IMPLEMENTATION: WATERSHED CLASSIFICATION & PRIORITIZATION

Crow Wing County is blessed with abundant water resources. Because of this sheer quantity, sorting these resources and prioritizing implementation strategies as well as funding are some of the biggest water planning challenges. Because very few of the County's water resources are impaired and need to be restored, the focus of this plan is on which resources could be benefit from water *protection* strategies, rather than *restoration* strategies. For Crow Wing County and other counties with an abundance of natural resources and relatively low land values, a well-designed *protection* approach is much more efficient and cost-effective than a *restoration* approach.

This plan suggests a water protection model that assesses all 125 minor watersheds in the County to determine which watersheds are already in good condition (class: *vigilance*), which could use more protection (classes: *protection, enhance-protection*), and which would likely need restoration strategies (*enhancement*).

When prioritizing which watersheds to focus implementation strategies on, the distinction between public and private lands is important. From a planning perspective, watersheds with a high percentage of public land are not as at-risk for future water quality impacts and may not require the same level of focus as watersheds with a smaller percentage of public land. For purposes of this plan, public land is considered to be already in a "protected" state. Public water bodies, such as lakes and streams, are also "protected" in that they cannot generally be filled or drained. Wetlands on private lands are also protected by the Minnesota Wetland Conservation Act (WCA), which also generally prohibits draining or filling of wetland areas. The County also currently has over 8000 acres of land with perpetual conservation easements, which are also considered to be protected. These areas added together forms one of the critical foundations of this plan's watershed classification.

In addition to the amount of these protected lands/waters, each minor watershed was classified and mapped by the amount of land use disturbance. Sandy Verry and others have determined that the amount of mature forest cover on the landscape is a driving factor in sediment and nutrient delivery to downstream water bodies. Minimizing these changes in land use is important to maintaining high water quality. For this plan, land use disturbance includes land cover classes that are converted from a natural, forested state to man-induced classes such as: developed, cultivated, pasture, or grassland.

In addition to protected areas and land use disturbance, watershed health is also influenced by the water quality of the lakes / streams that they contain. For this plan, watersheds with a declining trend in water quality (based on the large lake assessments conducted on lakes > 400 acres; see Appendix 2) were classified lower simply because of the declining trend.

Water plan priority concerns such as aquatic invasive species prevention, stormwater management, shoreline buffers, private forest management, and agricultural best management practices were also incorporated in this watershed analysis and were prioritized by minor watershed in order to better craft implementation programs that achieve the highest return on conservation investment.

Figure 21. Existing "Protected" Areas (by Minor Watershed)
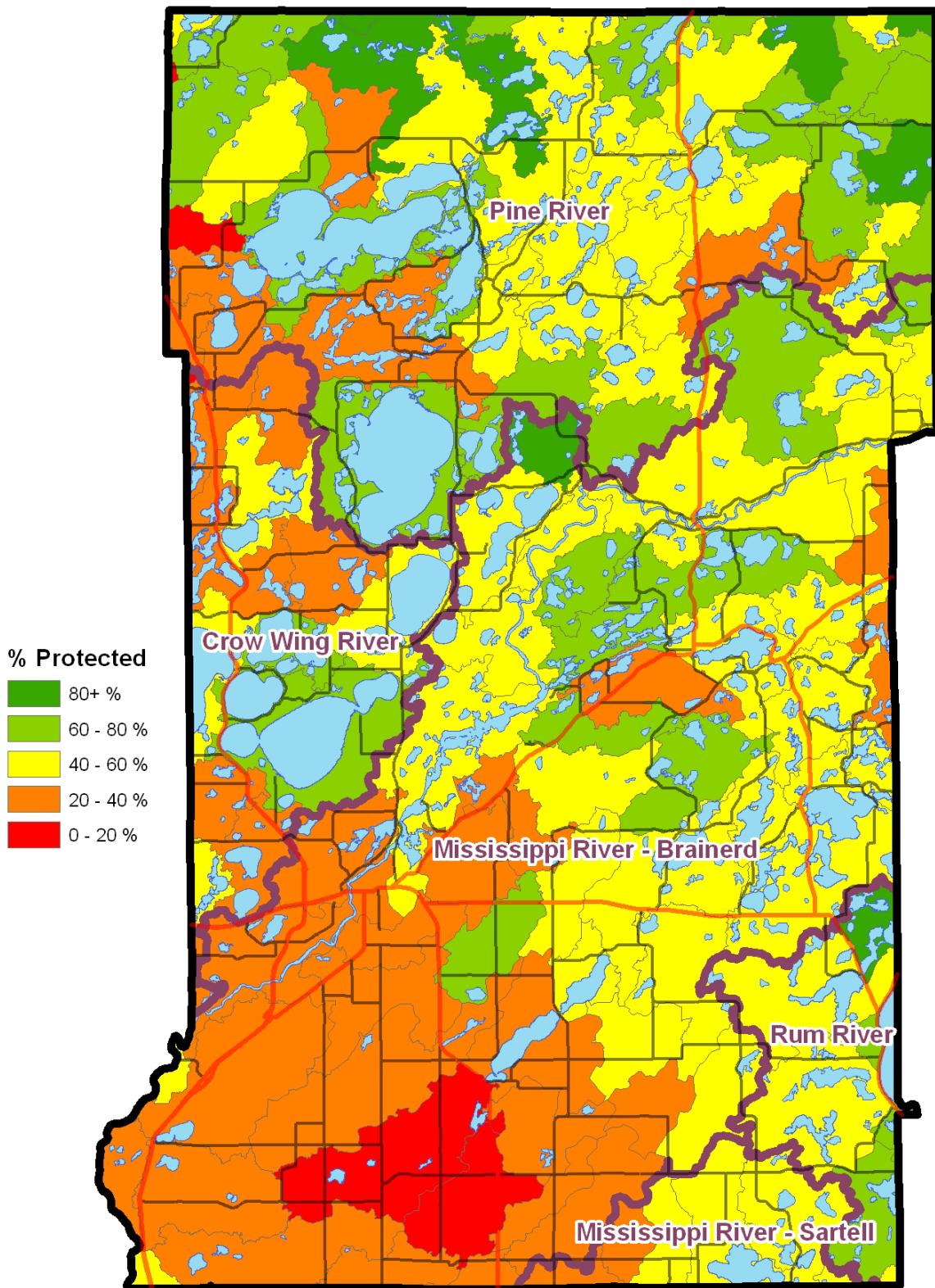
"Protected" = % Public Land, % Public Waters (Lakes & Rivers), % Easements, % Wetlands on Private Lands

