

PRIORITY CONCERNS: GOALS, OBJECTIVES, & ACTIONS TABLE

Based on the public feedback, agency comments, and current priorities, the table below shows the priority concerns, objectives, and action steps were identified for inclusion into the 2013-2023 Water Plan. The following pages summarize each of these in more detail.

Priority Concern: Aquatic Invasive Species

Objectives:

1. Lake Association Coordination

Action Steps:

Maintain a current contact list for County lake associations.

Distribute relevant news, grant opportunities, and information on upcoming events to lake associations on no less than a quarterly basis.

Host open houses or other educational events to provide a forum for discussion and collaboration amongst associations.

2. Watercraft Inspection

Coordinate a watercraft inspection program with DNR and local lake associations.

3. Lake Improvement District Management

Provide clear expectations, processes, and informational resources for new and existing LIDs.

Continue to improve and refine County LID policies.

Maintain LID reports and contact information online.

4. Education & Outreach

Improve AIS signage in visible locations.

Develop AIS displays, presentations, and promotional material for area schools, County Fair, and other forums.

Communicate to the public using website, social media, press releases and other means.

Priority Concern: Surface Water

1. Stormwater Management and Erosion & Sediment Control	Provide technical assistance and onsite guidance to enable landowners to implement stormwater management practices.
	Utilize grants and other funding mechanisms to provide financial incentives for implementing stormwater management practices.
	Expand the availability of educational materials, workshops, and network of resources for promoting stormwater management.
	Support scientific research and methods that promote minimal impact stormwater techniques that use natural drainageways and vegetated soil surfaces to convey, store, filter, and retain storm water onsite while mimicking the natural hydrology of a site.
	Develop public and private drainage solutions that incorporate effective stormwater management and erosion & sediment control.

2. Shoreline Buffers	<p>Provide technical assistance and onsite guidance to enable landowners to implement natural shoreline practices.</p> <p>Utilize grants and other funding mechanisms to provide financial incentives for implementing natural shoreline practices.</p>
3. Wetland Protection	Provide leadership in administration of WCA
4. Land Use & Development	<p>Offer educational opportunities for area contractors and professionals.</p> <p>Provide leadership in developing land use Ordinances that are outcome based.</p> <p>Measure Impervious Surface Coverage.</p> <p>Measure phosphorus inputs from land use activities and promote no net increase in phosphorous from development activities.</p> <p>Encourage common sense mitigation measures, such as shoreline buffers and stormwater management for Variances granted to the Land Use Ordinance.</p> <p>Maintain contact with network of local contractors, developers, realtors, consultants, and other professionals.</p>
5. Measure Water Quality Data & Assess Trends	<p>Promote conservation easements.</p> <p>Identify sensitive shorelines.</p> <p>Private forest management.</p> <p>Assess water quality trends and impairments.</p> <p>Promote water quality monitoring amongst local lake association volunteers, students, and others.</p> <p>Work with MPCA, Environmental Laboratories, and others to determine future water monitoring and assessment needs.</p>
6. Agricultural Best Management Practices	<p>Promote manure/nutrient management plans for livestock producers.</p> <p>Promote pasture management and encourage rotational grazing plans.</p> <p>Promote conservation drainage practices, including data driven solutions that rely on LIDAR/GIS, culvert inventories, etc.</p> <p>Promote BMPs such as buffer strips, cover crops, residue management, and sedimentation basins to prevent soil loss and reduce erosion.</p>

Promote targeted agricultural BMP implementation, both within the specific landscape and also watershed wide.

Priority Concern: Ground Water

1. Septic Maintenance & Inspection

Encourage landowners with septic systems to have their systems accessed for maintenance every three years.

Provide leadership in administration of the Minnesota septic rules (Minnesota Rules Chapter 7080).

Assist small communities in identifying potential centralized wastewater treatment options where applicable.

Provide landowners with information on available financial assistance for septic system upgrades

Work with MPCA to conduct assessment of current and potential sites for land application of septage.

2. Testing for Nitrates & Other Contaminants

Work with the Pollution Control Agency, Department of Agriculture, and other agencies to analyze long term groundwater monitoring data .

Make nitrate and groundwater information readily available to the public.

Coordinate regular nitrate testing opportunities.

3. Wellhead & Drinking Water Source Protection

Participate on local Wellhead Protection Planning teams.

Integrate Wellhead Protection Priorities into water plan implementation strategies.

Provide educational opportunities to non-community water sources and well owners about the importance of wellhead protection.

Promote agricultural BMPs that reduce the potential for groundwater contamination such as irrigation, fertilizer, and herbicide management.

Integrate the County Geologic Atlas into wellhead protection and water planning efforts.

4. Sealing of Unused / Abandoned Wells

Identify unused / abandoned wells, especially in sensitive groundwater areas.

Offer incentives to seal unused / abandoned wells.

5. Solid & Hazardous Waste Disposal

Provide citizens with information on the importance of recycling and solid waste management.

Promote proper disposal of household hazardous waste, electronic waste, and petroleum products.

Promote product stewardship for properly disposal of various types of solid and hazardous wastes as well as materials management which focuses on the economic value in waste recovery and recycling in addition to environmental protection.

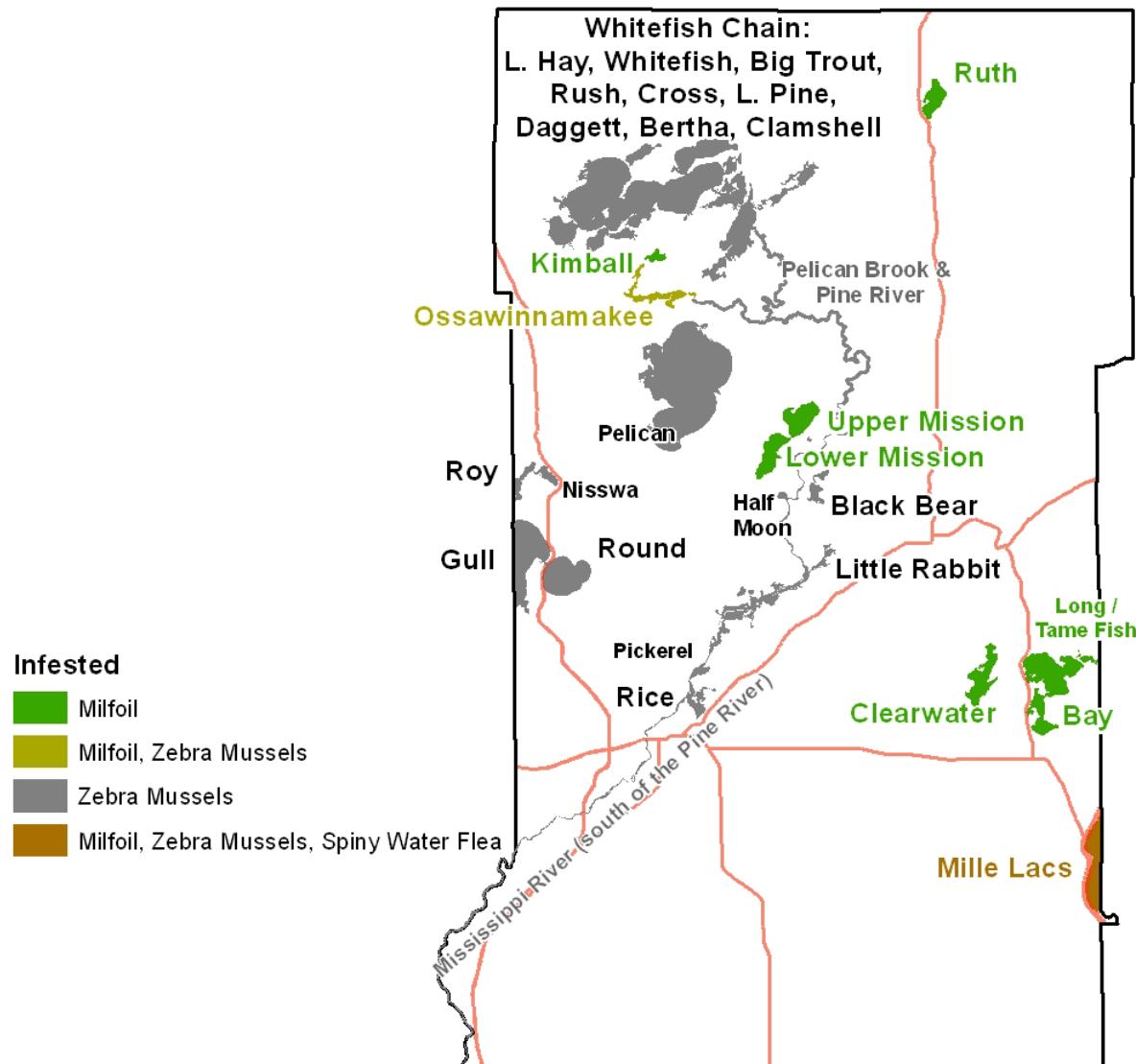
PRIORITY CONCERN: GOALS, OBJECTIVES, & ACTIONS

Priority Concern: Aquatic Invasive Species

Goal: To provide leadership in the fight against Aquatic Invasive Species by developing proactive solutions aimed at educating and empowering local citizens.

