Chapter 6: Water Resources

Marathon County depends on its water resources. They are economically and ecologically important to the health and welfare of its citizens. These water resources provide drinking water from both surface and groundwater sources. They provide very important recreational benefits as well as contribute to a diverse ecosystem which provides important functional and economic benefits. However, changes in land use and population shifts have increased demands for these water resources and this, in turn, threatens many of them.

Nonpoint runoff problems are both water quality and quantity based. Nonpoint pollution is a result of activities that take place on the land surface, and how water runs off the land surface or seeps into the ground. Most land use activities have the potential to contribute to nonpoint pollution problems.

Generally, because of the complexity of the problems and multiple jurisdictions involved, no one protective measure will wholly solve the problem caused by nonpoint sources of pollution in a given watershed or area of the county. More likely, a combination of mechanisms will be necessary, and in many cases may be preferred, to give locally based and supported initiatives maximum flexibility in achieving their protection goals and needs. Improved linkages among different levels of government and existing protective mechanisms are needed to ensure that actions taken do actually provide desired protection of Marathon County’s water resources.

Water Resources are prominent in Marathon County, which contains many streams and rivers. Most are tributaries to the Wisconsin River, which bisects the County as it flows to the south. In addition to 202 lakes, the County also has significant amounts of wetlands and floodplains. Maintaining excellent water quality is fundamental to the high quality of life in Marathon County.

Previous Plans and Studies

Marathon County Land and Water Resource Management Plan

The Marathon County Land and Water Resource Management (LWRM) Plan responds to soil and water quality concerns through local, state, and federal programs. The plan represents a 10 year (2010-2020) implementation plan that emphasizes cooperation with State and Federal conservation partners, as well as a renewed emphasis on education. The LWRM Plan brings the human and natural resources together in a strategic plan to protect and improve our soil and water resources.

The four long term program outcomes the LWRM Plan aims to achieve with a comprehensive strategy for the implementation of soil and water conservation are:

1. Land use activities are well planned to enhance community development, minimize conflicts, maximize infrastructure investments, and protect rural character.
2. Improve and protect the surface and ground water assets to enhance public health and safety, recreational opportunities, and economic development.
3. Maintain the soil and water resources as productive assets through topsoil and organic matter conservation.
4. Marathon County agricultural and woodlot producers are economically strong.
**Total Maximum Daily Load Program**

Section 303(d) of the Clean Water Act established the Total Maximum Daily Load (TMDL) program. The TMDL program identifies and restores polluted rivers, lakes, streams, and other surface waterbodies by detailing in a quantitative assessment the water quality problems and contributing sources of pollution. The TMDL determines how much a pollutant needs to be reduced to meet water quality standards, and provides the foundation for taking actions locally to restore a waterbody to fishable and swimmable standards.

TMDLs must be developed for waterbodies impaired by point sources and/or nonpoint sources. The TMDL is one important tool required by the Clean Water Act and employed by Wisconsin DNR to quantitatively assess a stream’s water quality and allocate allowable pollutant loads among sources along the stream and/or river. The Upper Wisconsin River TMDL is scheduled for completion in 2017. This plan specific pollutant allocation limits for all dischargers in the watershed to achieve statewide water quality goals.

**Groundwater Protection Guide**

The Groundwater Protection Guide was first developed in 1988. In April 2001, the plan was updated to reflect the changing programs and policies within the county as well as to acknowledge the increased...
level of regulation by state agencies to protect the groundwater resources of Marathon County. The guide identifies sources of groundwater in the county as well as consumption trends for the various community users. Environmental protection programs and responsibilities for implementation are identified for all the various State and local departments and agencies. Along with conservation programming, the enforcement of performance standards, zoning, wellhead protection activities, and groundwater monitoring will be necessary to help protect the groundwater.

Special considerations are evaluated that recognize that groundwater is a primary source of all water consumption by the residents and businesses of the county. As residential sprawl continues into the rural areas of the county and the scale of agricultural activities increasingly threaten the groundwater, the conservation efforts to protect the resource will need to increase. The Groundwater Plan and Central Wisconsin Basin Plan together identify risk concerns relative to type of pollutant sources present in specific watersheds as well as the relative risk of groundwater sources to potential problems.

**USGS Protecting Wisconsin’s Groundwater Through Comprehensive Planning**

In a joint effort, the Wisconsin Department of Natural Resources, the University of Wisconsin System, and the U.S. Geological Survey Cooperative Water Program worked together to build a website of data and information on geology, general hydrology, and groundwater quantity and quality. The website was developed to aid government officials and planners in Wisconsin for addressing groundwater in their comprehensive plans. The most recent data available for Marathon County was published in 2007. The full Marathon County report can be found at their website: [wi.water.usgs.gov/gwcomp/find/marathon/](http://wi.water.usgs.gov/gwcomp/find/marathon/).