Figure 22. Land Use / Land Cover Disturbance (by Minor Watershed)

Disturbed Land Cover = Developed, Cultivated, Pasture, & Grassland
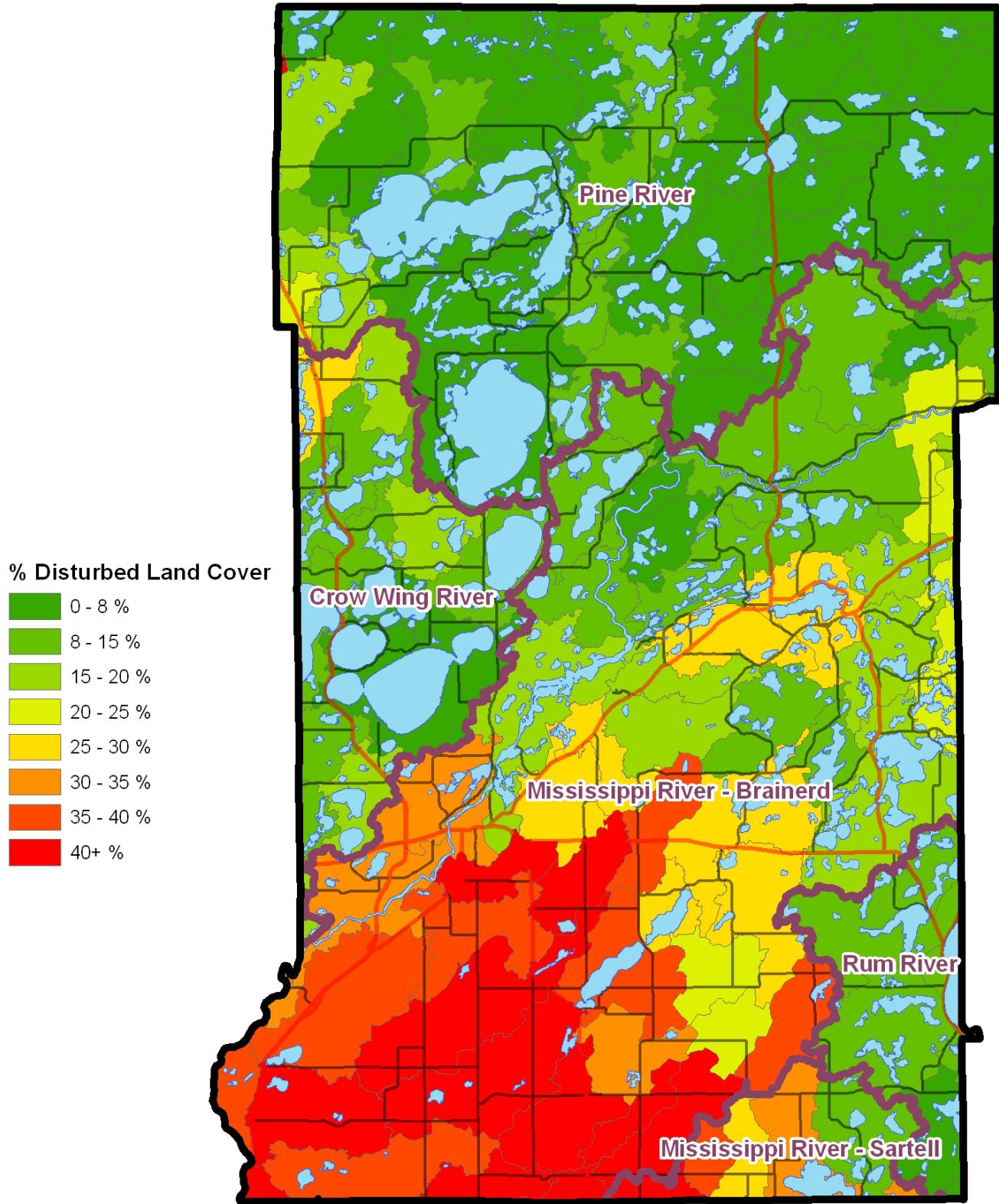
Figure 23. Water Quality Trends (by Minor Watershed)
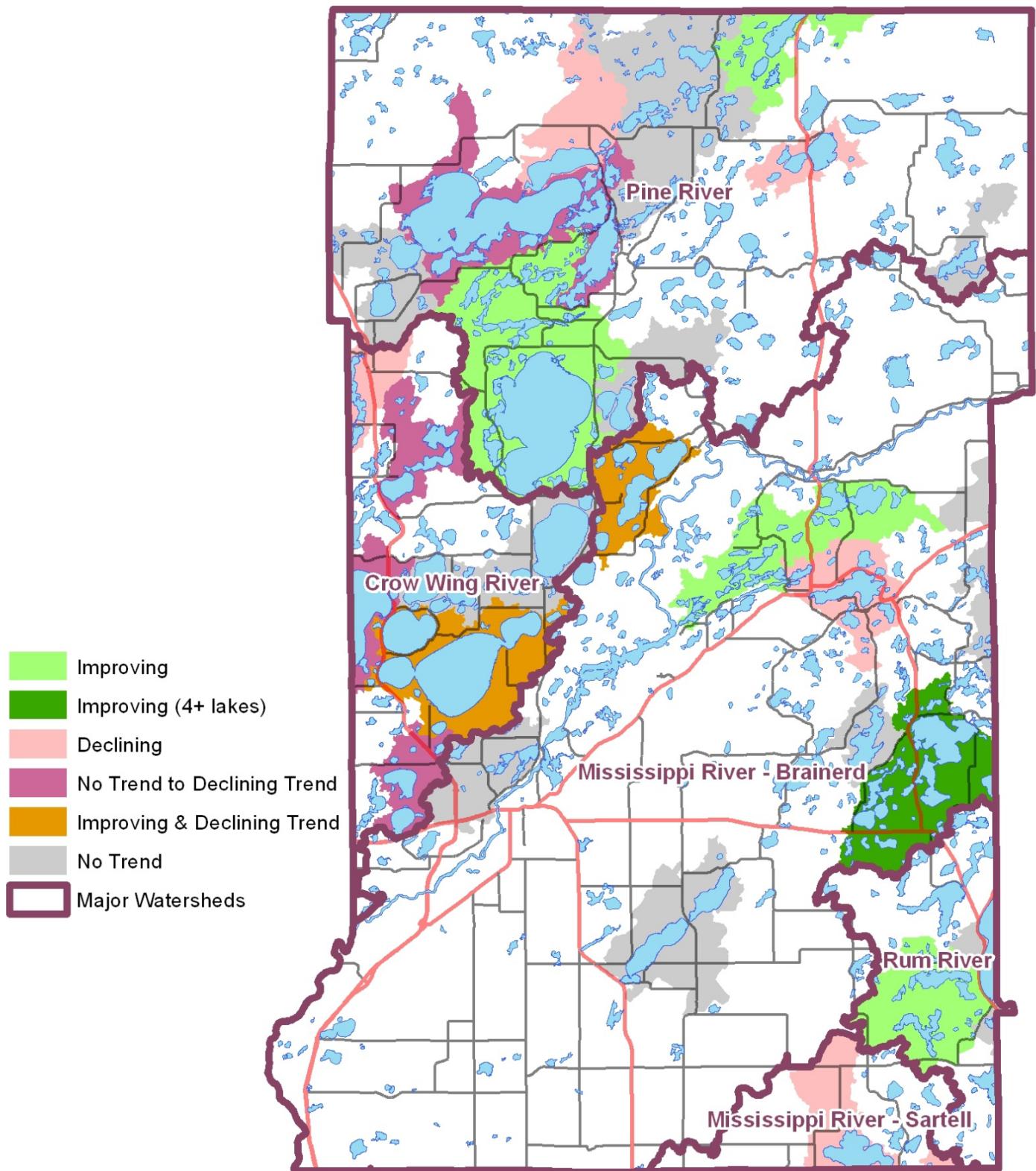
Minor Watershed Risk Classifications:

