Bank Service Area 3
Compensation Planning Framework

Watershed Based Approach to Wetland Compensatory Mitigation

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1. INTRODUCTION

This Compensation Planning Framework (CPF) provides documentation for a watershed-based approach to compensatory wetland mitigation in the Lower Red River Wetland Bank Service Area, also referred to as Bank Service Area (BSA) 3, as part of the Minnesota In-Lieu Fee Program (ILF). The CPF documents baseline conditions and prioritizes compensatory wetland mitigation on a major watershed scale by using statewide data sources, as well as local and regional planning efforts which are readily available to the public.

The CPF is a report which analyzes baseline conditions and develops a prioritization methodology for the siting of replacement sites as a requirement for the ILF Program. As required by both the Federal Mitigation Rule and the Minnesota Wetland Conservation Act (WCA), the CPF must designate areas of high priority for wetland replacement. These are areas of the state where preservation, enhancement, restoration, or creation of wetlands have high public value (Rodacker & Smith, 2018). Initially, the ILF will be focused on credit generation for the Local Government Road Wetland Replacement Program (LGRWRP) which is administered by the Minnesota Board of Water and Soil Resources (BWSR). A list of acronyms and their meanings can be referenced in Appendix A.

2. GEOGRAPHIC SERVICE AREA

Bank Service Area Overview

This CPF focuses on the Lower Red River Bank Service Area (BSA 3), which is part of the larger Souris-Red-Rainy Region Watershed Basin. The Lower Red River BSA has a unique Hydrologic Unit Code (HUC) of 0902. BSA 3 spans approximately 6.9 million acres and 12 counties in northwestern Minnesota. The boundary of BSA 3 ranges from the cities of Humbolt to Roseau in the North and Nielsville to Bagley in the South. The southeastern portion of BSA 3 extends around Upper and Lower Red Lake, encompassing the Red Lake Reservation and Red Lake State Forest (Figure B-1). According to the National Land Cover Database (NLCD), in 2019 land cover in BSA 3 was primarily agriculture and wetlands. Cultivated crops cover approximately 47% of BSA 3, along with woody wetlands covering 18% and herbaceous wetlands covering 17% (Table 2-1). Deciduous forest and open water comprise 6% and 5% of the area, respectively. 3% of the area is in pasture/hay and 3% is developed. Each of the remaining land use categories cover less than 1% of the area, including mixed forest, evergreen forest, grassland/herbaceous, shrub/scrub, and barren land. BSA 3 contains 10 major watersheds (HUC 8) including Red River of the North (RRN) – Sand Hill River (Major Watershed number 61; HUC8 ID 09020301), Upper/Lower Red Lake (62; 09020302), Red Lake River (63; 09020303), Thief River (65; 09020304), Clearwater River (66; 09020305); Red River of the North (RRN) – Grand Marais Creek (67; 09020306), Snake River (68; 09020309), Red River of the North (RRN) – Tamarac River (69; 09020311), Two Rivers (70; 09020312), and Roseau River (71; 09020314). The major watersheds are shown in Figure B-1 and described in the following paragraphs.

Table 2-1. Current Land Cover from the National Land Cover Database	
Landcover (NLCD 2019)	**Percent Area**
Cultivated Crops	47%
Woody Wetlands	18%
Emergent Herbaceous Wetlands	17%
Deciduous Forest	6%
Open Water	5%
Pasture/Hay	3%
Developed	3%
Mixed Forest	1%
Evergreen Forest	< 1%
Grassland/Herbaceous	< 1%
Shrub/Scrub	< 1%
Barren Land	< 1%
Land cover data from the National Land Cover Database (NLCD) for BSA 3	

Ecological Classification

The ecological classification system used in this study was developed jointly by the Minnesota Department of Natural Resources (MnDNR) and the United States Forest Service (USFS). This system is used to classify areas with similar ecological characteristics. It is set up in tiers which become successively smaller and more unique. Provinces are the broadest tier and are defined by major climate zones, native vegetation, and biomes. There are four provinces present in Minnesota including Eastern Broadleaf Forest, Laurentian Mixed Forest, Prairie Parkland, and Tallgrass Aspen Parkland, and all four intersect with BSA 3. Within the provinces are sections, which are defined by the origin of glacial deposits, regional elevation, distribution of plants and regional climate. In Minnesota there are 10 sections but only five are present in BSA 3. Each section is then broken down further into subsections. Subsections are defined by the glacial deposition processes, surface bedrock formations, local climate, topographic relief, and the distribution of plants (Cleland et al., 1997). There are 26 total subsections in Minnesota, six of the subsections are represented within BSA 3. Maps of the provinces, and subsections can be found in Figure B-2. Each province and subsection is described in more detail below. The acreage of each province, section and subsection within each major watershed can be found in Table 2-2. This will be helpful for decision makers because it allows them to consider ecological patterns and identify areas with similar management opportunities.

EASTERN BROADLEAF FOREST PROVINCE

The Eastern Broadleaf Forest province extends over 6.5% (approximately 440,000 acres) of BSA 3. Outside of BSA 3 and Minnesota, this province spans most states in the Midwest. It is a transition zone between the semi-arid prairies in southwest United States and the semi-humid mixed conifer-hardwood forests to the north and

into Canada. During the last glaciation, glaciers covered the northern section of the Eastern Broadleaf Forest Province in Minnesota. After receding, the glaciers left a thick layer of glacial drift which can be the cause of poor drainage and is highly erodible (MnDNR, n.d.-d). There is one subsection within BSA 3.

Hardwood Hills Subsection

The Hardwood Hills subsection is characterized by steep slopes, high hills, and lakes which formed in glacial end moraines and outwash plains. It was once dominated by conifers and aspen-birch forests. The northern portion of this subsection covers a portion of southern BSA 3. The 440,000 acres of the subsection within BSA 3 extends across three major watersheds including Clearwater River, Red Lake River, and RRN – Sand Hill River watersheds. In the northern portion of the Hardwood Hills subsection the land cover is a mix of wetlands, lakes, forests, and cultivated crops. Wetlands in this subsection formed in the poorly drained potholes and remnant features of glaciation (MnDNR, n.d.-e).

LAURENTIAN MIXED FOREST PROVINCE

The Laurentian Mixed Forest province covers 31% (approximately 2.1 million acres). This province has broad areas of conifer forest, mixed hardwoods and conifer forest, and conifer bogs and swamps. A unique characteristic of this landscape is the thin layer of glacial deposit which overlays bedrock. This leads to a landscape that is rugged, rocky, and has many lakes. Wetlands in this province appear in poorly drained depressions which accumulate organic matter (MnDNR, n.d.-f). There are three subsections within BSA 3.

Agassiz Lowlands Subsection

The Agassiz Lowlands subsection covers about 1.5 million acres of the eastern portion of BSA 3. It spans six major watersheds including Clearwater River, Red Lake River, Roseau River, Thief River, and Upper/Lower Red Lake watersheds. This subsection is characterized by expansive peatlands and three large lakes. Glacial Lake Agassiz once occupied this area and deposited calcareous, silty till. In some areas, peat is up to 15 feet deep. This section is nearly level, and efforts to ditch and drain the landscape to support agriculture proved unsuccessful (MnDNR, n.d.-h, n.d.-a).

Chippewa Plains Subsection

The Chippewa Plains subsection covers about 380,000 acres of the southeastern portion of BSA 3. It spans two major watersheds, Clearwater River and Upper/Lower Red Lake. This subsection is characterized by vast forest cover and popular lakes. The landscape in the Chippewa Plains subsection is mostly gently rolling hills. Areas of thick glacial drift cover most of the subsection. Soils range from fine sands to clays. The wetlands in this subsection are mostly forested wetlands with some emergent wetlands present. The drainage network throughout the subsection is poorly developed which leads to more lakes and wetlands on the land surface (MnDNR, n.d.-c).

Littlefork-Vermillion Uplands Subsection

The Littlefork-Vermillion Uplands subsection covers approximately 180,000 acres in the southeastern portion of BSA 3, directly north of the Chippewa Plains subsection. It is entirely located within the Upper/Lower Red Lake

watershed within this BSA. This subsection also lies in the footprint of Glacial Lake Agassiz and acts as a transition between expansive peatlands to the West and bedrock driven landscape to the East. It is largely flat, but transitions to gently rolling hills toward the East. The mineral soils are moderately well to poorly drained. The drainage network in this section is comprised of undisturbed, freely meandering streams and rivers (MnDNR, n.d.-h, n.d.-g).

PRAIRIE PARKLAND PROVINCE

The Prairie Parkland Province covers the western side of Minnesota and extends northwest into Canada, west into North and South Dakota, and south into Iowa, Nebraska, Kansas, Oklahoma, and Missouri. This province has less precipitation and higher temperatures than the other provinces in Minnesota. Prairies and grasslands were the dominate vegetation before European settlement. The thick layer of glacial drift left by the Des Moines lobe as well as the natural development of prairie soils rich in organic matter, provide incredibly fertile soil for agriculture. One of the most distinct characteristics of this province is the Minnesota River, which formed from extreme erosion and downcutting when Glacial Lake Agassiz was dramatically drained. This province is home to prairie pothole wetlands. These wetlands formed in the uneven landscape left by the receding Des Moines Lobe. They are not well connected via surface water, leading to wetlands with variable hydrology and groundwater connections. They are extremely important for both the flora and fauna of the area (MnDNR, n.d.-i). There is one subsection within BSA 3.

Red River Prairie

The Red River Prairie subsection covers 21% of BSA 3 (approximately 1.4 million acres) and spans 7 major watersheds including Clearwater River, Red Lake River, RRN – Grand Marais Creek, RRN – Sand Hill River, RRN – Tamarac River, Snake River and Two Rivers watersheds. Contiguous tallgrass prairie growing on top of lacustrine till from Glacial Lake Agassiz is characteristic of this subsection. The area is largely flat with some gently rolling hills. Pockets of poorly drained clay deposits resulted in the prairie-pothole topography, with wet prairies and meadows located in shallow depressions across the landscape. Nearly all of these wetlands have been ditched and drained to support agriculture. Spring flooding in this subsection is common (MnDNR, n.d.-j)

TALLGRASS ASPEN PARKLAND PROVINCE

The Tallgrass Aspen Parkland province spans a large portion of BSA 3, covering 42% (approximately 2.9 million acres). This province represents the transition zone between mixed forested areas to the East and dry, arid prairie to the West. Comprised of a mosaic of prairies, wetlands, and woodlands, the edges of each habitat type are constantly shifting depending on fire, soil moisture, and other disturbances. Sedge meadows, wet prairies, and fens are common types of wetlands in this province (MnDNR, n.d.-k). There is one subsection within BSA 3.

Aspen Parklands Subsection

The only subsection within the Tallgrass Aspen Parkland Province in Minnesota, the Aspen Parklands subsection covers ~2.9 million acres across all major watersheds within BSA 3. This subsection is the transition zone from peatlands to the East to prairie in the West. Glacial Lake Agassiz once covered this subsection and left behind soils that range from loams to silts to sand and gravel. Rather than corresponding to soil type, vegetation

composition is driven by fire disturbance, with prairie and vegetated wetlands covering areas that experience more frequent fires and forests located in areas burned less frequently. The drainage system is underdeveloped, and meandering streams and rivers are abundant. There are no natural lakes within this subsection (MnDNR, n.d.-b).

Table 2-2. Area (Acres) of Ecological Subsections Broken Down by Each Major Watershed within BSA 3							
Provence:	**Eastern Broadleaf Forest**	**Laurentian Mixed Forest**			**Prairie Parkland**	**Tallgrass Aspen Parklands**	
Section:	**Minnesota and NE Iowa Morainal**	**Northern Minnesota and Ontario Peatlands**		**Northern Minnesota Drift and Lake Plains**	**Red River Valley**	**Lake Agassiz, Aspen Parklands**	
Subsection:	**Hardwood Hills**	**Agassiz Lowlands**	**Littlefork-Vermillion Uplands**	**Chippewa Plains**	**Red River Prairie**	**Aspen Parklands**	**Total**
Clearwater River	309,209	50,345	-	127,502	80	382,327	869,463
Red Lake River	2,581	166,861	-	-	180,733	507,326	857,500
RRN – Grand Marais Creek	-	-	-	-	315,716	63,094	378,810
RRN – Sandhill River	131,333	-	-	-	230,828	33,420	395,581
RRN – Tamarac River	-	-	-	-	354,487	212,271	566,758
Roseau River	-	364,786	-	-	-	315,026	679,812
Snake River	-	-	-	-	212,031	286,578	498,609
Thief River	-	158,019	-	-	-	513,005	671,024
Two Rivers	-	-	-	-	114,231	590,508	704,739
Upper/Lower Red Lake	-	805,910	179,157	255,282	-	1,342	1,241,691
BSA 3 Total	**443,123**	**1,545,921**	**179,157**	**382,784**	**1,408,105**	**2,904,896**	**6,863,985**

Major Watershed Descriptions

The purpose of each watershed description is to provide context for future decisions about mitigation site selection. Data used to fill out the watershed descriptions is plentiful and publicly available. Reports that were used include: Watershed Restoration and Protection Strategy Reports (WRAPS) from the Minnesota Pollution Control Agency (MPCA), Watershed Health Assessment Framework (WHAF) from the MnDNR, county local water management plans, and One Watershed One Plan documents, when available. Mapping resources used were provided from various state agencies through the Minnesota Geospatial Commons. Other resources used in the descriptions are watershed specific and listed when appropriate. For descriptions of the ecological classifications see section 2-B.

CLEARWATER RIVER

The Clearwater River watershed (HUC 09020305) is located along the southern border of BSA 3. It includes six counties: Beltrami, Clearwater, Mahnomen, Pennington, Polk, and Red Lake. The population within the watershed, based on the 2010 U.S. Census, was 14,166 (MnDNR, 2015a). The landscape of the watershed varies, with more than 50% of the watershed being cropland. Forest (22%) and wetland (16%) make up the majority of the watershed, with only 4% of the landscape being developed.

The watershed spans four different ecological subsections, including the Aspen Parklands, Hardwood Hills, Chippewa Plains, and the Agassiz Lowlands. Forested wetlands make up 33% of the wetland areas, with emergent wetlands making up the remaining 65% (MnDNR, 2017a). Soils in the Clearwater River watershed are loams with some areas of high sand. The watershed receives an average of 23.4 inches of precipitation every year. Most of the precipitation (10.5 inches) falls during the summer (June through August) (MnDNR, 2019a).

RED LAKE RIVER

The Red Lake River watershed (HUC 09020303) is located in the center of BSA 3. It has a population of 27,112 according to the 2010 U.S. Census and covers five counties: Beltrami, Clearwater, Pennington, Polk, and Red Lake. This watershed has the highest population in BSA 3. The landscape of the watershed is primarily cropland (65%) but is about one quarter wetland. Development is low across the watershed at less than 5% and focused in and around Thief River Falls, Minnesota and Crookston, Minnesota. Forested areas and surface water are also extremely low at less than 5% of the watershed, collectively (MnDNR, 2015b, 2017b). The Red Lake River (the major surface water feature within the watershed) starts at the outlet of Lower Red lake and extends to is confluence in the Red River of the North.

The Red Lake River watershed covers four different ecological subsections including Aspen Parklands, Red River Prairie, Agassiz Lowlands, and a small portion located in the Hardwood Hills. The wetland areas are split between forested wetlands (45%) and emergent wetlands (55%). The dominate soil types across the watershed are loams with some areas of high sand, and the eastern portion of the watershed being high in organic matter (MnDNR, 2017b). Annually, Red Lake River watershed receives on average 22.1 inches of precipitation. The majority of the precipitation occurs during the summer months (10.1 inches) and the least occurs during the winter months (1.8 inches) (MnDNR, 2019b).

RED RIVER OF THE NORTH – GRAND MARAIS CREEK

The Red River of the North – Grand Marais Creek watershed (HUC 09020306) is on the western side of BSA 3. It covers three different counties including Marshall, Pennington, and Polk. Based on the 2010 U.S. Census the population in the watershed was 2,228. The landscape of the watershed is dominated by agricultural crop production (92%). Development in this watershed is less than 5%, and forested and wetland areas are very low at 2% of the watershed. There are no large cities in this remote watershed (MnDNR, 2017d)

The ecological subsections included in this watershed include the Red River Prairie and the Aspen Parklands. Of the wetland areas within this watershed, forested wetlands make up three-quarters and emergent wetlands make up one-quarter. Soils in the Red River of the North – Grand Marais Creek watershed are loamy with some areas of high sand. The average annual precipitation is 21.3 inches. Summer receives the most precipitation at 9.7 inches and winter receives the least, 1.8 inches (MnDNR, 2017d, 2019c).

RED RIVER OF THE NORTH – SANDHILL RIVER

The Red River of the North – Sandhill River watershed (HUC 09020301) is located along the southwestern border of BSA 3. The 2010 U.S. Census listed the population as 12,671. It spans three counties, including Mahnomen, Norman, and Polk. The largest city in the watershed is East Grand Forks. Agriculture and cultivated crop land use comprises 78% of the watershed area. The watershed has almost equal amounts of forest and wetlands, approximately 6% each. Only about 6% of the watershed is developed. The developments are centered around the cities of East Grand Forks in the northwest of the watershed, and Fosston in the east (MnDNR, 2017e).

The ecological subsections in the Red River of the North – Sandhill River watershed includes the Red River Prairie, Hardwood Hills, and the Aspen Parklands. Forested wetlands make up 29% of the wetland areas, and emergent wetlands make up 70% of the wetland areas of the watershed. Soils across the watershed range from sand and loams. The watershed receives about 22.9 inches of precipitation per year. The summer average precipitation is 10.3 inches and in the winter it is 1.9 inches (MnDNR, 2017e).

RED RIVER OF THE NORTH – TAMARAC RIVER

The Red River of the North – Tamarac River watershed (HUC09020311) is located in the northwestern corner of BSA 3. According to the 2010 U.S. Census the population in this watershed was just over 3,500. It spans three counties, including Kittson, Marshall, and Roseau. There are no large cities within this remote watershed. The watershed's landscape is dominated by cropland (81%). Forested areas, wetland areas, and development make up roughly equal parts of the watershed, each at approximately 6% (MnDNR, 2017f).

The ecological subsections in the Red River of the North – Tamarac River watershed include the Red River Prairie and the Aspen Parklands. Forested wetlands make up 30% of the wetland areas, with emergent wetlands making up 70%. Soils range across the watershed from sand and loams with areas of clay mixed in. The watershed receives about 21.7 inches of precipitation per year. In the summer the average is 9.7 inches and in the winter it is 2.1 inches (MnDNR, 2017f).

ROSEAU RIVER

The Roseau River watershed (HUC 09020314) is located on the northern border of BSA 3. In the 2010 U.S. Census, the population was 7,731 people. The watershed stretches across five counties: Beltrami, Kittson, Lake of the Woods, Marshall, and Roseau. There are no large cities within this remote watershed. The watershed is mostly wetland (44%) and cropland (40%). Development in the watershed is low at 3% (MnDNR, 2017c). The Roseau River (the major surface water feature within the watershed) flows into Manitoba and discharges into the Red River of the North, upstream of Lake Winnipeg.

The watershed covers two different ecological subsections, the Agassiz Lowlands and Aspen Parklands. Wetland areas in the Roseau River watershed are equal parts forest wetlands and emergent wetlands, each at approximately 50%. Soils are mostly sandy loam with some areas of organic matter. The Roseau River watershed receives on average 23.3 inches of precipitation annually. The summer receives the most precipitation, 10.3 inches, and the winter receives the least, 2.3 inches (MnDNR, 2017c).

SNAKE RIVER

The Snake River watershed (HUC 09020309) is located on the western border of BSA 3. It covers three counties: Marshall, Pennington, and Polk. The 2010 U.S. Census listed the population in the watershed at 6,149. The landscape of the watershed is dominated by agricultural crop production at 82%. Forested areas and wetland areas make up 6% and 7% of the landscape, respectively. Development in the watershed is low at 5%. There are no large cities within this remote watershed (MnDNR, 2017g).

The Snake River watershed is split between two different ecological subsections, the Aspen Parklands and the Red River Prairie. Wetland areas within the watershed consist of forested wetlands (26%) and emergent wetlands (74%). Soils vary across the watershed but are predominantly sandy loam with areas of silt loam. The watershed receives about 21.4 inches of precipitation a year. In the summer the average is 9.7 inches and in the winter it is 1.9 inches (MnDNR, 2017g).

THIEF RIVER

The Thief River watershed (HUC 09020304) is located near the center of BSA 3. It covers three counties: Beltrami, Marshall, and Pennington. The 2010 U.S. Census listed the population in the watershed as 2,606. The landscape of the watershed is roughly equal parts wetland and cropland, each at approximately 44%. Forested areas make up 6% of the landscape, with developed areas being very low at 3%. There are no large cities in this remote watershed (MnDNR, 2017h).

The Thief River watershed spans across two different ecological subsections, the Aspen Parklands and the Agassiz Lowlands. Of the wetland areas, emergent wetlands made up 62%, with forested wetlands making up 38%. Soils throughout the watershed are predominantly sandy loam with areas of high organic material. The watershed receives about 22.4 inches of precipitation a year. In the summer the average is 10.2 inches and in the winter it is 1.9 inches (MnDNR, 2017h).

TWO RIVERS

The Two Rivers watershed (HUC 09030312) is located in the northwestern corner of BSA 3. According to the 2010 U.S. Census the population in this watershed was 5,535. It spans three counties, including Kittson, Marshall, and Roseau. There are no large cities within this remote watershed. The watershed's landscape is dominated by cropland (69%) with the next most abundant landscape being wetland (16%) and forest (4%). Development in this watershed is low at 4% (MnDNR, 2017i).

The ecological subsections in the Two Rivers watershed include the Aspen Parklands and the Red River Prairie. The wetland areas within this watershed are comprised of emergent wetlands (82%) and forested wetlands (18%). Soils in the watershed are loams with areas of high sand and clay. The watershed receives about 22.4 inches of precipitation per year. In the summer the average is 9.9 inches and in the winter it is 2.2 inches (MnDNR, 2017i).

UPPER/LOWER RED LAKE

The Upper/Lower Red Lake watershed (HUC 09020302) is located on the eastern border of BSA 3. According to the 2010 U.S. Census the population in this watershed was 10,784. It spans four counties, including Beltrami, Clearwater, Itasca, and Koochiching. There are no large cities within this watershed. The landscape of the watershed is dominated primarily by wetlands (48%, the Red Lake peatlands). The next most abundant landscapes are open water (24%) and forest (18%). This watershed is home to the two largest bodies of water within the state: Upper Red Lake and Lower Red Lake (MnDNR, 2017j; MPCA, 2023).

The ecological subsections in the Pine River watershed include the Agassiz Lowlands, Chippewa Plains, and Littlefork-Vermillion Uplands. A small portion of the watershed, about 1200 acres, is located in the Aspen Parklands. The wetland areas within the watershed are comprised of forested wetlands (76%) and emergent wetlands (24%). Soils in the watershed are sandy loams with areas of high silt and high organics. The watershed receives about 24.5 inches of precipitation per year. In the summer the average is 10.8 inches and in the winter it is 2.1 inches (MnDNR, 2017j).

3. BASELINE CONDITIONS

The baseline conditions section analyzes and describes the current conditions of water resources across BSA 3. All of the data analyzed is readily available to the public. Additional information about the land use, vegetation cover, and permitting history is included to add a greater understanding of current conditions and to further inform the prioritization process. Maps for the geographic service area and the baseline conditions are located in Appendix B.

Pre-settlement vegetation

The Historic Vegetation Model (VEGMOD) developed by the Minnesota Department of Transportation (MnDOT) was summarized to gain insight into the distribution of vegetation prior to the significant changes resulting from European settlement (pre-settlement). VEGMOD was developed to represent the vegetation present at the time

of the Public Land Survey (1848-1907) across Minnesota. The model is based on statistical analysis of interpreted data which includes surveyor's observations and modern terrain and soils data (MnDOT, 2019). A summary of the vegetative cover grouped by vegetative class is provided in Table 3-1.

Results from the VEGMOD data (Figure B-3) reflect the ecological classification subsections for each of the major watersheds. This includes wetland, bog, and mixed forested areas in the eastern region of BSA 3 that transitions to a prairie landscape in the western region of BSA 3. These areas are still present today but exist in a greatly altered state, particularly in the western region of BSA 3 where the prairie landscape is reduced to support agriculture.

Table 3-1. Summary of Pre-Settlement Vegetation for BSA 3

Category	Water	Wetland		Forest					Prairie			
Major Watershed	Surface Water	Seasonally Wet	Permanently Wet	Coniferous Forest	Coniferous Woodland	Mixed Coniferous-Deciduous Forest	Deciduous Forest	Deciduous Woodland	Brush-Prairie	Prairie	Coniferous Savanna	Deciduous Savanna
Clearwater River	3%	4%	23%	6%	-	2%	20%	5%	-	35%	-	1%
Red Lake River	1%	5%	22%	-	-	-	4%	4%	-	63%	-	-
RRN – Grand Marais Creek	-	2%	1%	-	-	-	1%	-	-	95%	-	-
RRN – Sandhill River	3%	4%	10%	-	-	-	10%	1%	-	71%	-	1%
RRN – Tamarac River	-	2%	9%	-	-	-	2%	-	-	85%	-	2%
Roseau River	1%	5%	58%	4%	-	2%	8%	2%	-	19%	-	1%
Snake River	-	3%	7%	-	-	-	1%	1%	-	85%	-	1%
Thief River	2%	12%	52%	-	-	-	3%	5%	1%	24%	-	1%
Two Rivers	-	5%	17%	-	-	-	7%	3%	12%	55%	-	-
Upper/Lower Red Lake	24%	1%	51%	8%	-	11%	5%	-	-	-	-	-
BSA 3 Total	**5%**	**4%**	**29%**	**3%**	**-**	**3%**	**7%**	**2%**	**1%**	**45%**	**-**	**1%**
Category Total	**5%**	**33%**		**15%**					**47%**			

Wetlands

The current extent of wetlands in BSA 3 is based on the 2019 update of the Minnesota National Wetland Inventory (NWI) provided by the MnDNR (Kloiber et al., 2019). BSA 3 has approximately 1.8 million acres of palustrine wetlands (Figure B-4). Riverine and Lacustrine wetlands were not included in this analysis because they are more commonly associated with non-wetland deepwater habitats in the Cowardin classification system. Approximately 27% of the entire BSA 3 is palustrine wetlands, which is higher than the statewide percentage of 20%. The two most prevalent classes or types of wetlands in BSA 3 include emergent wetlands (342,720 acres; 35% of the wetlands in BSA 3) and scrub shrub wetlands (641,669 acres; 35% of the wetlands in BSA 3). Forested wetlands account for about 30% of the wetlands in BSA 3 (551,966 acres). Unconsolidated shore, unconsolidated bottom, and aquatic bed wetlands account for only about 1% (18,628 acres). On the watershed level, the Upper/Lower Red Lake watershed has the greatest area of wetlands with 541,312 acres (44% of the watershed area). The Roseau River watershed and the Thief River watershed also have close to 44% of the watershed area in wetlands (308,581 acres and 294,517 acres respectively). Table 3-2 includes the exact numbers and a comparison with the whole BSA 3 and statewide numbers.

ORGANIC SOILS

Organic soils are a unique feature in BSA 3. They are important for peatland wetland formation and impact other natural resources across the BSA. It is important to include them as a baseline condition because of their role in the development or preservation of boreal peatlands, a unique wetland system. For the purpose of this report three categories are included within organic soils to get a holistic view across the landscape and across land use types. These include soils mapped as histosols, soils with a histic epipedon, and wetlands mapped as peatlands. Histosols are soils that formed within organic materials. It is a soil without permafrost where the upper 80cm are more than half organic (USDA, 1999). A histic epipedon is a soil horizon or layer that forms at or near the surface which consist of organic material and is characterized by saturation and reduction (USDA, 1999). Peatlands can be mapped several ways but for this report the Hydrogeomorphic (HGM) wetland classification system was used to define a peatland. The HGM classification system aims to be a generic approach to classification. It emphasizes the geomorphic position, the water source, and the hydrodynamics of a wetland (Brinson, 1993). As such, there are seven broad classes, of which only six occur within Minnesota (Kloiber et al., 2019). In the HGM, peatlands (also referred to as Organic Flats) are wetlands that occur on a nearly level landform. Their hydrology is not influenced by stream, river, or flow-through ditches and the soil type is predominately organic. To map the extent of peatlands within BSA 3, the Minnesota 2019 NWI was used as it includes the HGM classification. It should be noted that for summarizing wetlands previously in this report the Cowardin classification system was used. There is no defined relationship between the Cowardin and HGM classifications. Therefore, wetlands that are classified as peatlands within HGM could fall into any of the palustrine wetland class within the Cowardin system. But not all palustrine wetlands would be considered peatlands. The combination of histosol soils, soils with histic epipedons, and peatlands was used to characterize the extent of organic soils in BSA 3 in order to achieve a holistic analysis.

Organic soils within BSA 3 cover approximately 24% of the BSA area (1,638,898 acres; Figure B-5). The majority of the organic soils are located in the eastern portion of the BSA, within the Upper/Lower Red Lake major watershed (586,551 acres). As you travel west across the BSA the total amount of organic soils decreases and becomes smaller and more disjointed. This is likely largely attributed to geology, which consists of more sedimentary bedrock and sandstone in the western sections of BSA 3. The Red River of the North – Grand Marais Creek watershed has the lowest watershed area covered by organic soils (1% of the watershed area). Table 3-3 shows the amounts of distribution of organic soils across the BSA.

Table 3-2. Acres of Wetland

Major Watershed	Watershed Acres	Palustrine				Total Wetland Acres	Percent Watershed Wetland
		Emergent	Forested	Scrub-Shrub	AB+UB+US*		
Clearwater River	869,463	96,410	32,929	48,578	5,670	183,587	21%
Red Lake River	857,500	106,571	44,386	58,760	1,948	211,666	25%
RRN – Grand Marais Creek	378,810	10,704	1,680	613	436	13,433	4%
RRN – Sand Hill River	395,585	21,361	5,085	4,459	2,190	33,095	8%
RRN – Tamarac River	567,039	28,066	12,494	20,298	725	61,584	11%
Roseau River	679,898	98,495	76,702	132,358	1,027	308,581	45%
Snake River	498,609	28,974	8,986	13,385	554	51,900	10%
Thief River	671,024	97,331	52,034	143,390	1,762	294,517	44%
Two Rivers	704,818	81,260	23,110	49,781	1,158	155,308	22%
Upper/Lower Red Lake	1,241,691	73,547	294,559	170,047	3,160	541,312	44%
BSA 3 Total	**6,864,435**	642,720	551,966	641,669	18,628	1,854,983	27%
Statewide	**55,643,000**	**3,497,216**	**4,017,768**	**3,272,709**	**291,837**	**11,079,099**	**20%**

Data from the Minnesota NWI (2019 update)
*Aquatic Bed, Unconsolidated Bottom, and Unconsolidated Shore

Table 3-3. Acres of Organic Soils

Major Watershed	Watershed Acres	Organic Soils (Acres)	Percent Watershed
Clearwater River	869,463	258,926	30%
Red Lake River	857,500	158,661	19%
RRN – Grand Marais Creek	378,810	3,842	1%
RRN – Sand Hill River	395,585	21,243	5%
RRN – Tamarac River	567,039	27,690	5%
Roseau River	679,898	238,358	35%
Snake River	498,609	31,432	6%
Thief River	671,024	215,066	32%
Two Rivers	704,818	97,128	14%
Upper/Lower Red Lake	1,241,691	586,551	47%
BSA 3 Total	**6,864,437**	**1,638,898**	**24%**

Organic soils baseline condition is a combination of Histosol soils, soils with Histic Epipedon, and wetlands defined as "Peatland" in HGM classification in the 2019 NWI

Lakes

According to the MnDNR Hydrography data, BSA 3 has approximately 352,647 acres of lakes (Figure B-6). About 24% of the BSA 3 area is lakes. The Upper/Lower Red Lake watershed has the greatest area of lakes within BSA 3. Red Lake, which is 283,813 acres, is located within this watershed as the name suggests. The watershed with the second highest lake acreage is the Clearwater River watershed with 21,249 acres. The area of lakes in all watersheds can be found in Table 3-4. The five largest lakes in BSA 3 include Upper and Lower Red Lake, as mentioned before, Thief Lake (6,896 acres in Thief River watershed), Blackduck Lake (2,711 acres in Upper/Lower Red Lake watershed), and Puposky Lake (2,177 acres in Upper/Lower Red Lake watershed).