**Central Wisconsin River Basin Plan**

The Central Wisconsin River Basin Plan was updated in 2010. Findings from the Basin Plan were used to assure that the LWRM Plan addresses those impacted waters and targeted activities of the county with the greatest need. The Basin Plan identifies:

a. Impacted Watersheds,
b. Exceptional waters and outstanding waters,
c. 303(d) waters,
d. Significant sources of pollutants or activities impacting the waters.

**Strategic Plan for the Big Eau Pleine River Watershed and Reservoir**

In 2009, Marathon County convened a meeting between Wisconsin Department of Natural Resources, Wisconsin Department of Agriculture, Trade and Consumer Protection, livestock producers, Big Eau Pleine Organization, and Wisconsin Valley Improvement Company in response to reoccurring fish kills in the Bid Eau Pleine Reservoir. In 2009, the Big Eau Pleine Task Force completed the short-term strategic plan which included the following:

a. Historic Case Study of the Big Eau Pleine Watershed and Reservoir
b. Action plan to upgrade the 1981 Aerator system
c. Long range “plan of work” to address the water quality and quantity of the Big Eau Pleine River System
The strategic plan identifies the roles and commitments of governmental agencies, sportsman and citizen groups, educational institutions, agricultural groups, and the Wisconsin Valley Improvement Company to address the water quality concerns of the reservoir. The log range plan includes the development of the Fenwood Creek pilot watershed project as a means to begin educational and landowner outreach efforts prior to completion of the TMDL plan. The pilot project will create landowner awareness of agricultural contributions to water quality degradation.

**Big Eau Pleine**

The Big Eau Pleine Citizens Organization (BEPCO) has embarked on an effort to review many years of scientific data. This effort began in April, 2014 with stakeholders (Wisconsin Department of Natural Resources, Wisconsin Valley Improvement Corporation, Marathon County, and local residents) meeting to better understand the hydrodynamics of the reservoir and how they relate to inflow, outflow, reservoir water levels and dissolved oxygen. A better understanding of this complex system will allow for more efficient and effective management decisions. The second phase of this effort involved continuing to develop organizational capacity and stakeholder involvement with the BEP issues as well as developing a lake management plan for the reservoir. Additional information on the BEP project can be found on the BEPCO website at [http://www.bigeaupleine.org/](http://www.bigeaupleine.org/)

**Surface Water Resources:**

Marathon County has 202 lakes with a total surface area of 28,322 acres. Big Eau Pleine Reservoir is the largest body of water with a potential area of 6,830 acres when full. Many lakes lie in kettle holes left by the retreat of the glaciers. Seepage lakes are the most common type of lake in the County. These lakes do not have any surface outflow but depend on underground movement of water through highly permeable glacial soils for drainage. Most lakes are quite shallow, with depths ranging from less than one foot to a maximum of 34 feet. The largest “lakes” in the County have been formed behind river dams, including the Big Eau Pleine Reservoir, Lake Wausau, Half Moon Lake, and Lake Du Bay. Like other water resources, lakes provide flood retention, wildlife habitat, recreational opportunities, and scenic amenities. Many of these lakes are identified on Map 6-1: Water Resources.

The county has 356 rivers and streams with a surface area of 3,748 acres. The interconnected network of rivers and streams that cross Marathon County is characteristic of a landscape influenced by glacial impacts. The Wisconsin River flows south through the county. The river is regulated by several dams on the mainstream and tributaries, which are controlled by the Wisconsin Valley Improvement Corporation (WVIC). Major tributaries flowing from the east to west include the Trappe, Eau Claire, Little Eau Claire, and Plover Rivers. The major tributaries flowing from west to east are the Little Rib, Big Rib, Big Eau Pleine, and the Little Eau Pleine Rivers.

Map 6-1: Water Resources

**Watersheds**

Marathon County is geographically located in what the Wisconsin DNR has named the Central Wisconsin Basin, which is a subset of the entire Wisconsin River corridor located in Central Wisconsin. The Central
Wisconsin Basin extends south from the Merrill dam located on the Wisconsin River in Lincoln County to the Castle Rock Flowage Dam in Juneau and Adams Counties. The Central Wisconsin River Basin is comprised of 29 watersheds, 17 of which are all or part in Marathon County. A watershed is an area of land that is drained by a waterway that flows to a lake, reservoir, or river. The watershed boundary line is defined as a topographic dividing line from which surface streams flow in two different directions.