Vigilance

These watersheds have a high percentage of protected lands (> 50%), low amount of disturbed land cover classes (<8 %) and have no other potential threats to water quality, such as development, agriculture, drainage, or extractive uses. While all watersheds have some risk for negative impacts, "vigilance" watersheds have the least amount of risk and thus warrant the least amount of implementation focus.

Protected

These watersheds generally have a percentage of protected lands that is > 40% but also have some potential risk factors that could negatively impact the surface water (and / or groundwater) systems of the watershed. Low to moderate amounts of impervious surfaces, development pressures (existing or potential), disturbed land cover classes (8 – 30 %), animal units, extractive uses, and/or drainage systems are likely within the watershed. These watersheds are generally in good condition and have no lakes with a declining trend in water quality. However, these watersheds have the potential to be better protected with strategies such as private forest stewardship, stormwater management, shoreline buffers, and conservation easements in ecologically sensitive areas.

Enhance-Protection

These watersheds generally have a percentage of protected lands that is generally less than 40% but also have many potential risk factors that could negatively impact the surface water (and / or groundwater) systems of the watershed. Moderate amounts of impervious surfaces, development pressures (existing or potential), disturbed land cover classes, animal units, extractive uses, and/ or drainage systems are likely within the watershed. In addition, lakes or streams that are impaired or have declining trends in water quality may also be present in these watersheds. These watersheds are in fair condition but have great opportunities for project implementation and further protection efforts.

Enhance

These watersheds generally have a percentage of protected lands that is < 40 % but also have numerous potential risk factors that could negatively impact the surface water (and / or groundwater) systems of the watershed. High amounts of impervious surfaces, development pressures (existing or potential), disturbed land cover classes (>30%), animal units, extractive uses, and/or drainage systems are likely within the watershed. In addition, lakes or streams with declining trends in water quality or that are impaired for nutrients are also typically present in these watersheds. These watersheds are in fair to poor condition and while there are limited opportunities for protection or restoration strategies, many projects would likely be required to make a meaningful difference.

The County's Risk Classification for each watershed is based on the best available data and is subject to change should better data become available. The classification and recommendations for each watershed is not exhaustive with respect to all the water protection strategies that could be employed in a given watershed. This plan is intended to stimulate conversation about water plan priorities but is not intended to deter landowners, lake associations, or Local Units of Government from developing their own water protection priorities or initiating projects that are outside the recommendations of this plan.