Aquatic invasive species (AIS) are non-native plants, animals, or pathogens that live primarily in water and thrive in their new environment, often out-competing native species. Well known AIS include: zebra mussels, curlyleaf pondweed, Eurasian watermilfoil, spiny waterflea, sea lamprey, and Asian carp. AIS management has quickly become one of the County's biggest challenges. Although the scenario varies by lake and by species, it is clear that the easiest and most cost effective method is prevention.

Figure 6. Current Crow Wing County AIS Waters (does not include waters with curly-leaf pondweed)



Objective 1: Lake Association Coordination

Crow Wing County recognizes that lake associations play a huge role in the fight against AIS because of their ability to motivate and deploy volunteers and resources that state and local agencies typically do not have. In addition to mailings and meetings, often the next step for volunteers to get involved is by taking an AIS volunteer training class given by the DNR Watercraft Inspection Program. Once certified, volunteers can be stationed at public accesses to provide AIS awareness and prevention to the public when entering / exiting the water. Lake associations also promote other water conservation measures including shoreline protection and stormwater management. Crow Wing County maintains a list of area lake associations and disseminates news and information to them on a quarterly basis.

Action 1: Maintain a current contact list for County lake associations.

Action 2: Distribute relevant news, grant opportunities, and information on upcoming events to lake associations

Action 3: Host open houses or other educational events to provide a forum for discussion and collaboration amongst associations.

Lead: Crow Wing County Land Services Department

Partners: Crow Wing Soil & Water Conservation District, 30 Lakes Watershed District, University of Minnesota Extension, Local Lake Associations, Crow Wing Lakes & Rivers Alliance

Financial: In-kind staff time

Duration: Length of plan

Measurable Outcomes:

- Host one annual workshop / open house.
- Communicate on no less than a quarterly basis,
- Maintain spreadsheet or database of current lake association contacts that is updated no less than on an annual basis

Objective 2: Watercraft Inspection

In recent years there has been an increased focus on controlling the spread of aquatic invasive species (AIS) in Minnesota by monitoring watercraft as they enter and depart from public water bodies. Although the Minnesota Department of Natural Resources (DNR) has taken the lead in watercraft inspection, the amount of man-hours and funding dedicated to this ever-increasing threat has been inadequate in slowing the spread of AIS. This has prompted Crow Wing County to take an increasing role in this fight. Beginning in 2011, the Land Services Department has partnered with local lake associations and the Minnesota Department of Natural Resources (DNR) to provide watercraft access inspectors at heavily used water access points in the County. In 2013, the County formally initiated a County-wide watercraft access inspection program.

Action: Coordinate a watercraft inspection program with DNR and local lake associations.

Lead: Crow Wing County Land Services Department

Partners: Minnesota Department of Natural Resources, Local Lake Associations, Crow Wing Soil & Water Conservation District, 30 Lakes Watershed District, Lake Improvement Districts, Crow Wing County Cities & Townships, Mississippi Headwaters Board

Financial: State Grants, In-kind staff time, Lake Association funds

Duration: Length of plan

Measurable Outcomes:

Provide annual watercraft inspection totals of the number of watercraft inspected by DNR and County inspections for each lake in Crow Wing County.

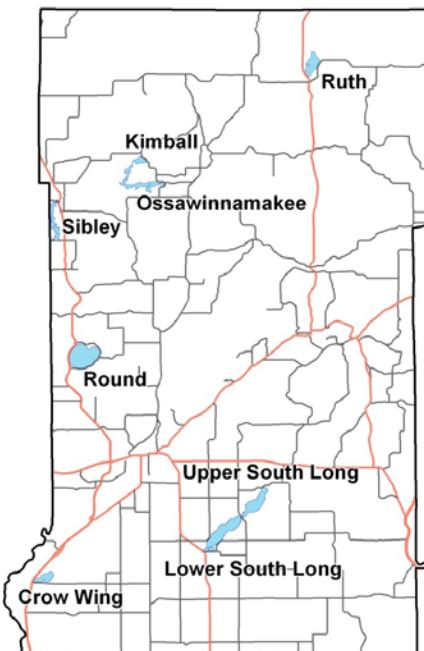
Objective 3: Lake Improvement District (LID) Management

A Lake Improvement District (LID) is a taxing district formed around a lake in accordance with Minnesota Statutes, sections 103B.501-103B.581 and Minnesota Rules 6115. A lake improvement district is a local unit of government established by resolution of appropriate county boards and/or city governing bodies, or by the Commissioner of Natural Resources, for the implementation of defined lake management projects and for the assessment of those costs.

Crow Wing County has eight lake improvement districts (LIDs), all of which were established primarily to control nuisance and invasive aquatic plant species, including Curly-leaf pondweed and/or Eurasian watermilfoil. Lake improvement districts are required to abide by statute and rule as well as County policies which were developed in 2010-2011. One of the LID requirements is to submit an annual report and a more in-depth 5-year report. All reports and LID information is available on the County website.

Figure 7. LIDs in Crow Wing County

- *Crow Wing*
- *Kimble*
- *Lower South Long*
- *Ossawinnamakee*
- *Round*
- *Ruth*
- *Sibley*
- *Upper South Long*



Action 1: Provide clear expectations, processes, and informational resources for new and existing LIDs.

Action 2: Continue to improve and refine County LID policies.

Action 3: Maintain LID reports and contact information online.

Lead: Crow Wing County Land Services Department

Partners: Crow Wing County Board of Commissioners, Local Lake Improvement Districts, Department of Natural Resources

Financial: In-kind staff time

Duration: Length of plan

Measurable Outcomes:

- LID Annual Reports shall be submitted to the Land Services Department, who will provide copies to County Board and public (via the website).
- County shall maintain LID factsheets and other LID information online.

Objective 4: Education and Outreach

Education and outreach measures that increase awareness of the threat and promote common sense prevention measures that can be effective in the fight against AIS.

Action 1: Improve AIS signage in visible locations.

Action 2: Develop AIS displays, presentations, and promotional material for area schools, County Fair, and other forums.

Action 3: Communicate to the public via website, social media, press releases, etc.

Lead: Crow Wing County Land Services Department

Partners: Crow Wing Soil & Water Conservation District, 30 Lakes Watershed, University of Minnesota Extension, Minnesota Department of Natural Resources, Local Lake Associations, Crow Wing Lakes & Rivers Alliance, Lake Improvement Districts, Local School Districts, Community Groups, Crow Wing County Cities & Townships, Mississippi Headwaters Board

Financial: Local & state grants, In-kind staff time

Duration: Length of plan

Measurable Outcomes:

- Annually attend or present at an AIS event.
- Issue at least one press release or appear on radio / TV at least once annually to promote AIS prevention / control.
- Distribute AIS information annually at County Fair.

Priority Concern: Surface Water

Goal: To empower landowners to steward surface water resources for use and enjoyment by current and future generations

Water is the centerpiece of Crow Wing County. Our health, safety, and general welfare are all influenced in a large degree by our water resources. Protecting these resources is the primary purpose of water planning. In 2012 there were approximately 560 lakes that were identified in local city and county ordinances. In addition, there are over 500 miles of streams, including nearly 70 miles of the Mississippi River that is within Crow Wing County. All told, these lakes and rivers make up 14% of the total area within the County and are the primary reason that the County is a vacation and retirement destination.

Based on the results of over 600 people that participated in the Water Plan survey in 2012, the most common use of County surface water resources is fishing, followed by general boating, swimming, and viewing (in roughly equal amounts).