Table 3-4. Summary of Lake Area (Acres) for BSA 3

Major Watershed	Watershed Acres	Lake Acres[1]	Lake Area %
Clearwater River	869,463	21,249	2%
Red Lake River	857,500	2,794	0.3%
RRN – Grand Marais Creek	378,810	98	0.03%
RRN – Sand Hill River	395,585	7,586	2%
RRN – Tamarac River	567,039	731	0.1%
Roseau River	679,898	1,995	0.3%
Snake River	498,609	311	0.1%
Thief River	671,024	13,353	2%
Two Rivers	704,818	1,461	0.2%
Upper/Lower Red Lake	1,241,691	303,068	24%
BSA 3 Total	**6,864,435**	**352,647**	**5%**

[1]Data from MnDNR Hydrography- Lakes and Open Water

Watercourses

The MnDNR Rivers and Streams dataset was used to conduct an inventory of all watercourses within each major watershed. This dataset is part of the National Hydrography Dataset (NHD) provided by the United States Geological Survey (USGS). The length of mapped watercourses, categorized by channel type (ditched or natural) and flow regime (unknown, intermittent or perennial), is provided in Table 3-5. A measure of watercourse density (watercourse length in miles divided by area of watershed in square miles) for each major watershed was calculated to assess variability of the tributary network throughout BSA 3. The majority of the watercourses within BSA 3 are categorized as Drainage Ditches (5,896 miles; Figure B-7). The watershed with the most watercourse miles in the Clearwater River watershed. All of the watersheds, excluding Upper/Lower Red Lake watershed, have high density of watercourses with the density ranging from 1.0 to 1.4. The Upper/Lower Red Lake land area is dominated more by lakes than watercourses.

Table 3-5. Summary of Watercourses (Miles) for BSA 3						
Major Watershed	**Drainage Ditch**	**Natural – Unknown Flow Regime**	**Natural-Intermittent**	**Natural-Perennial**	**Total**	***Watercourse Density**
Clearwater River	542	141	727	309	**1,720**	**1.3**
Red Lake River	828	212	371	99	**1,510**	**1.1**
RRN – Grand Marais Creek	346	62	147	12	**567**	**1.0**
RRN – Sand Hill River	437	44	307	88	**876**	**1.4**
RRN – Tamarac River	481	54	390	58	**983**	**1.1**
Roseau River	732	89	433	167	**1,421**	**1.3**
Snake River	459	11	361	171	**1,001**	**1.3**
Thief River	1,105	26	162	54	**1,347**	**1.3**
Two Rivers	648	45	318	141	**1,151**	**1.0**
Upper/Lower Red Lake	317	112	348	548	**1,324**	**0.7**
BSA 3 Total	**5,896**	**796**	**3,562**	**1,646**	**11,900**	**1.1**
*Watercourse Density is the number of stream miles per square mile of watershed						

Altered Watercourses

An inventory of altered watercourses statewide was completed via a joint project with MPCA and the Minnesota Geospatial Information Office (MnGEO). The inventory analyzed historic aerial photos as well as LiDAR and up to date aerial photography to determine watercourses that have been altered. Watercourses were sectioned into four categories: altered, impounded, natural, and no definable channel. An altered watercourse is a naturally occurring stream or river or an artificially constructed canal or ditch where habitat has been compromised through hydrologic alteration. Streams where flow has been dammed are categorized as impounded. Natural watercourses are those that have little to no human influence. The no definable channel category includes flowlines from the NHD that no longer appear on the aerial imagery or LiDAR hillshade (MnGEO, 2013). BSA wide, most of the watercourses are categorized as altered, meaning that it has had some hydrologic alteration (Figure B-8). The major land use in BSA 3 is agriculture, therefore it is expected that the majority of the watercourses would be altered at some point. The majority of the altered watercourses fall in the Thief River watershed. The second highest category is natural with 2,924 miles. The watershed with the most miles of natural watercourses is the Upper/Lower Red Lake watershed. Exact lengths of altered watercourses for each watershed and their category can be found in Table 3-6.

Table 3-6. Summary of Altered Watercourses (Miles) in BSA 3				
Major Watershed	**Altered**	**Impounded**	**Natural**	**No Definable Channel**
Clearwater River	967	1	477	275
Red Lake River	1,006	1	393	109
RRN – Grand Marais Creek	442	0	90	36
RRN – Sand Hill River	526	1	171	178
RRN – Tamarac River	712	2	157	113
Roseau River	868	0	316	235
Snake River	515	1	253	233
Thief River	1,160		39	148
Two Rivers	817	3	221	110
Upper/Lower Red Lake	408	1	806	109
BSA 3 Total	7,422	10	2,924	1,546
Data from the MPCA Altered Watercourses Project updated in 2019				

Water Quality

Water quality in BSA 3 was assessed using the MPCA 303(d) impaired waters list of. Data for lakes, streams, and wetlands were updated in 2022. Not all impairments are pertinent to wetland restoration and protection; therefore, a subset of the impairments were chosen. The impairments included in this report are dissolved oxygen (DO), fish bioassessments, aquatic macroinvertebrate bioassessments, nitrate, nutrients and eutrophication biological indicators, sulfate, turbidity, and total suspended solids (TSS). Lakes and streams that were assessed and located partially or wholly within tribal lands are included in this analysis. Across BSA 3, 189 lakes were assessed, and 12 lakes were found to be impaired (Figure B-9). Of the impaired lakes, one (1) lake was located partially or wholly on tribal land. The RRN – Sand Hill River watershed had the highest percentage (20%) of its lakes impaired. Several watersheds had the no impairments or were not assessed. Hayes Lake within the Roseau River watershed is nearly impaired for nutrients. **Error! Reference source not found.** includes assessed and impaired lake area and percentage for each watershed.

In addition to evaluating the number of impaired waterbodies, lakes and streams that are nearly impaired or barely impaired (nearly/barely) for one or more impairments were also evaluated. The MPCA identifies nearly/barely waterbodies by analyzing water quality data to determine what waterbodies are close to the impairment thresholds. This information is helpful to establish more context for impaired waterbodies as well as identify waterbodies that aren't included in the impairment analysis but are nearing impairment thresholds. An important consideration when evaluating nearly/barely waterbodies is that these categorizations are based on the waterbody's designated use classification (i.e. aquatic life and aquatic recreation), not specific parameters, so it is possible for a stream to be impaired for one aquatic life parameter (i.e. dissolved oxygen) but also be listed as nearly impaired for aquatic life due to another parameter (TSS, nutrients and eutrophication biological indicators, etc.) nearing the threshold. Additionally, nearly/barely lakes summarized here only consider nearly/barely designations for nutrients under the aquatic recreation designated use.

There are six lakes in BSA 3 that are nearly impaired, two lakes within the RRN – Sandhill River watershed, one lake within the RRN – Tamarac River watershed, and three lakes in the Clearwater River watershed. There are three lakes that are barely impaired, two lakes within Clearwater River watershed and one lake in the Upper/Lower Red Lake watershed. The list of nearly/barely lakes is presented below in Table 3-8.

Table 3-7. Assessed and Impaired Lakes

Major Watershed	Assessed		Impaired		% Impaired
	Acres	Count	Acres	Count	
Clearwater River	9,869	64	378	3	5%
Red Lake River	364	4	-	-	0%
RRN – Grand Marais Creek	-	-	-	-	-
RRN – Sand Hill River	3,337	20	701	4	20%
RRN – Tamarac River	43	1	-	-	0%
Roseau River	195	2	-	-	0%
Snake River	-	-	-	-	-
Thief River	6,529	2	-	-	0%
Two Rivers	320	1	-	-	0%
Upper/Lower Red Lake	296,740	95	3,285	5	5%
BSA 3 Total	**317,397**	**189**	**4,364**	**12**	**6%**

Data includes lakes wholly and partially on tribal lands

Table 3-8. Nearly/Barely Waterbodies

Major Watershed	Lake ID	Lake Name	Lake Area (acres)	Nearly/Barely
RRN - Sandhill River	60-0093-00	Hilligas	132	Nearly
	60-0309-00	Arthur	119	Nearly
RRN - Tamarac River	45-0119-00	Unnamed	49	Nearly
Clearwater River	15-0144-00	Lindberg	96	Nearly
	60-0032-00	Turtle	525	Nearly
	60-0214-00	Badger	226	Barely
	15-0035-00	Spike	80	Nearly
	15-0140-00	Second	72	Barely
Upper/Lower Red Lake	04-0069-00	Blackduck	2711	Barely

Regarding streams, there were 311 individual stream reaches assessed across BSA 3 and 120 of those reaches were found to be impaired (39%; Figure B-10). Five (5) of the impaired stream reaches were partially or wholly on tribal land. The RRN – Grand Marais Creek watershed had the highest percentage of its stream reaches impaired at 64%. The Thief River, Upper/Lower Red Lake, and Roseau River watersheds had the lowest percentage of impairments with 23%, 23%, and 24% respectively.

Nearly/barely data for streams was also analyzed. There were six stream reaches identified as nearly impaired or barely impaired within BSA 3, all falling within the Clearwater River watershed. Two reaches on different streams were barley impaired for one aquatic life parameter including a 34-mile reach of Hill River that was barely impaired for fish bioassessments and a 19.2-mile reach of Silver Creek that was barely impaired for macroinvertebrate bioassessments. Along the Clearwater River, an 11.8-mile reach was nearly impaired for at least one Aquatic Life impairment (DO, TSS, nutrients, fish bioassessments, and/or macroinvertebrate bioassessments) and a 34.6-mile reach was barely impaired for DO, TSS, and nutrients. Along the Poplar River , a 14.2-mile reach was nearly impaired for at least one Aquatic Life impairment and a 39.3-mile reach is currently impaired for DO, fish bioassessments, macroinvertebrate bioassessment, and barely impaired for an additional Aquatic Life impairment. See Table 3-9 for assessed and impaired stream miles and percentages in each watershed and Table 3-10 for nearly/barely streams.

Table 3-9. Assessed and Impaired Streams

Major Watershed	Assessed		Impaired		% Impaired
	Miles	Count*	Miles	Count*	
Clearwater River	435	56	250	19	34%
Red Lake River	499	47	201	22	47%
RRN – Grand Marais Creek	263	14	142	9	64%
RRN – Sand Hill River	198	16	119	8	50%
RRN – Tamarac River	234	26	114	11	42%
Roseau River	223	17	26	4	24%
Snake River	294	24	220	13	54%
Thief River	218	39	77	9	23%
Two Rivers	305	28	220	15	54%
Upper/Lower Red Lake	409	44	148	10	23%
BSA 3 Total	**3,079**	**311**	**1,518**	**120**	**39%**

*Count is the number of stream reaches not individual streams
Data includes streams wholly and partially on tribal lands

Table 3-10. Nearly/Barely Waterbodies

Major Watershed	Stream ID	Stream Name	Stream Length (mi)	Nearly/Barely	Nearly/Barely Parameter
Clearwater River	09020305-518	Poplar River	39.3	Barely	Aquatic Life
	09020305-504	Poplar River	14.2	Nearly	Aquatic Life
	09020305-527	Silver Creek	19.2	Barely	Macroinvertebrate Bioassessment
	09020305-539	Hill River	34.1	Barely	Fish Bioassessment
	09020305-647	Clearwater River	34.6	Barely	DO, Nutrients, Turbidity
	09020305-653	Clearwater River	11.8	Nearly	Aquatic Life

Land Cover

The National Land Cover Dataset (NLCD) was used to analyze the current land cover across BSA 3. There are 20 land cover classifications in the NLCD but a simplified list of classes was used for this study. The simplified classifications include *Agriculture, Barren, Developed, Forest, Grassland, Water*, and *Wetlands*. Unclassified area was excluded from the analysis. The 2019 NLCD was used to analyze BSA 3. Table 3-11 includes the landcover classification breakdown within each individual watershed.

The majority of land cover in BSA 3 is classified as *Agriculture* (50%) with the second highest category being *Wetlands* at 34% (Figure B-11). Although the wetland area as mapped in the NWI and the NLCD are similar (27% and 34% of BSA 3 respectively), the difference is a result of different mapping methods, scales, and accuracy. On a watershed level, *Agriculture* is the highest land cover in the Sandhill River, Red Lake River, Clearwater River, Grand Marais Creek, Snake River, Tamarac River, and Two Rivers watersheds. *Wetlands* are the highest in the Upper/Lower Red Lake, Thief River, and Two Rivers watersheds.

Table 3-11. Land Cover Percentage of Each Watershed in 2019

Major Watershed	Agriculture	Barren	Developed	Forest	Grassland	Water	Wetlands
Clearwater River	53%	< 1%	4%	16%	1%	2%	24%
Red Lake River	64%	< 1%	4%	2%	< 1%	1%	29%
RRN – Grand Marais Creek	93%	< 1%	4%	1%	< 1%	1%	2%
RRN – Sand Hill River	80%	< 1%	5%	4%	1%	2%	9%
RRN – Tamarac River	77%	< 1%	4%	5%	< 1%	< 1%	14%
Roseau River	34%	< 1%	3%	4%	< 1%	< 1%	59%
Snake River	77%	< 1%	4%	4%	< 1%	< 1%	15%
Thief River	36%	< 1%	2%	1%	< 1%	2%	58%
Two Rivers	57%	< 1%	3%	8%	< 1%	< 1%	31%
Upper/Lower Red Lake	6%	< 1%	1%	14%	< 1%	24%	54%
BSA 3 Total	**50%**	**< 1%**	**3%**	**7%**	**< 1%**	**5%**	**34%**

Data from the National Land Cover Database. Categories simplified based on 2019 NLCD categories

Perennial Cover

In addition to analyzing land cover, perennial cover was evaluated using the 2019 NLCD. Of the seven classes, *Forest*, *Grassland*, and *Wetlands* were categorized as *Perennial*. *Agriculture*, *Barren*, and *Developed* were classified as *Non-Perennial*. *Water* and any uncategorized data were omitted from the analysis. As can be seen in Figure B-12 and Table 3-12, major watersheds on the western portion of BSA 3 are dominated by *Non-Perennial* cover, transitioning to *Perennial* cover in the east. Western watersheds dominated by *Non-Perennial* cover include Red Lake River (68% *Non-Perennial*), RRN – Grand Marais Creek (96%), RRN – Sand Hill River (85%), RRN – Tamarc River (76%), and Snake River (78%). Clear water River and Two Rivers watersheds have a relatively even split of *Perennial* to *Non-Perennial*. Watersheds with dominant *Perennial* cover include Roseau River (67% *Perennial*), Thief River (62%), and Upper/Lower Red Lake (93%). Across BSA 3, 47% is covered with *Perennial* cover and 53% with *Non-Perennial* cover.

Table 3-12. Acres of Perennial and Non-Perennial Cover in 2019			
Major Watershed	**Perennial**	**Non-Perennial**	**Total**
Clearwater River	402,606	446,995	**849,601**
Red Lake River	276,057	573,469	**849,526**
RRN – Grand Marais Creek	13,899	362,194	**376,093**
RRN – Sand Hill River	58,724	328,065	**386,789**
RRN – Tamarac River	137,018	427,296	**564,314**
Roseau River	456,747	220,432	**677,179**
Snake River	111,574	386,263	**497,836**
Thief River	408,223	250,389	**658,613**
Two Rivers	336,880	366,177	**703,056**
Upper/Lower Red Lake	880,506	61,554	**942,060**
BSA 3 Total	**3,082,233**	**3,422,835**	**6,505,067**
Based on the 2019 NLCD.			

Areas of Biodiversity Significance

To assess sensitive plant communities and rare species, the Biodiversity Significance Rank provided by the Minnesota Biological Survey was used. This dataset was developed over 30 years. Initial surveys were conducted starting in the 1990's to inventory and map Minnesota's native plant communities. Sites were selected on a county basis using aerial photos to identify locations where native plant communities would be present. As a result, not all potential areas of biodiversity significance were chosen, and it is likely some boundaries within mapped areas have shifted over time.

Within the survey, ranks were given to each site based on the presence of rare species populations, the size and condition of native plant communities, and the proximity of the site to different land uses (MnDNR, 2022). One of four ranks was assigned to each site: *Outstanding*, *High*, *Moderate*, and *Below*. Sites ranked as *Outstanding* typically have the most numerous occurrences and best examples of the rarest species and contain the most intact rare native plant communities. Sites ranked as *High* have medium occurrences of rare species and are good examples of high quality rare native plant communities. Sites ranked as *Moderate* contain some rare species and have moderately disturbed native plant communities. These sites have very good potential for recovery of native plant communities. Sites ranked as *Below* lack rare species and native plant communities. However, these sites may still be important for local conservation efforts and may benefit native plants and animals. They have high potential for restoration of native habitat (MnDNR, 2022).

Within BSA 3, approximately 1.8 million acres (26% of the total area of BSA 3) was surveyed for biodiversity significance (Figure B-13). The majority of sites (11% of the total area of BSA 3, 42% of surveyed area) were ranked as *Moderate* across the BSA. Six watersheds including Clearwater River, RRN – Sand Hill River, RRN – Tamarac River, Roseau River, Thief River, and Upper/Lower Red Lake had the most of their sites ranked as *Moderate*. The majority of sites were ranked as *High* in Red Lake River and RRN – Grand Marais Creek watersheds. Most sites in Two Rivers watershed were ranked *Outstanding*. Upper/Lower Red Lake watershed

had the most acreage of sites ranked as Outstanding (~180,000 acres, 15% of watershed). It should be noted that the Red Lake peatlands, a large area of relatively low impact, high quality wetlands, is part of the Upper/Lower Red Lake major watershed. Four watersheds had 10% or less area ranked for biodiversity significance, including only 1% of RRR – Grand Marais Creek. Acres and percentages for each watershed and BSA can be found in Table 3-13.

Table 3-13. Acres of Areas of Biodiversity Significance and Rank

Major Watershed	Below		Moderate		High		Outstanding		Grand Total	
Clearwater River	11,310	1%	76,674	9%	38,872	4%	17,443	2%	**144,299**	**17%**
Red Lake River	14,959	2%	23,568	3%	160,488	19%	12,162	1%	**211,177**	**25%**
RRN – Grand Marais Creek	949	<1%	948	<1%	1,697	<1%	-	-	**3,593**	**1%**
RRN – Sand Hill River	2,052	1%	8,050	2%	2,392	1%	4,124	1%	**16,618**	**4%**
RRN – Tamarac River	12,781	2%	18,989	3%	16,231	3%	10,461	2%	**58,462**	**10%**
Roseau River	35,729	5%	163,459	24%	43,366	6%	47,774	7%	**290,328**	**43%**
Snake River	6,943	1%	6,274	1%	10,256	2%	11,382	2%	**34,856**	**7%**
Thief River	92,699	14%	143,996	21%	48,098	7%	15,963	2%	**300,756**	**45%**
Two Rivers	18,880	3%	51,403	7%	41,755	6%	59,729	8%	**171,768**	**24%**
Upper/Lower Red Lake	3,589	<1%	263,351	21%	118,931	10%	182,268	15%	**568,139**	**46%**
BSA 3 Total	**199,891**	**3%**	**756,714**	**11%**	**482,086**	**7%**	**361,306**	**5%**	**1,799,996**	**26%**

Data updated 2023

Prairie Conservation Plan

The Minnesota Prairie Conservation Plan (Prairie Plan) was used to assess current and future prairie-pothole habitat areas on the landscape (Minnesota Prairie Plan Working Group, 2018). This 25-year strategy aims to protect and restore critically endangered prairie habitat for plant and wildlife species. The second version of the Prairie Plan, published in 2018, includes measurable goals for grassland and wetland acres within several zones that would support mobile wildlife species, maintain current acres of prairie, and improve habitat within the surrounding agricultural landscape for species adapted to live in the agricultural countryside. Within the Prairie Plan dataset, there are three categories of land use. Core areas represent areas on the landscape that currently retain some features of a functioning prairie landscape. Strategic habitat complexes represent areas where future grassland and wetland habitat is needed to provide habitat steppingstones from one core area to the next. Corridor area represents a six-mile-wide corridor running nearly the entire length of Minnesota, connecting all core areas and strategic habitat complexes to each other. There is a goal of 10 percent grassland and wetland habitat for each square mile within the corridor areas to allow for habitat connectivity.

Across BSA 3, approximately 1.2 million acres are within the core areas, strategic habitat complexes, or corridor (Figure B-14). Based on the Prairie Plan, approximately 14% of the land area is planned to be used as grassland or wetland habitat by 2033. Two Rivers watershed currently has the most acres of prairie (241,331 acres) and will have the highest percentage of prairie over time (34%). Thief River watershed has the most opportunity for grassland and wetland restoration, with 91,160 acres located within strategic habitat complexes. Clearwater

River and Snake River watersheds have large amounts of acreage within the corridor (72,075 and 69,228 acres, respectively), representing a need for many small areas of restoration and protection evenly dispersed throughout the corridor. Upper/Lower Red Lake is the only watershed within BSA 3 that is not impacted by the Prairie Plan, as this watershed is not located within the Prairie Parkland or Tallgrass Aspen provinces. Table 3-14 includes the acres of present and planned prairie habitat based in the Prairie Plan within each individual watershed.

Table 3-14. Acres of Present and Planned Prairie Habitat

Major Watershed	Watershed	Core Areas (Present)	Strategic Habitat Complexes (Planned)	Corridor (Planned)	% Prairie*
Clearwater River	869,460	43,534	6,275	72,075	7%
Red Lake River	857,496	134,175	6,246	52,986	17%
RRN – Grand Marais Creek	378,808	34,610	-	6,225	9%
RRN – Sand Hill River	395,583	38,932	5,732	33,275	12%
RRN – Tamarac River	567,036	80,621	4	10,429	14%
Roseau River	679,895	99,649	-	-	15%
Snake River	498,607	98,334	5,613	69,228	22%
Thief River	671,021	25,968	91,160	52,757	18%
Two Rivers	704,816	241,331	-	9,863	34%
Upper/Lower Red Lake	1,241,686	-	-	-	-
BSA 3 Total	**6,864,408**	**797,153**	**115,031**	**306,839**	**14%**

*Percent Prairie is the core areas plus strategic habitat complexes plus ten percent of the corridor acreage divided by watershed acreage.

Permitting Analysis

Permits issued under the U.S. Army Corps of Engineers (USACE) Regulatory Program were reviewed for the four-year period between January 2017 and December 2021. This review focused on authorized impacts to wetlands (e.g., filling or draining) that resulted in a permanent loss of the resource.

Table 3-15 provides a summary of authorized wetland impacts between 2017 and 2021. It is important to note that this information provides only a subset of wetland impacts over this period. For example, the placement of fill material into a wetland for residential development would be included in this summary. However, the placement of fill material into a wetland for a temporary road, which would be restored to its preexisting condition at a later time, would not be included in this summary. Lastly, the USACE does not regulate impacts to all wetlands. Certain wetlands that are considered isolated are not regulated by the USACE and would not be included in this summary.

None of the watersheds had a significant amount of wetland impacts over this time period.

Table 3-15. Acres of Permitted Wetland Impact	
Major Watershed	**Acres of Impact**
Clearwater River	2.9
Red Lake River	3.8
RRN – Grand Marais Creek	-
RRN – Sand Hill River	0.1
RRN – Tamarac River	< 0.1
Roseau River	0.4
Snake River	1.2
Thief River	-
Two Rivers	0.2
Upper/Lower Red Lake	3.0
BSA 3 Total	**11.62**
Data from 2017 to 2021 provided by the U.S. Army Corps of Engineers	

4. CUMULATIVE IMPACT ANALYSIS

Wetland Loss

Wetland loss was analyzed for the entirety of BSA 3. To quantify wetland loss, the historic extent of wetlands was compared to the current extent. The historic extent of wetlands are wetlands that existed prior to European Settlement (from here on referred to as pre-settlement wetlands). To estimate pre-settlement wetlands, a combination of hydric soil data map unit (DMU) ratings and current wetlands extent was used. Hydric soils, as defined by the United States Department of Agriculture (USDA), are soils that have been formed under conditions of saturation, flooding, and ponding, long enough during the growing season to develop anaerobic conditions in the upper part. Soil DMUs mapped with a hydric rating of 66% and above were used in combination with Palustrine class wetlands from the NWI to estimate the areal coverage of pre-settlement wetlands. Soil mapping processes for hydric soils underestimates the actual extent of wetlands, therefore the assumption was made that wetlands that exist today outside the mapped hydric soils also existed pre-settlement. Using this method, there were approximately 4.4 million acres of wetland in BSA 3 prior to European settlement. Compared to the current extent of wetlands, there has been a 58% loss. The greatest loss has occurred in the Red River of the North – Grand Marais Creek watershed with 90% of the wetlands lost. The Upper/Lower Red Lake watershed has experienced the least amount of wetland loss with only 21%. Table 4-1 summarizes the total wetland loss for BSA 3 by watershed and the entire area.

Another approach to quantify the area of pre-settlement wetlands was conducted by Anderson & Craig (1984) by analyzing soil maps provided by the Minnesota Soil Atlas for the entire state. They selected soils that were either peat or wet mineral soils and assumed that these represent areas where pre-settlement wetlands once existed. Wet mineral soils are soils mapped as poorly drained mineral soils. They found that there were 18.4 million acres of pre-settlement wetlands across the state. Within BSA 3 they found approximately 4.5 million acres of pre-settlement wetlands. Compared to the extent of wetlands at the time of publishing in 1984 (1.8 million acres), there was a 63% loss in wetland acreage. See Table 4-2 for detailed numbers for each watershed.

Tables 4-1 and 4-2 show the percent lost in BSA 3 from Anderson & Craig (1984) is 63% and the percent lost based on hydric soils and the current NWI is 58%. There are several reasons for this difference including mapping methodologies and the level of accuracy of each method. Anderson & Craig (1984) data is accurate as of 1984.

Table 4-1. Wetland Loss Based on Hydric Soils and NWI				
Major Watershed	**Pre-settlement Acres**	**Current Acres***	**Wetland Loss (acres)**	**Percent Lost**
Clearwater River	443,355	183,587	259,768	59%
Red Lake River	549,786	211,666	338,120	62%
RRN – Grand Marais Creek	140,166	13,433	126,733	90%
RRN – Sand Hill River	176,389	33,095	143,294	81%
RRN – Tamarac River	369,126	61,617	307,508	83%
Roseau River	546,297	308,594	237,703	44%
Snake River	328,319	51,900	276,420	84%
Thief River	589,395	294,517	294,878	50%
Two Rivers	562,066	155,336	406,730	72%
Upper/Lower Red Lake	682,442	541,315	141,127	21%
BSA 3 Total	**4,387,341**	**1,855,060**	**2,532,281**	**58%**
*Based on the NWI, includes only Palustrine class wetlands				

Table 4-2. Wetland Loss Based on Anderson & Craig (1984)			
Major Watershed	**Pre-settlement Acres**	**Acres as of 1984**	**Percent Lost**
Clearwater River	431,955	123,900	71%
Red Lake River	552,246	105,093	81%
RRN – Grand Marais Creek	200,015	15,370	92%
RRN – Sand Hill River	176,159	8,166	95%
RRN – Tamarac River	449,327	86,370	81%
Roseau River	509,962	232,626	54%
Snake River	421,847	78,262	81%
Thief River	505,551	183,521	64%
Two Rivers	526,288	159,425	70%
Upper/Lower Red Lake	708,109	671,411	5%
BSA 3 Total	**4,481,460**	**1,664,144**	**63%**
The county data presented in Anderson & Craig (1984) was processed so that numbers could be summarized by watershed. It was assumed that wetland coverage was equal across the county.			

Banking Analysis

Since passage of the Clean Water Act in 1972 and WCA in 1991, most wetland impacts are regulated by one or both programs and may require mitigation to offset the functions lost as a result of the authorized impacts. Today, credits obtained from wetland mitigation banks are the primary source of mitigation for these impacts. Project-specific mitigation is also an agency accepted option, provided the site meets regulatory and technical eligibility requirements. To assess how wetland banking credits are being used to offset wetland impacts in BSA 3, an analysis of wetland banking activity and the current credit inventory in the private market and LGRWRP accounts was completed. Banking activity was evaluated by compiling annual credit withdrawals for wetland

banks located in BSA 3. The analysis utilized annual reports obtained from the State of Minnesota wetland banking database from 2018 through 2022. Credit inventory in the private market in BSA 3 was assessed using information from the BWSR Available Wetland Credit listing which displays credits available for purchase based on feedback from the account holders.

Table 4-3 provides a summary of wetland credits withdrawn in each BSA in Minnesota for the period of 2018 through 2022. The withdrawal numbers include transactions for MnDOT, LGRWRP, and standard accounts. Transactions associated with the agricultural wetland bank are not included in the table. As shown, BSA 3 is the fifth most active BSA in Minnesota generating an average annual credit demand of 64 credits during the period of analysis. BSA 3 accounts for approximately 10% of the credits withdrawn statewide each year.

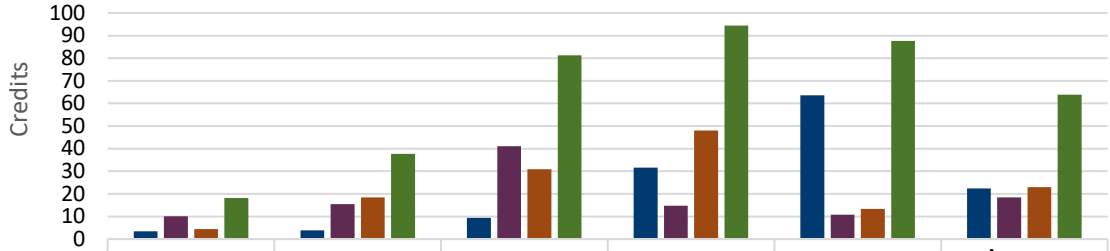
Withdrawal data for BSA 3 was further analyzed to determine the individual type contributions (MnDOT, LGRWRP, and standard) for each year. The results of this analysis are summarized in Figure 4-1. Not surprisingly, transactions from standard bank accounts represent most of the credit withdrawal activity in this BSA followed by MnDOT and then the LGRWRP. On an average annual basis, they represent 37%, 34%, and 28% respectively of the total number of credits withdrawn during the past five years.

Table 4-3. Wetland Credits Withdrawn by Bank Service Areas 2018-2022[1]

BSA	2018	2019	2020	2021	2022	Total	Average
1	30	15	141	340	119	**645**	129
2	8	18	31	25	10	**91**	18
3	18	38	81	94	88	**319**	64
4	10	24	53	106	17	**210**	42
5	22	52	199	136	127	**536**	107
6	24	38	23	26	4	**115**	23
7	120	121	122	155	142	**660**	132
8	26	52	44	82	27	**232**	46
9	66	57	66	135	88	**411**	82
10	0.5	7	5	0.2	23	**36**	7
Total	**325**	**421**	**765**	**1099**	**645**	**3255**	651

[1] Excludes withdrawals from agricultural wetland bank accounts

Figure 4-1
BSA 3 Wetland Credit Withdrawals
by Account Type 2018-2022



	2018	2019	2020	2021	2022	Average Annual
MnDOT	3.4925	3.8435	9.3545	31.6724	63.6489	22.4024
Road Program	10.1431	15.4204	41.0381	14.78	10.73	18.4223
Standard	4.4943	18.3998	30.9077	48.0051	13.315	23.0244
Total	18.1299	37.6637	81.3003	94.4575	87.6939	63.8491

CURRENT STATUS

Standard wetland bank ledger information in BSA 3 was compiled and reviewed to provide a snapshot of the number of credits currently available. This analysis focused solely on credits that were deposited into Minnesota wetland banks as of March 2023 and listed for sale on the BWSR Available Wetland Credit listing. This analysis does not include credits from MnDOT or the LGRWRP (the status of credits associated with these state programs is addressed later in this section). The total number of credits available for public sale in BSA 3 is 356.1048 credits spread amongst 6 sites and 9 accounts. It is unknown what amount of this credit inventory is under contract and thus not available to future permittees to satisfy mitigation requirements. Regardless, it is reasonable to conclude that BSA 3 has a substantial supply of publicly available wetland credits with at least a 15-year supply based on the average annual demand for standard credits calculated in Table 4-3. A substantial number of these credits are from banks located along the eastern border of the BSA, in Beltrami County.

MnDOT and LGRWRP credit balances in this BSA are sufficient to meet expected demand for at least the next four years. MnDOT presently has a balance of 240.6117 credits across three accounts that will meet their program demand for at least the next ten years based on the five-year annual average calculated for this analysis. The LGRWRP has an approximate four-year supply of credits with a total available balance of 61.3209 credits.

5. WATERSHED TRENDS AND THREATS

Trends in Wetland Quantity and Quality

Minnesota has adopted a policy goal to achieve a no-net-loss in quantity and quality of wetlands across the state. This is achieved through many regulatory and non-regulatory programs, including WCA. Since 2006, the MPCA

and MnDNR have completed routine surveys to assess the status and trends in quantity and quality of wetlands across the state of Minnesota.