Figure 24. Minor Watershed Risk Classification Flow Chart
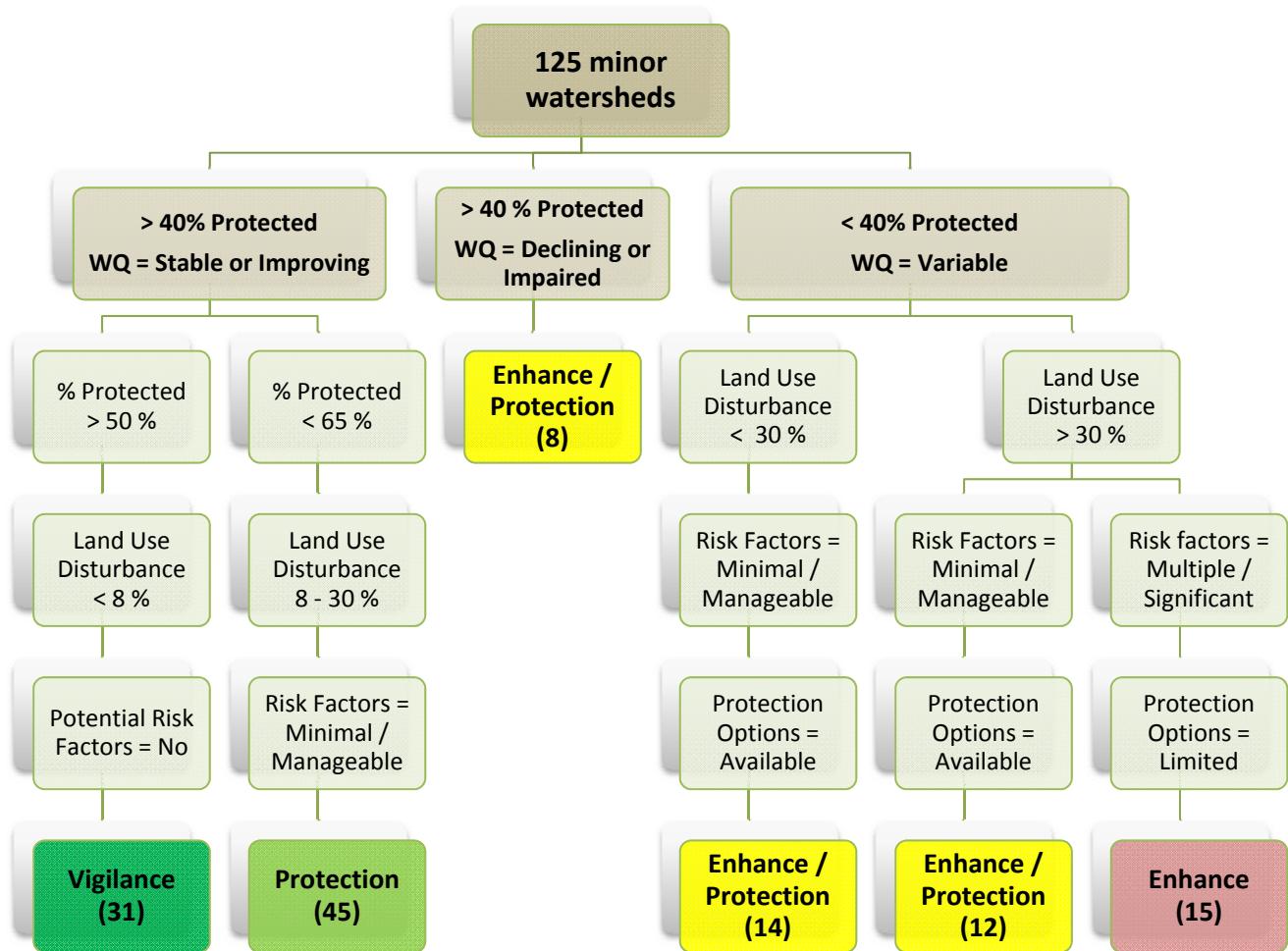
Protected = Total % of public ownership, permanent conservation easements, lakes, rivers, wetlands (private property)

Land Use Disturbance = Source 2006 National Land Cover Dataset (includes: *development, cultivated, pasture, grassland*)

Possible Risk Factors Include = Agriculture (measured by # of animal units), development, ditching / drainage, extractive use