Objective 1: Stormwater Management & Erosion and Sediment Control

One of the most effective ways to improve water quality in Crow Wing County is to better manage stormwater runoff. Stormwater that is not managed can have devastating consequences on the quality of lakes, streams, and rivers. Stormwater often contains oil, chemicals, excess nutrients (such as phosphorous), toxic metals, litter, and disease-causing organisms. In addition, stormwater frequently overwhelms streams and rivers, scours stream banks and river bottoms, and hurts or eliminates fish and other aquatic organisms.

Based on the 2012 Water Plan survey, 95% of those that responded were aware that stormwater runoff was a detriment to water quality and 45% had implemented stormwater best management practices on their property. 70% were aware that certain land use permits required stormwater management.

- Action 1:** Provide technical assistance and onsite guidance to enable landowners to implement stormwater management practices.
- Action 2:** Utilize grants and other funding mechanisms to provide financial incentives for implementing stormwater management practices.
- Action 3:** Expand the availability of educational materials, workshops, and network of resources for promoting stormwater management.
- Action 4:** Support scientific research and methods that promote minimal impact stormwater techniques that use natural drainage-ways and vegetated soil surfaces to convey, store, filter, and retain storm water onsite while mimicking the natural hydrology of a site.
- Action 5:** Develop public and private drainage solutions that incorporate effective stormwater management and erosion & sediment control.

Lead: Crow Wing County Land Services Department, Crow Wing Soil & Water Conservation District

Partners: 30 Lakes Watershed, University of Minnesota Extension, Minnesota Pollution Control Agency, Local Lake Associations, Crow Wing County Highway Department, Minnesota Department of Transportation, Department of Natural Resources, Crow Wing County Cities & Townships, Local Erosion / Sediment Control Product Suppliers, Mississippi Headwaters Board

Financial: Local & state grants, In-kind staff time

Duration: Length of plan

Measurable Outcomes:

- Provide annual total number of implemented stormwater plans across the County by various entities / programs.
- Work with landowners to voluntarily implement at least 15 stormwater plans annually, with at least half being on outstanding surface water resources or resources with a declining water quality trend.
- Host or present at one stormwater-related workshop annually.
- Maintain stormwater factsheets online.

Objective 2: Shoreline Buffers

Crow Wing County has over 550 lakes and 75 streams with over 2,000 miles of shoreline. These areas are an important buffer to the lake / stream ecosystem and if disturbed can impact water quality as well as fish and wildlife habitat.

Based on the 2012 Water Plan Survey, 60% of landowners reported that a majority of their shoreline was left natural

Action 1: Provide technical assistance and onsite guidance to enable landowners to implement natural shoreline practices.

Action 2: Utilize grants and other funding mechanisms to provide financial incentives for implementing natural shoreline practices.

Action 3: Expand the availability of educational materials, workshops, and network of resources for promoting natural shoreline practices.

Lead: Crow Wing County Land Services Department, Crow Wing Soil & Water Conservation District, Department of Natural Resources

Partners: 30 Lakes Watershed, University of Minnesota Extension, Minnesota Pollution Control Agency, Local Lake Associations, Crow Wing County Cities & Townships, Mississippi Headwaters Board

Financial: Local & state grants, In-kind staff time

Duration: Length of plan

Measurable Outcomes:

- Provide annual total number of implemented stormwater plans across the County by various entities / programs.
- Protect or restore ½ mile of shoreline annually.
- Host or present at one shoreline-related workshop annually.
- Maintain factsheets online about the importance of natural shorelines.

Objective 3: Wetland Protection

Approximately 25% of Crow Wing County is comprised of wetlands. Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Areas meeting this definition that are located below the ordinary high water level (OHWL) of a lake or average bank height of a stream are regulated as a Public Water by the Department of Natural Resources (DNR). Wetlands are protected by the Wetland Conservation Act (WCA), which is a state regulatory law (source: Minnesota Rules Chapter 8420) designed to achieve no net loss of wetlands, increase biodiversity of wetlands, avoid impacts to wetlands, and replace wetland values where avoidance is not feasible and prudent. In Crow Wing County, WCA is administered by the local zoning authority or their designee.

Action 1: Provide leadership in administration of WCA.

Action 2: Offer educational opportunities for area contractors and professionals.

Lead: Crow Wing County Land Services Department

Partners: Crow Wing Soil & Water Conservation District, Board of Water & Soil Resources, 30 Lakes Watershed District, Army Corps of Engineers, Department of Natural Resources

Financial: In-kind staff time

Duration: Length of plan

Measurable Outcomes:

- Provide annual total number of activities related to administration of the Wetland Conservation Act (WCA).
- Design processes and achieve outcomes consistent with goals & objectives of WCA under the oversight of a BWSR Wetland Specialist.
- Give one wetland-related presentation or training session annually.
- Maintain wetland-related factsheets online.

Objective 4: Land use and Development

The Crow Wing County Land Services Department is charged with administering the Land Use Ordinance in order to protect, preserve, and enhance the quality of the lakes, rivers, forests, wetlands, natural land forms, and open spaces of Crow Wing County for future generations. Common sense land use regulations that are administered by friendly and professional staff allow for everyone to appreciate the exceptional scenic, recreational, and economic qualities that our clean water provides.

Based on the 2012 Water Plan survey,

- 98% were aware that CWC required building permits
- 89% were aware that CWC required permits for shoreland alterations (dirt moving, landscaping, etc.)
- 64% were aware that CWC Land Service Specialists conduct onsite inspections prior to issuing permits
- 58% were aware that CWC Land Service Specialists meet landowners onsite to answer any questions for free
- 56% were aware that the CWC website provided applications, factsheets, and informational videos
- 53% were aware that the CWC website provided interactive maps & search tools for parcel information

Action 1: Provide leadership in developing land use Ordinances that are outcome based.

The groundwork for this Water Plan update and revision process was laid with the changes to the County Land Use Ordinance in 2011 which sought to integrate many of the water plan priority concerns and action steps from the 2008 plan into the daily operations of the Land Services Department. Performance standards were included in the Ordinance revision that are dependent on the location and scope of the project, including stormwater management, shoreline buffers, and septic system inspections/maintenance.

Crow Wing County is also working with a number of other municipalities within Crow Wing County to provide direction at how common sense, outcome-based land use can be implemented at the City level.

Action 2: Measure Impervious Surface Coverage.

In 2013, Crow Wing County completed a lakeshore research study project to calculate the amount of impervious surface coverage on 32 of the larger lakes in Crow Wing County. Impervious surfaces are hard surfaces on a lot such as rooftops, sidewalks, patios and driveways that don't allow water to soak into the ground. Impervious surface data was calculated using high-resolution aerial photography and property sketches from the Property Valuation and Classification Office. The amount of impervious surface was calculated for the entire riparian lot as well as within 250 feet

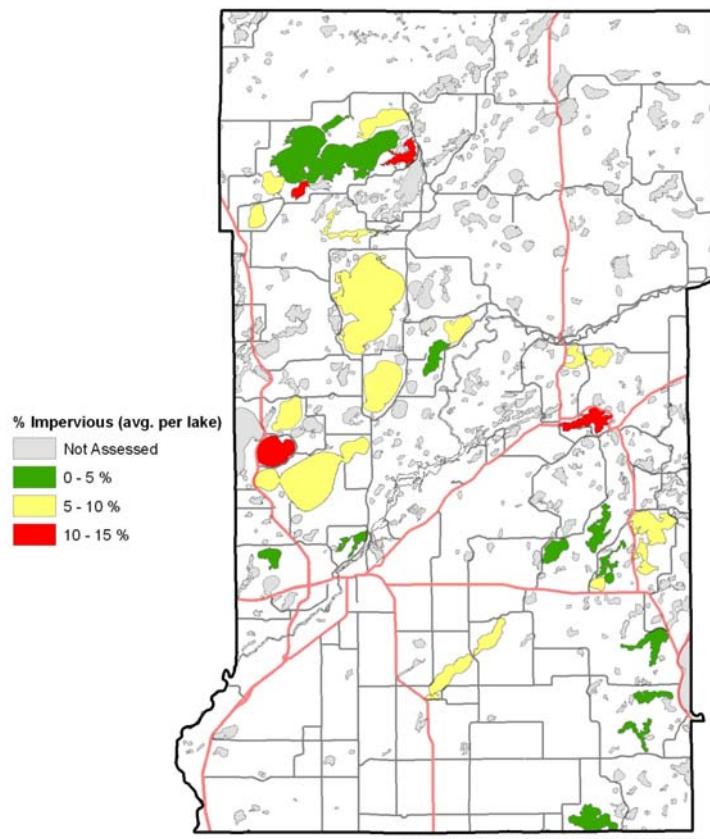
and 500 feet of the shoreline to determine how much impervious surface was located close to the shoreline. The results of both phases of the project indicate that the average impervious surface percentage on riparian lots on the County's larger lakes is less than 10%. See Appendix 4 for the full report. It can also be viewed online at the County website.