The MnDNR is responsible for quantifying the status and trends of wetland quantity across Minnesota. Using remote sensing data, three surveys have been completed: a baseline was established in 2006, the first iteration was in 2009, and the second iteration in 2012.

A three-year study was completed from 2006-2008, to establish a baseline in wetland quantity in Minnesota. It was found that there are 10.62 million acres of wetland across the state. The Prairie Parkland Region in southwestern Minnesota and the Paleozoic Plateau in southeastern Minnesota have considerably less wetlands than central and northern portions of the state. Forested wetland was the most widespread type, covering approximately 4.4 million acres. Emergent wetlands were the next most abundant with 3.1 million acres (Kloiber, 2010).

Between the first (2009) and second (2012) iterations there was a net increase of area that changed from upland to wetland. There was some change from wetland to upland which was due to human intervention. A high proportion of the changes in wetland type and area happened on agricultural land (Kloiber & Norris, 2017). It should be noted that the increase in wetland acreage was primarily in unconsolidated bottom type wetlands. It was also found that conversions between wetland types were primarily from emergent wetlands to cultivated or unconsolidated bottom wetlands.

The MPCA is responsible for assessing the status and trends in wetland quality in Minnesota. This is done by completing two surveys, the Depressional Wetland Quality Assessment (DWQA) and the Minnesota Wetland Condition Assessment (MWCA). The DWQA focuses on vegetation, macroinvertebrates, and water quality for depressional wetlands. It has undergone three iterations in 2007, 2012, and 2017. The MWCA, which covers a broader spectrum of wetlands, was first completed in 2011 to determine a baseline for wetland vegetation quality and to begin quantifying potential human impacts associated with degraded conditions (Minnesota Pollution Control Agency, 2015). It was repeated in 2016 to establish trends.

In 2011, the MWCA baseline survey found that Minnesota has relatively high-quality wetlands, but it is regionally specific. There are more wetlands in northern Minnesota than southern Minnesota which causes the data to be weighted towards the condition of the northern region. About 49% of Minnesota wetlands are in exceptional condition. These wetlands are predominately located in the north-central and northeastern portions of the state. As for the western and southern portions of the state, most wetlands are in fair or poor condition. The baseline survey also found that Minnesota's wetlands, as a whole, are exposed to a low level of stressors, but this is also regionally specific. The northern portions of the state experience low pressure from stressors, but the southern and western regions experience high pressure, specifically from non-native invasive plants (Minnesota Pollution Control Agency, 2015). BSA 3 crosses the boundary of two landscape types used within the MWCA survey. This means that the western portion of the BSA is more similar to southern Minnesota, with fair and poor condition wetlands. These wetlands tend to be severely impacted and experience high pressure from outside stressors. The eastern portion of the BSA is more similar to north-central and north-eastern Minnesota with exceptional

and good condition wetlands. These wetlands are much less impacted and experience lower pressure from outside stressors.

The results from the first iteration of the MWCA in 2016 found that Minnesota's wetland vegetation continues to be high quality. The results are similar to the baseline with the exception of a statistically significant 3% decrease of wetlands in poor condition. Vegetation quality still varied by region with the north having higher quality and less stressors, and the south and west having lower quality and more impact from stressors. In the western and southern portions of the state there was a statistically significant increase in the number of fair condition wetlands and a corresponding decrease in poor condition wetlands (Bourdaghs et al., 2019). Wetland vegetation quality in the eastern portion of BSA 3 has largely stayed the same since the first baseline assessment in 2011. The western portion of the BSA has experienced an increase in fair condition wetlands, a decrease in poor condition wetlands, and a decrease in exceptional/good condition wetlands since the baseline assessment.

The western portion of BSA 3 also falls in the study region for the DWQA. In 2017, it was found that 58% of plant communities in depressional wetland basins were in fair condition, 25% in poor condition, and 4% in good condition. The most recent iteration for the DWQA changed the vegetation quality methods and therefore cannot be compared to previous data. Based on the relative stability of aquatic macroinvertebrate community condition of the past surveys, there seems to be no significant change in the quality of depressional wetlands and ponds (Genet et al., 2019).

In summary, the vegetation quality of wetlands in Minnesota is high. The southern region tends to have lower quality because there is more pressure from stressors. These stressors are both human intervention and non-native invasive species. As far as areal extent, Minnesota has actually seen an increase in wetlands. It is important to note that there have been many conversions from emergent wetlands to deep-water habitats and ponds. BSA 3 reflects the regional trends in both wetland quality and extent. The eastern portion of the BSA has wetlands that are higher quality with less pressure from outside stressors. The western portion of the BSA has lower quality wetlands that experience significantly more pressure from outside stressors.

Description of Threats

Wetlands across Minnesota are under threat from many different stressors. In BSA 3, wetlands are threated specifically by the loss of hydrologic storage, pollution, and invasive species. These threats are based on the conditions established in the Baseline Conditions section as well as conversations with stakeholders. With the gradient of wetland quality across the BSA, it is important to recognize current and future threats, as well as the impact threats have on prioritizing areas for wetland restoration and protection.

LOSS OF HYDROLOGIC STORAGE

The loss of hydrologic storage can be seen through many of the baseline conditions explored above, specifically altered watercourses and wetland loss. Hydrologic storage is the ability of the landscape to hold water, permanently or temporarily, mainly in lakes, wetlands, and rivers. Storage on the landscape is important for flood mitigation and water quality (Mitsch & Gosselink, 2015). In particular the watersheds located along the Minnesota-North Dakota border (RRN – Tamarac River, Snake River, RRN – Grand Marais Creek, Red Lake River,

and RRN – Sandhill) have the most loss in hydrologic storage due to the number of ditched wetlands, extent of agriculture and impervious surfaces, and wetland loss. These watersheds have the largest amount of wetland loss within BSA 3, relative to the watershed area. The threat of flooding, according to FEMA, in these western watersheds is high. This is particularly important to this area of the BSA because of the lack of elevation change over large areas of land, the water retention and slow infiltration rates of the soils, and extensive agriculture. Watersheds in the northern and eastern portions of BSA 3 are also experiencing loss in hydrologic storage, although to a lesser degree.

THREAT OF POLLUTION

BSA 3 has a gradient of wetland quality and threats from pollution that varies from east to west. The east side generally has higher quality wetlands and less pollution potential, and the west side generally has lower quality wetlands and higher pollution potential. Even with this gradient, the threat of pollution is an issue, as are the expanding agriculture and urbanized areas, the unique geology and slope, and extent of peatlands. According to the NLCD, 47% of BSA 3 is agriculture and 3% is developed. The U.S. Census showed that between 2000 and 2010, BSA 3 has had an increase in population, with the largest increase in the Red Lake River watershed. The population is expanding which also means there will be an increase in urban development as cities and towns grow. Both agriculture and urbanization introduce new pollutants to the landscape and also decrease the hydrologic storage and the ability of water to filter through soil before entering ground water aquifers. Water quality decreases with an increase in agriculture and development pressure.

INVASIVE SPECIES

Invasive species are a serious problem for the future of our wetlands and can cause economic and ecological harm. Invasive species like Reed Canary Grass (*Phalaris arundinacea*), Purple Loosestrife (*Lythrum salicaria*), and Emerald Ash Borer (*Agrilus planipennis*) put native species in Minnesota, and specifically in BSA 3, at risk. Invasive species can crowd out native plants and limit sunlight, they can hinder water flow, and reduce wildlife habitat. The impact that invasive species can have on wetlands in BSA 3 includes changes in hydrology from dense root systems, lowered biological diversity due to outcompeting invasive species, and loss of native canopy cover from invasive pests.

6. STAKEHOLDER INVOLVEMENT

Stakeholders are a crucial part of the CPF development process and were included via virtual meetings. The first meeting took place in February 2023, to introduce the ILF and CPF development process to the stakeholders. A summary of the baseline conditions was presented to gather feedback from stakeholders so metrics could be tailored to BSA 3. Stakeholders invited to participate included: Soil and Water Conservation Districts (SWCDs), Counties, Cities, Tribal, BWSR, MnDNR, MPCA, EPA, and USACE. Those that attended included individuals from Soil and Water Conservation Districts, MPCA, BWSR, and the MnDNR. Discussions during the meeting highlighted the shared concern ensuring that locals felt invested in the CPF development process and capturing the prairie plan, specifically related to areas of groundwater sensitivity within the CPF. At the meeting, stakeholders

identified two additional baseline conditions, peatlands/organic soils and native prairie, to be included in the report. Stakeholders also requested that the water quality baseline condition include an evaluation of nearly/barely impairment data. A list of attendees and the material presented is provided in Appendix C-1.

The second stakeholder meeting took place in June 2023. This meeting reviewed the baseline conditions and presented the two conditions, peatlands/organic soils and native prairie, which were added based on the first meeting. The cumulative impact analysis as well as the BSA 3 trends and threats assessment were also presented. The main focus of the meeting was presenting prioritization criteria for both restoration and preservation and soliciting feedback from stakeholders. A draft list of the criteria and a preliminary map of prioritized catchments were introduced. The invite list was the same as the first meeting. Those that attended included individuals from Soil and Water Conservation Districts, Counties, MnDNR, and BWSR. The discussion focused on how restoration potential would be gauged in an area with dense altered watercourses. A list of the attendees and the material presented is provided in Appendix C-2.

The third and final stakeholder meeting took place in October 2023. The purpose of the meeting was to present the prioritization process and final results including weighting values that were developed using stakeholder survey feedback. A brief refresher of the purpose of the report, the baseline conditions, cumulative impact analysis, and BSA trends and threats was also given. The invite list was the same as the first two meetings. Those that attended included individuals from Watershed Districts, Soil and Water Conservation Districts, and BWSR. During the meeting, feedback was gathered on draft prioritization results and scored for the local planning criteria was asked to be reviewed again to capture more recent planning efforts. A list of the attendees and the material presented is provided in Appendix C-3.

7. PRIORITIZATION METHODS FOR SELECTING AND IMPLEMENTING MITIGATION ACTIVITIES

The geographic scale used to identify priority areas for wetland mitigation in this plan is the MnDNR Level 8 catchment. The MnDNR has defined Level 8 catchments to be “the smallest delineated and digitized drainage area mapped by the MnDNR Watershed Delineation Project.” The catchment scale was selected for two primary reasons. First, the prioritization process can be conducted at a finer scale which allows for more specific identification of areas where wetland mitigation may benefit watershed health. At the same time, the number of catchments in BSA 3 is not excessive and the process can be completed in a reasonable amount of time with meaningful results. Second, the MnDNR has developed large amounts of watershed data at the catchment level that can be easily accessed to support the prioritization process which reduces the time associated with the GIS-based analyses.

BSA 3 is made up of 818 catchments distributed across the ten major watersheds as follows: Clearwater River has 161 catchments, Red Lake River has 93 catchments, RRN – Grand Marais Creek has 45 catchments, RRN – Sandhill River has 83 catchments, RRN – Tamarac River has 59 catchments, Roseau River has 76 catchments,

Snake River has 57 catchments, Thief River has 59 catchments, Two Rivers has 87 catchments, and Upper/Lower Red Lake has 98 catchments (Figure 7-1).

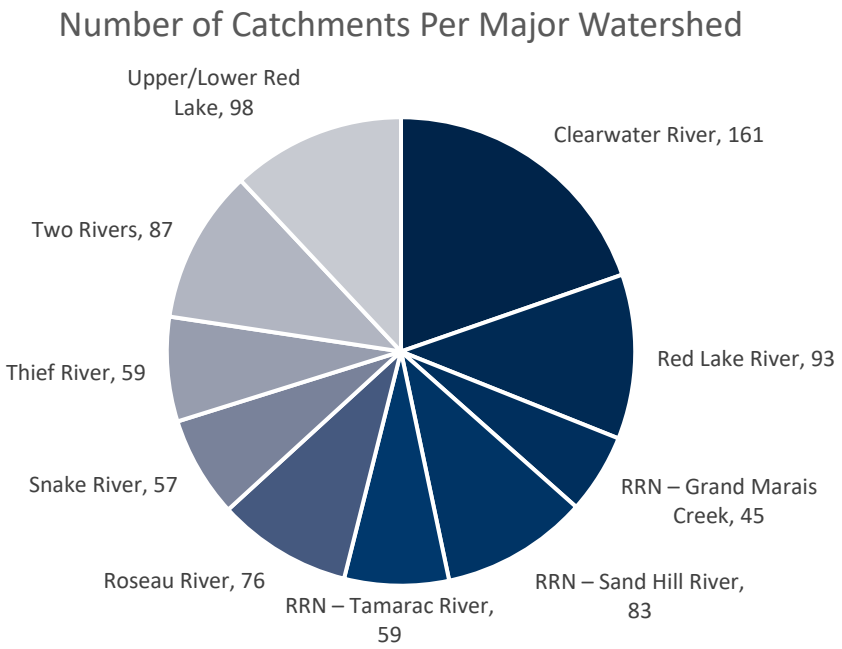


Figure 7-1. Chart showing the number of catchments within each major watershed.

In previous CPF Reports, prioritization of catchments focused solely on wetland restoration. This CPF is unique because of the inclusion of preservation in the prioritization process for four major watersheds including, Clearwater River, Red Lake River, Thief River, and Upper/Lower Red Lake. According to WCA rule, preservation can only be used within an area of the state where greater than 80% of the pre-settlement wetlands remain. The major watersheds included in the preservation prioritization are located along the eastern side of the BSA and either cross the boundary or are wholly included in the "greater than 80%" area. To keep the statistical analysis consistent, preservation prioritization was applied across the entire major watershed, even though some areas of Thief River, Red Lake River, and Clearwater River watersheds fall outside of the "greater than 80%" area. The catchments that are outside of this area are denoted differently on the figures within Appendix D as "less than 80%." The area within preservation plays a large role within BSA 3 because of the intact wetlands already on the landscape and relatively small amounts of urbanization present. Criteria and weighting were different for restoration and preservation which is reflective of local goals and current land use. It also should be noted that preservation is not the direct inverse of restoration. Although some criteria are inversed, different criteria were considered, and different weights were assigned by stakeholders to both restoration and preservation. A comparison of catchments prioritized for restoration only, preservation only, or for both can be seen in Figure D-1.

Criteria Selection

Criteria for catchment prioritization were selected by stakeholders attending the second stakeholder meeting. BWSR and ISG staff served as facilitators of the discussion and selection process by suggesting criteria for restoration and preservation and then seeking stakeholder input. After the meeting, each criterion was evaluated for availability and suitability of GIS-based data. As stated previously, criteria were selected for both restoration and preservation separately. The biggest difference in the analysis between restoration and preservation is that preservation considers criteria that reflects high quality habitats or ecosystems present in the eastern portions of BSA 3. This is reflective of the important and intact habitats that are unique to BSA 3, such as white cedar forests. A list and description of the restoration criteria can be seen in Table 7-1. Preservation criteria and descriptions can be seen in Table 7-2.

RESTORATION CRITERIA

A total of 11 different criteria were selected for restoration prioritization. They include *Altered Streams, Drained Wetlands, Flooding, Ground Water Pollution, Lake and River Impairments, Lake Phosphorus Sensitivity (LPSS), Local Plans, Perennial Cover, Prairie Plan, Wetland Loss, and WRAPS Stream Priorities*. The specific criterion and description of data used can be found in Table 7-1.

Table 7-1. Restoration Criteria and Description of Data

Criterion	Description
Altered Streams	This is a ratio of total stream miles classified by the MPCA altered watercourses project as *Impounded* and *Altered* to the total miles of watercourses. Lakes and *No-definable Channel* classification were removed due to the high number of lakes in this BSA and duplicate mapped features.
Drained Wetlands	The total area of wetlands, relative to catchment area, that have a "d" modifier in the National Wetland Inventory.
Flooding	Catchments with greater acreage within the FEMA 100-year floodplain were prioritized. This criterion was only applicable to major watersheds which flow to the Red River of the North, along the western border of the BSA. These watersheds include Two Rivers, RRN – Tamarac River, RRN – Grand Marais Creek, RRN – Sandhill River, Snake River, and Red Lake River.
Ground Water Pollution	This is based on the near-surface pollution sensitivity dataset from the WHAF. It is a measure of the travel time it takes for water to infiltrate to a depth of 10 feet. Areas of high sensitivity were prioritized.
Impairments	A combination of lake and river impairments as mapped by the MPCA impaired waters project (updated 2020) and the WHAF water quality non-point source score. Areas with both high number of impairments and non-point sources were prioritized.
Lakes of Phosphorus Sensitivity Significance (LPSS)	Lakes of Phosphorus Sensitivity Significance (LPSS) presents a ranked list of priority lakes based on sensitivity to additional phosphorus loading. Catchments with more area of LPSS lakes were prioritized.
Local Plans	These are areas specifically called out in One Watershed One Plan reports and WRAPS reports for wetland restoration. Scores were assigned as follows: 10: specific geographies and wetland restoration actions called out in the plan, 7: wetland restoration is called out as a priority in multiple spots with details given related to BMPs and entities participating but less specifics, 4: wetland

Table 7-1. Restoration Criteria and Description of Data	
Criterion	**Description**
	restoration generally mentioned as important but there are few specifics, and 1: wetland restoration is not mentioned at all.
Perennial Cover	*Perennial* cover as mapped in the National Land Cover Database, which includes *forest*, *grassland*, and *wetland*. Areas of low amounts of *perennial* cover relative to catchment area were prioritized.
Prairie Plan	This criterion includes areas called out within the Prairie Plan, including core areas, corridors, and corridor complexes. It was only applied within major watersheds that had area included the Prairie Plan.
Wetland Loss	Areas that have experienced high amounts of wetland loss, relative to catchment area, since European Settlement. This data was produced for this report. Details can be found in the Baseline Conditions section.
WRAPS Stream Protection Priorities	Streams that currently support biological communities are a priority for protection. Catchments with more stream miles of priority protection streams will be prioritized for wetland restorations to protect streams from potential of future degradation.

PRESERVATION CRITERIA

A total of 9 criteria were included in the prioritization of catchments for wetland preservation in the Clearwater River, Red Lake River, Thief River, and Upper/Lower Red Lake major watersheds. The criteria include *Areas of Biodiversity Significance, Current Protection, Development Pressure, Lakes of Biological Significance, Local Plans, Scientific Natural Areas, Trout Streams and Lakes, White Cedar Forest, and Wild Rice Waters*. The specific criterion and description of data used can be found in Table 7-2. The criteria chosen for this study generally aligns with the guidance information provided by USACE and BWSR within the document: *Guidance on Evaluating Potential Wetland Preservation Sites for Eligibility to Provide Compensatory Mitigation/Replacement in Minnesota* (USACE & BWSR, 2017).

Table 7-2. Preservation Criteria and Description of Data	
Criterion	**Description**
Areas of Biodiversity Significance	Areas of biodiversity significance as mapped by the Minnesota Biological Survey. Acres of areas ranked as *Below, High, Moderate*, and *Outstanding* were weighted, with *Outstanding* having the highest weight and *Below* and unranked having the lowest weights. Catchments with large areas categorized as *Outstanding* were prioritized.
Current Protection	Modeling completed by the MnDNR Fisheries found a relationship between protection (i.e. publicly owned or protected by conservation easements) and disturbance in watersheds which can help prioritize areas (MnDNR, 2013). They categorized the relationship into four categories: *Vigilance*: watersheds with at least 75% of their area protected and less than 25% disturbed land are reasonably protected from future disturbance; *Protection*: watersheds that have less than 75% of their area protected, and less than 25% disturbance need additional protection to avoid future water quality degradation; *Full Restoration*: Between 40% and 75% of the watershed is protected, and disturbance is between 25% and 60% have a realistic chance for full restoration;

Table 7-2. Preservation Criteria and Description of Data	
Criterion	**Description**
	Partial Restoration: watersheds with less than 25% of their area protected, and more than 60% disturbance, are too expensive and difficult to restore water quality. For the purpose of this study, each category was assigned a score: *Vigilance*: 4, *Protection*: 10, *Full Restoration*: 7, and *Partial Restoration*: 1. Disturbance and protection were computed using readily available GIS data.
Development Pressure	These are areas that have had a low degree of change from non-impervious to impervious surfaces from 2001 to 2016 as mapped by the National Land Cover Database.
Lakes of Biological Significance	Lakes of biological significance (LBS) as mapped by the Minnesota Department of Natural Resources. Lakes are assigned a rating of Moderate, High, and Outstanding based on aquatic plant, fish, bird, and amphibian communities. Catchments with large areas of LBS lakes categorized as Outstanding and High were prioritized.
Local Plans	These are areas specifically called out in BWSR's One Watershed One Plan reports and WRAPS reports for wetland protection. Scores were assigned as follows: 10: specific geographies and wetland protection actions called out in the plan, 7: wetland protection is called out as a priority in multiple spots with details given related to BMPs and entities participating but less specifics, 4: wetland protection generally is mentioned as important but there are few specifics, and 1: wetland protection is not mentioned at all.
Scientific and Natural Area	Sites meeting the criteria to qualify as a Scientific and Natural Area (SNA), as determined by the DNR, can be rare and important to maintaining biological diversity. Catchments with more SNA area were prioritized.
Trout Streams and Lakes	Wetlands directly adjacent to or at the headwaters of a designated trout stream can provide a source of hydrology, shade, temperature moderation, and other functions necessary for trout survival. Such wetlands are extremely valuable to the trout stream and its watershed. Catchments with more trout stream miles and lake acreage were prioritized.
White Cedar Forests	White cedar forests as mapped by the MnDNR Forest Stand Inventory, relative to catchment area. Areas with a high number of white cedar forests were prioritized.
Wild Rice Waters	Wild Rice waters are both ecologically and culturally significant making preservation of adjacent areas a priority. Catchments with more Wild Rice waters were prioritized.

Development of Criterion Maps

GIS transformation of spatially explicit data characterizing each criterion were normalized through a reclassification process to generate maps that captured the potential for a catchment to improve watershed health through wetland restoration and preservation. The geoprocessing for each criterion followed a straightforward and repeatable process (Figure 7-2).

First, GIS data representing each criterion was obtained and associated with each catchment in BSA 3. If a catchment value had not been assigned (GIS data obtained from the WHAF typically had predetermined criterion scores for each catchment), a value was calculated for each catchment using raw data. For example, the number

of ditched wetlands was determined by dividing the area of NWI wetlands with a "d" modifier by the total area of the catchment and multiplying the result by 100.

The resulting criterion scores were then normalized from 0 to 100 for each major watershed by dividing each catchment criteria value by the highest value in that major watershed. The normalized results were then classified into ten classes using the natural breaks tool in ArcGIS in an ascending order of priority (Reclassify step in Figure 7-2). In other words, low scores are catchments with lower potential for wetland mitigation to improve watershed health and high scores represent areas that would have a higher potential to improve watershed health for both restoration and preservation.

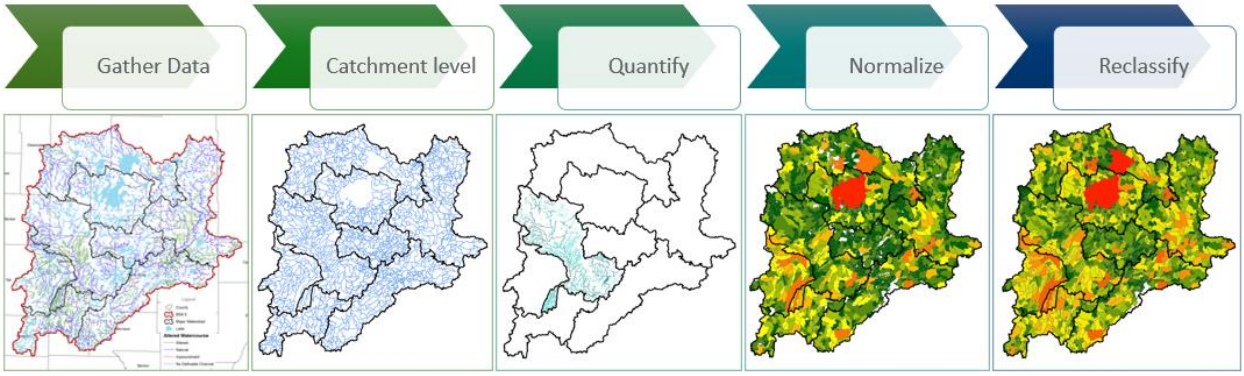


Figure 7-2. Data transformation process.

The process described above and in Figure 7-2 was used for all criteria except local plans and current protection. For those two criteria specific scores were given to each catchment based on the data. The description of the process and scoring used for current protection can be found in Table 7-2. For local plans, the process and scoring can be found in Table 7-1 and 7-2.

Weighting Derived from Stakeholder Input

Stakeholders were offered the opportunity to weight criteria based on the perceived value within their work area. A simple survey via Survey123 was sent out and the stakeholders had three weeks to respond. Within the survey, stakeholders were asked to rank the criteria from more important to least important for restoration and preservation separately. There were five responses to the survey. The results of the survey are shown in Tables 7-3 and 7-4. The rank of the criteria determined the weight it would receive in the final prioritization.

Weighting was calculated by using the rank sum methodology. Once the rank was assigned by stakeholders the associated weight was multiplied by the criterion score for each catchment. All of the weighted criterion scores were summed together to get the final prioritization score. Catchments with higher scores were prioritized more for restoration and/or preservation. Unweighted results for restoration can be seen in Figure D-2 and for preservation in Figure D-3. The weighted results for restoration can be seen in Figure D-4 and for preservation in Figure D-5.

Table 7-3. Restoration Ranks Assigned by Stakeholders and Resulting Weights		
Rank	**Criterion**	**Weight**
1	Drained Wetlands	0.1547
2	Wetland Loss	0.1401
3	Altered Streams	0.1300
4	Flooding	0.1198
5	Ground Water Pollution	0.0998
6	Impairments	0.0853
7	Local Plans	0.0751
8	Perennial Cover	0.0649
9	Prairie Plan	0.0547
10	WRAPS	0.0456
11	LPSS	0.0300

Table 7-4. Preservation Ranks Assigned by Stakeholders and Resulting Weights		
Rank	**Criterion**	**Weight**
1	Current Protection	0.2
2	Lakes of Biological Significance	0.1778
3	Areas Biodiversity Significance	0.1556
4	Trout Lakes and Streams	0.1333
5	Development Pressure	0.1111
6	Local Plans	0.0889
7	Wild Rice Waters	0.0667
8	White Cedar Forest	0.0444
9	SNA	0.0222

Designation of Priority Catchments

The analyses completed to this point separated catchments within each major watershed based on their expected potential to benefit watershed health through wetland restoration or preservation activities. The next step in the process was to take these results and identify the prioritized catchments for wetland mitigation projects. This required finding a breakpoint in the prioritization outputs that balanced the need for sufficient wetland mitigation opportunities with maximizing benefits to the watershed. For example, designating only a

small number of catchments as high priority areas may not result in enough opportunities for projects when a search is initiated through a selection process. Similarly, identifying a large number of catchments as high priority areas may decrease the potential benefits to the watershed because the value of the prioritization process is diluted. To this purpose, catchments that fell within the top third of the prioritization scores were run through an opportunity filter, to be described later, and considered prioritized. It should be noted that the top third was determined by the number of catchments, not the area.

In addition to establishing a breakpoint, the prioritized catchments were run through several opportunity filters to preemptively remove catchments that have little to no opportunity for project establishment. These filters considered landownership and wetland loss. The breakpoint or threshold for these filters was determined for the entire BSA by evaluating the data and applying professional judgement. For the landownership filter, catchments with 99% or more of land that was Federally owned (where conservation easements cannot by conveyed to the State) were removed from prioritization. Similarly, for wetland loss, any catchment with zero acres of loss were removed. Any catchments that were prioritized and then removed due to the filters, were replaced with a catchment with the next highest prioritization score. This was done so that the total number of catchments within the top third remained the same for each watershed.

For BSA 3, all catchments with prioritization scores in the top third of the score distribution within each major watershed that also passed the two opportunity filters were identified as a high priority area. Using this method, a total of 366 catchments were prioritized, 46 catchments were identified as high priority areas for both restoration and preservation, 92 catchments were prioritized for preservation only, and 228 were prioritized for restoration only. A table showing the number of catchments prioritized for restoration only, preservation only, and both by major watershed can be seen in Table 7-5. Figure D-6 shows the prioritized catchments for restoration. Prioritized catchments for preservation can be seen in Figure D-7. A map comparison of the catchments prioritized for restoration and preservation can be seen in Figure D-1.

For restoration, a total of 2,626,781 acres of BSA 3 were prioritized. The watershed with the largest area prioritized Upper/Lower Red Lake, with 484,349 acres. The watershed with the least area prioritized was RRN – Sandhill River, with 132,799 acres. Maps for individual watersheds showing the prioritized catchments for restoration can be seen in Figures D-8 through D-17. Table 7-6 lists the acres prioritized for each watershed as well as the percent of the total area for both preservation and restoration.

For preservation, a total of 1,979,862 acres of BSA 3 were categorized as high priority. Of the four watersheds included, the Upper/Lower Red Lake watershed had largest area prioritized with 895,469 acres. The watershed with the least area prioritized was Thief River, with 344,817 acres. Maps showing the prioritized catchments for preservation for each individual watershed can be seen in Figures D-18 through D-21.

Table 7-5. Number of Catchments Prioritized for Each Watershed

Major Watershed	Preservation Only	Restoration Only	Both	Total
Clearwater River	40	40	14	**94**
Red Lake River	19	19	12	**50**

RRN – Grand Marais Creek	-	15	-	**15**
RRN – Sand Hill River	-	28	-	**28**
RRN – Tamarac River	-	20	-	**20**
Roseau River	-	25	-	**25**
Snake River	-	19	-	**19**
Thief River	13	13	7	**33**
Two Rivers	-	29	-	**29**
Upper/Lower Red Lake	20	20	13	**53**
BSA 3 Total	**93**	**229**	**45**	**366**

Table 7-6. Area of Prioritized Catchments Per Watershed

Major Watershed	Preservation		Restoration	
	Acres	Percent of BSA Area	Acres	Percent of BSA Area
Clearwater River	377,536	5%	396,917	6%
Red Lake River	362,039	5%	270,124	4%
RRN – Grand Marais Creek	-	-	181,329	3%
RRN – Sand Hill River	-	-	132,799	2%
RRN – Tamarac River	-	-	178,066	3%
Roseau River	-	-	237,241	3%
Snake River	-	-	144,303	2%
Thief River	344,817	5%	316,142	5%
Two Rivers	-	-	285,510	4%
Upper/Lower Red Lake	895,469	13%	484,349	7%
BSA 3 Total	**1,979,862**	**29%**	**2,626,781**	**38%**

8. CONCLUSION

This CPF report established baseline conditions, analyzed wetland trends and threats, gathered stakeholder input, and prioritized catchments for wetland restoration and preservation within BSA 3. The prioritized catchments have high public value and identify areas where wetland restoration or preservation efforts are expected to provide the greatest benefit to watershed health. The primary use of the CPF is determining the preferred location of future compensatory wetland mitigation sites for the ILF program. In addition, due to the BSA specific data and local input used in prioritization, the CPF can be helpful in guiding the location of private (standard) bank establishment. The CPF can also be used for establishing or updating other watershed based planning documents or selecting non-regulatory restoration projects. Data used within this CPF will be periodically updated and can be requested from BWSR.