The watersheds in Marathon County contain numerous scenic vistas including rock outcroppings and flowages. They are also characterized by diverse agricultural activities throughout the basin. The last glaciers created a network of warm and cold water streams fed by surface and groundwater sources that all connect to the Wisconsin River, except for the two sub-watersheds in the southeastern part of the County, which flow into the Fox-Wolf Basin.

Figure 6-1: Watersheds in Marathon County

**Wetlands**

Wetlands consist of transitional areas between uplands and open water. Wetlands perform important ecological functions such as flood retention and water quality improvements. They provide valuable wildlife habitat as well as recreational opportunities. In Marathon County, wetlands were severely impacted or destroyed by agricultural activities from the late 1940s through the 1970s. Many were
drained for cropland through the creation of “w” ditches, which consist of a narrow, raised field with a ditch on either side. Many of these ditches still exist.

Programs in three levels of government - local, state and federal - regulate activities in wetlands. Permits are required for activities that impact wetlands, such as land and road development. In some cases wetland replacement or mitigation is required. While the State policy does not mandate wetland mitigation on non-federal wetlands, it does encourage efforts to minimize loss through the use of “best management practices” (BMPs), which include a variety of techniques and approaches aimed at minimizing the impacts of construction and development on the natural environment.

Wetlands that remain in the County are generally located adjacent to rivers, creeks, and floodplains as shown on the Natural Resources Map. Most are wooded, although several types of WDNR classified wetlands can be found throughout the County.

From the last 1940s through the 1970s, many natural wetland areas on the west side of the county were drained for cropland through constructed “w”-shaped surface ditches. These long, narrow drainage channels improved crop production, but also increased runoff rates and the flashy nature of the streams. The majority of these drainage ditches still function in agricultural areas. The drainage system, although an effective crop production enhancement, contributes the rapid transport of nutrients and sediment from the landscape into surface waters. The TMDL plan will prescribed best management practices at the edge of cropland fields to reduce the runoff potential of these drainage ditches, as well as to enhance the wetland capacity of the watershed.

**Floodplains**

As defined in the County Zoning code, the floodplain consists of the “floodway” and “flood fringe”. The “floodway” is defined as the channel of a river or stream and those portions of the floodplain adjoining the channel required to carry the regional flood discharge. “Flood fringe” is defined as that portion of the floodplain outside of the floodway covered by floodwaters during the regional flood and generally associated with standing water rather than rapidly flowing water.

In Marathon County, areas within the 100-year floodplain are typically located immediately adjacent to rivers, streams and creeks. In some flatter areas, such as around the Big Eau Pleine River, the floodplain extends some distance from the water’s edge. Likewise, floodplains usually do not exist along river segments with steep or high banks, although these areas experience greater flood depths due to constricted flow.

Floodplains are subject to potential flooding and/or intermittent wetness and therefore they are not generally appropriate for development. Like wetlands, floodplains provide areas where water from swollen rivers and streams can over-flow. They also provide valuable wildlife habitat.

**Lakes of Marathon County**

Marathon County has a number of lakes which provide wildlife habitat, recreational opportunities and aesthetic enjoyment. Several lakes have citizen organizations or sports clubs that work to protect and
preserve the water resources such as the Big Eau Pleine Citizens Organization (BEPCO), DuBay Property Owners Association, Lake Wausau Association and Pike Lake Sportsmen Club. Marathon County also has two lake districts: Big Bass Lake Rehabilitation District, and Mayflower Lake Improvement District. A lake district is a special purpose unit of government established to maintain, protect, and improve the quality of a lake and its watershed.

Over the years, little data has been collected related to water quality conditions, health of fisheries and the aquatic plant community. This lack of good science based information made it difficult to develop strategies and to focus resources on the improvement or protection of these lake ecosystems.

In 2010, Marathon County embarked on a project to collect scientific and social information and develop lake management plans on eleven lakes in Eastern Marathon County. This Eastern Lakes Project is a partnership of citizens, eastern Marathon County communities, Marathon County government, and the University of Wisconsin Stevens Point. Scientific data collected included: watershed and land use assessment, water quality, shoreland health, fishery, zooplankton, aquatic plants and sediment core analysis. Based on this scientific data, lake management plans were developed outlining goals and objectives for protection and improvement efforts. Additional information on the Eastern Lakes Project can be found on the Marathon County website at http://www.co.marathon.wi.us/Departments/ConservationPlanningZoning/ConservationServices/Lake Programs.aspx.

In 2011, the Lake Wausau Association (LWA) reorganized to address citizen concerns about the lake's water quality. Over the past decade there has been substantial weed and algae growth raising concern over water quality and bacteria. The LWA took action by launching a lake evaluation project in the spring of 2012, after months of planning and prioritizing objectives of the evaluation. The project focused on evaluating the condition and health of the lake including water quality, water flows, fisheries habitat, aquatic plant management, shoreland habitat, community values, and recreational uses. Boundaries of the evaluation area are from the Wausau dam, Schofield dam, Domtar dam, and HWY 51 Rib River Bridge.