Figure 8. Impervious Surface % (average per lake)

Arrowhead	= 1.7%	Ossawinnamakee	= 7.6%
Bay	= 7.2%	Pelican	= 5.5%
Bertha	= 10.5%	Pig	= 1.9%
Big Trout*	= 5.4%	Platte	= 2.3%
Borden	= 2.8%	Portage	= 6.4%
Camp	= 3.4%	Rabbit*	= 6.5%
Clearwater	= 2.7%	Red Sand	= 4.8%
Crooked	= 3.8%	Round*	= 14.5%
Edward	= 6.0%	Rush*	= 13.7%
Gilbert*	= 3.5%	Serpent*	= 14.5%
Hanks	= 4.4%	Smith	= 2.2%
Hubert*	= 6.4%	South Long	= 5.7%
Lower Hay	= 5.9%	Upper Hay	= 5.6%
Lower Mission	= 2.2%	Upper Mission	= 5.2%
Nokay	= 3.1%	Upper South Long	= 7.1%
North Long	= 6.2%	Whitefish*	= 4.8%

* indicates lakes with some parcels located within city limits (not included)

Figure 9. Impervious Surface Summary Map



The lakes measured correspond with the lakes that were part of the County's water quality screening efforts (see Objective 5). The goal of the program is to determine what link exists between impervious surface coverage on the land and water quality in the lake as well as to target specific parcels for stormwater management that would help improve water quality.

Action 3: Measure phosphorus inputs from land use activities and promote no net increase in phosphorous from development activities.

Phosphorus is a limiting nutrient in our lakes and rivers, the presence of which greatly affects our water quality. By reducing total phosphorus (TP) inputs by effectively implemented storm water management practices, septic systems, and shoreline buffers, we can have a measurable impact on the quality of our surface and ground waters.

In 2012, Crow Wing County implemented a model for determining the amount of phosphorous (TP) that is contributed by land use activities. It is based on the amount of impervious surfaces, which is tracked on every permit in the Shoreland District. The Land Services Department's goal is to have no-net increase of phosphorous from all added impervious surfaces from riparian permits.

Action 4: Encourage common sense mitigation measures, such as shoreline buffers and stormwater management for variances granted to the Land Use Ordinance.

Action 5: Maintain contact with network of local contractors, developers, realtors, consultants, and other professionals.

Action 6: Promote conservation easements.

Conservation easements are an interest in real property where landowners voluntarily place certain restrictions on the use of their property for conservation purposes. These easements are also an agreement between the landowner and the easement holder. Conservation easements provide flexibility to accommodate a landowner's interest in protecting the land while still retaining ownership.

Conservation easements in Minnesota can be acquired and held by (1) governmental entities otherwise authorized to hold real property or (2) charitable organizations whose purpose meets the statutory definition of a conservation easement.

Grants can provide the funding resources needed to help provide financial incentives that encourage landowners to sell development rights and place a conservation easement on their land. Grants can also be obtained to help cover the closing costs associated with a landowner donating an easement.

Action 7: Identify sensitive shorelines.

The Department of Natural Resources (DNR) has identified areas along lakeshores that provide unique or critical ecological habitat using objective, science-based criteria. Their work has been focused on large bodies of water (500+ acres) in north-central Minnesota that still have undeveloped areas that could benefit from additional protection. In Crow Wing County, the Whitefish Chain and Pelican Lake have been intensively surveyed. In addition, the DNR has developed a rapid sensitive shoreline model to provide a rough idea of sensitive shorelines on the remainder of Crow Wing County lakes over 500 acres in size.

Crow Wing County Land Use Ordinance changes in 2011 created new land use (ie. zoning) districts, which included a Sensitive Shoreland District classification which would rely on DNR sensitive shoreline identification in order to potentially reclassify certain shoreland areas to Natural Environment status.

Action 8: Promote private forest management.

Although many watersheds in Crow Wing County have vast amounts of public forests, which are effectively managed by the County's Public Land Management office, it is the forested lands on private property that provide one of the largest opportunities to maintain high water quality in the watershed. Landowners have a number of educational resources, tax incentives, and other economic opportunities available to them that work to promote long-term forest health and productivity along with benefits to wildlife and water quality.

Lead: Crow Wing County Land Services Department

Partners: Crow Wing County Land Services Department, Crow Wing Soil & Water Conservation District, Department of Natural Resources (including the Private Forest Management Program), 30 Lakes Watershed District, Crow Wing County Cities & Townships, Camp Ripley, Minnesota Land Trust, Trust for Public Lands, Minnesota Center for Urban and Regional Affairs, Nature Conservancy, Leech Lake Area Watershed Foundation, Minnesota Forest Resources Council (specifically its North Central Landscape Committee), Mississippi Headwaters Board

Financial: Local & state grants, In-kind staff time

Duration: Length of plan

Measurable Outcomes:

- Provide annual total number of permits issued (by type).
- Calculate and record impervious surface totals along with phosphorous input / reduction for each permit issued in the Shoreland District. Summarize this information annually with the goal of achieving no-net increase in phosphorous from the added impervious surfaces on riparian properties.
- Conduct onsite visits prior to Public Hearings to provide stormwater and shoreline buffer recommendations.
- Host or present at one land use or Ordinance-related workshop annually.
- Protect at least two miles of shoreline and 1000 acres of land via conservation easements, private forest management plans, or similar means during the length of the plan.
- Identify specific areas in the County where conservation easements would be desirable from an enhanced public benefits perspective – water quality, groundwater protection, biodiversity, resource or habitat protection, etc.
- Promote existing private forest management landscape stewardship initiatives such as DNR & BWSR's Tullibee Lakes and Wild Rice projects as well as Camp Ripley's Army Compatible Use Buffer (ACUB) program.
- Participate on the Minnesota Forest Resources Council's North Central Landscape Committee
- Partner with the Minnesota Forest Resources Council's North Central Landscape Committee and the Department of Natural Resources' Private Forest Management Program to identify and pursue funding for emerging private forest management / landscape stewardship projects and projects that increase the delivery of services to private woodland owners.
- Maintain factsheets, ordinances, and other land-use information online.

Objective 5: Measure Water Quality Data and Assess Trends

Crow Wing County's larger lakes have been monitored off and on since 1970. This monitoring has been completed by numerous organizations including Lake Associations, Minnesota Pollution Control Agency, Minnesota Department of Natural Resources, Crow Wing SWCD, Thirty Lakes Watershed District, and the University of Minnesota. Water is sampled for transparency (water clarity) and chemistry (phosphorous and chlorophyll a). These measurements are summarized and reported to the Minnesota Pollution Control Agency (MPCA), who is mandated by the federal Environmental Protection Agency to maintain water quality standards for Minnesota's lakes and streams. Those water bodies that do not meet standards are deemed to be impaired (*Figure 12*) and require total maximum daily load (TMDL) studies in order to set pollutant reduction goals needed to restore these waters.

Half of those that responded to the 2012 Water Plan survey were aware of whether the water quality of their lake/stream was improving or declining.

From 2008-2013, Crow Wing County contracted with an environmental laboratory to compile all available data for larger lakes in Crow Wing County from all the different sources, evaluate the data quality, identify data gaps, assess the data, and look for water quality trends. These reports

contain a summary of the current state of large Crow Wing County lakes and recommendations for future monitoring. Individual lake reports and a summary report for the project are included in Appendix 2. In addition to lake trends, these reports provided an analysis of the lakeshed of each lake assessed to determine the amount of “protected” land (i.e. public lands/waters & wetlands) within the area that drained to the lake. These lake screening reports formed the basis of this plan’s “protection” approach. Lake water quality trend is one of the three key data elements used to determine the risk classification of each minor watershed in Crow Wing County. “Protected” lands and land cover within the watershed were also used. Please refer to the *Implementation: Priority Watersheds* section.