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Appendix A: Acronyms

Acronym	Full Name
1W1P	One Watershed One Plan
BMP	Best Management Practice
BSA	Bank Service Area
BWSR	Minnesota Board of Water and Soil Resources
CPF	Compensation Planning Framework
DMU	Data Map Unit
DO	Dissolved Oxygen
DWQA	Depressional Wetland Quality Assessment
EPA	Environmental Pollution Agency
GIS	Global Information Systems
HGM	Hydrogeomorphic wetland classification system
HUC	Hydrologic Unit Code
ID	Identifier
ILF	In-Lieu Fee Program
LBS	Lakes of Biological Significance
LGRWRP	Local Government Road Wetland Replacement Program
LiDAR	Light Detection and Ranging- remote sensing method for measuring elevations
LPSS	Lakes of Phosphorus Sensitivity Significance
MBS	Minnesota Biological Survey
MnDNR	Minnesota Department of Natural Resources
MnDOT	Minnesota Department of Transportation
MnGEO	Minnesota Geospatial Information Office
MPCA	Minnesota Pollution Control Agency
MWCA	Minnesota Wetland Condition Assessment
NHD	National Hydrography Dataset
NLCD	National Land Cover Database
NWI	National Wetlands Inventory- specifically for Minnesota
SNA	Scientific Natural Area
SWCD	Soil Water Conservation District
TSS	Total Suspended Solids
USACE	United State Army Corps of Engineers
USDA	Unites States Department of Agriculture
USFS	United States Forest Service
USGS	United States Geological Survey
VEGMOD	Historic Vegetation Model
WCA	Wetland Conservation Act
WHAF	Watershed Health Assessment Framework
WRAPS	Watershed Restoration and Protection Strategy Report