LWA contracted services with the Wisconsin Department of Natural Resources (WDNR), University of Wisconsin-Stevens Point (UWSP), and the U.S. Army Corp of Engineers (ACE) in conducting the comprehensive lake evaluation project. These researchers and specialists are performing various tasks including hydrodynamic modeling, aquatic macrophyte surveying, bathymetry and in-lake habitat surveying, shoreland habitat surveying, community capacity analysis, and social and economic values surveying. The bathymetry and in-lake habitat surveying included production of a digital map of the lake for use in the project, as well as for long-term monitoring of the lake.

Development of a lake management plan is the final task of the project. The plan will provide direction for implementation needed to achieve goals related to water quality and water flows, recreation, shoreland management, fishery management, communication, and water governance. The plan will identify the steps required to achieve these goals and the parties that are responsible for the action steps. Additional information on the Lake Wausau Association and their resource protection efforts can be found on their website at: http://lakewausau.org/.
**Groundwater Resources:**

**Groundwater Characteristics**

Groundwater is the major source of all water consumption in Marathon County. The 17 municipal water systems in Marathon County are owned and operated by specific communities. All public and private water supplies and most domestic, industrial, and agricultural water supplies rely on groundwater. According to the department of Natural Resources Inventory of Watersheds, in 2006, 15 of the 20 inventoried watersheds rank “high” relative to groundwater impacts and threat to the resource. As residential development continues to expand into the rural areas of the county and agricultural production methods intensify, the concern for groundwater protection grows. Increased nitrate and bacteria levels in residential wells pose serious health concerns. For more information about municipal water utilities and private wells, see Chapter 8 on Infrastructure.

Access to groundwater varies across the County, as does the amount of water available. The depth to reach groundwater is shown in Map 6-2. Some areas, particularly those with high bedrock, require wells with depths of 50-feet or more. Water supplies are generally good in the Wisconsin River Valley.

Over the past 3 years, the concern for groundwater quantity has increased. From 1979 to 2005, total water use in Marathon County increased from 40.7 million gallons per day to 68.2 million gallons per day. The increase of water use is due to a growing industrial consumption. Recently, the communities of Dorchester and Abbotsford have documented concerns about limited municipal water supplies and its impact to future growth. The concern has also extended to other small rural communities, as well as Towns where large scale livestock operations draw heavily on the regional water supplies.

Map 6-2: Depth to Groundwater

**Groundwater Use Limitations (recheck natural resources chapter for consistency ) Issue**

Available groundwater in much of central Wisconsin is limited to discharge through wells of low yield. Aquifers that yield small amounts of water to wells are associated with fractured crystalline rock formations at or near ground surface in the central and eastern parts of the County, sandstone overlying crystalline rock in the southern and western parts, and glacial till that covers the area north and west of the Marshfield moraine. Many wells in crystalline rock yield less than 2 gallons per minute (gpm). About 90 percent of the wells in sandstone and most wells in glacial till yield 5-20 gpm.

Water for public and industrial supplies is limited in a large part of central Wisconsin. Yields of ground water and natural stream flows during dry seasons are too low to sustain large supplies. In some towns and villages, public water supplies are inadequate; in others, they are barely adequate and cannot sustain the increase in future needs.

The number of high capacity wells for municipal, agricultural, and industrial use continues to increase in Marathon County. High capacity wells are wells which have the capacity to draw 70 gallons per minute or more. As a result of increased demand and/or persistent drought conditions, some areas of Marathon County are experiencing the impacts of limited groundwater resources. Proposed legislation to manage groundwater quality in designated management areas did not advance out of legislative committee in 2009. Therefore education about groundwater conservation is the primary tool available to help manage
groundwater quality issues. Protection of groundwater quality continues to be an important management issue in Marathon County. Overall progress has been made on groundwater quality; however the communities should continue to be diligent on well head protection. Runoff contamination can be an issue and this past year two private wells were impacted by manure runoff in Marathon County.

In recent years, the State of Wisconsin has introduced legislative initiatives to better regulate groundwater competition and over-draw in areas where supplies are limited. Furthermore, Marathon County will need to track evolving legislation to target program services where groundwater quality and quantities are a challenged.

In the western half of Marathon County, limited groundwater storage potential and rapid surface runoff deprive the area of much water that otherwise would be available. Only a small part of the total water yield, excluding surface-water reservoir potential, is available for large public supplies. Soils of low permeability impede downward seepage and promote rapid surface runoff. Crystalline rock at or near the surface, generally covered by thin deposits of low permeability, limit the groundwater storage potential. The result is a water-poor area in a water-rich State.