Figure 25. Minor Watershed Risk Classification Map
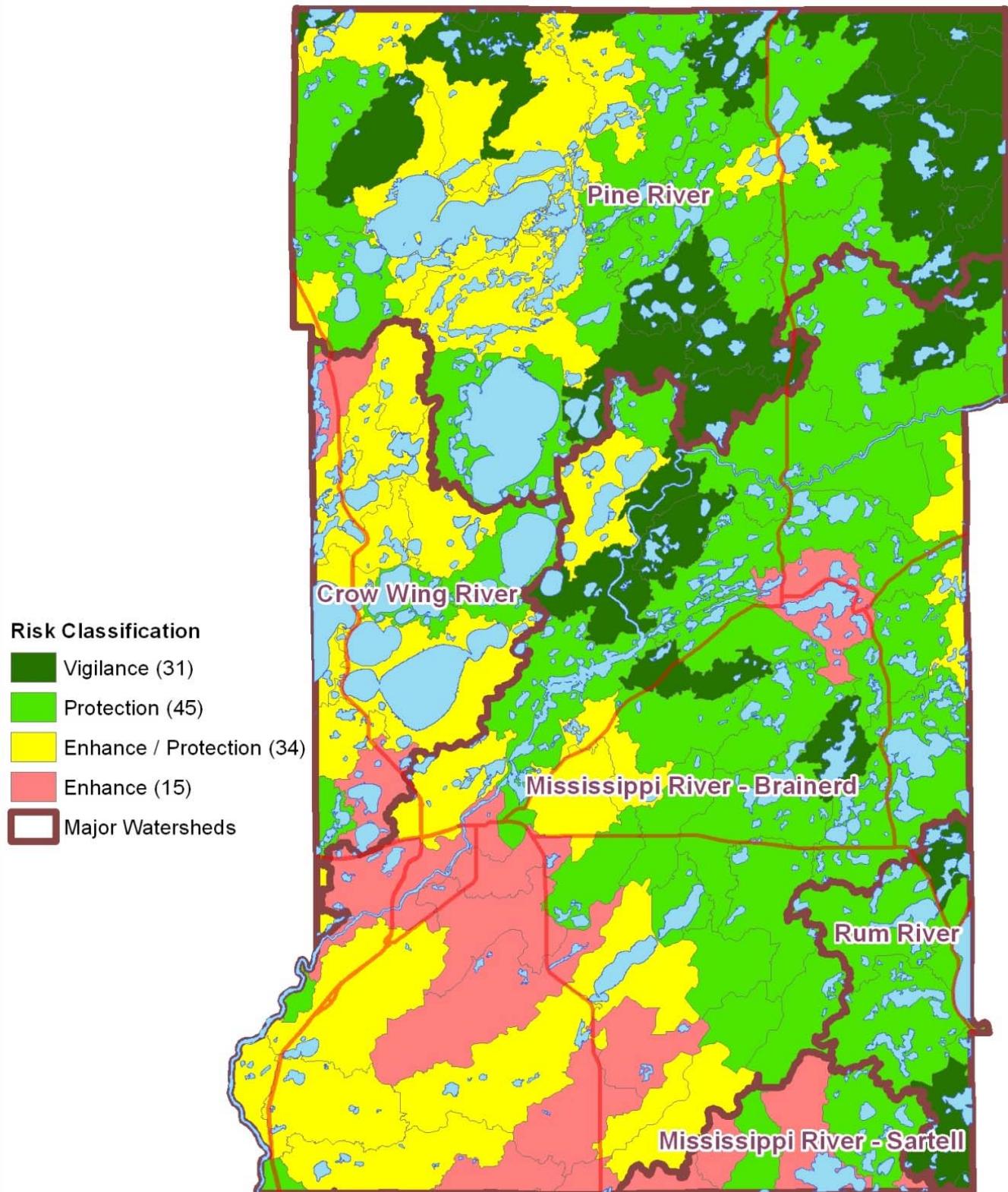
Risk Classification is a composite index of protected lands, land use disturbance, and water quality trends

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IMPLEMENTATION: OUTSTANDING SURFACE WATER RESOURCES

Crow Wing County has a number of surface water resources that have outstanding characteristics and implementation focuses that are often independent of the watershed in which they reside. These include: lakes with outstanding water quality with deep, clear water capable of supporting cisco / tullibee and trout or shallow lakes that support vast areas of wild rice critical for maintaining healthy wildlife and waterfowl populations. Below is a map that highlights these areas with their respective watershed risk classification.

Figure 26. Outstanding Surface Water Resources
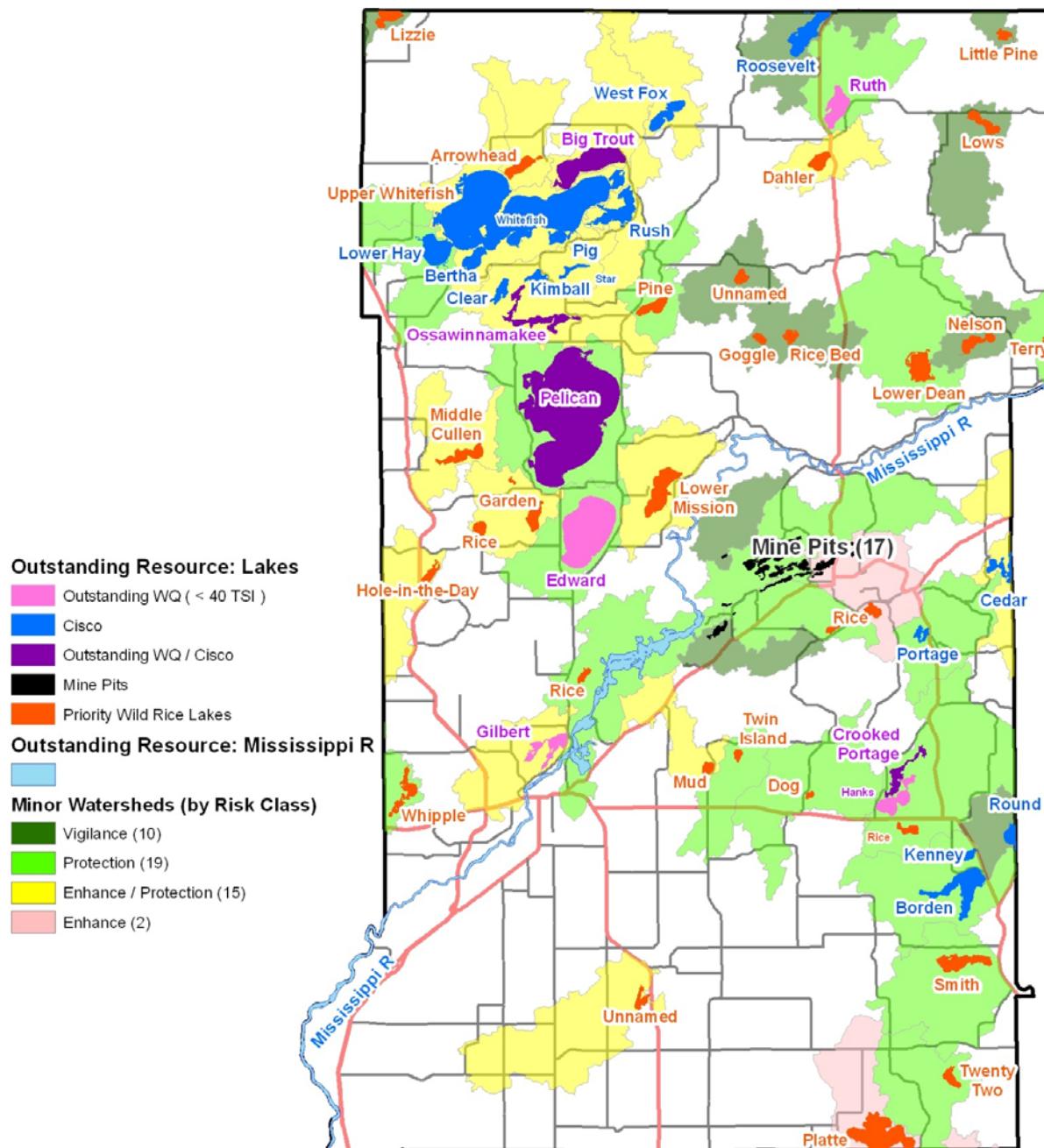
Wild Rice

