservation buffer strips within the basin utilizing the Conservation Reserve Program (CRP).

Volunteers will have the opportunity to work one-on-one with property owners who have lands eligible for buffer establishment, in addition to distributing educational brochures, assisting local conservation agencies, and monitoring water quality and habitat of the targeted areas. Landowners will be encouraged to enroll the buffers in such programs as the USDA's continuous Conservation Reserve Program (CRP). The Specialist will coordinate with USDA's Natural Resources Conservation Service (NRCS), the Farm Service Agency (FSA), and County Land Conservation Departments (LCD).

Conservation buffer strips are a low-cost addition to a farmer's toolbox for managing on-farm nutrients. Farmers can diversify and in some cases increase the farm income by enrolling the buffer areas into programs such as the Conservation Reserve Program (CRP). In the next ten years, the project will potentially generate an additional $1,950,000 in cost share and rental payments for area farmers from CRP. (Herdrich/Beaster 2000)

Smart Growth Initiative

The Smart Growth Initiative provides communities with the framework for developing comprehensive plans that have a connection between development and quality of life. The comprehensive plan will improve

Want to know more about community planning?
http://www.smartgrowth.org/index2.html
http://www.smartgrowthamerica.com/
http://www.1000friendsofwisconsin.com/smartgrowth/sg_intro.shtml

a community's ability to guide future development in ways that promote interrelationships between various facets of a community. By January 1, 2010, all communities which make land use decisions will need to make those decisions based on an adopted comprehensive plan. Elements of the plan include: issues and opportunities, housing, transportation, utilities & community facilities, natural & cultural resources, economic development, intergovernmental cooperation, land use, and implementation. See Appendix 2: Goals of the Smart Growth Program. The Smart Growth program provides funding to communities in the process of creating a plan and also funding to those communities that have a current acceptable plan in place.

State Agency Involvement - Each state agency, including the DNR, is encouraged to design state programs, policies, and investments in ways that respect the efforts of local governments. The law specifically asks us to balance our mission with a number of local planning goals. It also requires us to ensure that plans submitted as part of programs we administer comply with the comprehensive plan definition and help achieve the specified local planning goals (Intranet website & Smart Growth Network website). The DNR could also assist through providing essential maps and map layers such as wetlands, hydrologic layers, and other GIS data.

Dam Removal/Restoration

Want to know more about dam removal?
http://www.wisconsinrivers.org

Since the early 1880's 18 Mile Creek had been dammed at the Village of Colfax in eastern Dunn County. The dam, standing 13 feet tall and 75 feet wide, was originally built to power a mill for grinding grain. Over the years it washed out and was rebuilt several times. As sedimentation increased in the impoundment, the once cold-water stream was converted to a warm water fishery, with increased water temperatures, low dissolved oxygen levels and excessive silt. The impoundment prevented upstream migration of native fish species and created poor habitat for the coldwater fish community.

The cost to repair and dredge the impoundment was estimated at $1 million, while actual removal costs were $202,000. Residents of Colfax voted to remove the dam and in 1997 the impoundment was drained. During the winter of 1997-1998 the dam was removed. The stream channel was stabilized by removing sediment, which in turn protected the Red Cedar River and Tainter Lake from adverse effects. Local DNR staff, Colfax High School students, and Trout Unlimited members reseeded the exposed lake bed and installed habitat structures.

The project was a collaborative effort between the DNR, the Village of Colfax, Dunn County Land Conservation Department, and local conservation organizations including Trout Unlimited. With the help of local groups, 3,200 feet of trout habitat in the Village of Colfax was eventually restored. (River Alliance/WDNR webpages)

Figure 7 - 18 Mile Creek - Before Restoration

Figure 8 - 18 Mile Creek - After Restoration

Wellhead Protection

One way to promote safe drinking water is to protect the area around municipal water supply wells from sources of contamination. The Wellhead Protection (WHP) Program allows municipalities to restrict land use around public water supply wells. Wisconsin's WHP program requires that wells proposed after May 1, 1992 have Wellhead Protection Plans. For older wells the program is voluntary. Wellhead protection delineations for all municipal wells in the state have been completed.

The DNR Source Water Assessment Program identifies land areas that contribute water to public wells, conducts inventories of potential contaminant sources, and determines the susceptibility for each public water supply - surface or groundwater. The assessment will assist water system operators in preparing WHP plans.

Wisconsin's Land Legacy

The Department is conducting a study to assess the state's land ownership needs in order to adequately protect Wisconsin's critical land and water resources and to provide satisfying outdoor recreation opportunities for future generations. This study is intended to identify areas of the state that should be considered for some form of protection over the next 50 years.

Interested in the Land Legacy Program?
http://www.dnr.state.wi.us/master_planning/land_legacy/index.html

This study is being conducted in two phases. The first phase of the study has been focused on developing criteria that address important characteristics of conservation and recreation lands. The second phase of the study will identify areas of the state that most effectively meet these criteria. The criteria will be applied using both objective (based on existing data, primarily in GIS form) and subjective (based on the personal knowledge of Department staff and the public) approaches. A public meeting is scheduled for February 28, 2001 to solicit this public input. The plan is expected to be presented to the Natural Resources Board in the fall of 2001. The Department expects to seek approval from the Natural Resources Board (NRB), over a period of time, to conduct feasibility studies on selected sites.

Areas of the LC Basin that are identified in the Land Legacy Report will be included in future updates of the State of the Basin Report.