Appendix B: Baseline Condition Maps

Figure B-1. Project Location

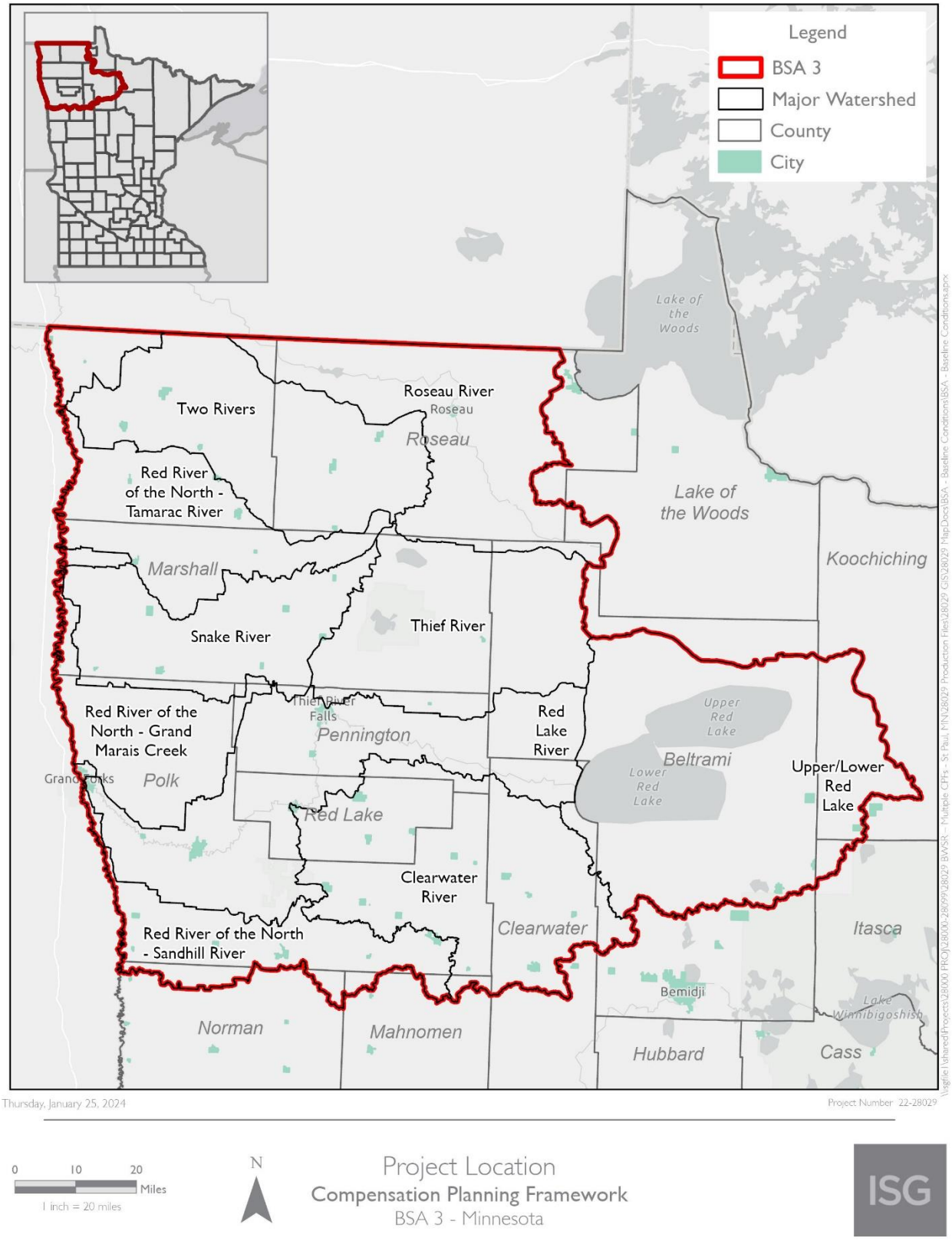


Figure B-2. Ecological Classification

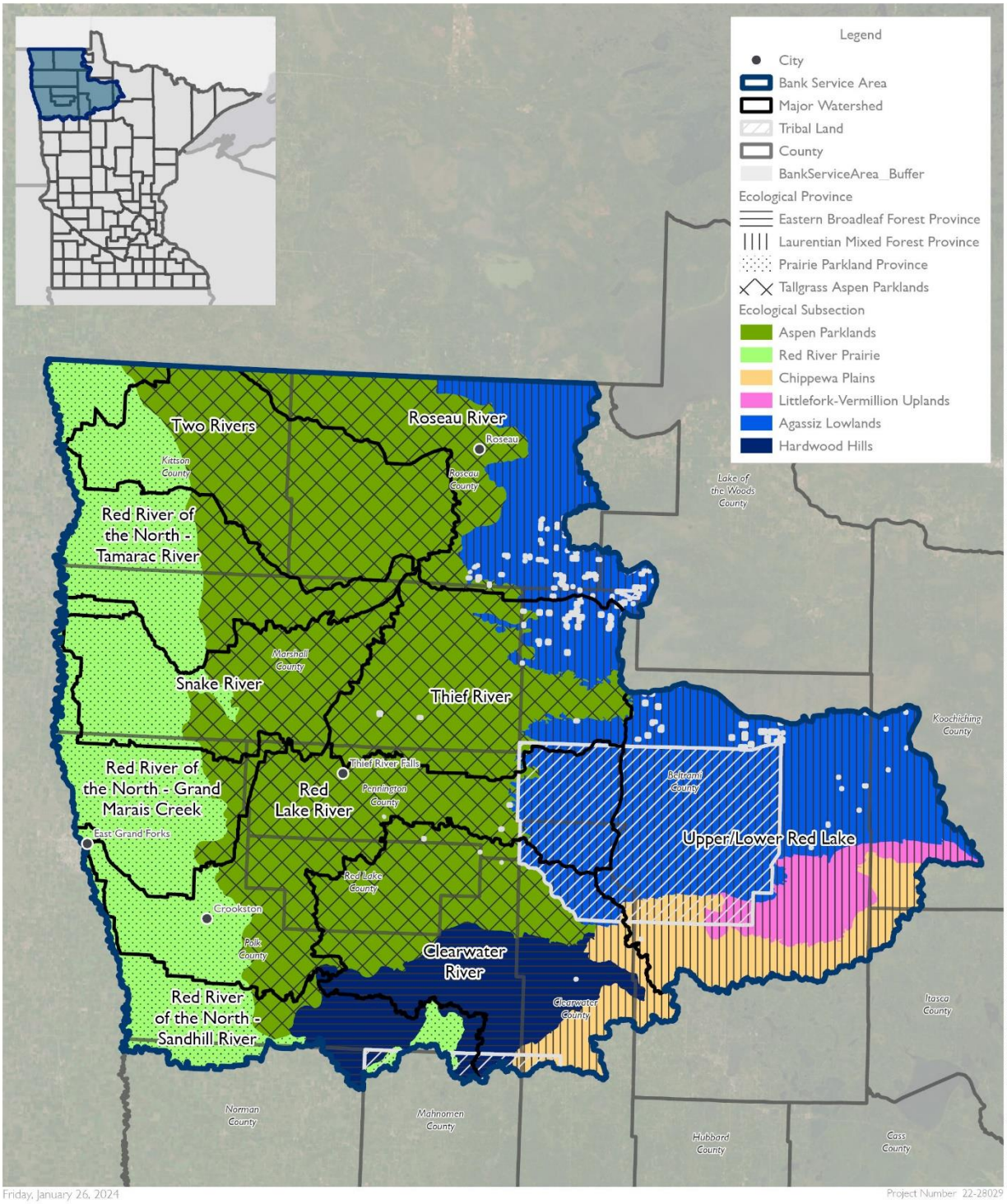


Figure B-3. Pre-settlement Vegetation

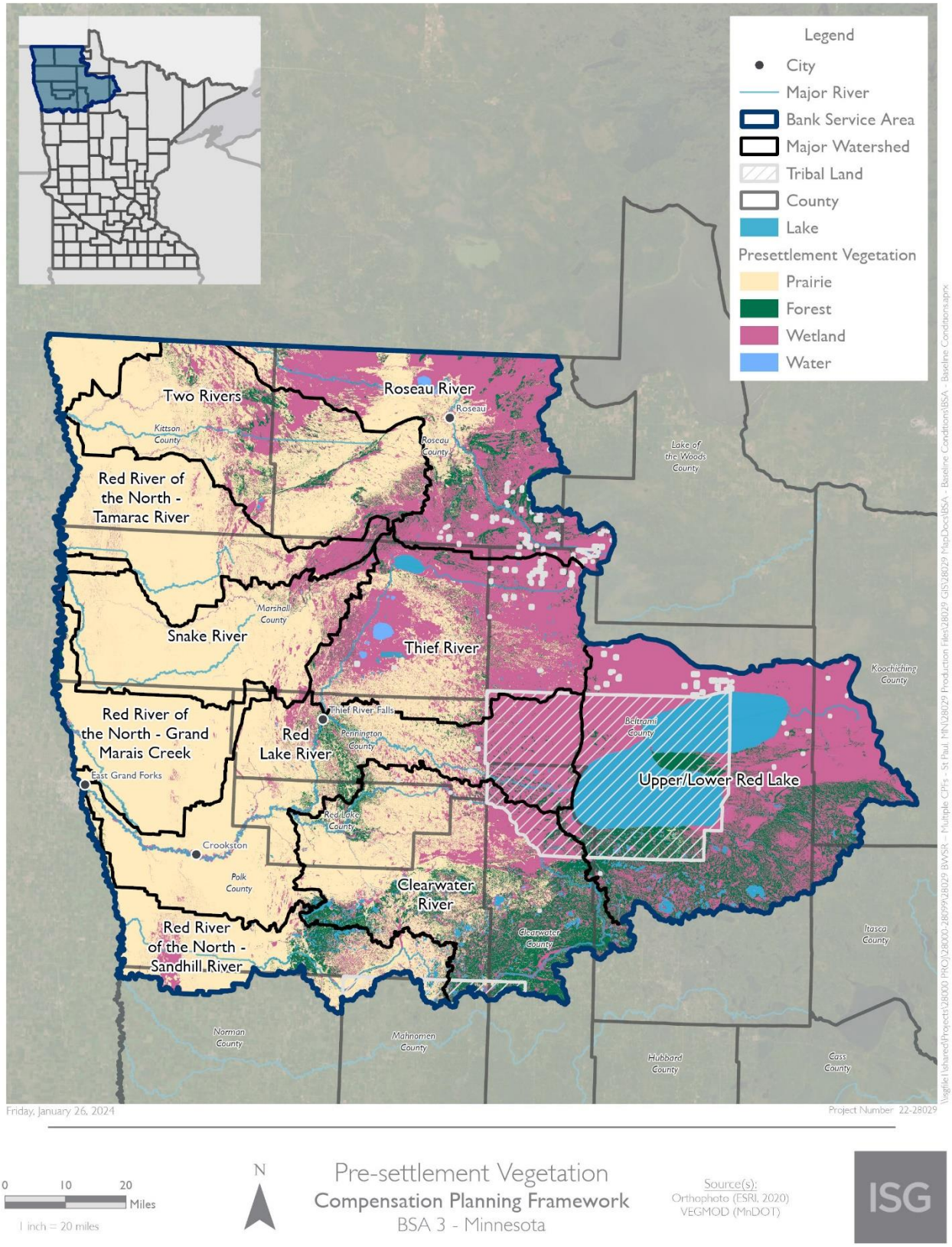


Figure B-4. Wetlands

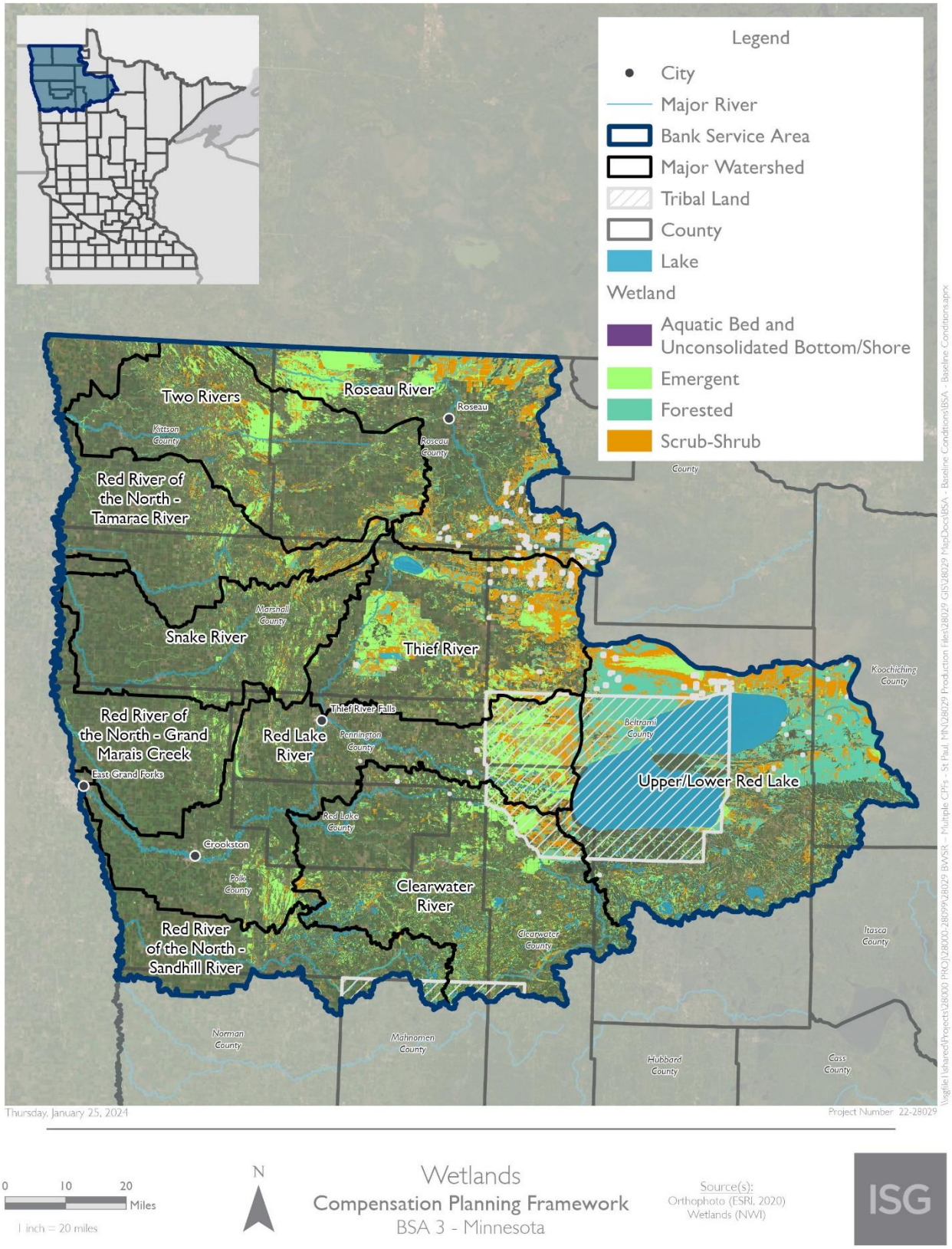


Figure B-5. Organic Soils

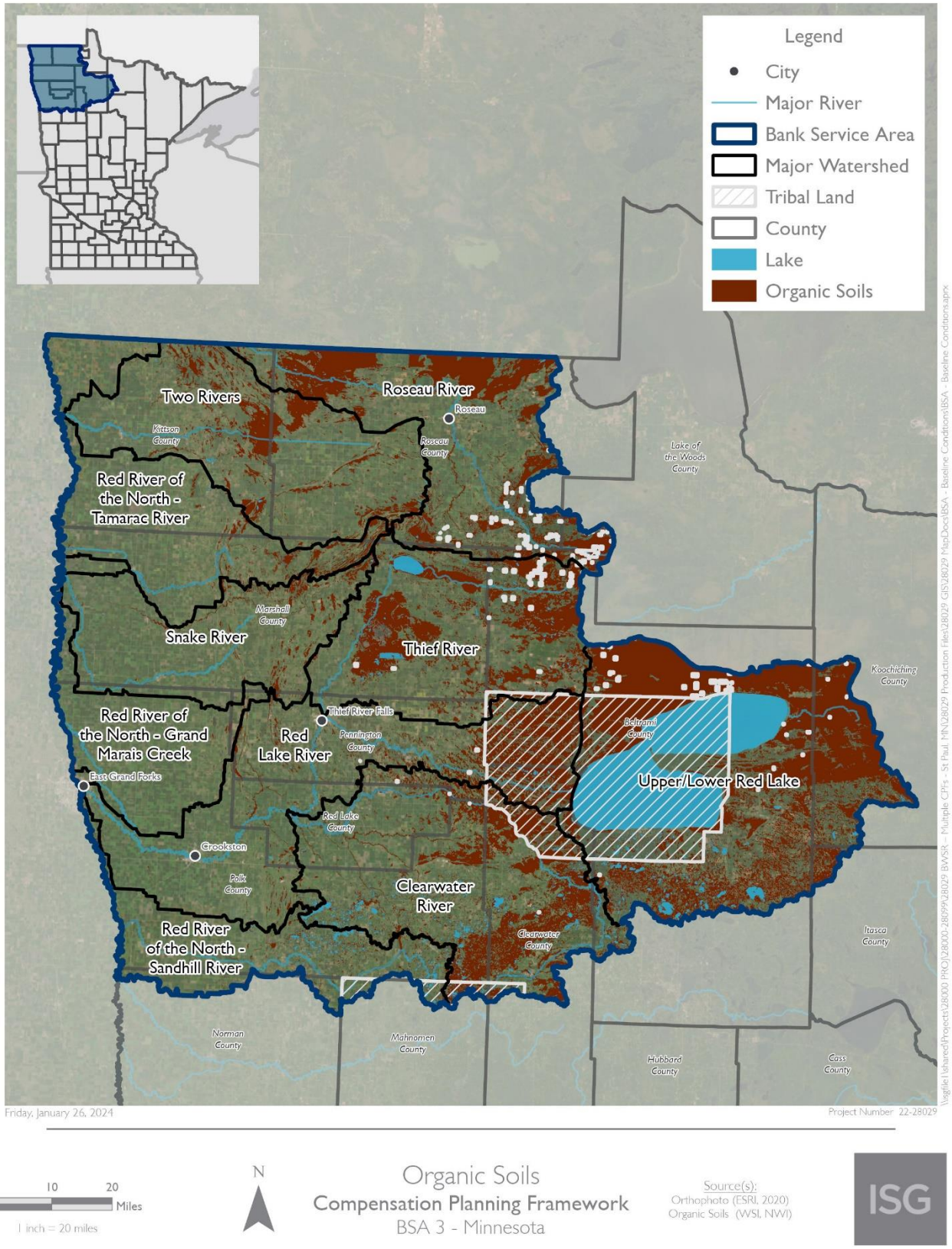


Figure B-6. Lakes

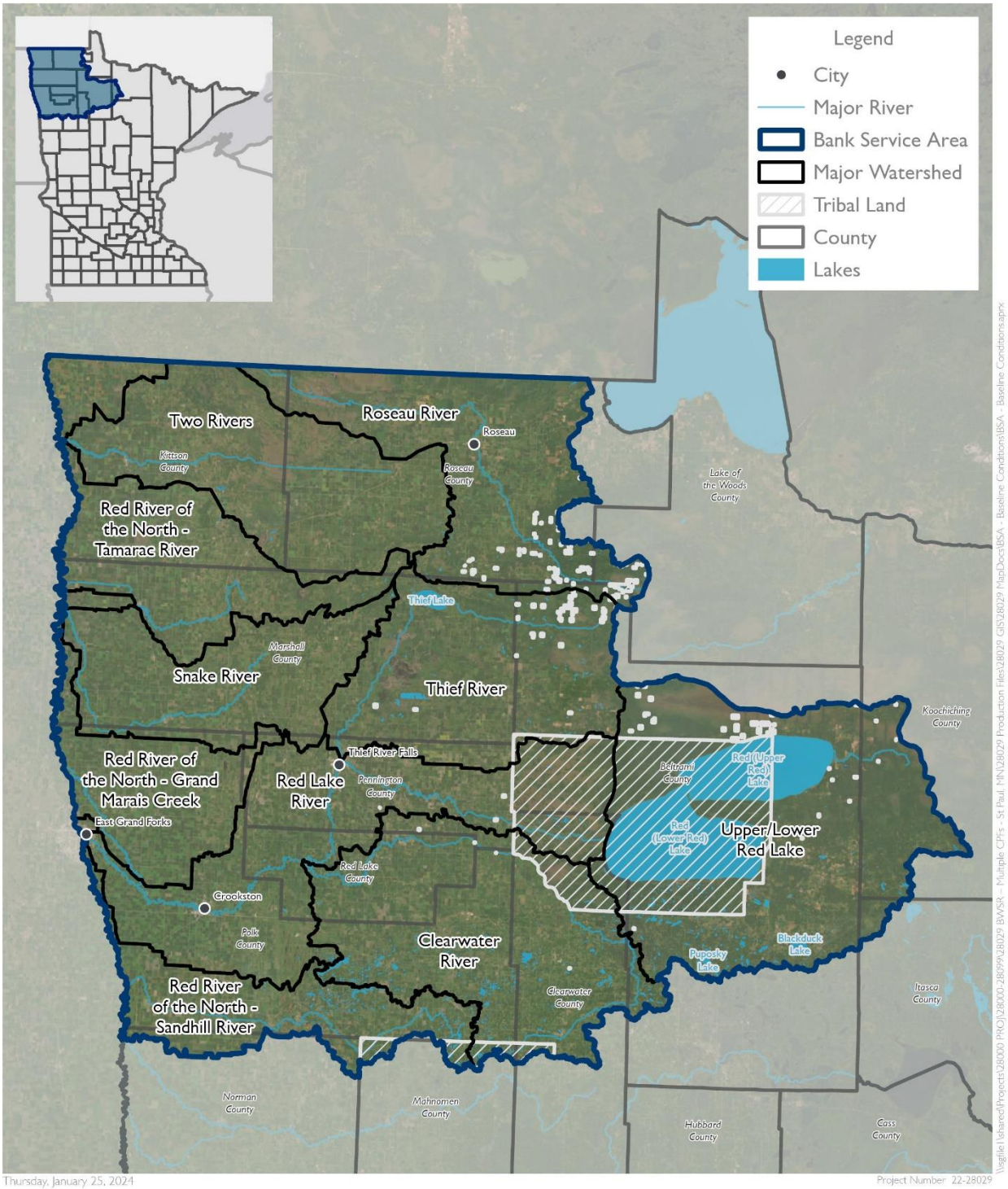


Figure B-7. Watercourses

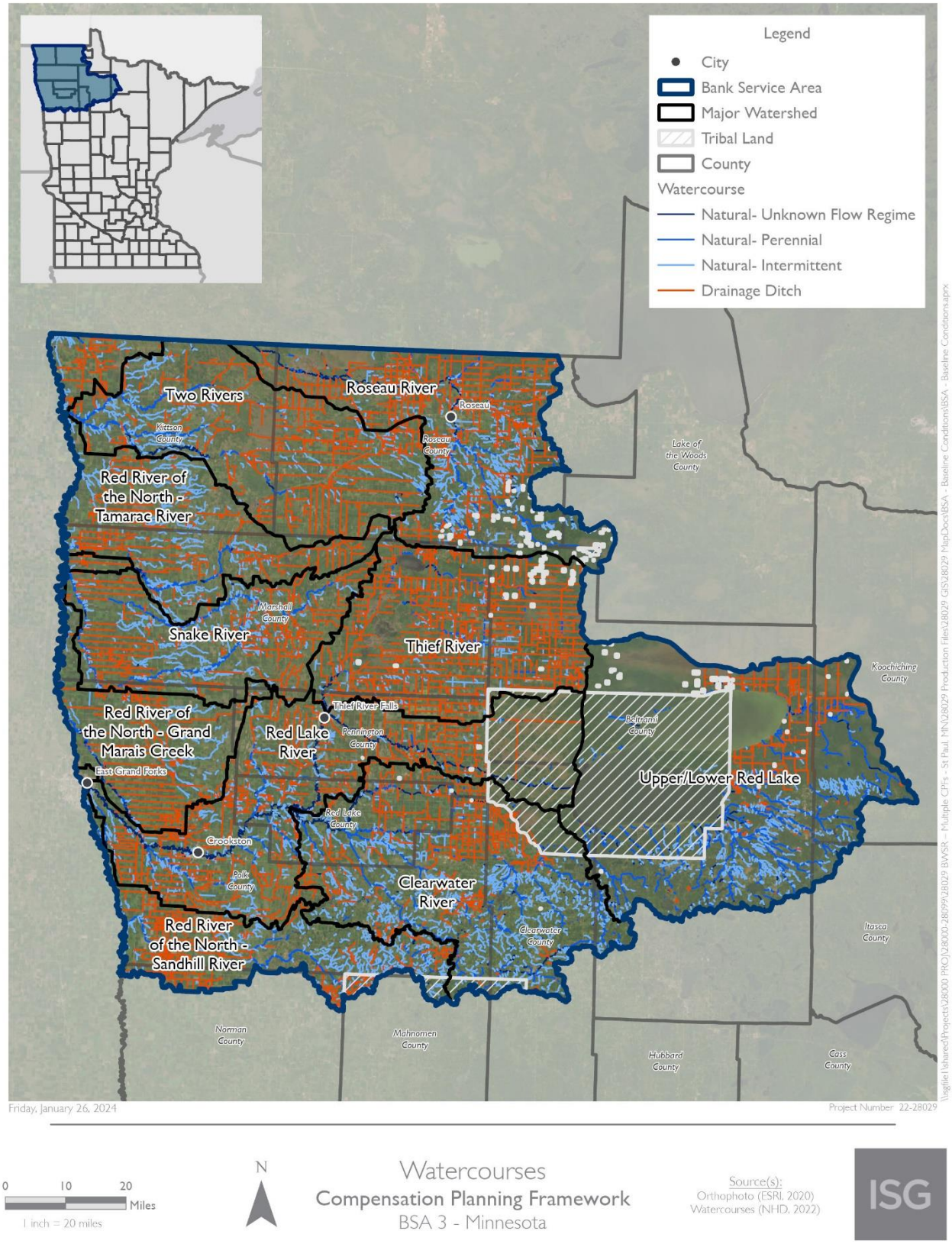


Figure B-8. Altered Watercourses

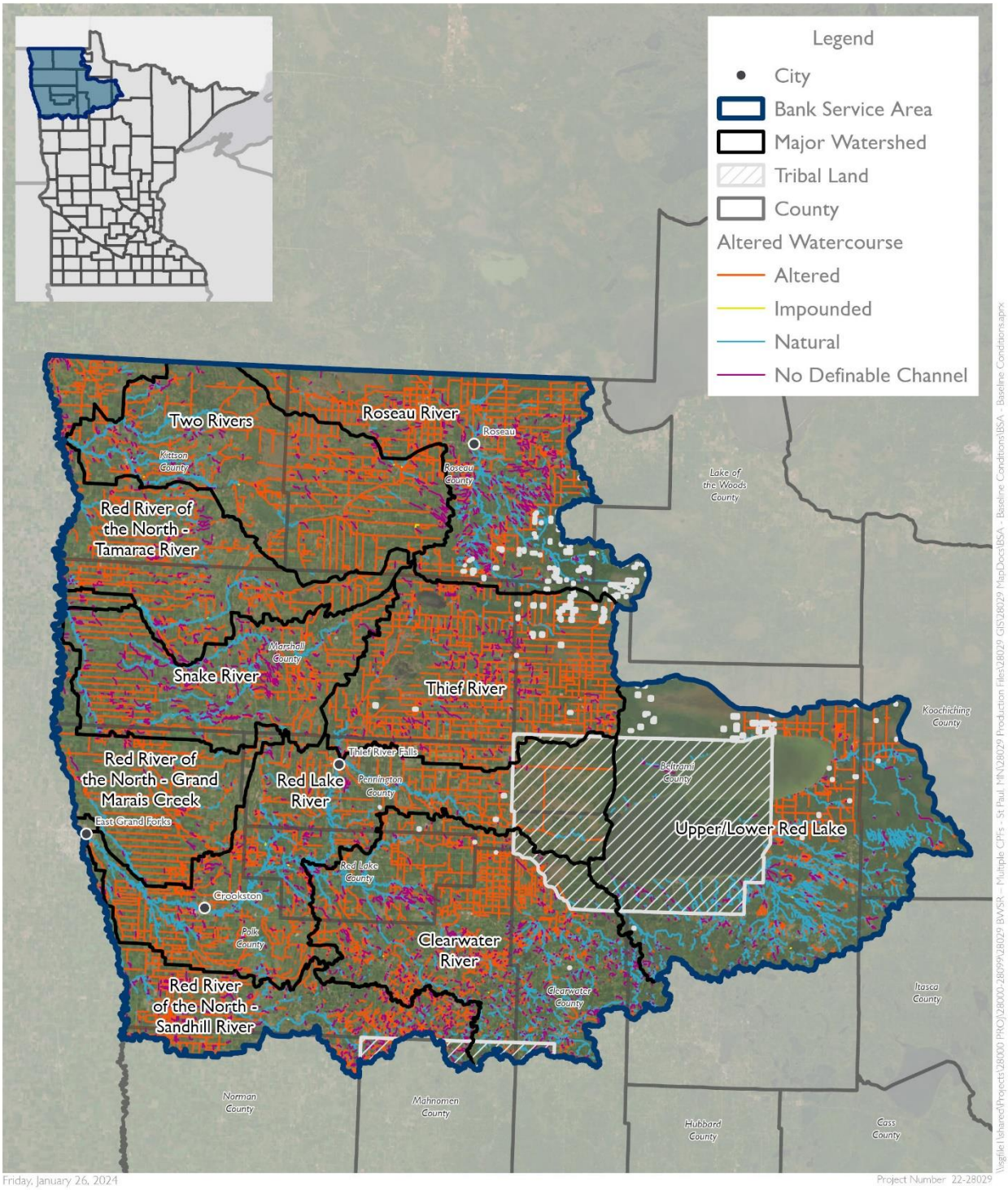


Figure B-9. Water Quality- Lakes

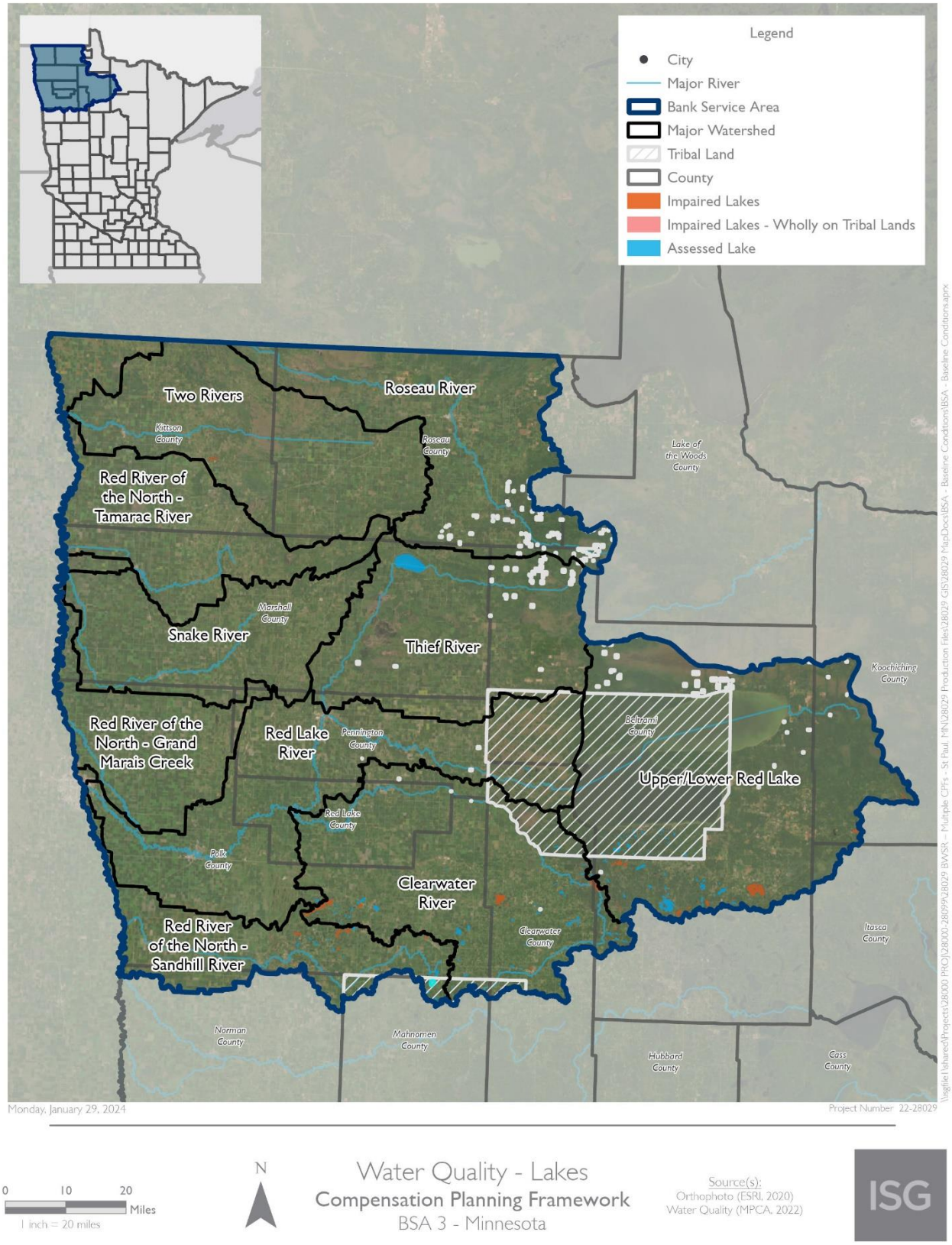


Figure B-10. Water Quality- Streams

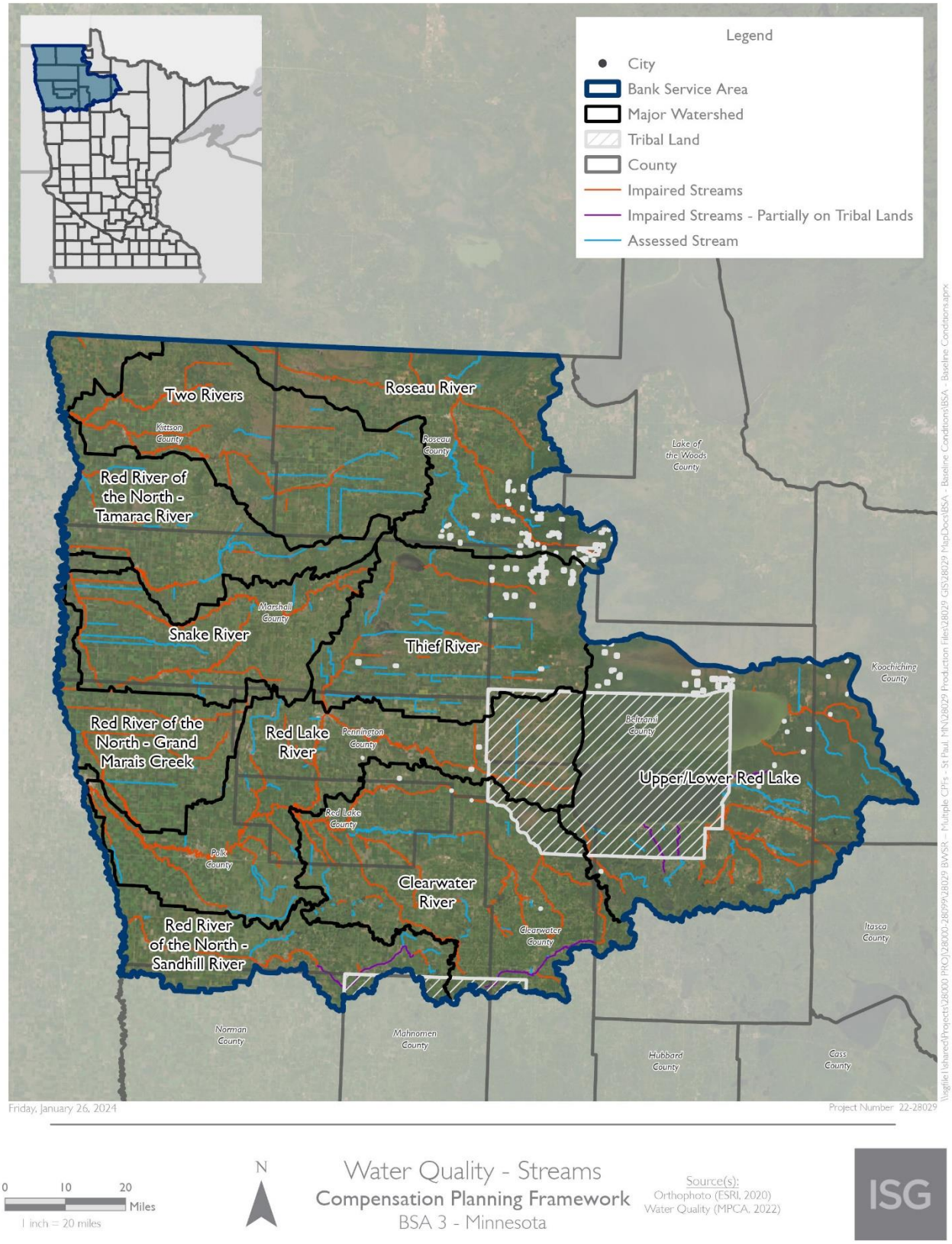


Figure B-11. Land Cover

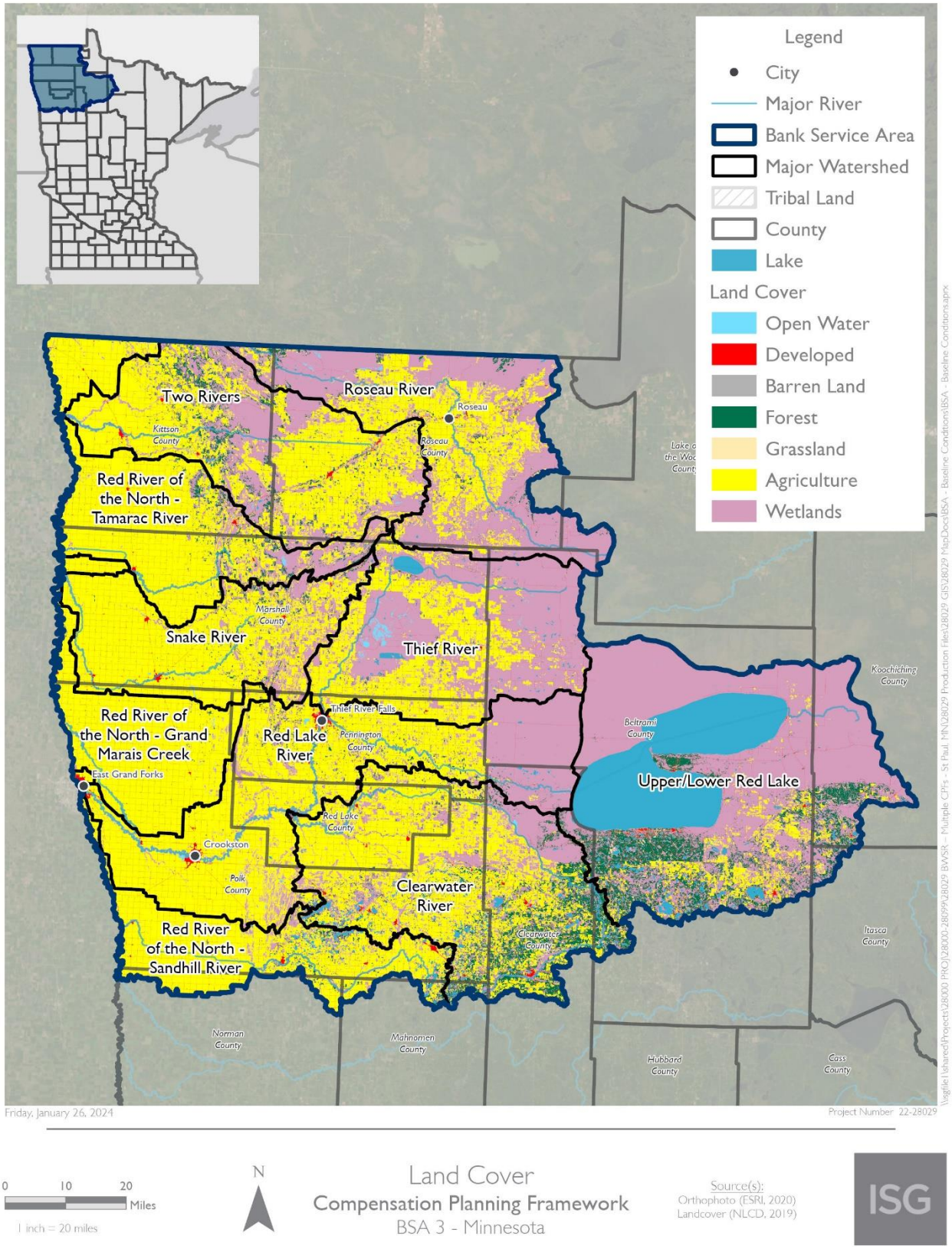


Figure B-12. Perennial Land Cover

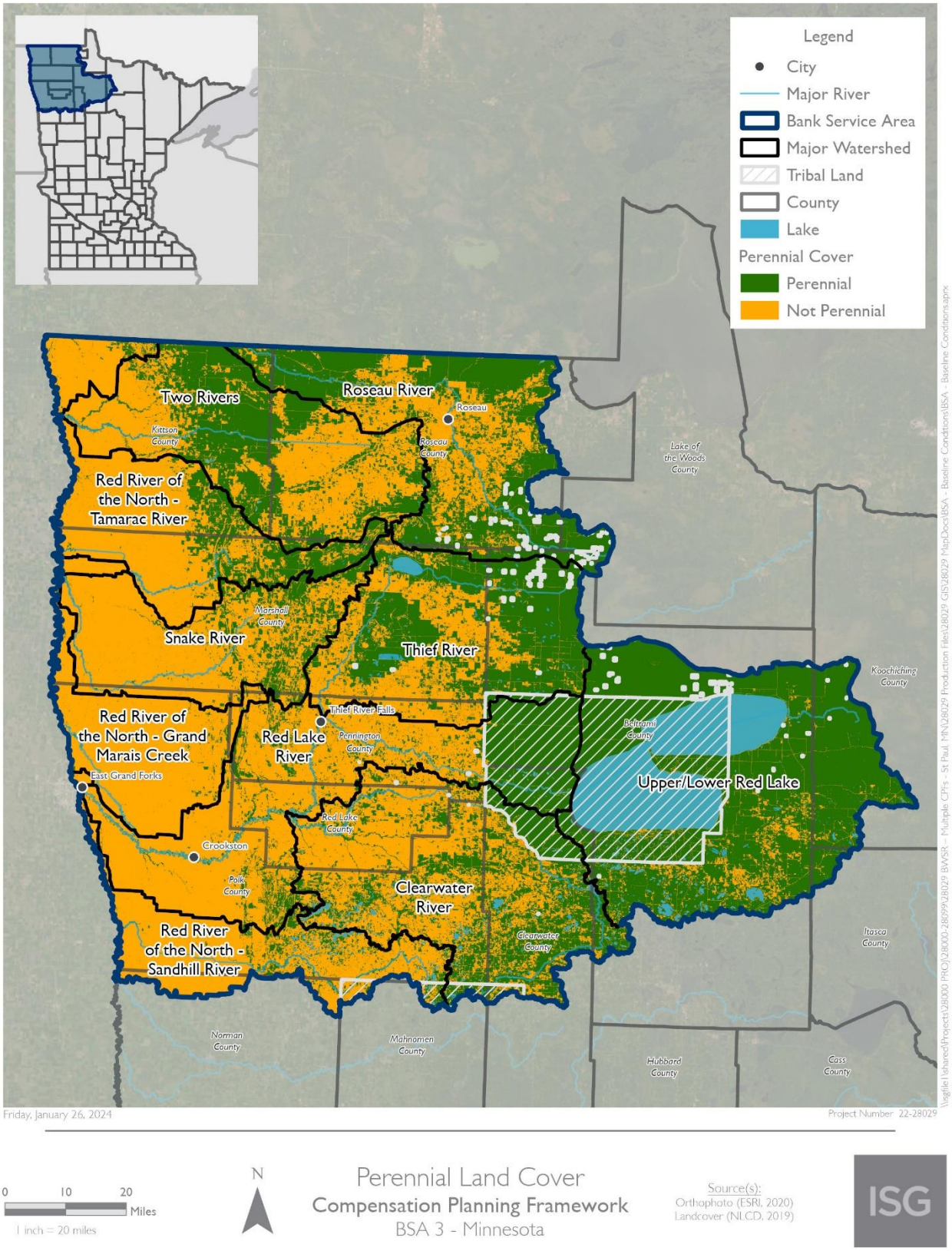


Figure B-13. Areas of Biodiversity Significance

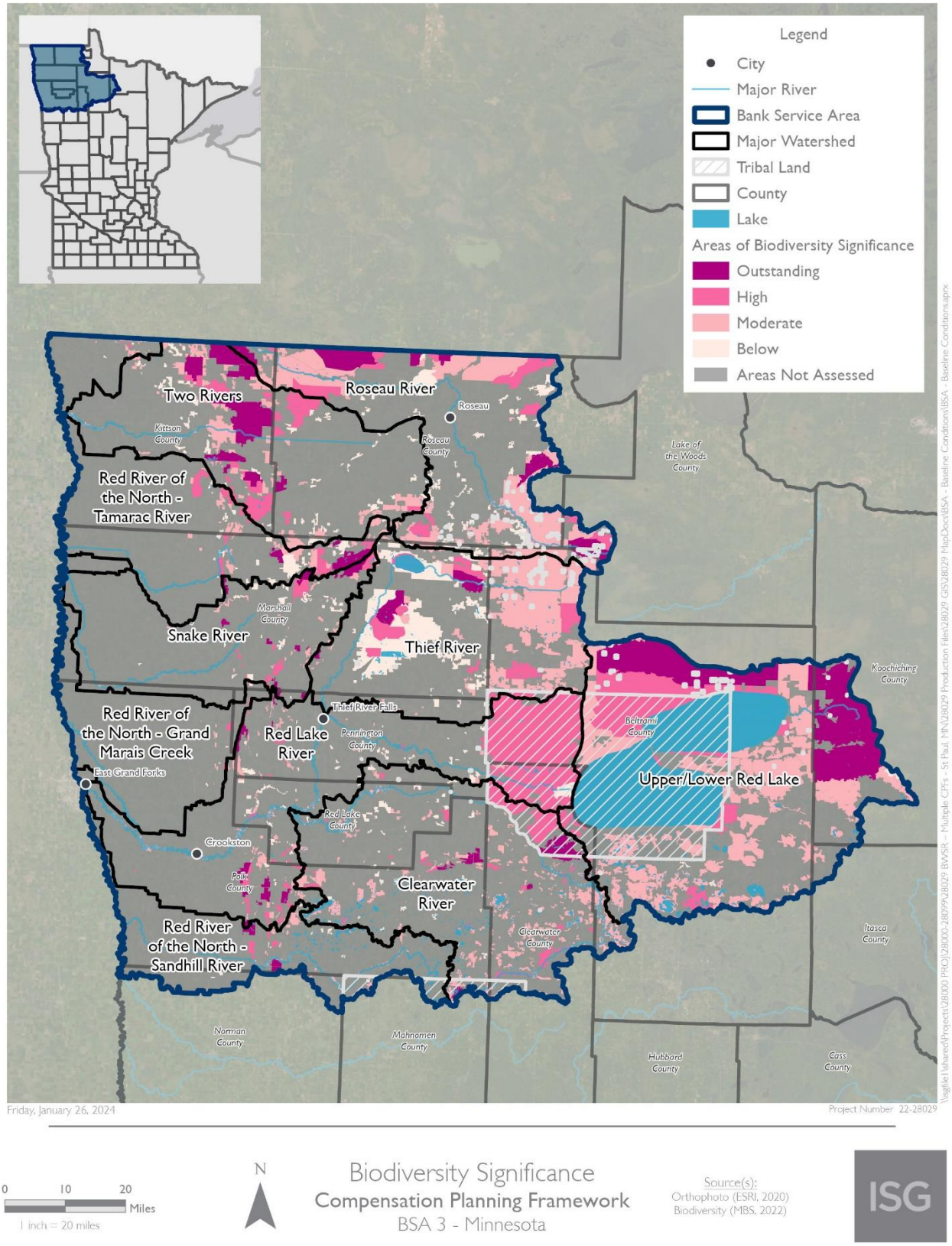
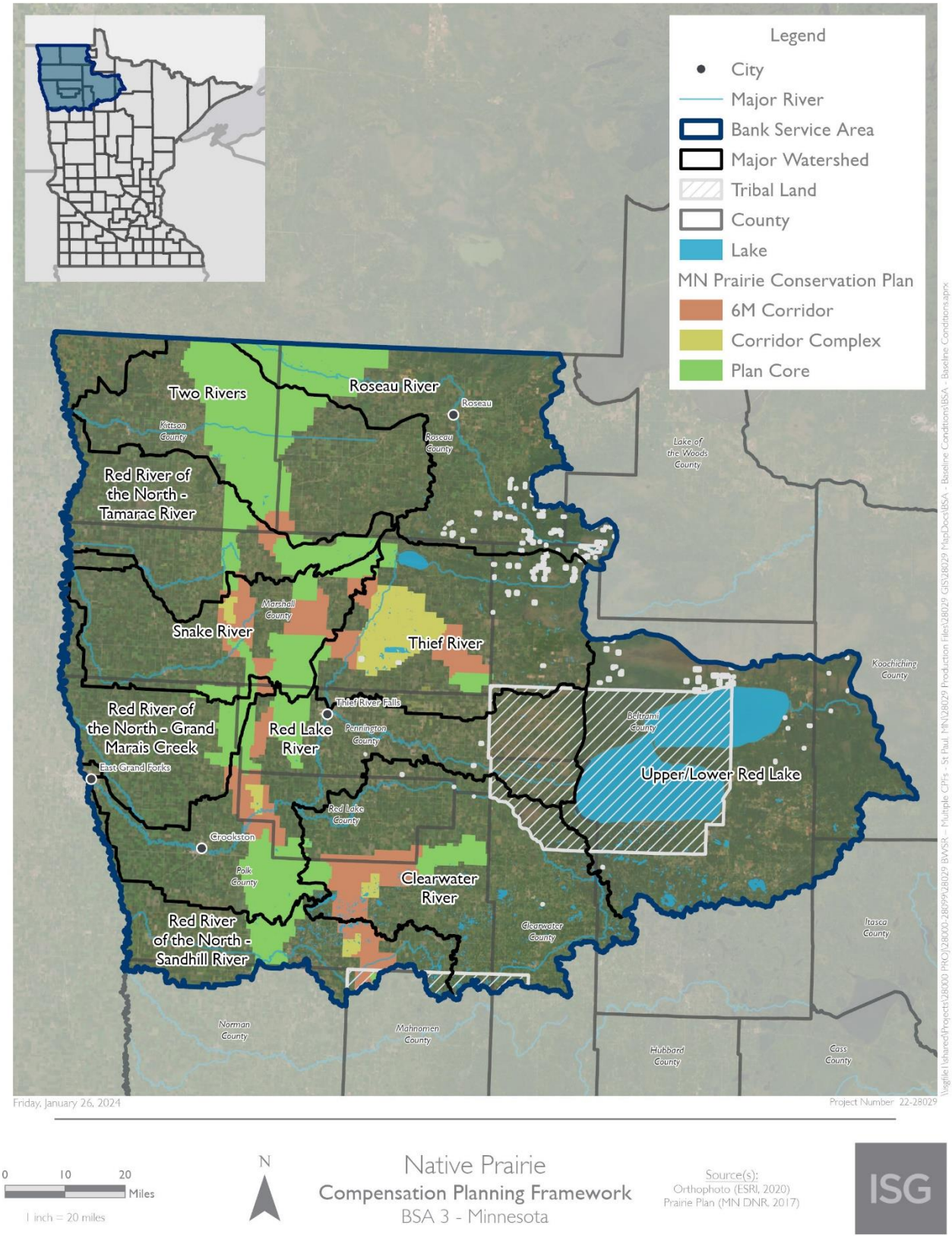


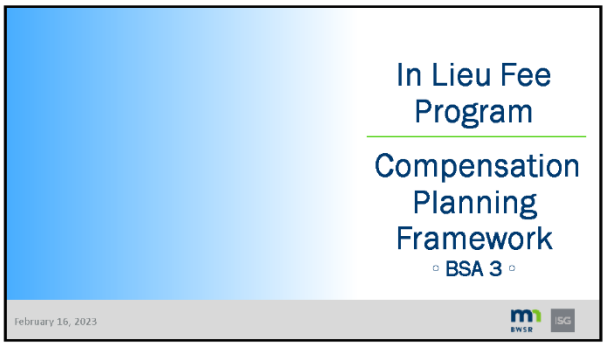
Figure B-14. Prairie Plan- Priaire Areas



Appendix C: Stakeholder Meeting Attendees and Presentations

C-1. Meeting 1- February 2023 Stakeholder Meeting List of Attendees

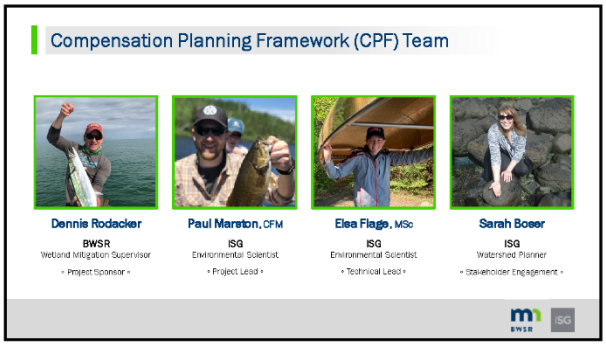
First Name	Last Name	Email	Organization
Darren	Carlson	darren.carlson@mn.nacdnet.net	Marshall SWCD
Mark	Christianson	markc@arvig.net	WCA - Norman County SWCD
Peter	Curran	peter.curran@redlake.mnswcd.org	WCA - Red Lake SWCD
Matthew	Fischer	matt.fischer@state.mn.us	BWSR
Larissa	Fitzgerald	larissa.fitzgerald@pennington.mnswcd.org	WCA - Pennington County SWCD
Cary	Hernandez	cary.hernandez@state.mn.us	MPCA WPM
Stephanie	Klamm	stephanie.klamm@state.mn.us	DNR Hydrologist
Sam	Martin	samuel.martin@state.mn.us	MnDNR Area Hydrologist
Lynda	Ponting	lynda.ponting@state.mn.us	BWSR
Josh	Stromlund	josh_s@co.lotw.mn.us	Lake of the Woods SWCD


In Lieu Fee Program
Compensation Planning Framework
BSA 3
February 16, 2023

1


Compensation Planning Framework Team

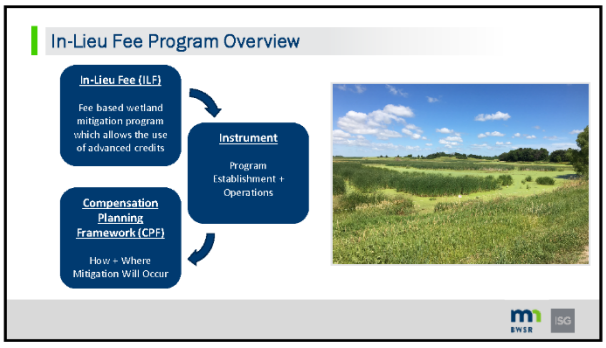
2


Compensation Planning Framework (CPF) Team
Dennis Rodacker
BWSR
Wetland Mitigation Supervisor
• Project Sponsor •
Paul Marston, CFM
ISG
Environmental Scientist
• Project Lead •
Elea Flage, MSc
ISG
Environmental Scientist
• Technical Lead •
Sarah Boser
ISG
Watershed Planner
• Stakeholder Engagement •

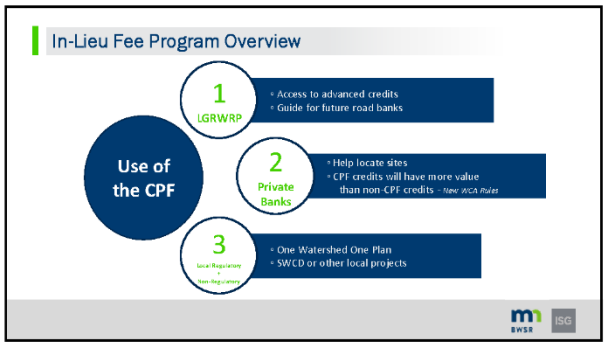
3


In-Lieu Fee Program + Compensation Planning Framework Overview

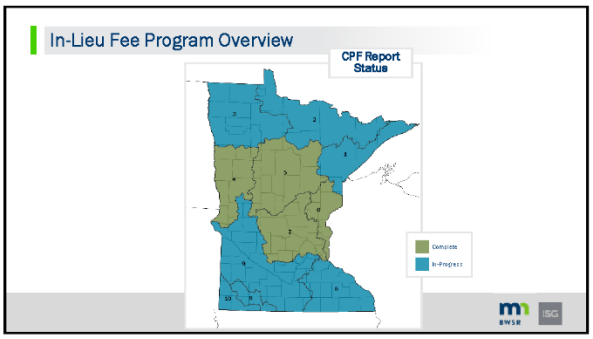
4


In-Lieu Fee Program Overview
In-Lieu Fee (ILF)
Fee based wetland mitigation program which allows the use of advanced credits
Instrument
Program Establishment + Operations
Compensation Planning Framework (CPF)
How + Where Mitigation Will Occur

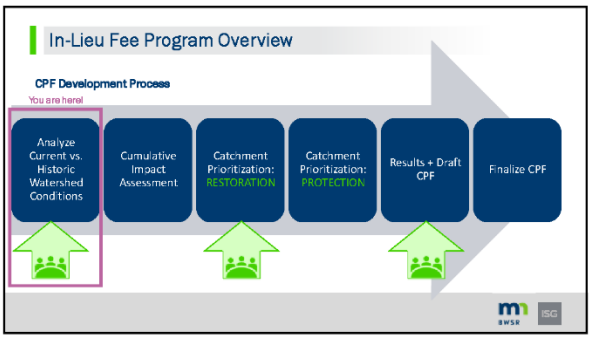
5


In-Lieu Fee Program Overview
Use of the CPF
1
LGRWRP
• Access to advanced credits
• Guide for future road banks
2
Private Banks
• Help locate sites
• CPF credits will have more value than non-CPF credits – New WCA Rules
3
• One Watershed One Plan
• SWCD or other local projects

6


In-Lieu Fee Program Overview
CPF Report Status
Complete
In-Progress

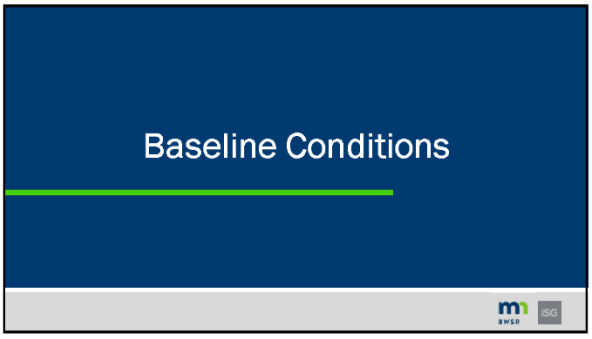
7


In-Lieu Fee Program Overview
CPF Development Process
You are here!
Analyze Current vs. Historic Watershed Conditions
Cumulative Impact Assessment
Catchment Prioritization: RESTORATION
Catchment Prioritization: PROTECTION
Results + Draft CPF
Finalize CPF

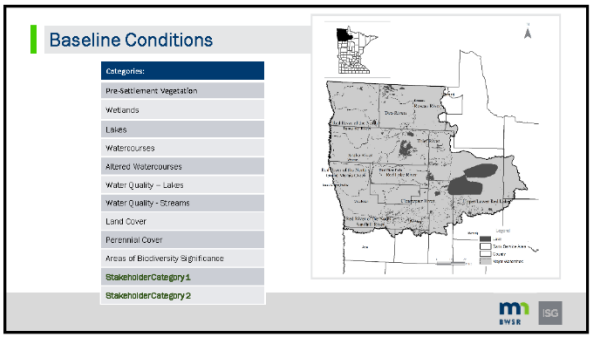
8


In-Lieu Fee Program Overview
Key CPF Development Component
Stakeholder Input
Nothing replaces local knowledge
Input on appropriate data sources
State + Local
Leads us through local plans
Identifies the most important watershed goals

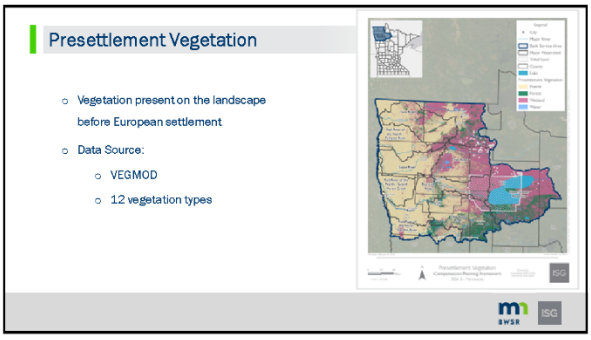
9


Baseline Conditions

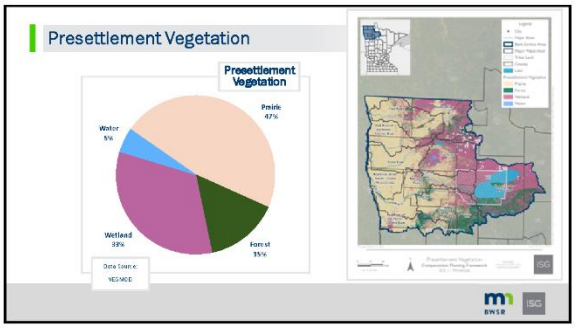
10


Baseline Conditions
Categories:
Pre-Settlement Vegetation
Wetlands
Lakes
Watercourses
Altered Watercourses
Water Quality – Lakes
Water Quality - Streams
Land Cover
Perennial Cover
Areas of Biodiversity Significance
StakeholderCategory1
StakeholderCategory2

11


Presettlement Vegetation
Vegetation present on the landscape before European settlement
Data Source:
VEGMOD
12 vegetation types

12



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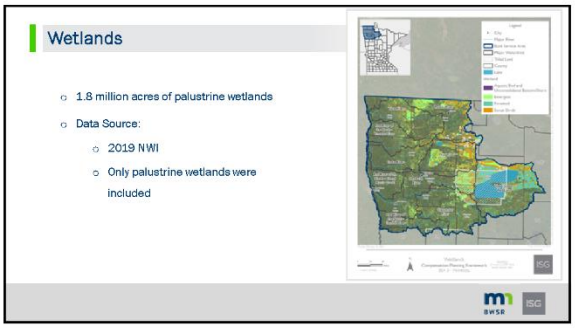

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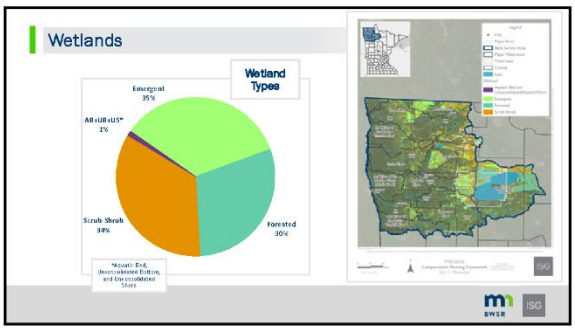

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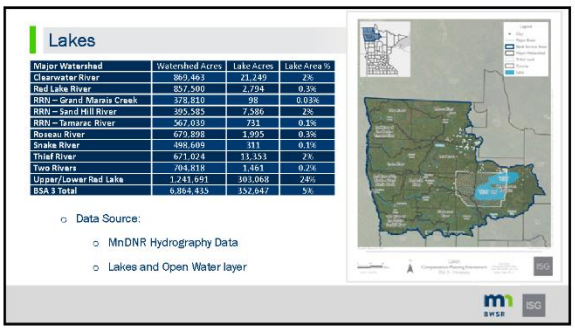