Minnesota is the epicenter of the world's natural wild rice. Although once found throughout most of the state, it is now concentrated in north-central Minnesota. Wild rice is typically found in shallow lakes and rivers and in shallow bays of deeper lakes and provides some of the most important habitat for wetland-dependent wildlife species in Minnesota, especially migrating and breeding waterfowl. Wild rice is Minnesota's state grain and provides unique recreation opportunities and has cultural significance to Native Americans.

With funding from the Clean Water Land & Legacy Amendment, the Board of Water & Soil Resources, Department of Natural Resources, Soil & Water Conservation Districts, and Ducks Unlimited have partnered to acquire shoreline properties on priority wild rice lakes and the Mississippi River to protect these areas. 30+ priority water bodies were selected in Crow Wing County because they maintained at least 40 acres of wild rice.

Cisco / Tullibee

Cisco (also known as tullibee or lake herring) is a coldwater fish that live in many of the nicest lakes in Minnesota. They provide excellent forage for trophy walleye, northern pike, muskellunge, and lake trout. A requirement for cold, well-oxygenated water allows them to primarily live in deep lakes that have good water quality. In the summer, tullibee live in the cold water below the thermocline in most Minnesota lakes. Unfortunately, oxygen concentrations below the thermocline decline throughout the summer in many lakes, especially in more eutrophic systems, which can be caused by a loss of water quality from increased nutrient levels. Increased nutrients generate more algal cells, which eventually die and settle into the deeper portion of the lake where they decompose and consume oxygen, thereby causing a decline in oxygen levels in the water below the thermocline. As the upper layers of the lake warm, tullibee can experience a "squeeze" as they move up in the water column to avoid low oxygen concentrations and encounter the warmer water. In some summers, the squeeze is so great that some tullibee will die as they get forced into lethally warm temperatures.

Fortunately, many deep lakes with good water quality maintain adequate oxygen conditions below the thermocline all summer long, even in warm summers. The Minnesota DNR Fisheries Research Unit, in conjunction with the University of Minnesota, have identified 176 lakes that are deep and clear enough to sustain tullibee in warm conditions. 20 of these Lakes are in Crow Wing County and include Big Trout, Roosevelt, Pelican, and Whitefish.

Trout

Trout lakes and streams require cool, well oxygenated water and their presence in a lake or stream is often a result of the overall quality of that water body as well as suitable groundwater and substrate. Minnesota has hundreds of trout streams and lakes managed for trout by the Department of Natural Resources. In Crow Wing County, there are 12 state-designated trout streams and 15+ trout lakes, although not all sustain active trout populations. The majority of these managed trout fisheries are the mine pits lakes located in the Crosby / Ironton area. Natural shorelines as well as cover and spawning habitat within the water body are critical to the long term health of trout lakes and streams.

Shallow / Wildlife
Shallow lakes provide critical wildlife habitat, especially for waterfowl. Eight of these lakes have been identified in Crow Wing County by the Department of Natural Resources' Division of Fish & Wildlife and were included in the 2011 revision to the Land Use Ordinance as *Natural Environment – Special Shallow* and require a larger building setback.

Rare Species / Habitats (from Natural Heritage / MCBS data)
Several lakes in Crow Wing County have rare species that are unique to aquatic ecosystems as identified by the Department of Natural Resources' Minnesota County Biological Survey (MCBS) and Natural Heritage database. The number and type of species present varies by lake.

Stream Confluences
Confluences of streams are important areas for habitat, water quality, and conservation. In addition to smaller confluences, the Pine River and Nokasippi River confluences with the Mississippi River and their flow-through lakes are two important focal points.

Figure 27. Trout Lake and Streams

Trout Lakes:	DNR ID:
Allen	18-208
Big Trout	18-315
Huntington Mine	18-441
Mahnomen, Alstead, Arco	18-440
Manuel Mine	18-435
Pennington Mine	18-439
Pleasant	18-278
Portsmouth Mine	18-437
Roosevelt	011-43
Sagamore Mine	18-523
Section 6 Mine	18-667
Snoshoe Mine	18-524
Strawberry	18-363
Yawkey Mine	18-434

Trout Streams:	DNR ID:
Barbour Creek	020R
Black Bear Creek	016R
Black Hoof Creek	045R
Borden Creek	018R
Camp Creek	001R
Cullen Brook	059R
Long Brook	023R,026R
Round Lake Creek	
Sand Creek	033R
Spring Brook	087R
Van Sickle Brook	081R
Whitleys Creek	036R

Trout Lakes (by species)
- Brook
- Brown
- Lake
- Rainbow
- Rainbow, Brook
- .... Trout Streams