Figure 10. Lake Water Quality Trends (source: RMB Environmental Laboratory)

IMPROVING	Parameter:	NO TREND	Parameter:
Bay	Transparency	Camp	Transparency
Crooked	Transparency	Cedar	Transparency
Hanks	Transparency	Clearwater	Transparency
Lower Mission	Transparency	Cross	Transparency
North Long (East Bay)	Transparency	Edward	Transparency
Ossawinnamakee	Transparency	Gilbert	Transparency
Pelican	Transparency	Gilbert	TP, CHLA
Portage	Transparency	Gladstone	Transparency
Rabbit	Transparency	Gull (Main Lake)	Transparency
Roosevelt (South Bay)	Transparency	Horseshoe	Transparency
Smith	Transparency	Horseshoe	TP, CHLA
DECLINING		Hubert	Transparency
		Lower Hay	Transparency
Big Trout	Transparency	Lower South Long	Transparency
Emily	Transparency	Mille Lacs – north end	Transparency
Gull (Booming Out Bay)	Transparency	Mitchell	Transparency
Lower Cullen	Transparency	Red Sand	Transparency
Lower Cullen	TP, CHLA	Roosevelt (North Bay)	Transparency
Middle Cullen	Transparency	Ross	Transparency
North Long (Main Bay)	Transparency	Round	Transparency
North Long (West Bay)	Transparency	South Long	Transparency
Platte	Transparency	Upper Cullen	Transparency
Platte	TP, CHLA	Upper Cullen	TP, CHLA
Rush	Transparency	Upper Hay	Transparency
Serpent	Transparency	Upper South Long	Transparency
Sibley	Transparency	West Fox	Transparency
Upper Mission	Transparency	West Fox	TP, CHLA
White Sand	Transparency	Whitefish (Upper)	Transparency
Whitefish (Lower)	Transparency		

Figure 11. Lake Water Quality Trends

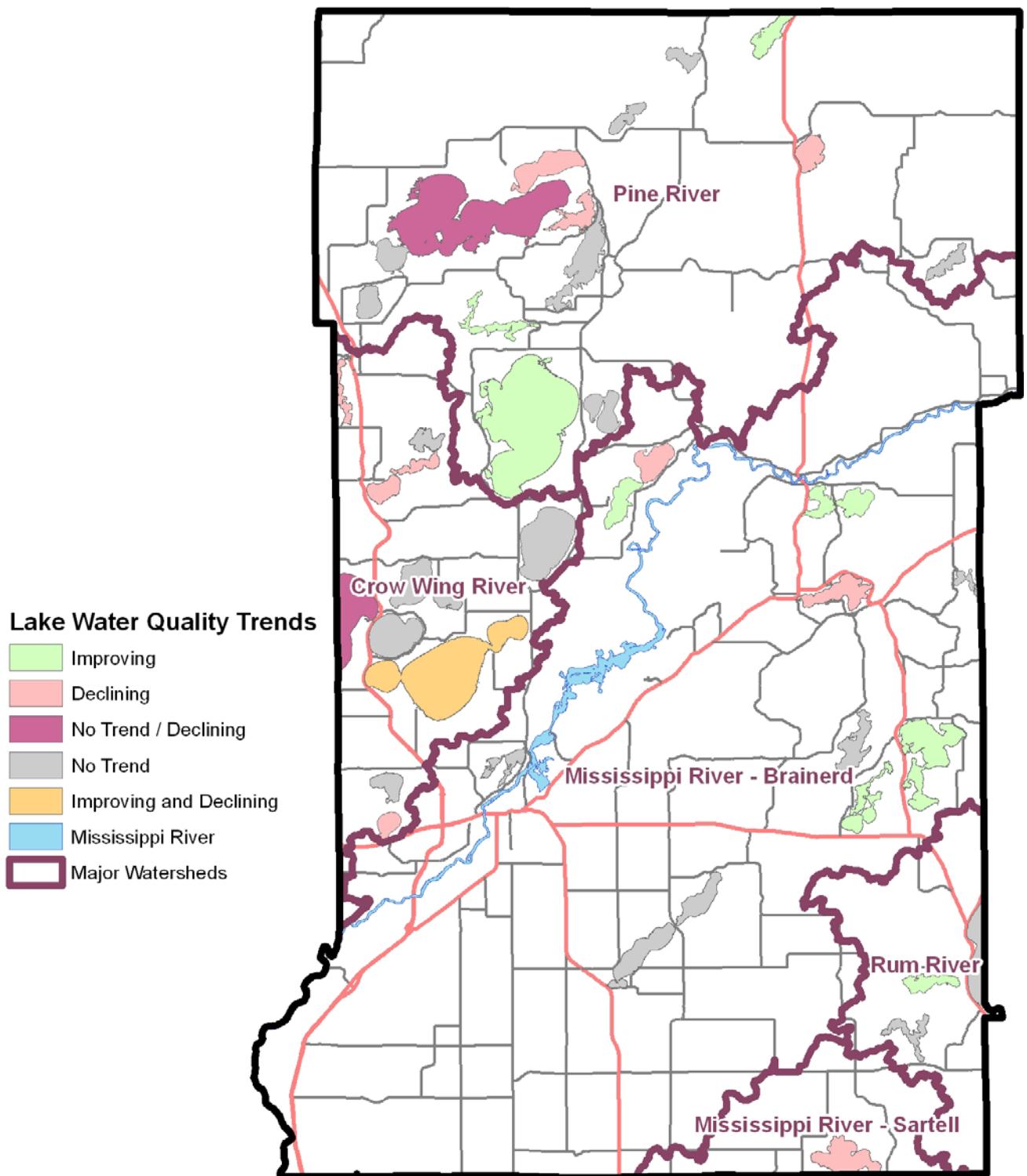
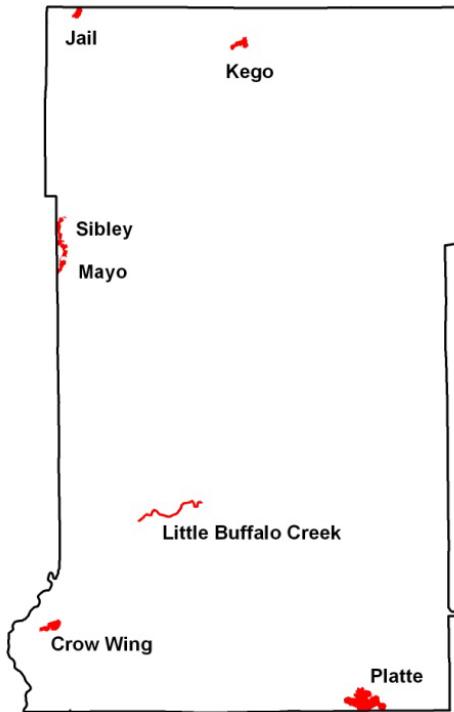


Figure 12. Impaired Waters in CWC (does not include water bodies impaired for Mercury)



Action 1: Assess water quality trends and impairments.

Action 2: Promote water quality monitoring with local lake association volunteers, students, and others.

Action 3: Work with MPCA, Environmental Laboratories, and others to determine future water monitoring and assessment needs.

Lead: Crow Wing County Land Services Department, Crow Wing Soil & Water Conservation District

Partners: Pollution Control Agency, Local Lake Associations, 30 Lakes Watershed District, Environmental Laboratories, Area Colleges and Universities, Mississippi Headwaters Board

Financial: Local & state grants, In-kind staff time, Volunteer time

Duration: Length of plan

Measurable Outcomes:

- Conduct water quality assessments on all lakes with enough water quality data to assess.
- Create one-page factsheets for all assessed lakes.
- Re-assess all lakes prior to 2023 revision of Water Plan.
- Maintain factsheets, ordinances, and other land-use information online.

Objective 6: Agricultural Best Management Practices (BMPs)

Livestock manure used as fertilizer has benefited farmers for decades and if applied properly can meet crop nutrient requirements, build up soil organic material and decrease dependence on commercial fertilizers, increase soil fertility, and in some cases, reduce soil erosion. Manure as fertilizer is a constant reminder that we can reuse and recycle a product that was once thought of as a waste product with insignificant value. However, if manure is not properly applied it can lead to negative environmental impacts.

Manure, feed/silage leachate and milkhouse waste can be high in nutrient values, specifically pertaining to nitrogen and phosphorous. If improperly applied, manure does have the potential to contribute to nutrient loading and bacteria/viral levels of water sources.