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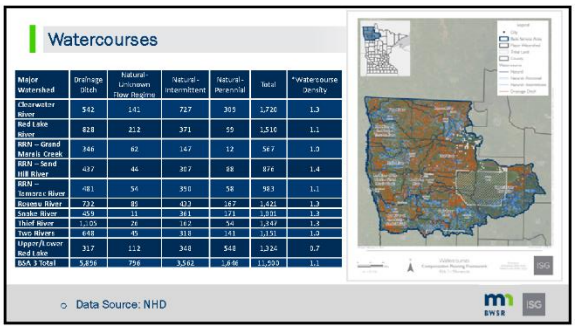

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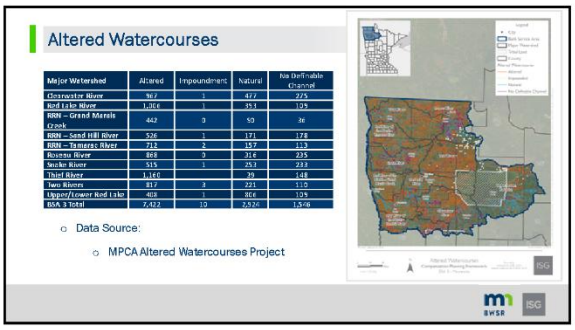

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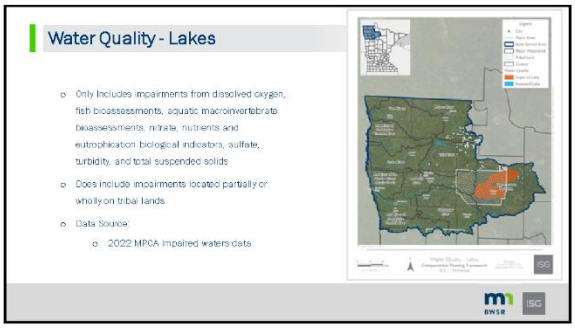

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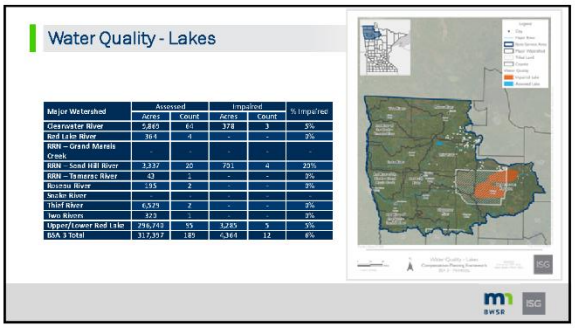

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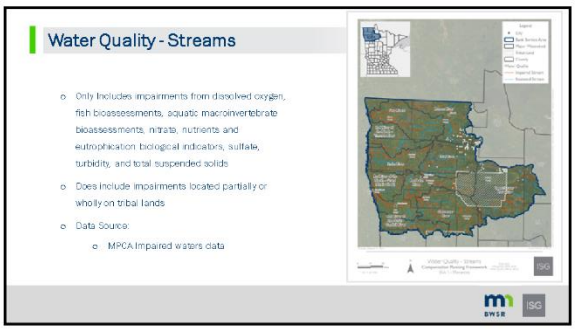

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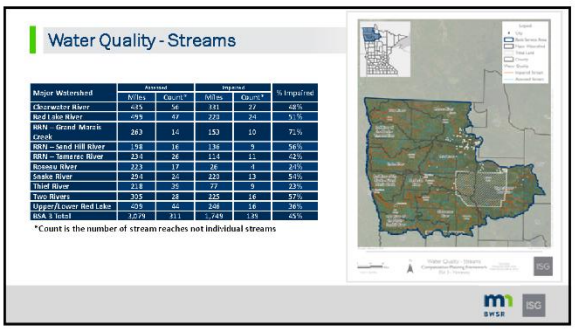

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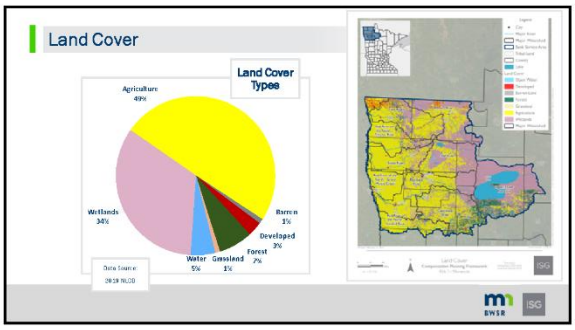

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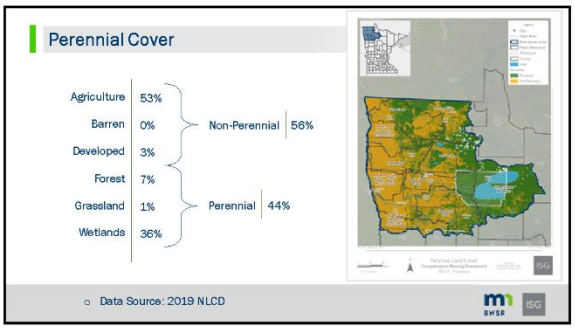

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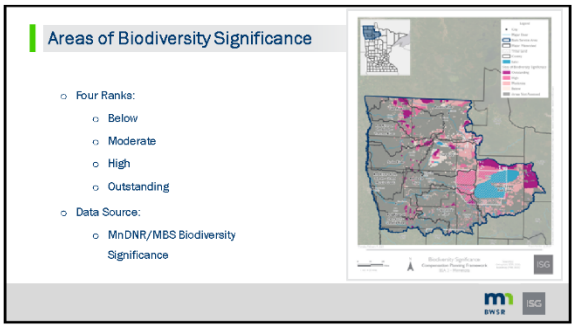

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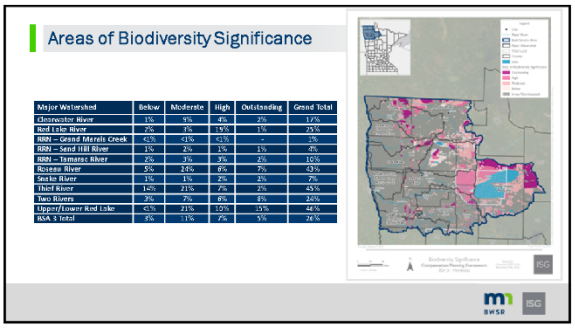

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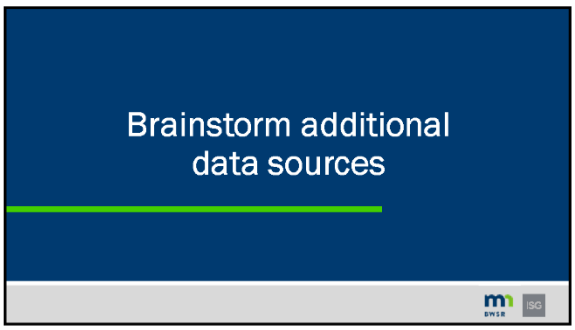

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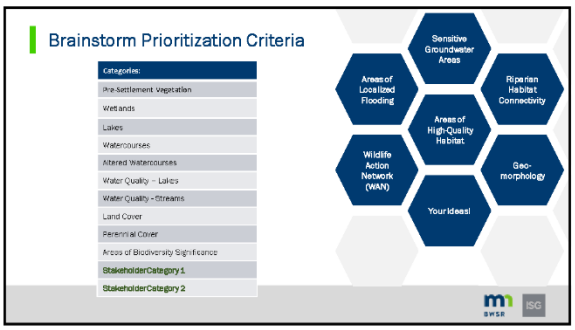

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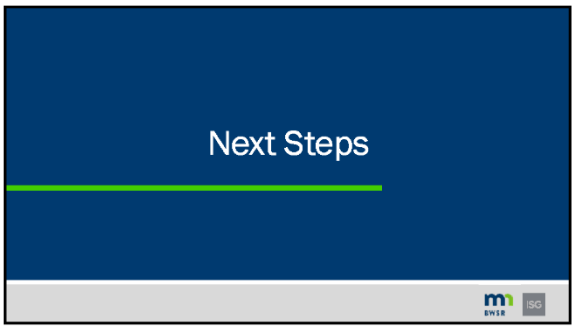

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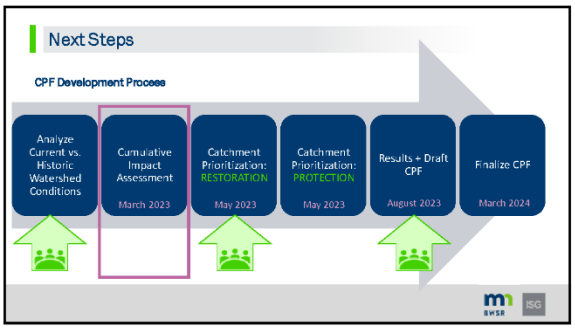

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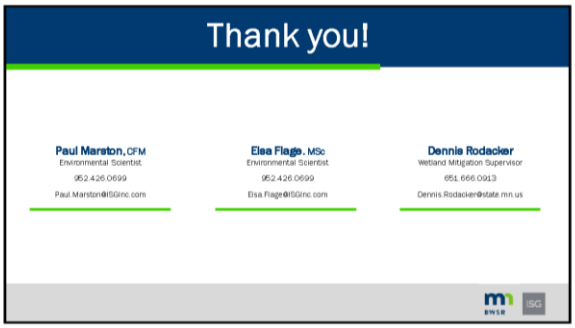
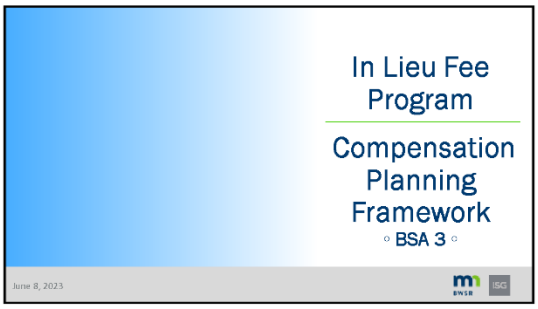

Thank you!
Paul Marston, CFM
Environmental Scientist
952.426.0699
Paul.Marston@ISGinc.com
Elsa Flage, MSc
Environmental Scientist
952.426.0699
Elsa.Flage@ISGinc.com
Dennis Rodacker
Wetland Mitigation Supervisor
651.666.0913
Dennis.Rodacker@state.mn.us
ISG

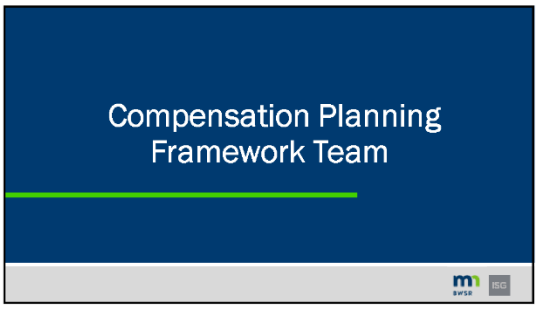
31

C-2. Meeting 2- June 2023 Stakeholder Meeting List of Attendees

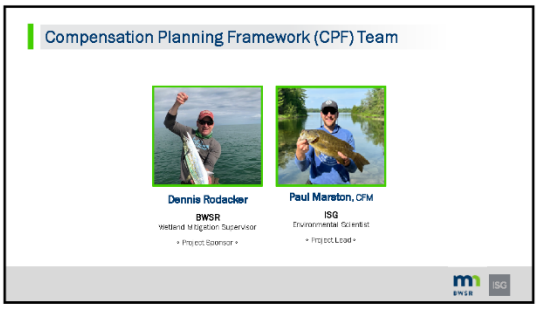
First Name	Last Name	Email	Organization
Matthew	Gouin	matt.gouin@co.koochiching.mn.us	WCA - Koochiching County
Mike	Hirst	Mike.Hirst@mn.nacdnet.net	Lake of the Woods SWCD
Sam	Martin	samuel.martin@state.mn.us	MnDNR Area Hydrologist
Phil	Norvitch	phil@nslswcd.org	North St. Louis SWCD
Lynda	Ponting	lynda.ponting@state.mn.us	BWSR
Josh	Stromlund	josh_s@co.lotw.mn.us	Lake of the Woods SWCD


In Lieu Fee Program
Compensation Planning Framework
BSA 3
June 8, 2023

1


Compensation Planning Framework Team

2


Compensation Planning Framework (CPF) Team
Dennis Rodacker
BWSR
Wetland Mitigation Supervisor
Project Sponsor
Paul Marston, CFM
ISG
Environmental Scientist
Project Lead

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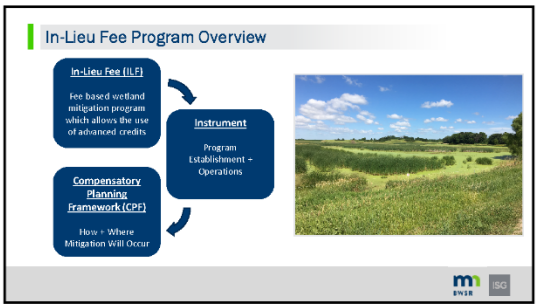
In-Lieu Fee Program + Compensation Planning Framework Overview

4


In-Lieu Fee Program Overview
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Fee based wetland mitigation program which allows the use of advanced credits
Instrument
Program Establishment + Operations
Compensatory Planning Framework (CPF)
How + Where Mitigation Will Occur

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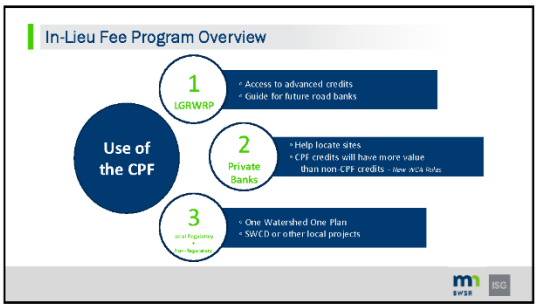
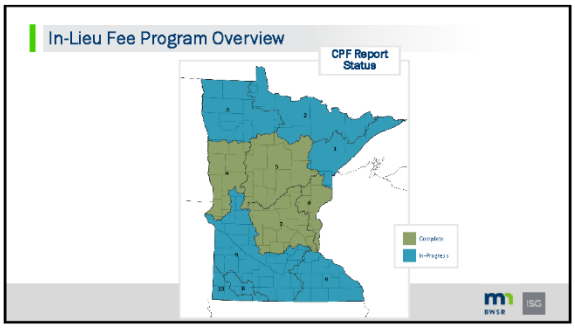
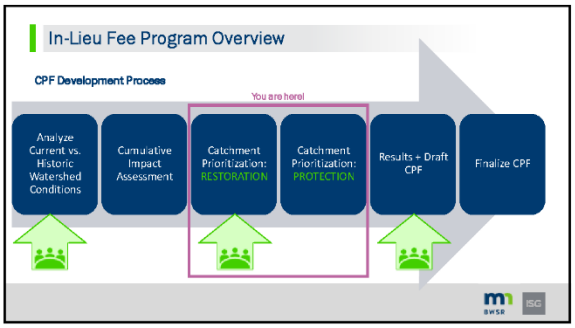

In-Lieu Fee Program Overview
Use of the CPF
1
LGRWRP
Access to advanced credits
Guide for future road banks
2
Private Banks
Help locate sites
CPF credits will have more value than non-CPF credits
3
One Watershed One Plan
SWCD or other local projects

6


In-Lieu Fee Program Overview
CPF Report Status

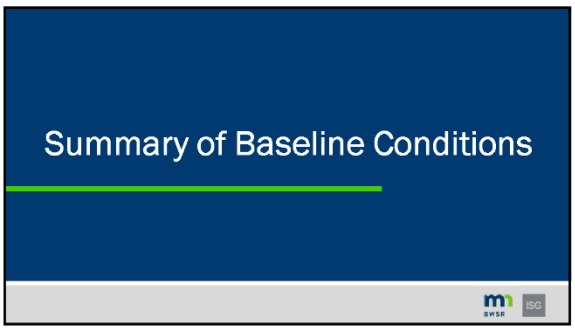
7


In-Lieu Fee Program Overview
CPF Development Process
You are here!
Analyze Current vs. Historic Watershed Conditions
Cumulative Impact Assessment
Catchment Prioritization: RESTORATION
Catchment Prioritization: PROTECTION
Results + Draft CPF
Finalize CPF

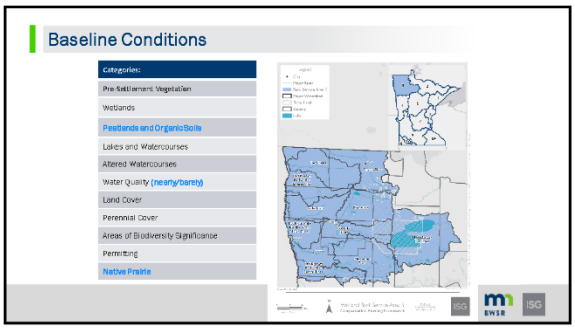
8


In-Lieu Fee Program Overview
Key CPF Development Component
Stakeholder Input
Nothing replaces local knowledge
Input on appropriate data sources
State + Local
Leads us through local plans
Identifies the most important watershed goals

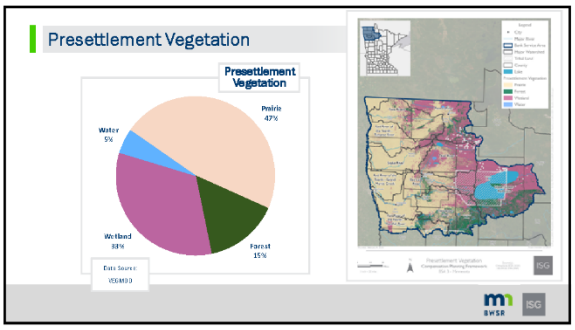
9


Summary of Baseline Conditions

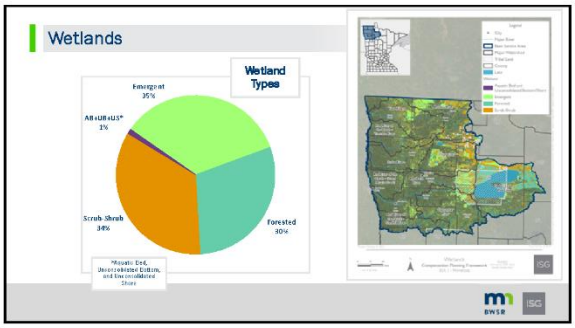
10


Baseline Conditions
Categories:
Pre-Settlement Vegetation
Wetlands
Peatlands and Organic Soils
Lakes and Watercourses
Altered Watercourses
Water Quality (nearly/barely)
Land Cover
Perennial Cover
Areas of Biodiversity Significance
Permitting
Native Prairie

11


Presettlement Vegetation
Presettlement Vegetation
Prairie 47%
Water 5%
Wetland 88%
Forest 15%

12



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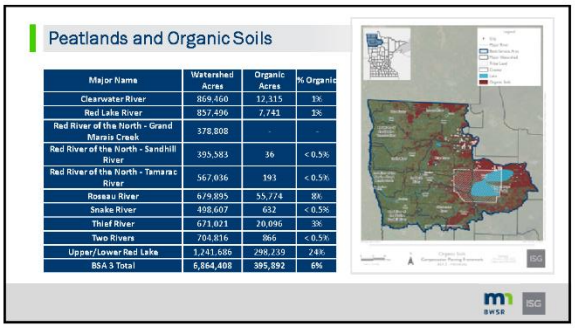

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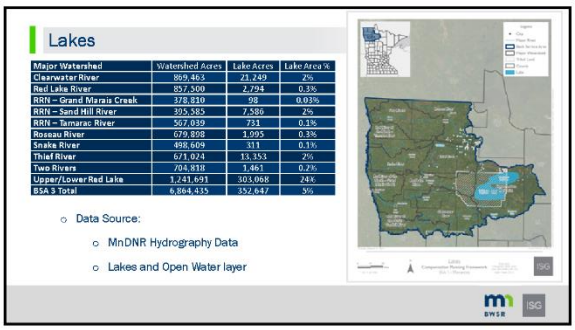

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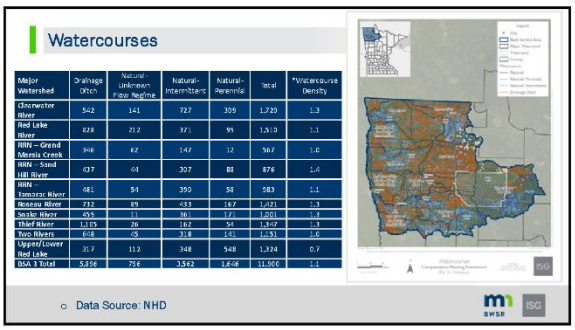

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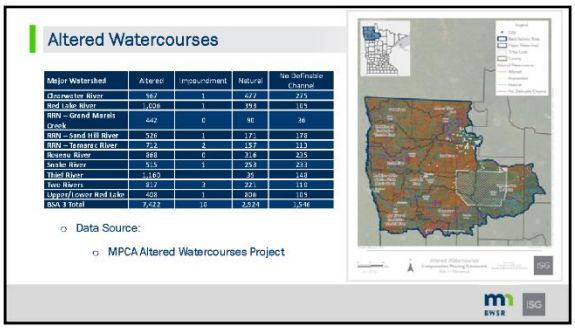

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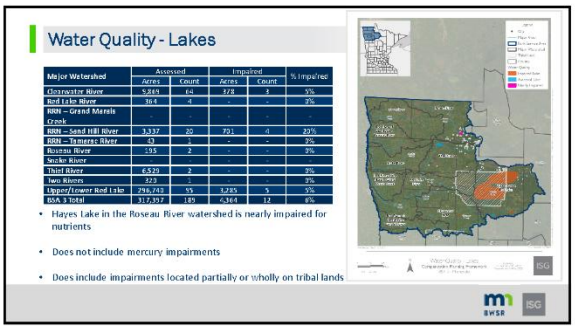

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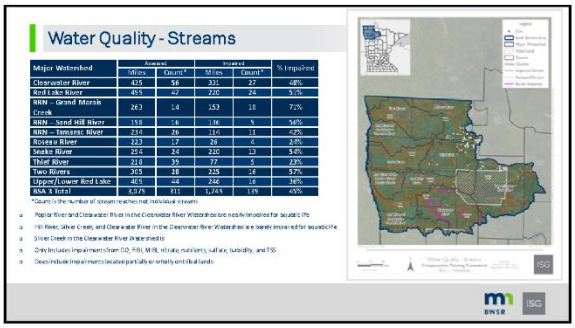

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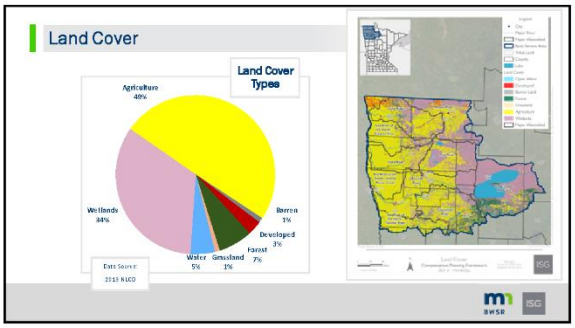

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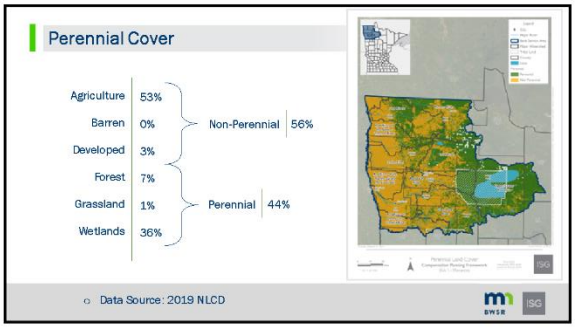

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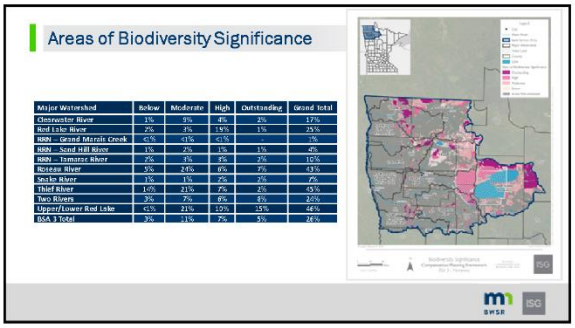

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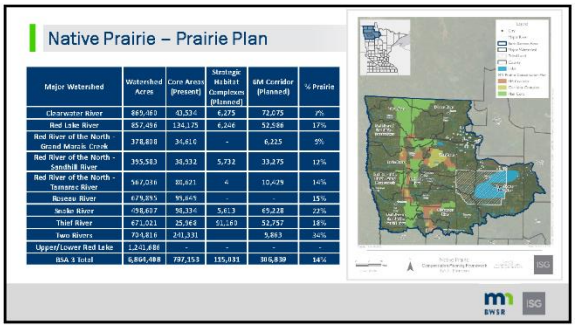

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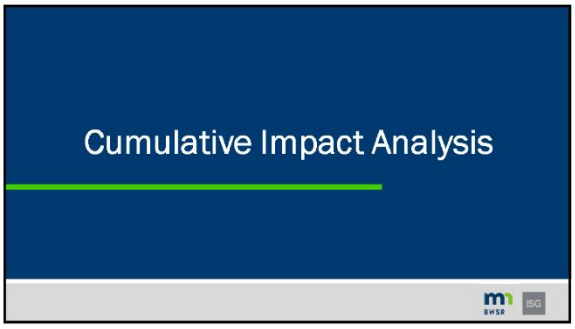

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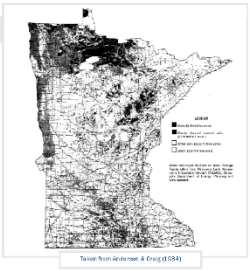
Cumulative Impact Analysis

Wetland Loss

	Total Watershed Acres	Presettlement Wetlands (soils + NWI)	Current Wetlands (NWI)	Wetland Loss	% Loss
BSA 3 Total	6,864,435	4,387,341	1,855,060	2,532,281	37%



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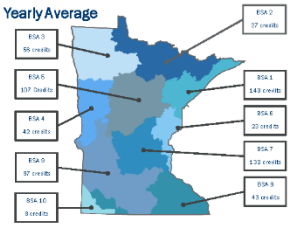
Cumulative Impact Analysis

Credit Usage – Yearly Average



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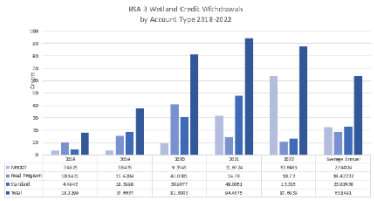
Cumulative Impact Analysis



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BSA
Trends and Threats

28

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MnDNR Survey

Baseline (2006):

- 10.62 million acres wetland in Minnesota

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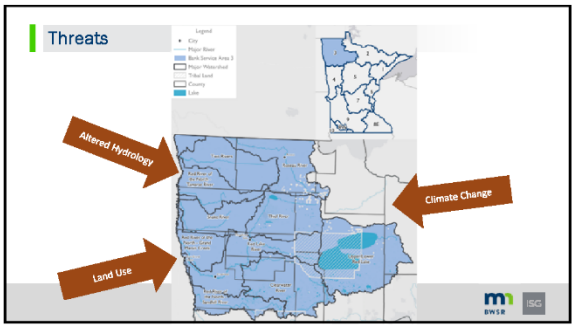
30



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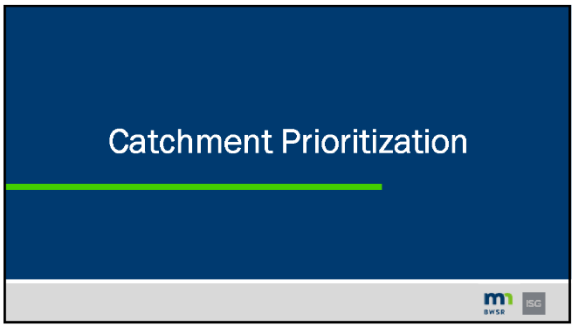

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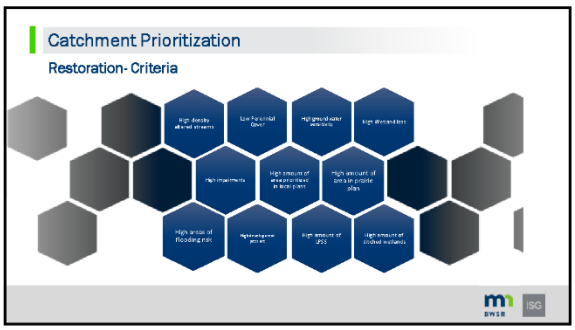

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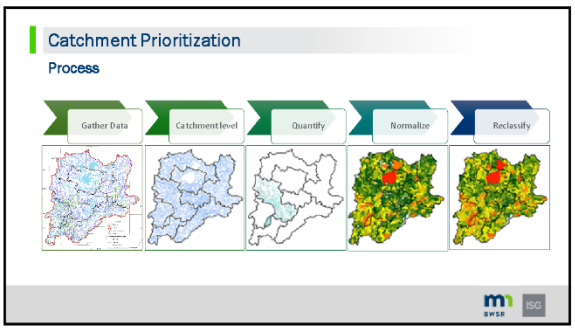

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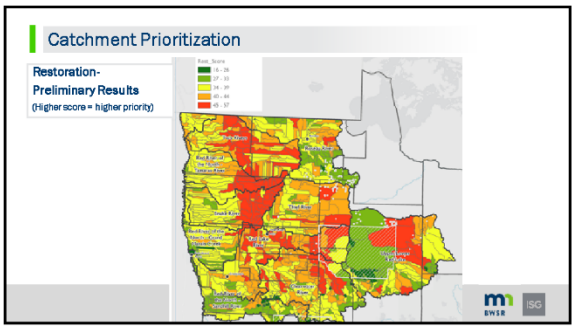

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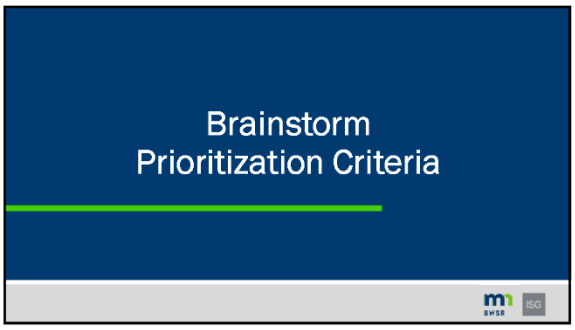

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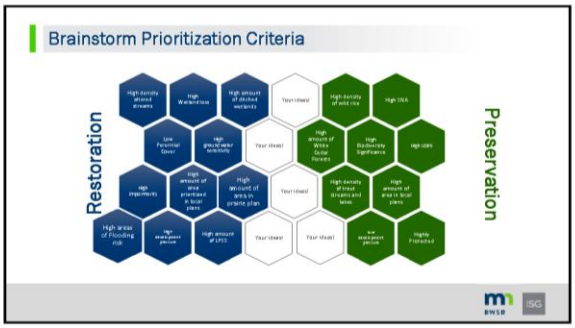

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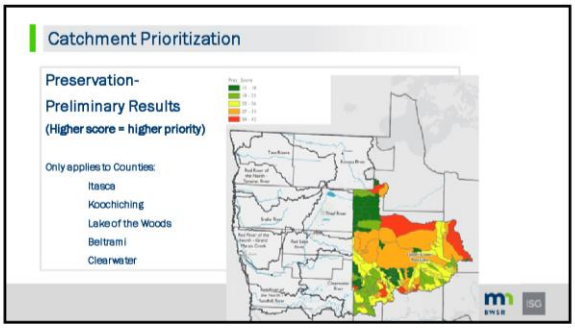

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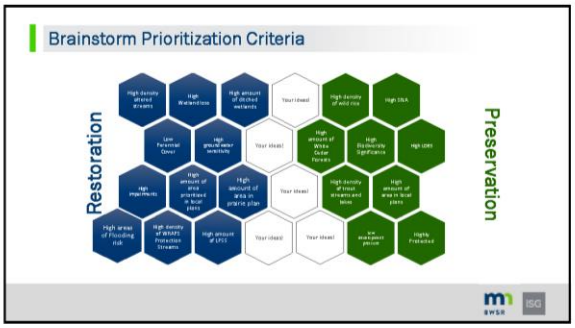

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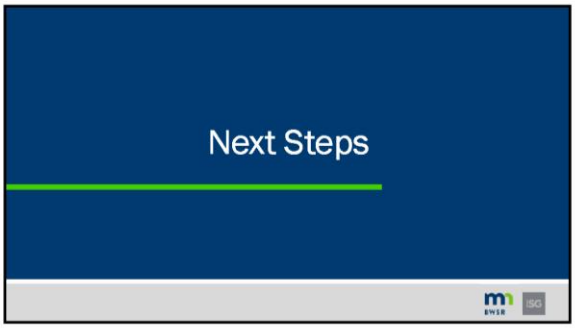