Figure 28. Wild Rice Lakes

Lake Name	
Arrowhead	Mitchell
Bass (18-11)	Mollie
Bass (18-229)	Mud (18-094)
Bay	**Mud (18-137)**
Big Bird	**Mud (18-326)**
Birchdale	Mud (18-198)
Borden	**Nelson**
Buffalo	Nisswa
Bulldog	North Long
Butterfield	Olson
Camp	Ossawinnamakee
Caraway	Perch
Carlson	**Pine**
Clark	**Platte**
Cole	Pointon
Crow Wing	Rat
Dahler	Red Sand
Deadman's	**Rice (18-53)**
Deer	**Rice (18-68)**
Dog	**Rice (18-121)**
Duck (18-178)	**Rice (18-316)**
Duck (18-314)	**Rice (18-327)**
Eagle	Rice (18-405)
Emily	**Rice Bed**
Erskine	Rock
Faupel	Rogers
Flanders	Round (18-373)
Garden	Round (18-147)
Gilbert	Roy
Goggle	Sebie
Goodrich	Sewells Pond
Grass (18-230)	Sibley
Grass (18-362	**Smith**
Green	South Long
Greer	Stewart
Half Moon	Tamarack
Happy	**Terry**
Hay	**Twenty Two**
Hole-in-the-Day	**Twin Island**
Holt	Unnamed (18-55)
Horseshoe	Unnamed (18-201)
Island	**Unnamed (18-228)**
Island	Unnamed (18-413)
Jail	Unnamed (18-543)
Johnson	Unnamed (18-544)
Lily Pad	Unnamed (18-550)
Little Pine (18-176)	Upper Cullen
Little Pine (18-266)	Upper Dean
Lizzie	Upper Hay
Long (18-031)	Upper Mission
Love	Velvet
Lower Dean	**Whipple**
Lower Mission	**Whitefish (18-310)**
Lows	Whitefish (18-1)
Mahnomen	Williams
Mallard	Wilson
Maple	Wolf
Middle Cullen	

Source: Minnesota DNR

Wild Rice Lakes

Priority (> 40 acres of rice)

Other wild rice lakes
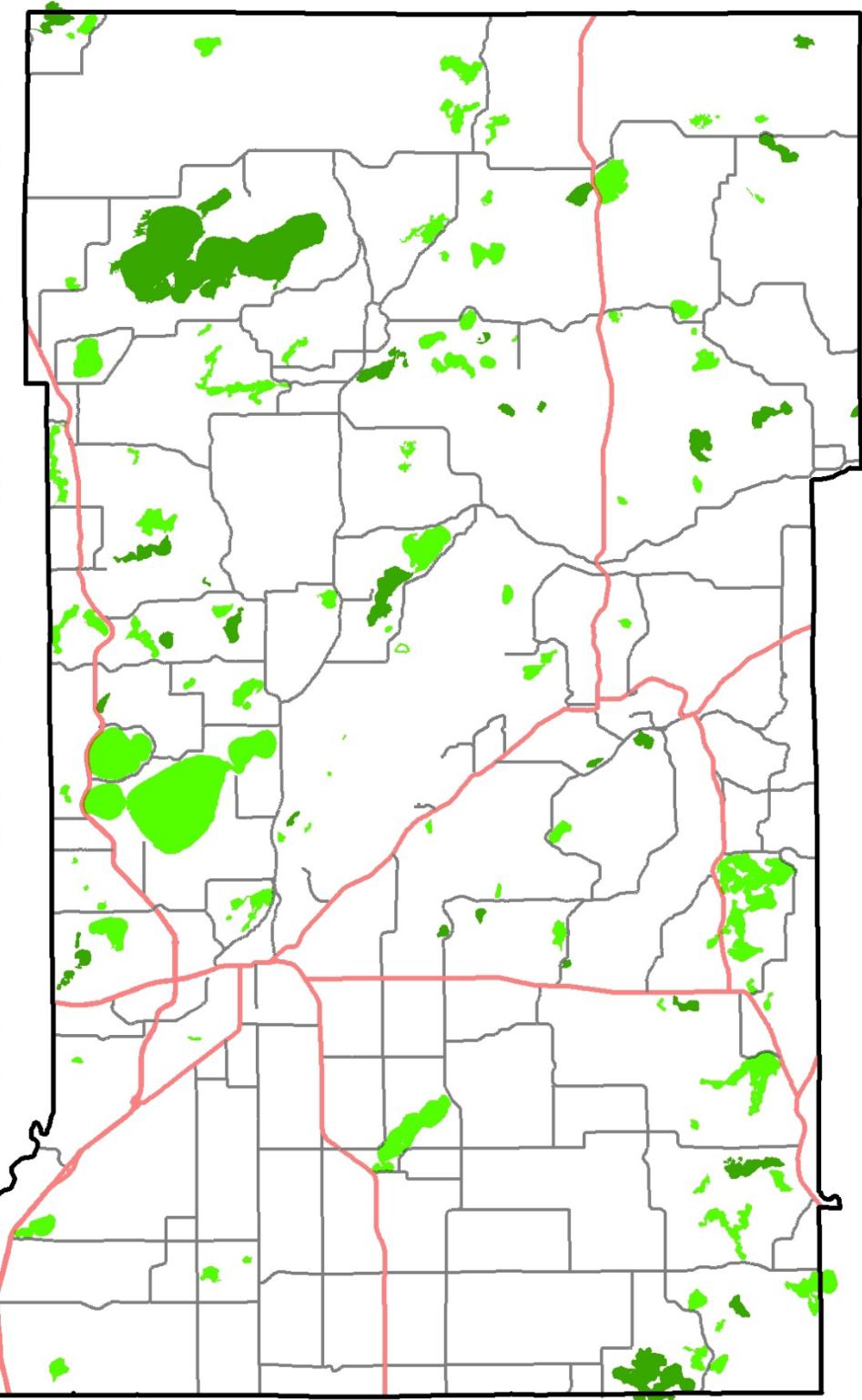
Figure 29. Cisco / MCBS / Shallow Lakes