Pasturing livestock is a common practice among livestock producers. Several studies and research through the University of Minnesota show that livestock grazing, if done properly, can enhance the quality of grazing lands. Pasture areas are often those areas that are not conducive to farming and generally contain sensitive landscape and surface water features. Nutrients left by livestock serve as a fertilizer source to pasture plant species, which then utilize and filter the nutrients rather than the nutrients being in excess and exiting the area in the form of runoff.

Adequate drainage can be a critical component of a successful farm operation. High crop and land prices have the potential of increasing conversion of pasture and forage land to row crops, which in turn may lead to the installation of new drainage systems or drainage improvements to existing systems. New drainage and drainage improvements represent an opportunity to design and install systems in ways that help reduce nutrient losses into surface water and positively affect the timing and flows of drainage water into surface waters.

There is no single best management practice (BMP) that will address all agriculture issues. Technical, financial and staff resources are becoming more difficult to retain and obtain. As resources are scarce, the targeting of agricultural BMPs and conservation structures to the most vulnerable areas of the landscape is critical.

Action 1: Promote manure/nutrient management plans for livestock producers.

These plans address agronomic application rates for crops planted, buffered or protection areas around sensitive features, and reduce the potential of impacting surface or ground water.

Action 2: Promote pasture management and encourage rotational grazing plans.

Pastures or grazing systems not managed properly can restrict or eliminate vegetative growth and cover, which in turn can result in potentially negative water quality issues.

Action 3: Promote conservation drainage practices, including data driven solutions that rely on LIDAR/GIS, culvert inventories, etc.

Action 4: Promote BMPs such as buffer strips, cover crops, residue management, and sedimentation basins to prevent soil loss and reduce erosion.

Action 5: Promote targeted agricultural BMP implementation, both within the specific landscape and also watershed wide.

Lead: Natural Resources Conservation Service (NRCS)

Partners: Crow Wing County Land Services Department, Crow Wing Soil & Water Conservation District, 30 Lakes Watershed District, Minnesota Department of Agriculture, Pollution Control Agency, University of Minnesota Extension, Mississippi Headwaters Board

Financial: Local, state, & federal grants, In-kind staff time

Duration: Length of plan

Measurable Outcomes:

Implement:

- 2 prescribed grazing plans per year
- 1 nutrient management plan per year
- 1 conversion to no-till / strip till plan per year
- 1 cover crop plan every other year
- 1 agricultural waste facility improvement every other year

Priority Concern: Ground Water

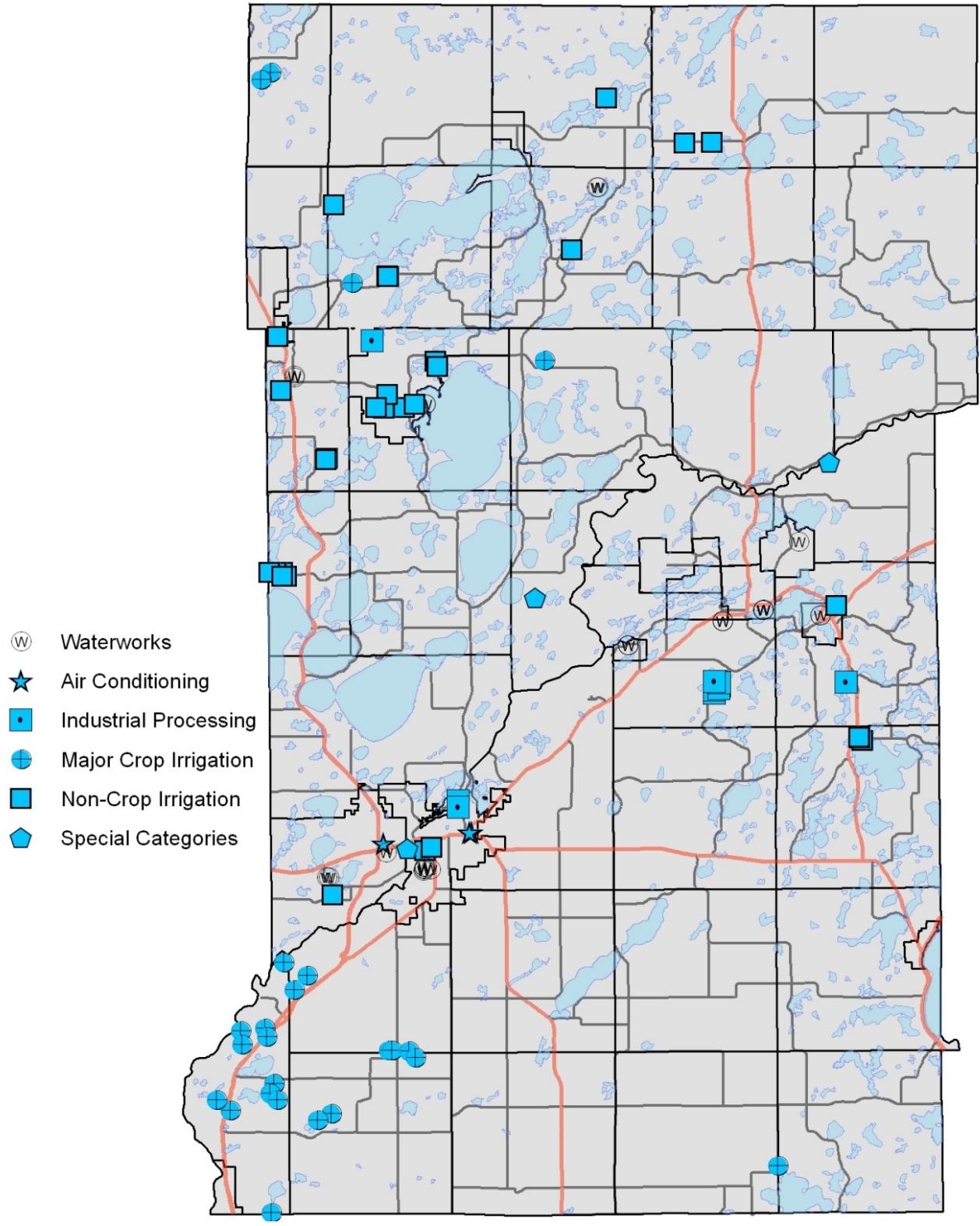
Goal: *To maintain safe, clean drinking water for future generations.*

Crow Wing County is blessed with an abundance of groundwater. It is estimated that over 70% of Minnesotans use groundwater as their source of drinking water. Other users of groundwater include irrigation, cooling, power generation, extractive use operations, and other industrial uses. Users of over 10,000 gallons per day or 1 million gallons per year are regulated by the Minnesota Department of Natural Resources. See Figure 13 on the next page for a map of these locations in Crow Wing County.

Wise stewardship of this resource is of the utmost importance, especially since much of Crow Wing County has sandy soils that allow water (and contaminants) to infiltrate from the surface to the groundwater relatively quickly. Spills and leaks from underground petroleum fuel tanks are common sources of soils and groundwater contamination. Chlorinated cleaning solvents are another significant source of contaminants. Many of these manmade or refined organic compounds, referred to as Volatile Organic Compounds (VOCs), are common in commercial and household products. High nitrogen content fertilizers such as ammonia are a source of nitrate groundwater contamination. Agricultural pesticides and herbicides are additional concerns for potential groundwater contamination. Poorly functioning septic systems can also contribute excess nitrogen and phosphorus to the soil and groundwater. Increasing chloride levels from human uses are also a concern.