Map 6-3: High Capacity Wells

Water Quality

Surface Water Quality:

Water quality concerns take on many forms. Contributions to degradation can either be by point source (industrial discharge pipe or direct discharge from an animal lot) or by the less obvious nonpoint sources. The Central Wisconsin River Basin Plan recognizes cropland runoff and animal waste runoff as the most significant sources of pollutants to the watersheds of Marathon County.

The nonpoint sources associated with the agricultural livestock industry are increasing relative to both scale of runoff event and frequency. Since 2003, the Conservation, Planning, and Zoning staff has documented several significant discharges in the County associated with agricultural livestock waste, most in the late winter-early spring season. These runoff events are oftentimes characterized as “point sources” and many cases caused either fish kills or well contamination.

Nonpoint sources, including soil erosion, animal waste runoff, pesticide runoff, and urban runoff have been identified as significant sources of pollution that need to be controlled in order to meet State water quality goals. The impact of these pollutants include eutrophication, well contamination, fish kills, algae blooms, beach closings, high bacteria counts, turbidity, and loss of aquatic habitat. Most surface waters designated as 303d impacted waters are impacted by phosphorus. To a large degree, the Upper Wisconsin TMDL will focus upon the reduction of phosphorus delivery to surface water.

Public awareness of wetlands as a valuable resource continues to increase. However as with other counties, Marathon County has seen a net loss in wetland acreage. Minimizing the loss of wetland with their buffering capacity is a high priority for the enhancement of water resources in Marathon County. Building wetland function adjacent to cropland is an important element in the reduction of nonpoint
runoff and promotion of groundwater recharge, two important resource concerns in Marathon County. Wetland restoration and sediment control are important water quality tools that will be promoted over the next 10 years.

**Designated Waters**

**Outstanding and Exceptional Resource Waters**

The U.S. Clean Water Act states that waters identified as largely unaffected by should be kept that way, establishing the designations of Outstanding and Exceptional Resource Waters to classify protected waters. An Outstanding Resource Water (OWR) is a lake, stream, or flowage having excellent water quality, high recreational and aesthetic value, and high quality fishing. ORWs are free from point source or nonpoint source pollution. An Exceptional Resource Water (ERW) is a lake, stream, or flowage exhibiting the same high quality resource values as outstanding waters, but may be affected by point source pollution. Several streams in the County are classified as ORW or ERW and are noted on Map 6-3. A complete listing of these high quality surface waters can be found on the WI DNR web site.

**Map 6-4: Designated Waters**

**Impaired Waters**

The Wisconsin Department of Natural Resources (WDNR) identifies “impaired waters” that belong on the “303(d) list” of the U.S. Clean Water Act. This list, maintained by the EPA, identifies waters that do not meet current water quality standards and merit water quality improvement and protection. Some of the pollutants and impairments measured include phosphorus, sediment (total suspended solids), bacteria (E.coli), and mercury. A complete list of impaired waters is on the WI DNR web site. Water impaired due to low dissolved oxygen and phosphorus associated with agricultural nonpoint runoff includes the Big Eau Pleine Reservoir and the Big Eau Pleine River Watershed. The 303(d) waters, and proposed 303(d) waters, in Marathon County are shown on Map 6-3.

**Environmentally Sensitive Areas**

Environmentally Sensitive Areas (ESAs) include geographic areas of the landscape encompassing high quality or environmentally important resource features such as lakes, rivers, streams, wetlands, undeveloped shoreland, floodplains, and areas of steep slopes. These areas are particularly vulnerable to degradation or destruction from development and other impacts and therefore should be protected from intensive disturbances.

**Water Quality Management Area (WQMA)**

One shoreline protection designation is the Water Quality Management Area (WQMA). WQMAs are defined as a) an area located within 1,000 feet from the ordinary high-water mark of navigable waters; b) an area located within 300 feet from the ordinary high-water mark of navigable waters. Marathon County has delineated the WQMA’s areas greater than five acres in size on Map 6-3. Due to the highly developed drainage systems in the County, the WQMAs are extensive and widespread.
Marathon County has a shoreland zoning ordinance which protects all the water quality management areas within the County. The ordinance protects 1,000 feet from the ordinary high-water mark of a lake, pond, or flowage and 300 feet from the ordinary high water mark of a river or stream.