Lake Name	DNR ID:	Cisco	MCBS	Sensitive Shallow
Ann	18-65		X	
Arbor	18-80		X	
Bertha	18-355	X		
Big Trout	18-315	X	X	
Blue	18-211		X	
Borden	18-20	X		
Cedar	1-209	X		
Clear	18-364	X		
Crooked	18-41	X		
Crystal	18-341		X	
Dog	18-107			X
Duck	18-178			X
Eagle	18-296		X	
East Fox	18-298		X	
Edna	18-396		X	
Fool	18-224		X	
Garden	18-329			X
Island	18-269	X		
Kenney	18-19	X		
Kimball	18-361	X	X	
Lily Pad	18-275		X	
Lizzie	18-416		X	X
Lower Dean	18-181			X
Lower Hay	18-378	X		
Lows	18-180			X
Mitchell	18-294		X	
Moulton	1-212		X	
Nelson	18-164			X
Ossawinnamakee	18-352	X		
Pelican	18-308	X		
Pig	18-354	X		
Partridge	18-48		X	
Placid	18-76		X	
Platte	18-88		X	
Portage	18-69	X		
Rogers	18-184		X	
Roosevelt	11-430	X		
Round	1-204	X		
Round	18-32			X
Rush	18-311	X		
Scott	18-33		X	
Shirt	18-72		X	
Smokey Hollow	18-220		X	
Sorenson	18-323		X	
Star	18-359	X		
Stark	18-169		X	
Townline	1-207		X	
Trout	18-218		X	
Turtle	18-47		X	
Twin	18-167		X	
West Fox	18-297	X		
Whitefish	18-310	X		
Wood	18-222		X	

Legend:
- Cisco Lakes (blue)
- MCBS Lakes (red)
- Shallow Lakes (yellow)
- MCBS / Shallow Lakes (orange)
- Cisco / MCBS Lakes (purple)
- Other Lakes (white)
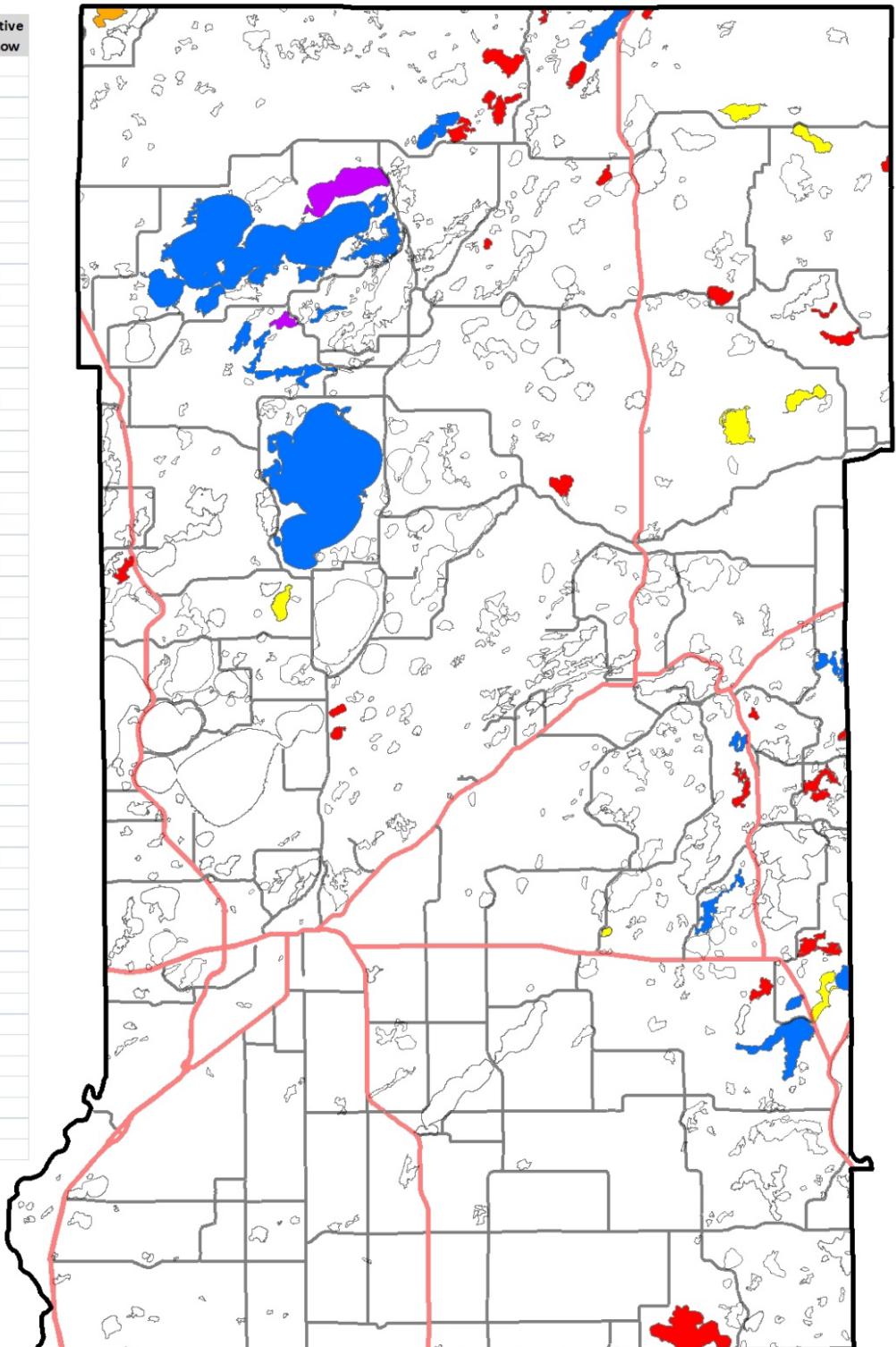
Data Source: Minnesota Department of Natural Resources (DNR) / Minnesota County Biological Survey

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