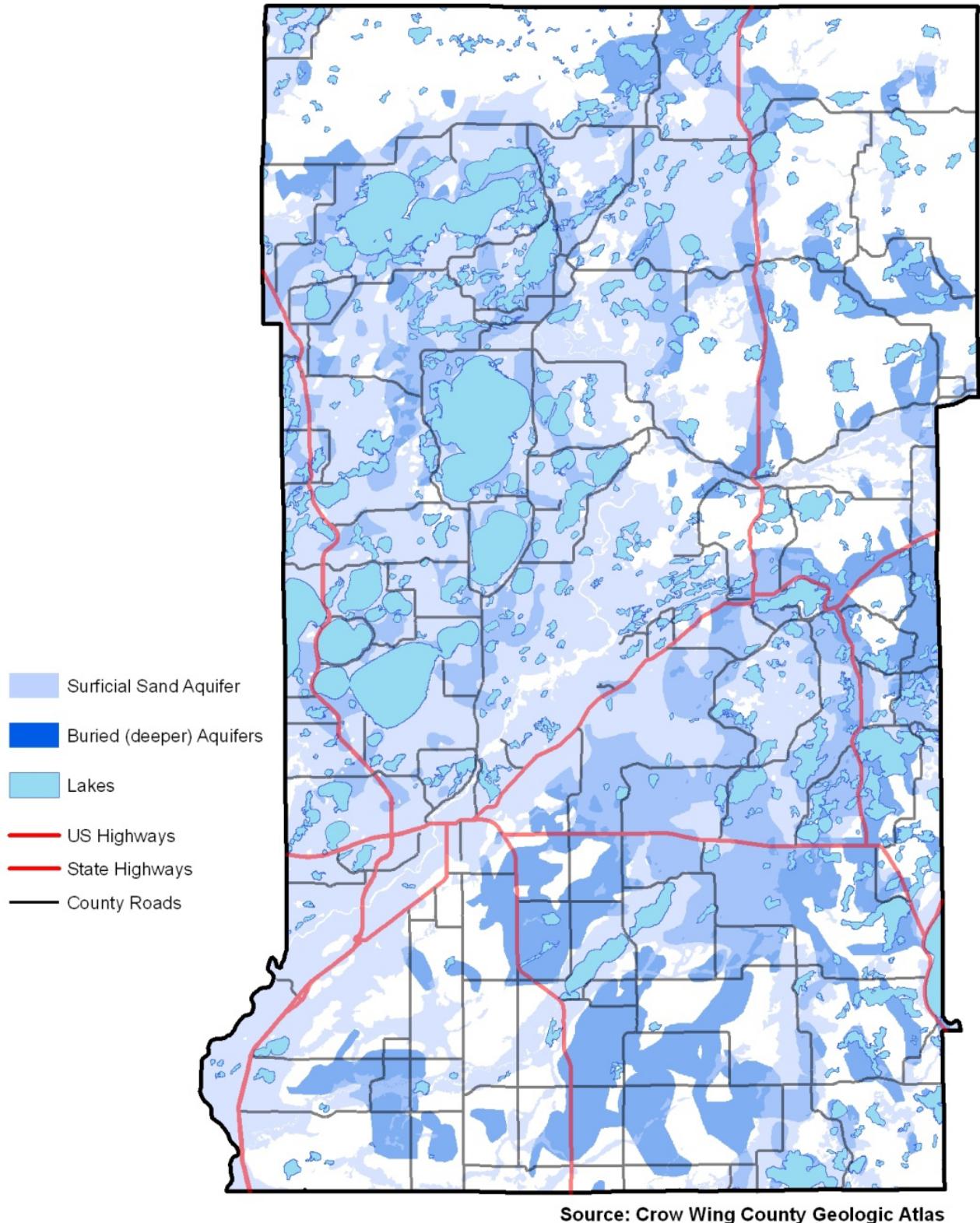
In addition to the land uses of an area, the potential for contamination is influenced by the surficial or "surface" geology (or bedrock geology in the southeastern portion of the state). Since water moves more rapidly through sandy soil, shallow sand-point wells are more susceptible to contamination than deep, drilled wells. Many of the deeper aquifers have clay barriers that limit water movement from upper aquifers. Much of the region around the Crow Wing County's lakes has a surficial sand aquifer (and thus, many shallow wells). Water table depths in this area are often less than 25 feet. In certain areas within this surficial sandy layer, there is a deeper aquifer below. Please refer to Figure 14 for a map of the location of the surficial sand layer in Crow Wing County as well as the location of some of the deeper aquifers.

Figure 13. High Capacity Water Use (>10,000 gallons per day or 1 million gallons per year)



Source: Department of Natural Resources

Figure 14. Aquifers in Crow Wing County



Objective 1: Septic System Maintenance and Inspection

Over 25 percent of Minnesota households use on-site sewage treatment systems, commonly referred to as septic systems, to treat their wastewater. Crow Wing County has over 23,000 septic systems, the third highest total in Minnesota (behind Anoka and St. Louis counties) and has averaged approximately 300 septic systems permits per year (one-third of those are for septic system upgrades).

While septic systems are designed and installed by licensed professionals to meet the needs of individual sites, homeowners are responsible for the system's operation and maintenance. Often septic systems fail because owners do not maintain them after installation.

In the typical system, raw sewage is collected by the plumbing in the home and delivered to the septic tank. There the light solids float to the top, forming a scum layer, and the heavy solids sink to the bottom, forming sludge. In the tank, organic solids such as food particles and human waste are decomposed by millions of naturally occurring bacteria. The septic tank delivers the partially treated liquids, or effluent, to the soil treatment area. Effluent contains pathogens, nutrients, and some fine solids. A thin layer of fine solids, dead bacteria, and soil bacteria, called a biomat, forms naturally where the effluent enters the soil. The biomat restricts the flow sufficiently to keep the soil beneath unsaturated. The unsaturated soil contains oxygen which allows aerobic bacteria to live and destroy pathogens. These air spaces also force nutrients such as phosphorus and sodium to come in direct contact with soil particles to which they become attached. A portion of the nitrogen passes through into the groundwater. After passing through the unsaturated soil, the now harmless water evaporates into the air or returns to the soil and groundwater system.

Since the early days of water planning, regular septic system inspection and maintenance have been increasingly more routine. In the 2012 Water Plan Survey, over 70% of those that responded reported having their tanks pumped every 3 years (per State of MN guidelines) or more frequently.

- Action 1:** Encourage landowners with septic systems to have their systems accessed for maintenance every three years.
- Action 2:** Provide leadership in administration of the Minnesota septic rules (Minnesota Rules Chapter 7080).
- Action 3:** Assist small communities in identifying potential centralized wastewater treatment options where applicable.
- Action 4:** Provide landowners with information on available financial assistance for septic system upgrades.
- Action 5:** Work with MPCA to conduct assessment of current and potential sites for land application of septage.

Lead: Crow Wing County Land Services

Partners: Soil & Water Conservation District, 30 Lakes Watershed District, Pollution Control Agency, University of Minnesota Extension, Region Five Development Commission, Local Septic Professionals, Crow Wing County Cities & Townships

Financial: Local & state grants, In-kind staff time

Duration: Length of plan

Measurable Outcomes:

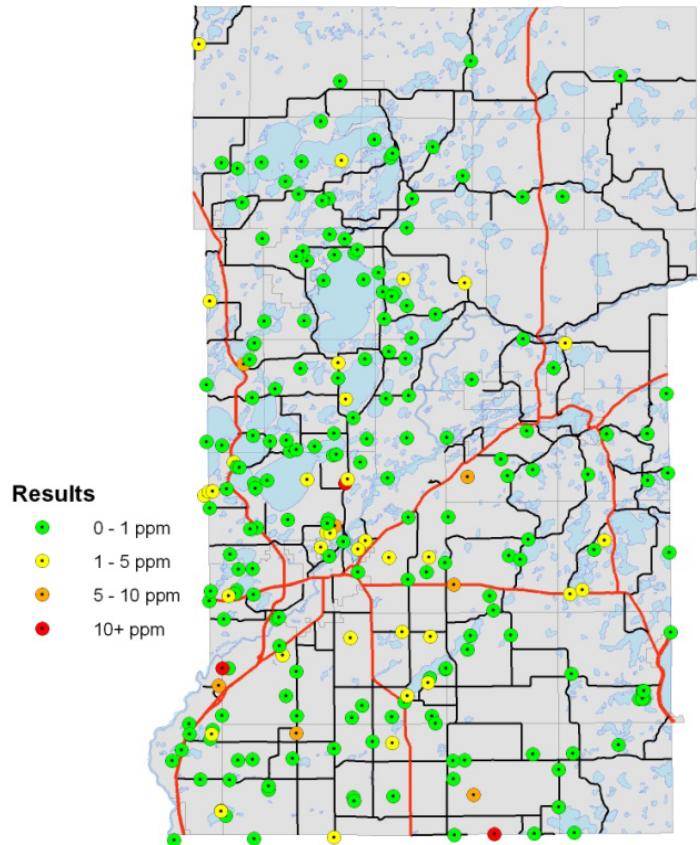
- Track septic installs, upgrades, and maintenance as part of all land use permits.
- Develop and maintain a GPS / GIS-based database of all new septic system installations.
- Adopt a new septic system ordinance.
- Upgrade ten failing systems for low-income residents.
- Conduct or host one septic-related workshop every other year.
- Maintain factsheets, ordinances, and other septic information online.