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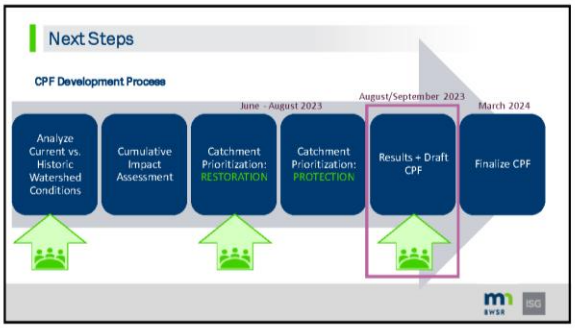

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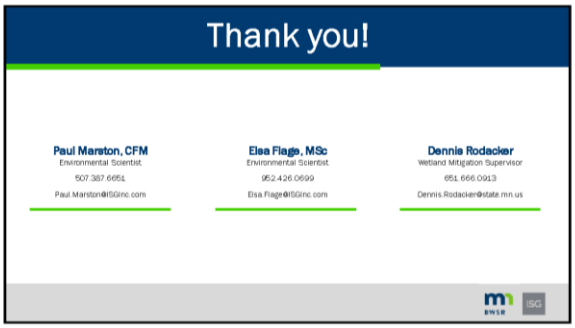
Thank you!
Paul Marston, CFM
Environmental Scientist
507.387.6651
Paul.Marston@ISGinc.com
Elsa Flage, MSc
Environmental Scientist
952.426.0699
Elsa.Flage@ISGinc.com
Dennis Rodacker
Wetland Mitigation Supervisor
651.666.0913
Dennis.Rodacker@state.mn.us
ISG

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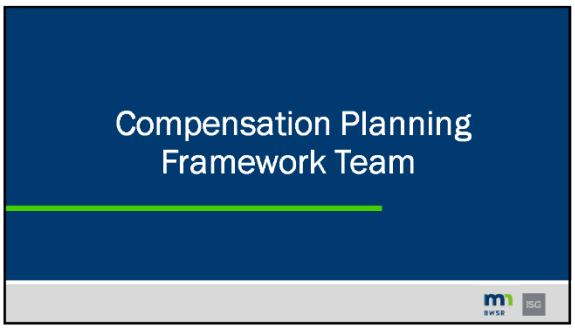
C-3. Meeting 3- October 2023 Stakeholder Meeting List of Attendees

First Name	Last Name	Email	Organization
Jeremy	Benson	jeremy.benson@mnswcd.org	Kittson SWCD
Matthew	Fischer	matt.fischer@state.mn.us	BWSR
Tara	Jensen	tara@wildricewatershed.org	Wild Rice Watershed District
Marcie	Peeters	marcie.peeters@co.koochiching.mn.us	Koochiching SWCD
Lynda	Ponting	lynda.ponting@state.mn.us	BWSR
Josh	Stromlund	josh_s@co.lotw.mn.us	Lake of the Woods SWCD

C-3. Meeting 3- October 2023 Stakeholder Meeting Presentation

1



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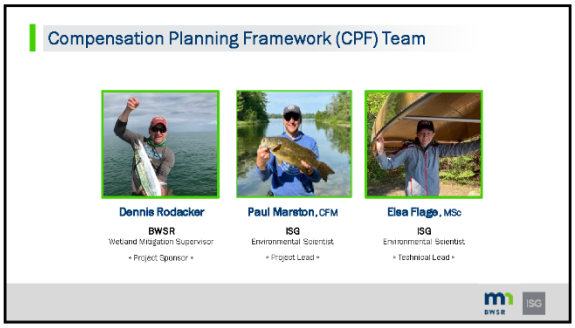

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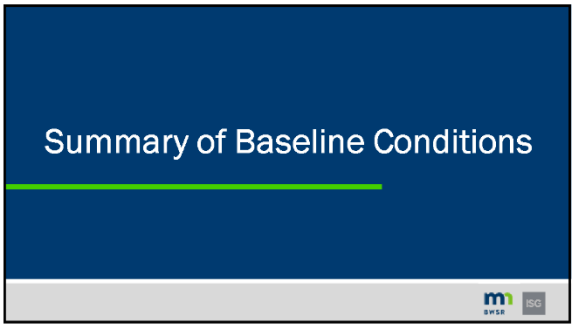

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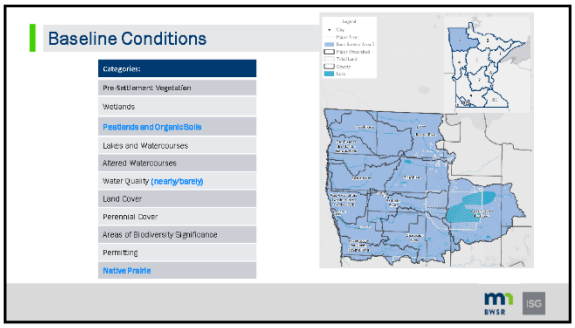

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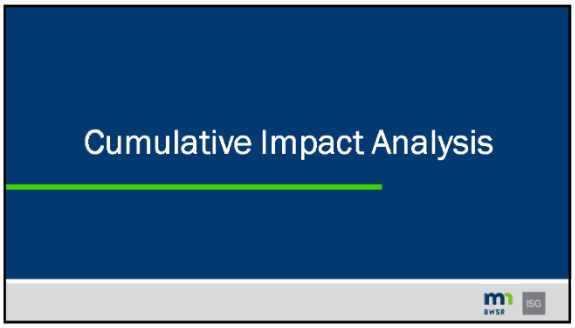
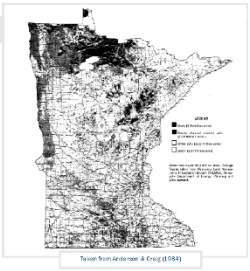


6

Cumulative Impact Analysis

Wetland Loss

Methodology	Presettlement Wetlands (Acres)	Current Wetlands (Acres)	% Loss
Anderson and Craig (1984)	4.4 Million	1.8 Million	37%
Soils + NWI Analysis	4.5 Million	1.7 Million	63%

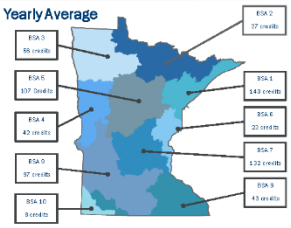


Taken from Anderson & Craig (1984)

7

Cumulative Impact Analysis

Credit Usage – Yearly Average



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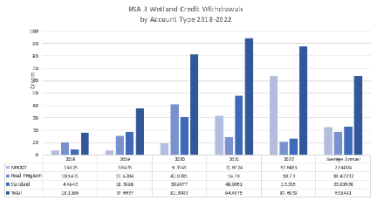

9

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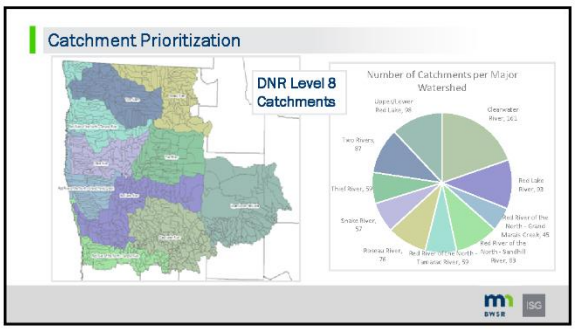

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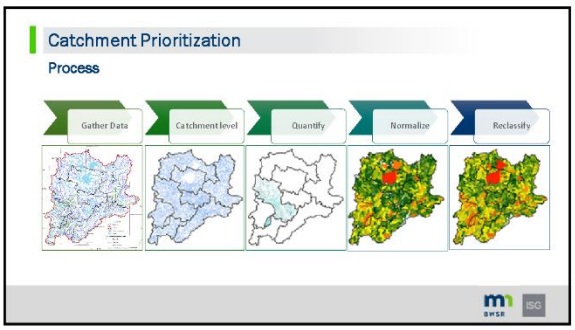

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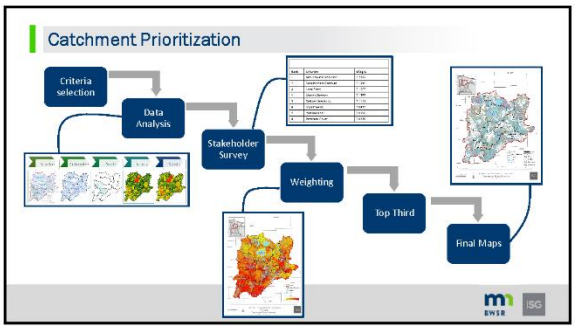

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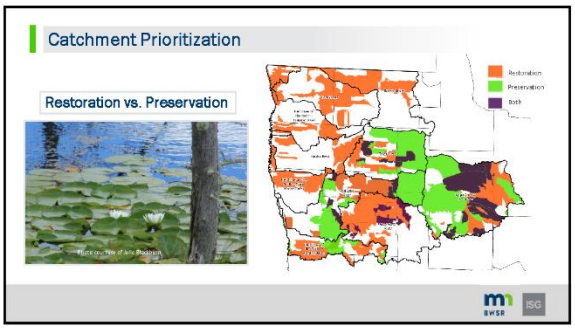

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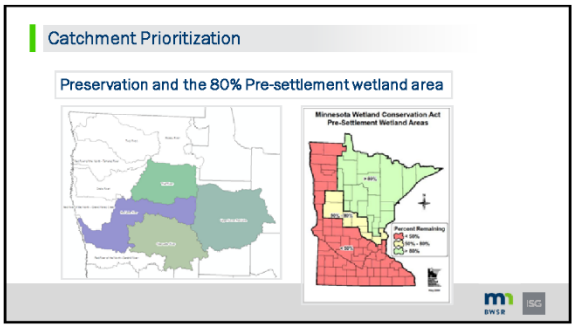

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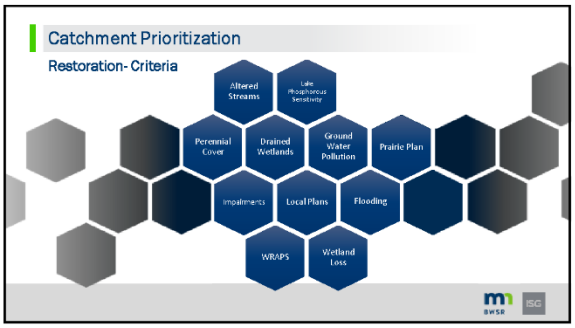

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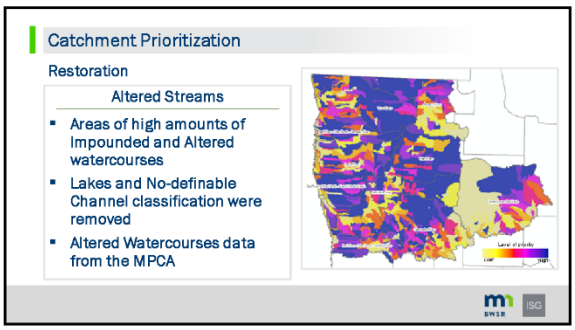

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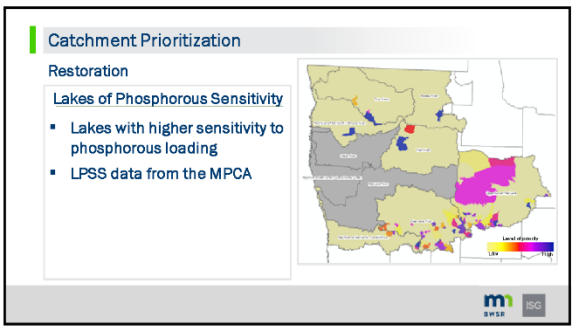

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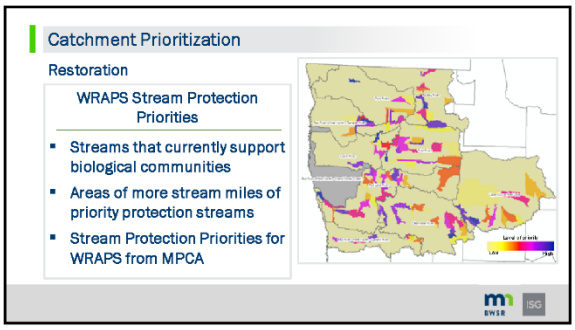

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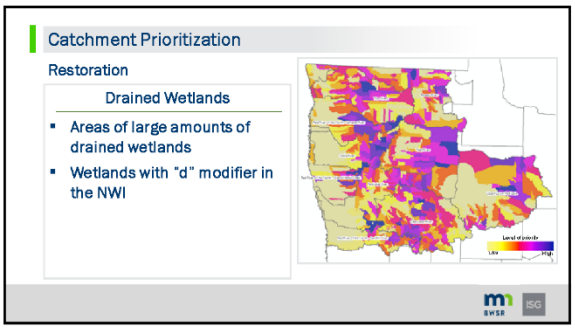

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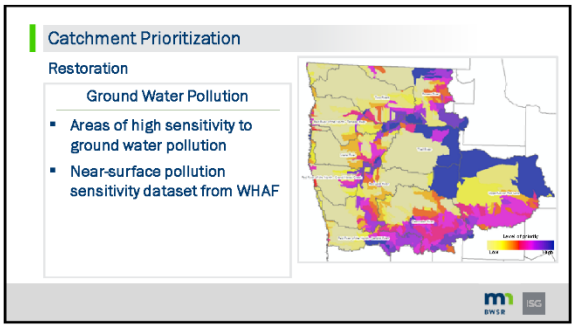

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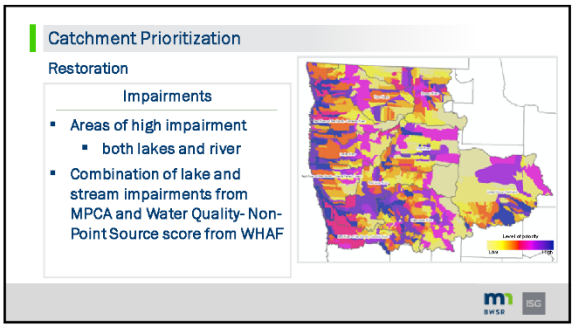

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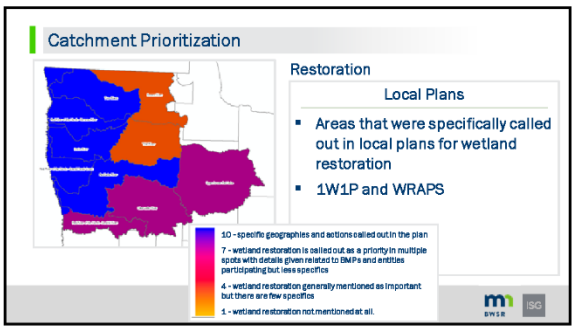

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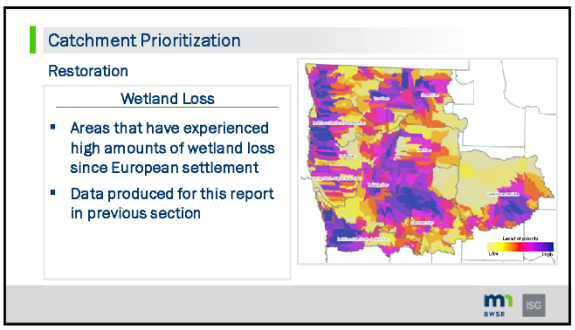

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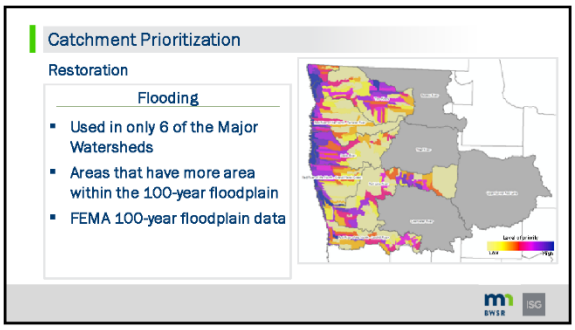

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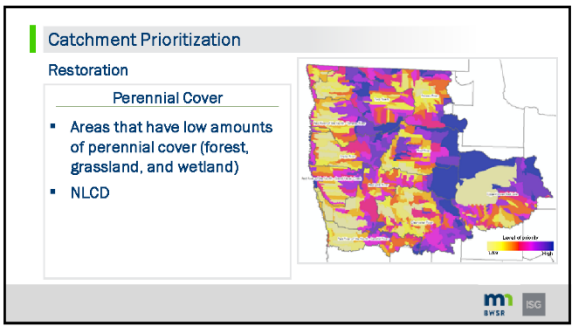

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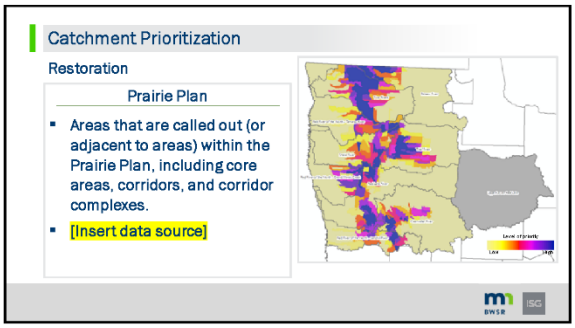

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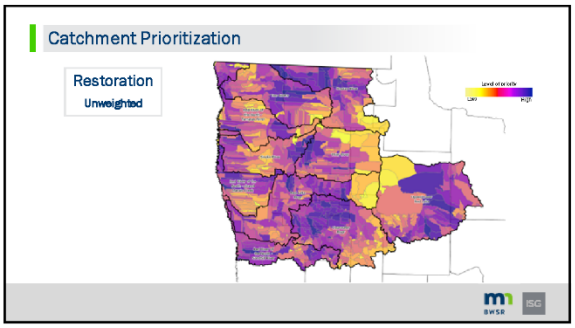

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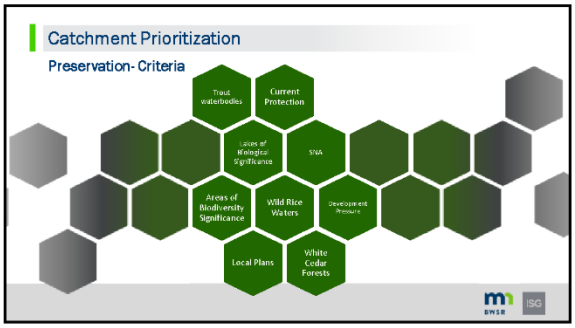

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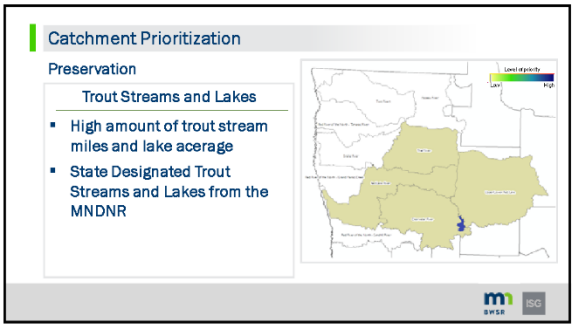

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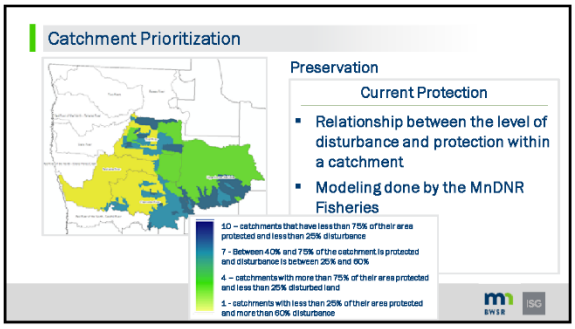

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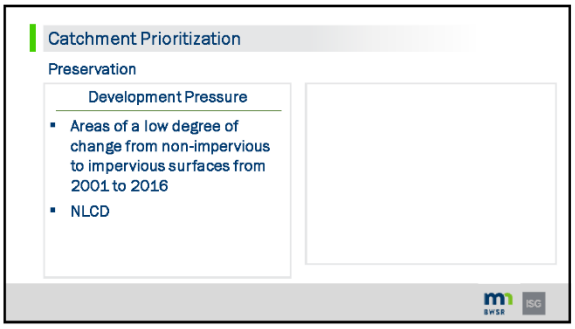

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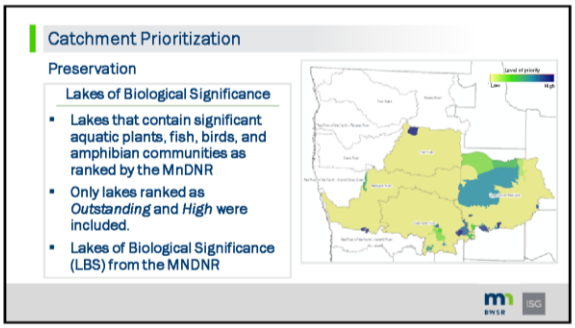

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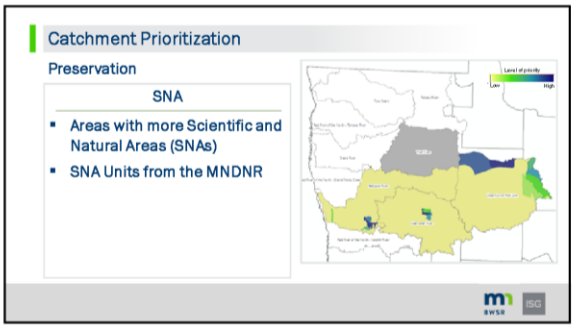

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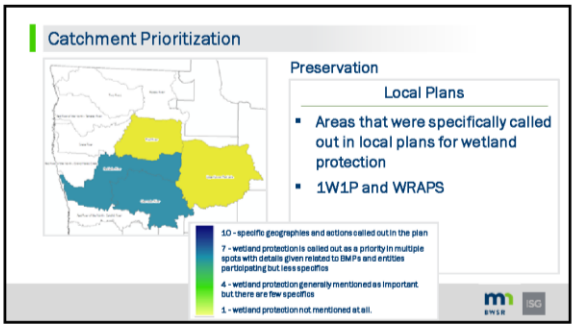

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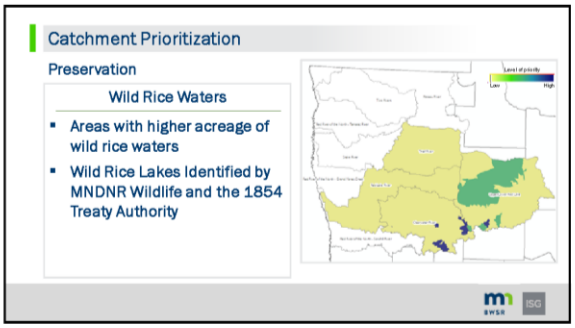

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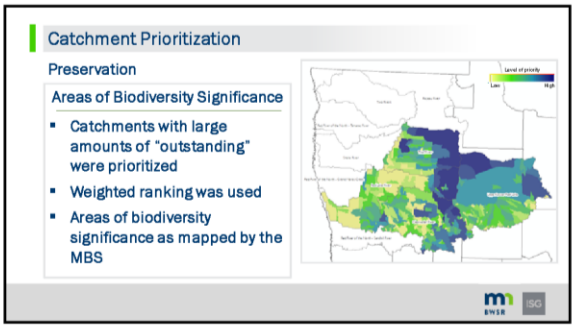

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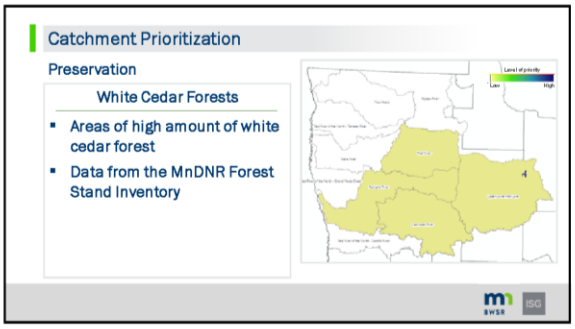

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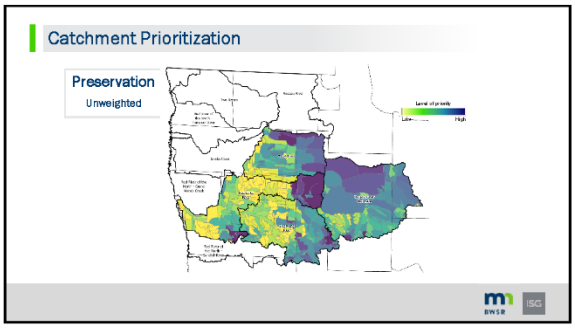

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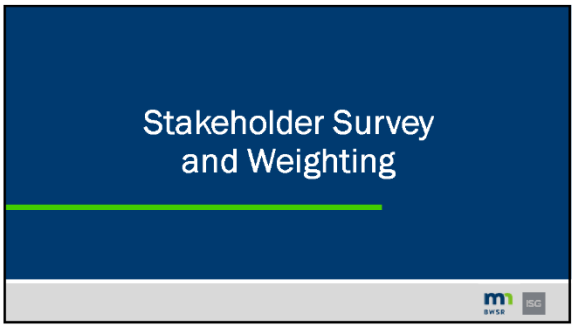

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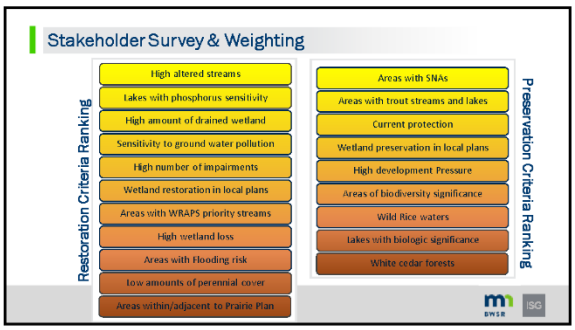

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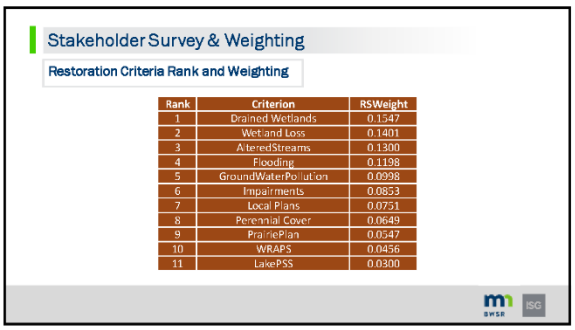
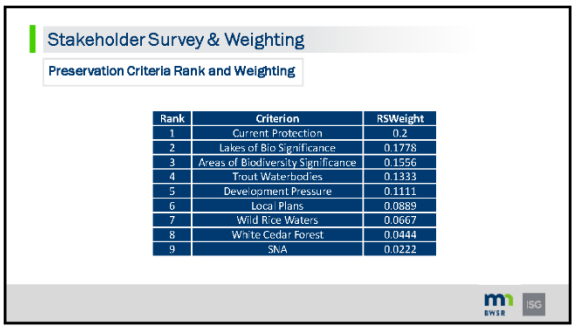


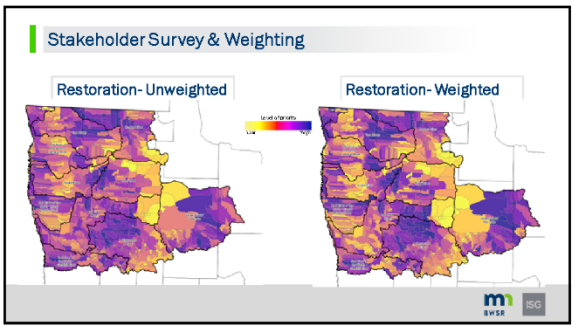
Rank	Criterion	RSWeight
1	Drained Wetlands	0.1547
2	Wetland Loss	0.1401
3	AlteredStreams	0.1300
4	Flooding	0.1198
5	GroundWaterPollution	0.0998
6	Impairments	0.0853
7	Local Plans	0.0751
8	Perennial Cover	0.0649
9	PrairiePlan	0.0547
10	WRAPS	0.0456
11	LakePSS	0.0300

46



Rank	Criterion	RSWeight
1	Current Protection	0.2
2	Lakes of Bio Significance	0.1778
3	Areas of Biodiversity Significance	0.1556
4	Trout Waterbodies	0.1333
5	Development Pressure	0.1111
6	Local Plans	0.0889
7	Wild Rice Waters	0.0667
8	White Cedar Forest	0.0444
9	SNA	0.0222

47



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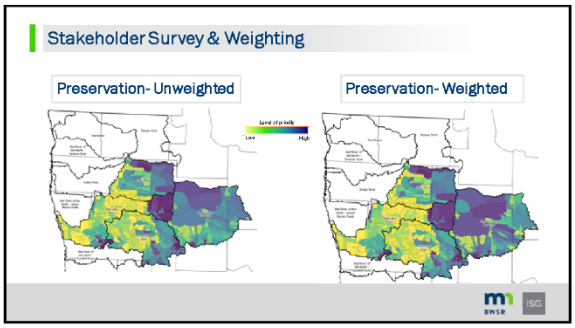

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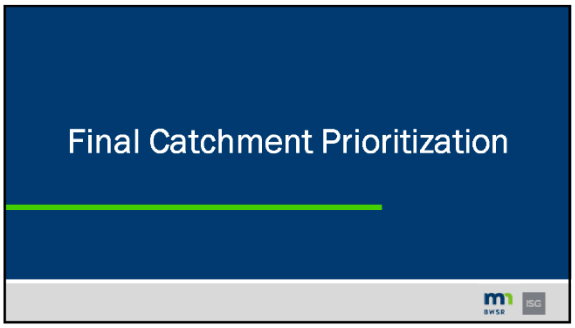

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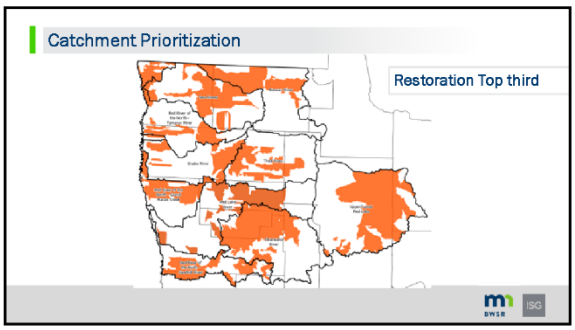

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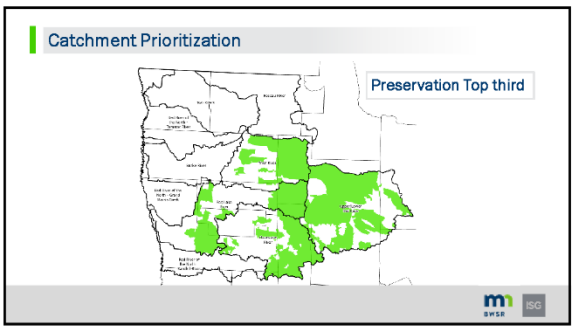

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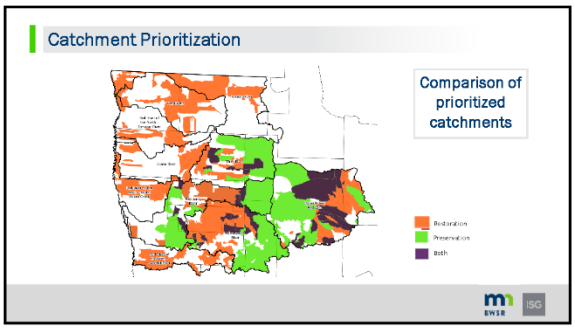

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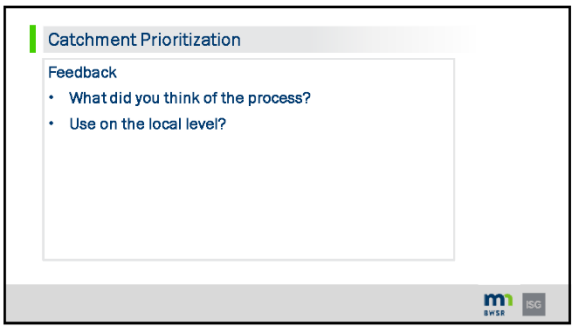

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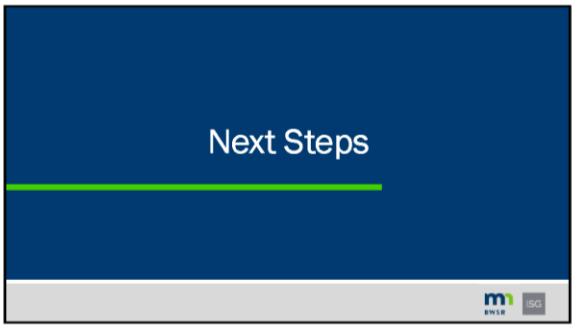
Next Steps