**Stormwater Management**

Surface water management (also referred to as “storm water management”) is one of the key components in efforts to improve water quality. It primarily involves controlling the volume, quality, and storage of runoff. Storm water management facilities in urban areas generally consist of a network of curbs, gutters, catch basins and pipes to collect water and holding or detention ponds to hold the water until it can seep into the soil or evaporate. Storm water management also typically involves some degree of control over development and/or construction practices to minimize runoff and erosion. These are often referred to as “best management practices” (BMPs) and may include restrictions on the amount of impervious area allowed on a parcel, limits on removal of vegetative cover which protects against erosion, and restrictions on building on steep, highly erodible slopes.

Requirements for surface water management planning stem from the Federal Water Pollution Control Act Amendments of 1972 objectives to improve water quality. All levels of government, from federal to local get involved in the management and regulation of surface water, depending on the size of the area, its incorporation status, and the specific activities or use of the land that could affect surface water quantity or quality. Storm water management at the local level typically occurs through site development standards and erosion control regulations. In Marathon County these standards are found in the Zoning Code (Chapter 17) and Land Division Regulations (Chapter 18). Wisconsin Pollutant Discharge Elimination System (WPDES) permits are required for large, and certain smaller municipalities or urbanized areas. In addition WPDES permits are required for paper mills, treatment plants and several of the large dairies and animal operations in Marathon County. These permits regulate discharges to groundwater and surface waters.

The Federal Emergency Management Agency (FEMA) deals with flood control and requires municipalities to perform floodplain mapping and develop management plans in order to receive federal flood insurance. Areas within the designated 100-year floodplain are discussed in greater detail in the Natural Resources section. The County administers land use and development control in areas identified as shoreland, floodplains and wetlands in accordance with the Zoning Code (Chapter #22). Generally, new development is not allowed in these areas, although there are structures that were built prior to current development restrictions that remain in the floodplain.

The County is particularly concerned about non-point sources of pollution, including failing septic systems, urban runoff, and issues often identified with rural areas such as soil erosion, animal waste and pesticides. Non-point pollution is best addressed at the watershed level. Marathon County encompasses portions of 22 watersheds as shown in the image on page 4.

**Aquatic Invasive Species move to surface water quality**

Prevention through education continues to be an important activity for invasive species control. Clean Boat volunteers are having a positive effect on public awareness. Permits for work in public waterways...
or in areas of land disturbance near waterways should include provisions to clean equipment prior to moving to the next site to prevent the unintentional transport of invasive species. In 2010, Marathon County has entered into a working relationship with the Golden Sands Resource Conservation & Development agency to conduct an inventory of lakes and flowages unassociated with the Wisconsin River for aquatic species. The inventory efforts will also involve educational outreach efforts to Park Department employees and students.

Currently, 21 water bodies are infested with aquatic invasive species.

**Groundwater quality:**

Groundwater is the primary source of drinking water in Marathon County. Nearly 85% of 762 private well samples collected in Marathon County from 1990-2006 met the health-based drinking water limit for nitrate-nitrogen. Over half of the samples contained 2-10 mg/L of nitrates serve as indicators that land use is affecting groundwater quality. The Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP) and DNR reports that 80% of nitrate inputs to wells originate from the agricultural land spreading of nutrients and legume cropping systems.

**Pollution and Contamination**

Since groundwater gets into the ground at the land surface, it makes sense that what happens on the land surface can have impact on groundwater. A great many land use activities have the potential to impact the natural quality of groundwater. For example, a landfill may leach contaminants into the ground that end up contaminating groundwater. Gasoline may leak from an underground storage tank into groundwater. Fertilizers and pesticides can seep into the ground from too much application on farm fields, golf courses, or lawns. Intentional dumping or accidental spills of paint, used motor oil, or other chemicals on the ground can result in contaminated ground or surface water.

In areas with many private wells, groundwater contamination is a concern, especially where the soil types are highly permeable. Sources of groundwater contamination, such as landfills, chemical spills, and high nitrates in runoff, are often linked to human activities. The Water Testing Lab at the Marathon County Health Department and the University of Wisconsin Stevens Point monitor public and private drinking water systems and recreational waters and tests for several microbiological and chemical parameters.

One way to measure past contamination is through the WDNR’s Bureau for Remediation and Redevelopment Tracking System (BRRTS), which records information about contaminated properties and other activities related to the investigation and cleanup of contaminated soil or groundwater in Wisconsin. As of August 2014, Marathon County had 89 open or conditionally closed sites which fall into a few different categories. The five types of sites tracked include Leaking Underground Storage Tank (LUST) sites, Environmental Repair (ERP) sites, Spills, Liability Exemption (VPLE) sites, and Abandoned Container site.

**Susceptibility of Groundwater to Contaminants**

Susceptibility of groundwater to pollutants is the ease with which a contaminant can be transported from the land surface to the top of the groundwater called the “water table”. Many materials that overlie the
groundwater offer good protection from contaminants that might be transported by infiltrating waters. The amount of protection offered by the overlying material varies depending on the materials. In some areas, the overlying soil and bedrock materials allow contaminants to reach the groundwater more easily than in other areas.