Objective 2: Testing for Nitrates and Other Contaminants

Nitrates are a common contaminant found in many wells in Minnesota. Too many nitrates in drinking water can cause serious health problems for young infants, including “blue baby syndrome” (or methemoglobinemia). Nitrates in the environment come from decomposition of plants and animal wastes. People also add nitrates to the environment in the form of fertilizers. Although natural nitrate levels in Minnesota are generally quite low, elevated levels are often found in agricultural areas where nitrate sources are often concentrated. Nitrates are tasteless and odorless, so routine testing is important, especially for landowners in high nitrate areas. In conjunction with the Minnesota Department of Agriculture, Crow Wing County has been testing for nitrates in well water since 2011. Less than 3% of measured samples have had a nitrate level above 10 parts per million, which is the national safe drinking water standard. See Figure 15 below. Many landowners in Crow Wing County are also part of a long-term nitrate monitoring network with the Department of Agriculture which conducts annual nitrate testing to determine if any trends exist. In addition, the Minnesota Pollution Control Agency recently installed a number of ambient groundwater monitoring wells in Crow Wing County to track long-term levels of various contaminants and other elements.

Figure 15. Nitrate Testing Results
2011-2012

Safe drinking water: <10 ppm



Action 1: Coordinate regular nitrate testing opportunities.

Action 2: Work with the Pollution Control Agency, Department of Agriculture, and other agencies to analyze long term groundwater monitoring data.

Action 3: Make nitrate and groundwater information readily available to the public.

Lead: Crow Wing County Land Services Department

Partners: Department of Agriculture, Pollution Control Agency, 30 Lakes Watershed District, Crow Wing Soil & Water Conservation District

Financial: Local & state grants,
In-kind staff time

Duration: Length of plan

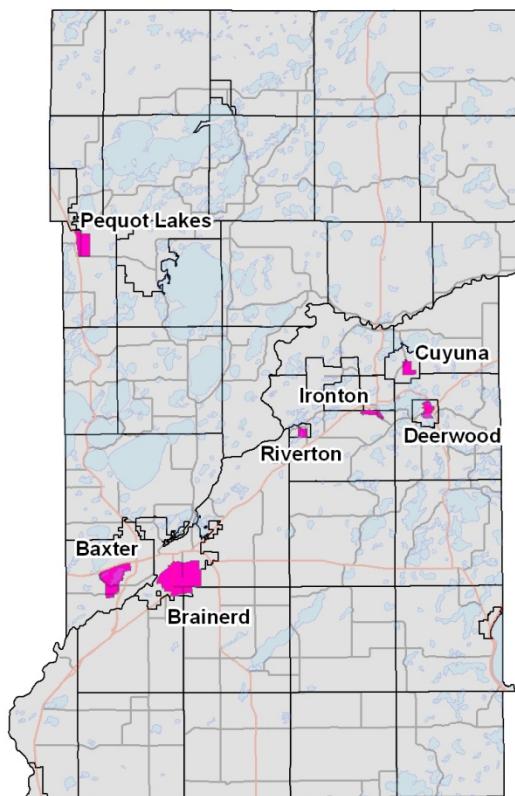
Measurable Outcomes:

- Host at least one annual nitrate testing clinic.
- Offer testing for arsenic and / or other contaminants.
- Provide annual report and map that summarizes the year's nitrate testing results.
- Maintain factsheets, ordinances, and other groundwater information online.

Objective 3: Wellhead and Drinking Water Source Protection

There are over 400 registered public water systems in Crow Wing County. The state of Minnesota requires that all public water systems have some sort of wellhead protection. The type of wellhead protection varies depending on the size of the system. At a minimum, a 200-foot buffer around public wells must be analyzed and managed for contamination. For larger systems, a full wellhead protection plan is developed with identifies the boundaries of the wellhead protection area and drinking water supply management areas (which is the political boundary of the wellhead protection area). Generally, the wellhead protection area includes the surrounding recharge areas where water has an estimated time of travel of 10 years to reach the well. The wellhead protection plan also assesses the vulnerability of the well(s) in this area, and creates a plan of action for wellhead protection, including contingencies. Specific reports, called "Source Water Assessments," are also produced by the Minnesota Department of Health and summarize all the information available regarding the water sources used by a public water system.

Figure 16. Wellhead Protection Areas in Crow Wing



- Action 1:** Participate on local Wellhead Protection Planning teams.
- Action 2:** Integrate Wellhead Protection Priorities into water plan implementation strategies.
- Action 3:** Provide educational opportunities to non-community water sources and well owners about the importance of wellhead protection.

Action 4: Promote agricultural BMPs that reduce the potential for groundwater contamination such as irrigation, fertilizer, and herbicide management.

Action 5: Integrate the County Geologic Atlas into wellhead protection and water planning efforts.

Lead: Crow Wing County Land Services, Crow Wing County Cities

Partners: Crow Wing Soil & Water Conservation District, 30 Lakes Watershed District, Department of Agriculture, Department of Health, Pollution Control Agency, Crow Wing County Cities & Townships

Financial: Local & state grants, In-kind staff time

Duration: Length of plan

Measurable Outcomes:

- Participate in at least one coordinated wellhead protection implementation event for each of the County's wellhead protection areas.
- Provide an annual report on wellhead protection activities conducted by Crow Wing County.

Objective 4: Sealing of Unused /Abandoned Wells

A well that is not in use, or abandoned, can be a source of groundwater contamination by provided a potential direct path for surface water runoff, contaminated water, or improperly disposed of waste to reach an uncontaminated groundwater source. Unused larger-diameter wells can also be a safety hazard for children and animals.

Action 1: Identify unused / abandoned wells, especially in sensitive groundwater areas.

Action 2: Offer incentives to seal unused / abandoned wells.

Lead: Crow Wing County Land Services

Partners: Crow Wing Soil & Water Conservation District, 30 Lakes Watershed District, Department of Agriculture, Department of Health, Natural Resources Conservation Service

Financial: Local & state grants, In-kind staff time

Duration: Length of plan

Measurable Outcomes:

- Seal twenty wells over the length of the plan by utilizing a mix of grant and landowner funds.
- Provide report of which wells were sealed and their location.

Objective 5: Solid & Hazardous Waste Disposal

Household hazardous waste, business and electronic waste, old prescription drugs, used oils, and many other common products should be properly disposed of, rather than simply dumping them into the environment or down the drain. If disposed of inappropriately, they may contaminate land, ground water or surface water, and air quality. The first option should always be to reduce, reuse, or recycle it; if no other options are available then they must be properly disposed of. Many of these items are banned from the landfill. The County maintains a Solid Waste Management Plan that addresses the solid waste management system available to manage this material. The County in 1991 began an aggressive two part approach to deal with solid waste; adequate infrastructure and an educational program. A proficient education program will bring residents to utilize the solid waste disposal resources, but facility infrastructure that is aesthetically pleasing and user friendly will ensure residents will return.

The County's Solid Waste Disposal Site complex is located between the two major population centers for the County: Brainerd/Baxter and Crosby/Ironton/Deerwood. The "One-Stop-Service" provides convenient access for proper disposal for these materials at a reasonable price. Prices are set to promote the proper management of waste. In many cases, the County's problem material program complements existing retailer programs to ensure in-depth coverage. The Crow Wing County site is able to accept many of these items for minimal costs (or even free) to ensure they are properly managed. See the Crow Wing County website for a location of drop-off sites and schedules to dispose of these items.

Action 1: Provide citizens with information on the importance of recycling and solid waste management.

Action 2: Promote proper disposal of household hazardous waste, electronic waste, and petroleum products.

Action 3: Promote product stewardship for proper disposal of various types of solid and hazardous wastes as well as materials management which focuses on the economic value in waste recovery and recycling in addition to environmental protection.

Lead: Crow Wing County Land Services

Partners: Crow Wing Soil & Water Conservation District, University of Minnesota Extension, Pollution Control Agency, Crow Wing County Cities & Townships

Financial: Local & state grants, In-kind staff time

Duration: Length of plan

Measurable Outcomes:

- Host several e-waste and business recycling events annually.
- Maintain factsheets, ordinances, and other solid / hazardous information online.