Five physical resource characteristics are used to determine how easily a contaminant can be carried through overlying materials to the groundwater. These characteristics are depth to bedrock, type of bedrock, soil characteristics, depth to water table, and characteristics of surficial deposits. The graphic below is a composite map compiling all five of these characteristics into one map which shows the combined score for each area – low scores represent areas that are more susceptible to contamination and high scores represent areas that are less susceptible to contamination.

Figure 6-2: Groundwater – Contamination Susceptibility Analysis map from USGS.

**Water Uses:**

According to a 2007 report by the USGS Wisconsin Water Science Center, the primary uses of water in Marathon County are domestic, livestock, aquaculture, irrigation, industrial, commercial, and public use and losses, see Figure 6-3. From 1979 to 2005, total water use in Marathon County has increased from about 40.7 million gallons per day to 68.2 million gallons per day. Industrial water use is the greatest component of use in the county and is responsible for the increase in total water use over this period. The proportion of county water use supplied by groundwater decreased from 46% in 2000 to 34% in 2005.

Most water used in Marathon County is drawn up from groundwater via high capacity wells. A high capacity well system is a water supply system that has the potential to draw over 100,000 gallons per day or 70 gallons/minute. (424 high capacity wells in Marathon County: Source DNR, July, 2015). Map 6-4 shows reported high capacity wells by number of wells per square mile. The largest numbers of wells are found in the Wausau metro area and in the agricultural area in the south eastern portion of the County. The four largest wells reported quantities of water higher than most wells by several million gallons. These highest use wells are the Weston Power Plant, the Domtar Mill, the Mosinee Paper Mill, and the City of Wausau.
Water and Industry

Marathon County is home to several industries which are heavy water users. Using the water for transportation in industry was a driving factor to settlement in the area. Today, water is used in manufacturing of several types of industries.

Paper Mills

Two paper mills continue to operate in Marathon County, both along the Wisconsin River. The mill in Rothschild originally opened in 1909 and is now operated by Domtar. This facility has one paper machine and one pulp line and has the capacity to produce 136,000 short tons of paper and 65,000 tonnes of pulp annually. The mill in Mosinee, originally founded in 1910, is currently operated by Expera Specialty Solutions. Two of the four high-capacity wells in Marathon County which draw the most water are these two mills.

Paper mills use vast quantities of water every day in their operations. According to a 2009 report sponsored by the Environmental Protection Agency, the average water use within pulp and paper mills is approximately 17,000 gallons/ton of paper. Water is necessary in most stages of the pulp and paper making process including raw materials preparation, pulping, chemical recovery, bleaching, and papermaking. Mills also discharge wastewater and often have their own wastewater treatment plants to minimize impacts on local water sources.

Power Plant

The power plant in Weston is operated by Wisconsin Public Service. At this site, three fossil-fueled electric generating units make electricity. Weston 4, the newest unit, began operating in 2008 and is one
of the cleanest power plants of its kind in the United States, uses clean coal technologies. Electricity generated at this site is split between Wisconsin Public Service customers (70%) and Dairyland Power Cooperative of La Crosse (30%). The Weston power plant is one of the largest water users in Marathon County.

Thermoelectric power plants, like the facility in Weston, use large amounts of water. As of 2010, more water was required to run power plants than any other industry in the United States, accounting for 49 percent of total industrial water use. Thermoelectric power plants boil water to create steam, which spins turbines to generate electricity. The steam must then be condensed back into water before it can be reused to produce more electricity.

**Food Production and Processing**

Marathon County has a strong industry in dairy production and is one of Wisconsin’s leading milk producers. Animal products require a large quantity of water to produce, in both the raising and feeding of the animals and in the production of consumer products such as milk, cheese, and meat.

Water is used in milk and cheese processing to clean equipment and to cool products during production. Dairy processing also produces wastewater which must be treated. It requires approximately 4.5 gallons of water to produce one gallon of milk, including both raising the cow and processing the product.

The meat processing industry is a high water user. Meat processing plants primarily use water for sanitizing animal holding areas, meat washing, chilling, waste fluming, and cleaning and disinfecting equipment. Typical water use in the processing of pork and cattle varies from around 1,000 to 10,000 gallons per ton of product. Meat processing also generates wastewater which must be treated before leaving the facility.

**Water and Agriculture**

Farms are major users of water, accounting for 70 percent of freshwater use worldwide. Crop farming in the eastern half of Marathon County requires irrigation and accounts for most of the high capacity wells found in that area on Map 6-4.

On dairy farms, water is used for animal consumption, milk cooling, cleaning and sanitizing equipment, cow cooling, irrigating crops, producing value added products, moving manure, and cleaning barns through flush systems. The average dairy cow drinks 43.6 gallons of water per day and requires 6.3 gallons per day for cleaning, a total of almost 50 gallons per cow.

Concentrated Animal Feeding Operations (CAFOs) Marathon County is home to nine permitted CAFOs as of 2014 according to the WDNR. CAFOscongregate animals, feed, manure and urine, dead animals, and production operations on a small land area. These operations require large quantities of water for animal consumption, cleaning, and other uses. Runoff from CAFOs can have negative impacts to water quality due to the amount of animal waste on site.

**Residential Use**

Water is also used directly by people for drinking, bathing, washing, and other regular activities. Most incorporated municipalities in Marathon County have a water utility which provides water to residents;
see the Infrastructure chapter for more information on water utilities. High capacity wells in the City of Wausau account for one of the top four largest drawing well areas.

Residents in rural areas rely on private wells for their water.

**Water-based recreation and tourism**

Marathon County is the home of many popular water-based outdoor recreation activities including boating, canoeing, kayaking, swimming, and fishing. The County is a destination for these activities, with people traveling from around the region to participate in them. Water-based recreational activities depend on safe, clean County lakes and streams for their continued success.

The surface waters of Marathon County are used recreationally by fishermen. The Wisconsin Department of Natural Resources (WDNR) notes fishery areas, and the locations waters for popular fish such as musky and trout. Marathon County has five identified fishery areas and one rearing station. The fishery areas are located on Big Rib River, Four Mile Creek, Freeman Creek, Plover River, and Spranger Creek. These areas are noted for their fish populations including brook trout, brown trout, smallmouth bass, and forage species. Marathon County has hundreds of miles of classified fishing rivers and streams and thousands of acres of designated fishing lakes.
Issues

- Protect Water Quality – There are numerous regulations and/or incentive programs at the County, State and Federal level aimed at protecting water resources from contamination from non-point sources such as farm runoff and soil erosion. One of the continuing challenges is ensuring coordinated and effective enforcement of the various regulations. In addition, some areas in or immediately adjacent to the Wausau metro area are experiencing strong development demand. Unrestricted or insensitive development can negatively impact water quality. Development in areas without sufficient infrastructure, in well recharge areas, or shoreland areas should be carefully controlled to minimize impacts to water resources.

- Water Contamination – While the quality of the groundwater in Marathon County is generally very good, contamination has occurred in some areas, usually as a result of human activities. The County is particularly concerned about non-point sources of pollution, including failing septic systems, urban runoff, soil erosion, manure runoff, nitrates and other chemicals in runoff. The County is currently addressing some of these through development of the TMDL plan. While the County Health Department laboratory analyzes samples from wells collected through voluntary means, the lab does not test for herbicides and pesticides. Where samples have been taken, evidence of these chemicals has been found at levels that could pose health concerns. This suggests that a more proactive approach to water quality monitoring may be needed to identify the location and extent of potential water contamination problems.

- Large scale livestock operations and Impact on Water Quality – Concentrated Animal Feeding Operations (CAFOs) are large scale (over 1000 animal units) agricultural operations where animals are kept and raised in confined situations. Medium Animal Feeding Operations are livestock operations with over 500 animal units. These types of operations congregate animals, feed, manure and urine, dead animals, and production operations on a small land area. Runoff from CAFOs can have very negative impacts on water quality because of the shear concentration of pollutant sources in one area.

- Upcoming TMDLs – Total Maximum Daily Loads (TMDLs) are standards which describe the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards. WDNR is currently implementing a plan to improve water quality in the Wisconsin River Basin, which includes all but the south eastern corner of Marathon County. Implementation of the TMDLs will improve water quality in the Wisconsin River basin, but it will require significant changes to address runoff from agricultural, municipal, and industrial sources.
**Water Quality and Quantity Goal and Objectives**

**Water Quality and Quantity Goal:** The water resources in Marathon County are of the highest quality, for the safety of residents and the health of aquatic ecosystems, and are protected from damaging behaviors like overuse and pollution.

Objectives:

1. Protect and enhance surface water resources and natural habitat areas.
2. Manage lake and reservoir resources to balance concerns of shoreland residents, users, and local businesses.
3. Protect and enhance the quantity and quality of potable groundwater and potable surface water supplies.
4. Reduce agricultural nonpoint runoff to surface water (soil sediment, organics, and nutrients).

The Action Plan, found in Chapter 13, builds on the goals and objectives found in the chapters by adding recommended action steps to take to reach the goal of becoming the healthiest, safest, most prosperous county in Wisconsin.