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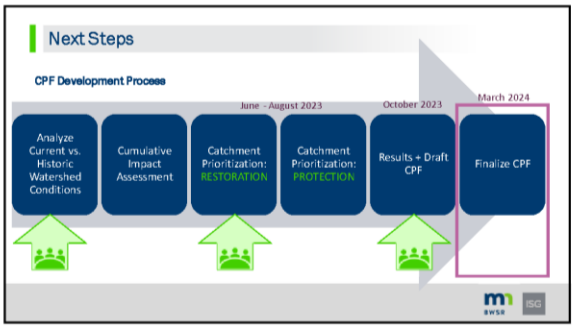
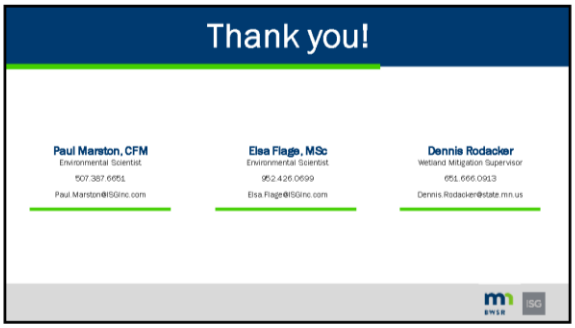

Next Steps
CPF Development Process
June - August 2023
October 2023
March 2024
Analyze Current vs. Historic Watershed Conditions
Cumulative Impact Assessment
Catchment Prioritization: RESTORATION
Catchment Prioritization: PROTECTION
Results + Draft CPF
Finalize CPF

56


Thank you!
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Appendix D: Catchment Prioritization Maps

Figure D-1. Catchment Prioritization Comparison

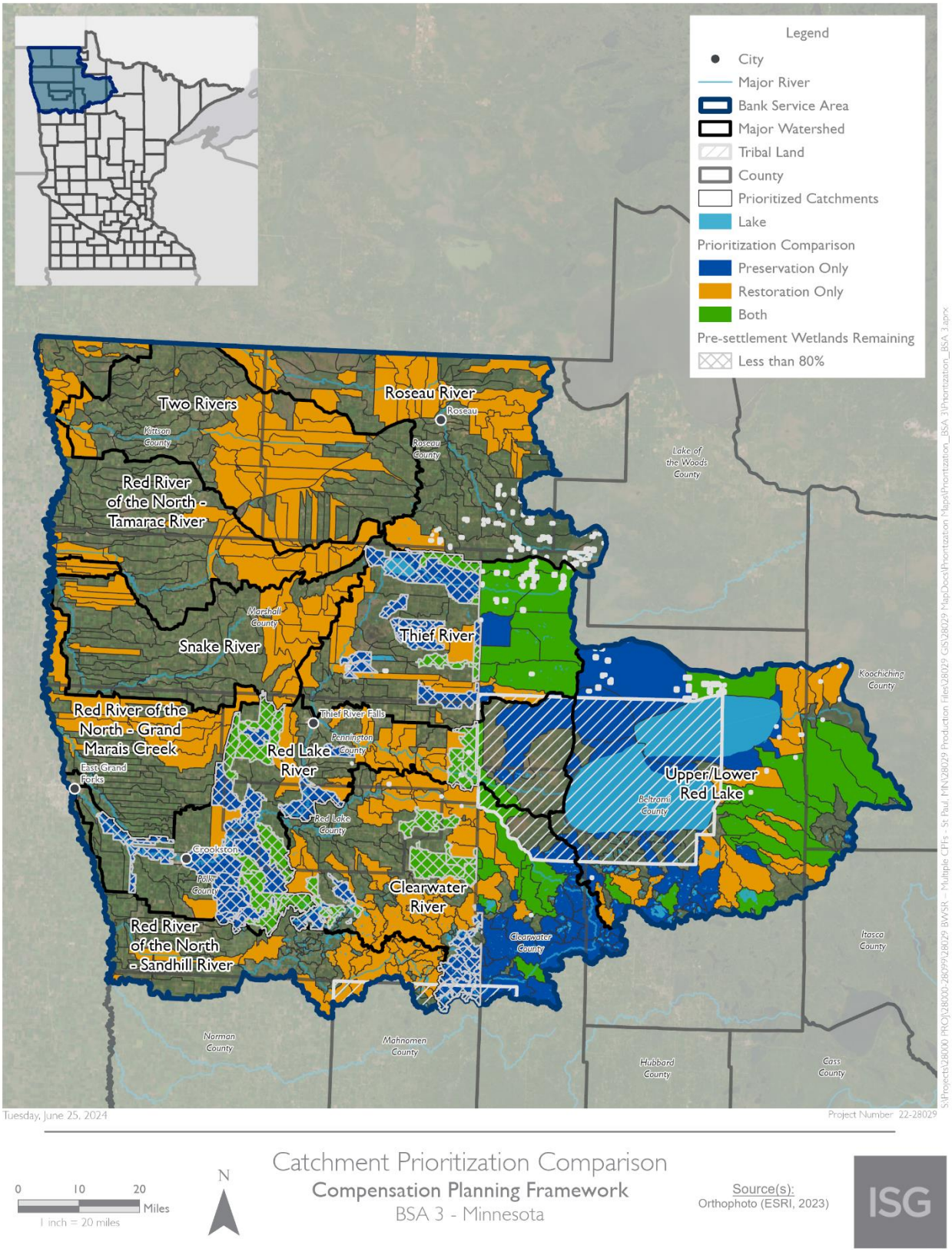


Figure D-2. Unweighted Restoration Catchment Prioritization

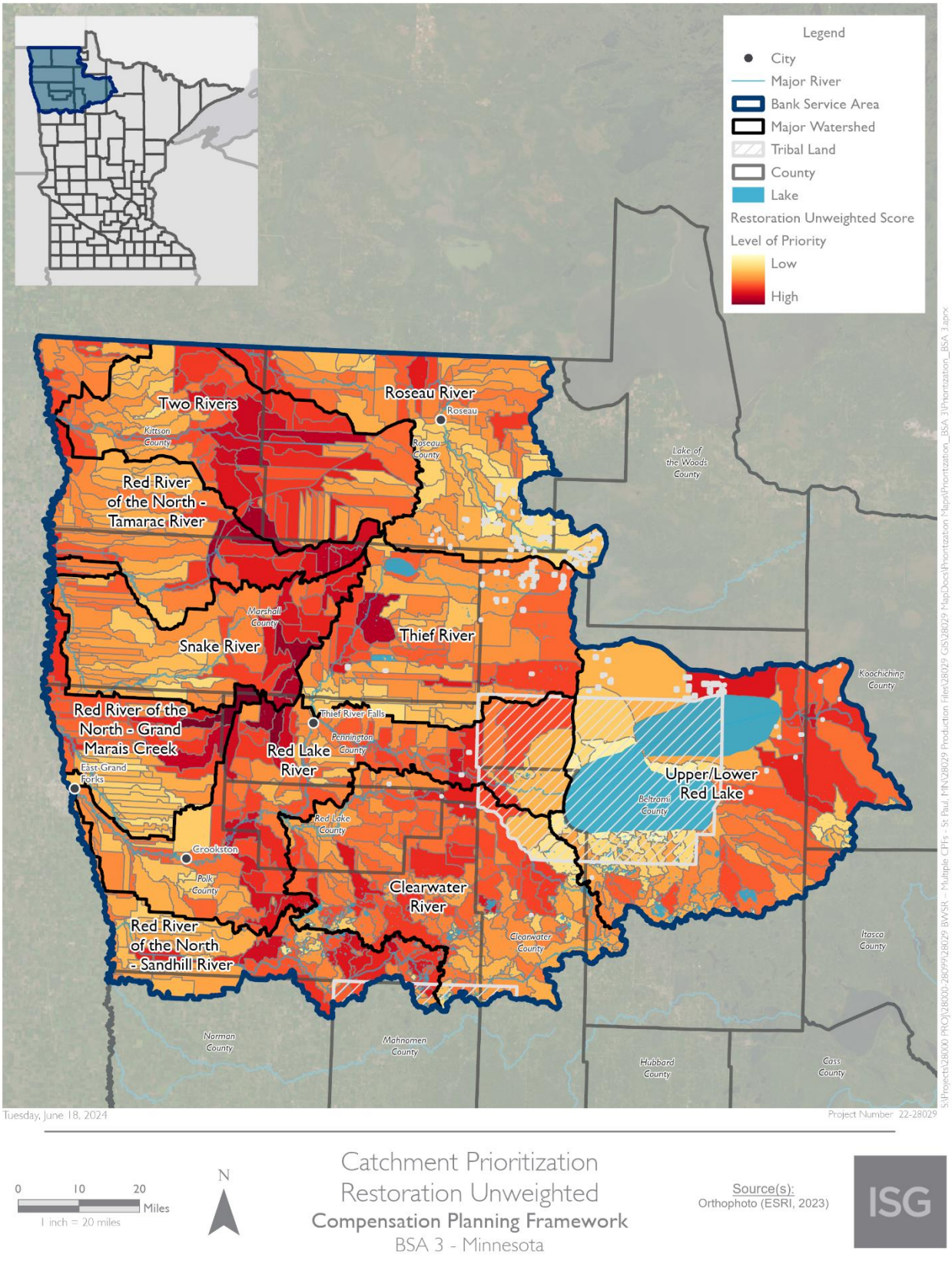


Figure D-3. Unweighted Preservation Catchment Prioritization

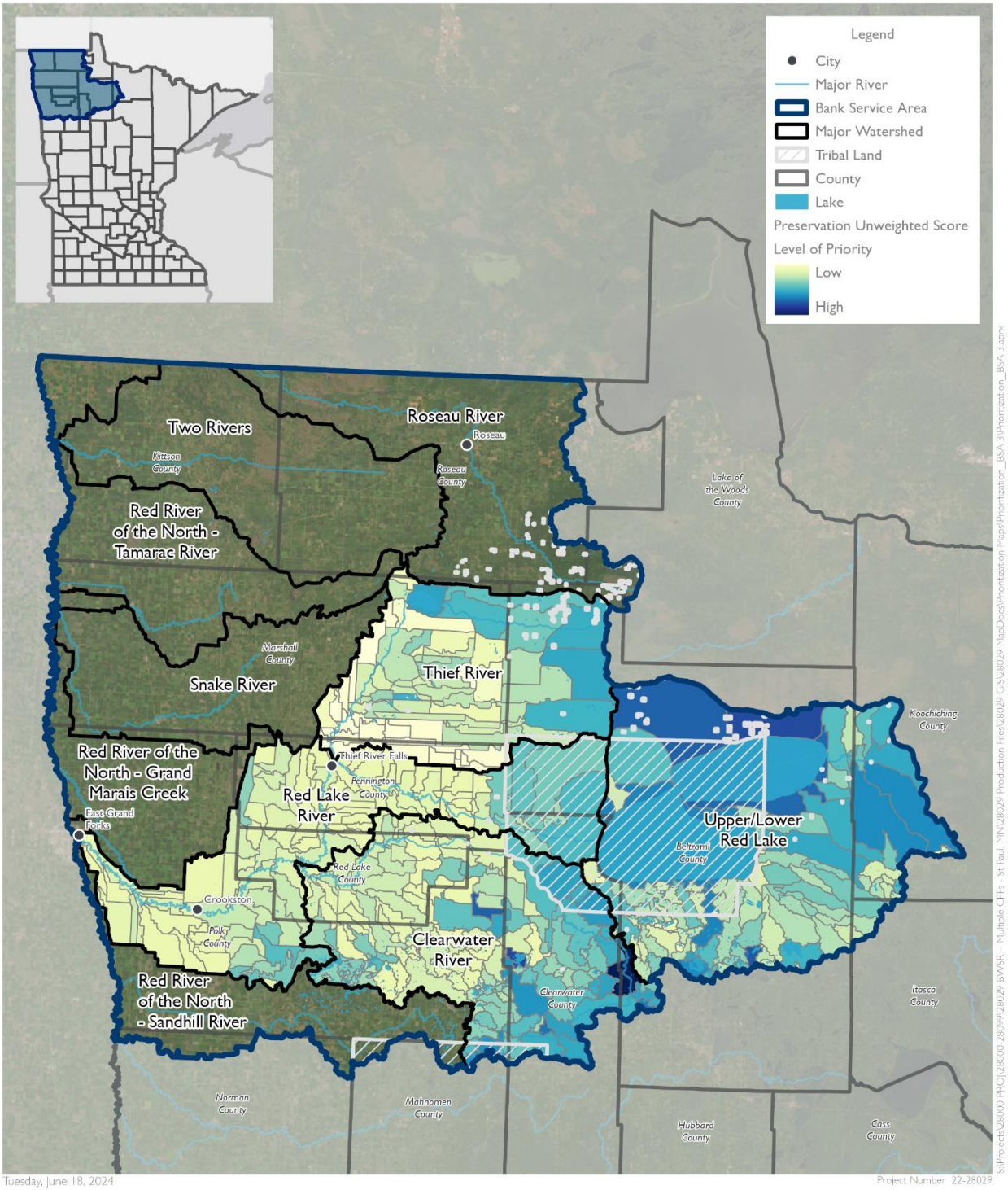


Figure D-4. Weighted Restoration Catchment Prioritization

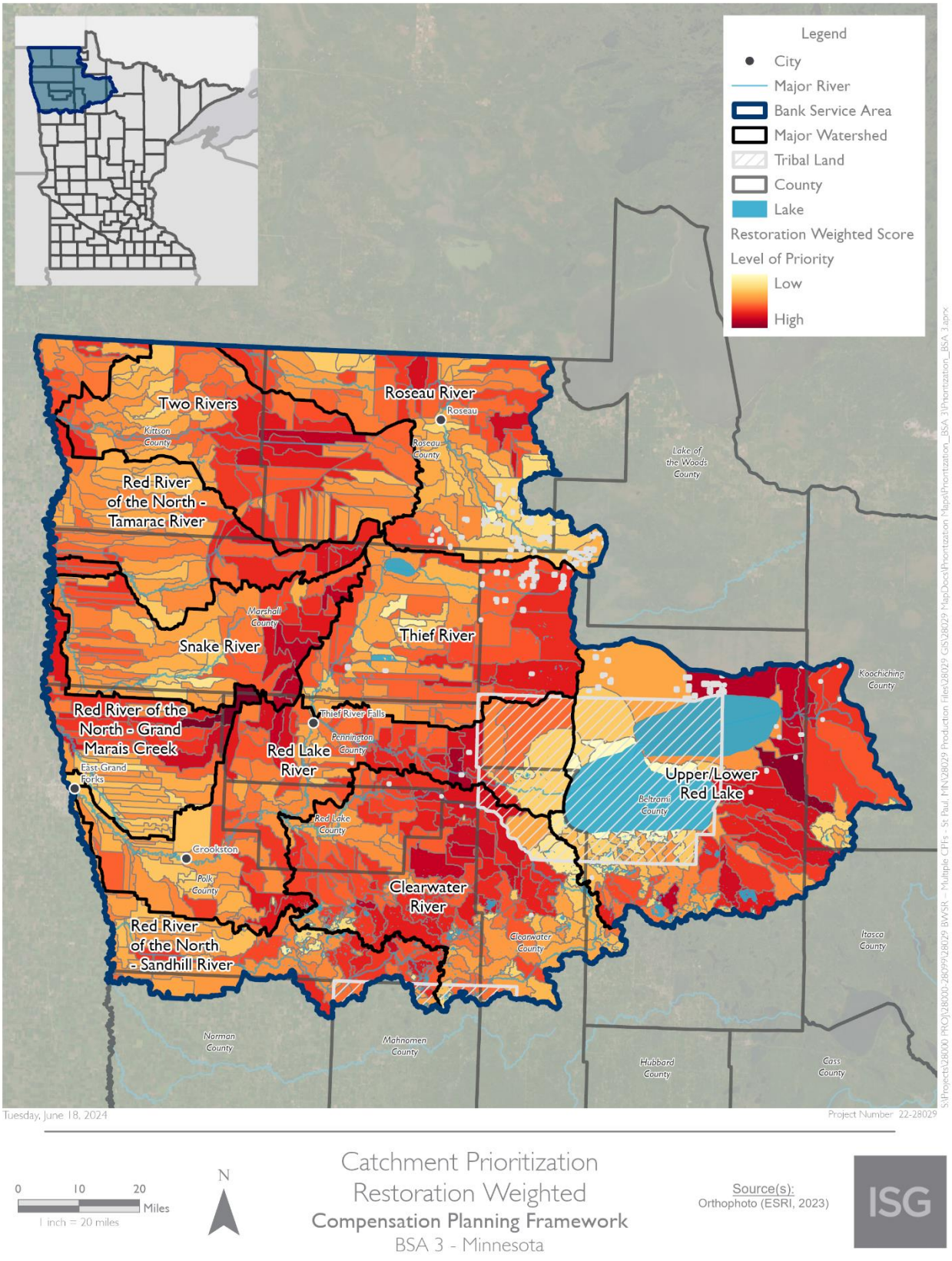


Figure D-5. Weighted Preservation Catchment Prioritization

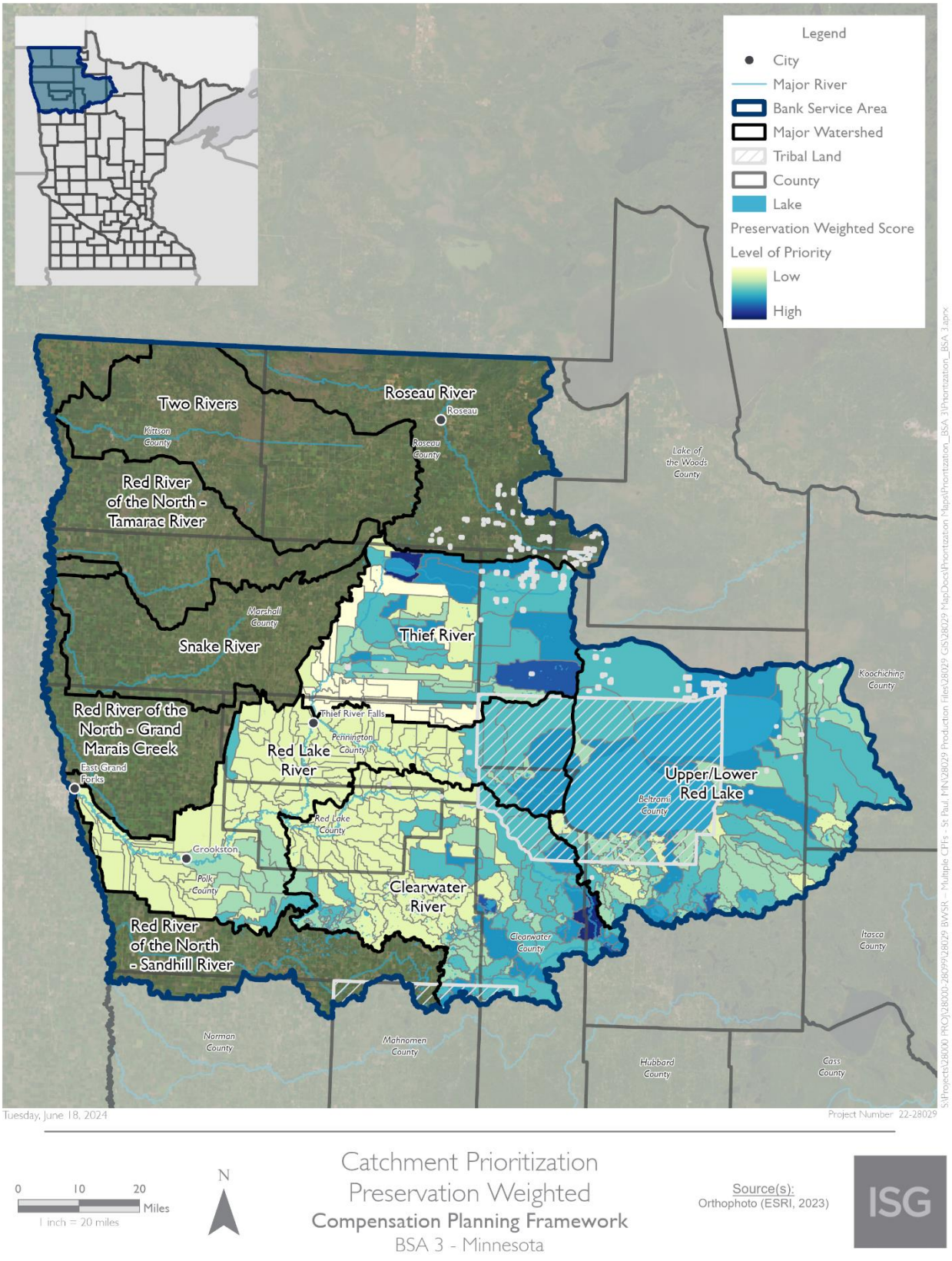


Figure D-6. Final Restoration Catchment Prioritization

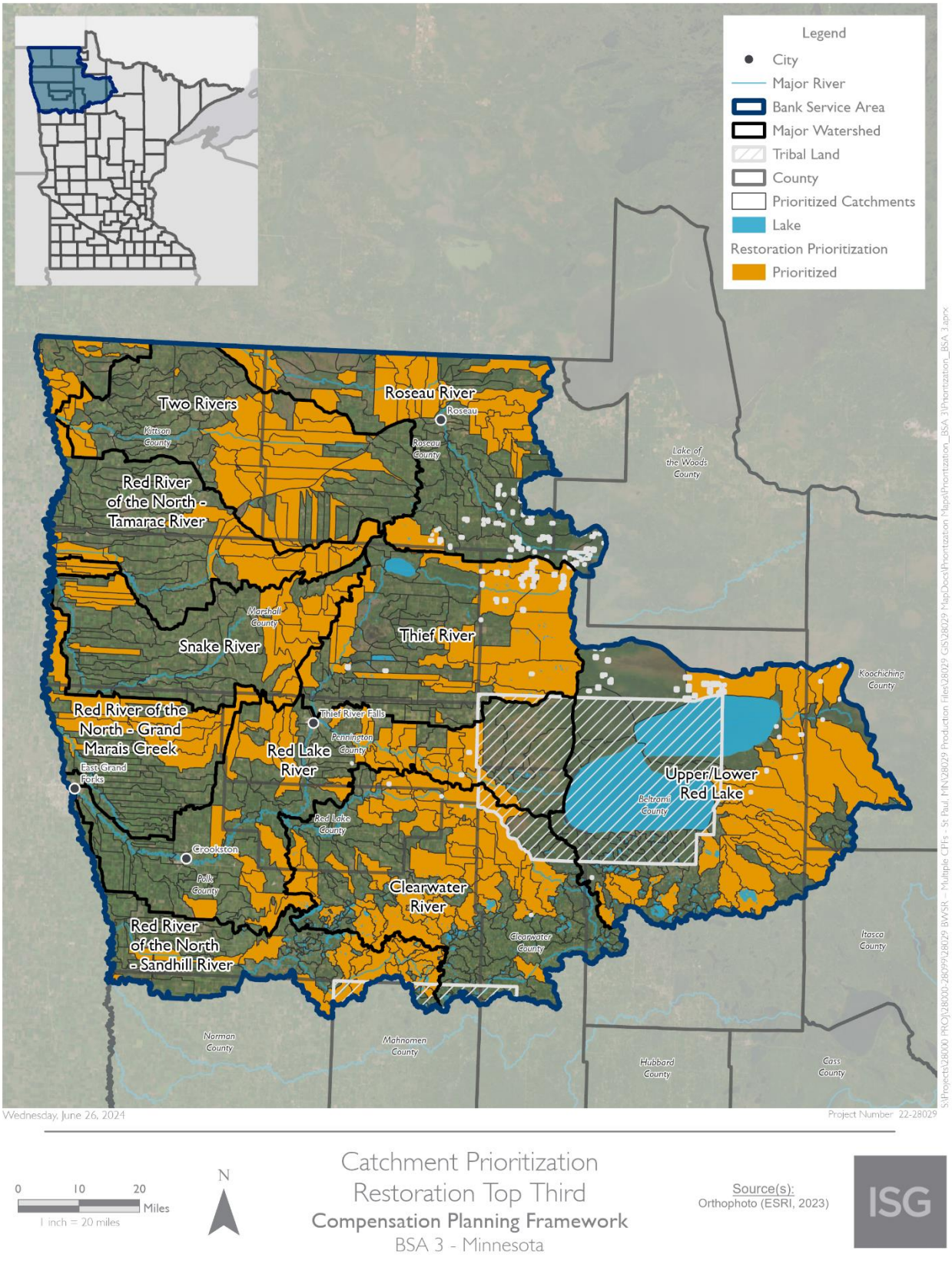


Figure D-7. Final Preservation Catchment Prioritization

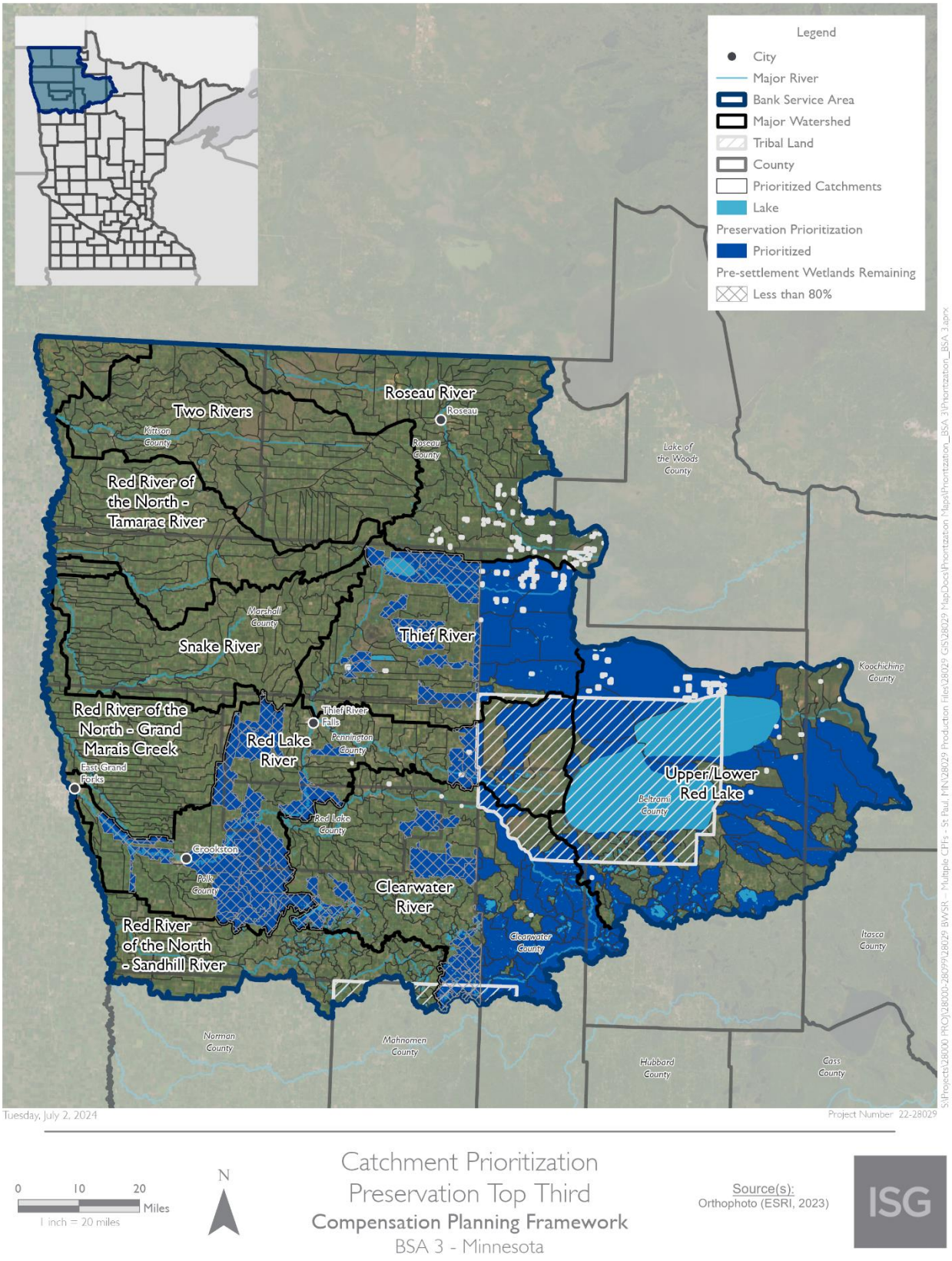


Figure D-8. Final Restoration Catchment Prioritization – Clearwater River Watershed

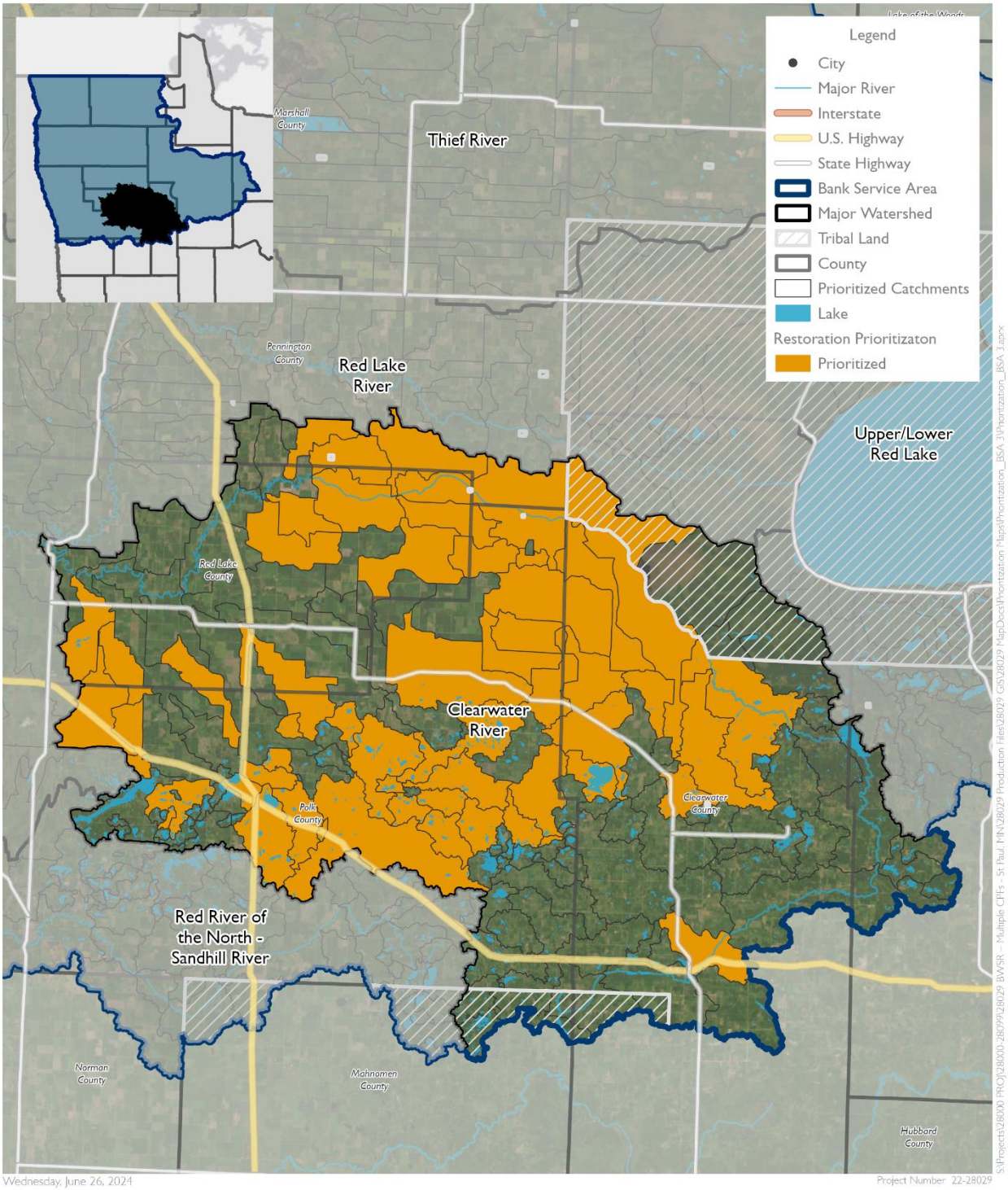


Figure D-9. Final Restoration Catchment Prioritization – Red Lake River Watershed

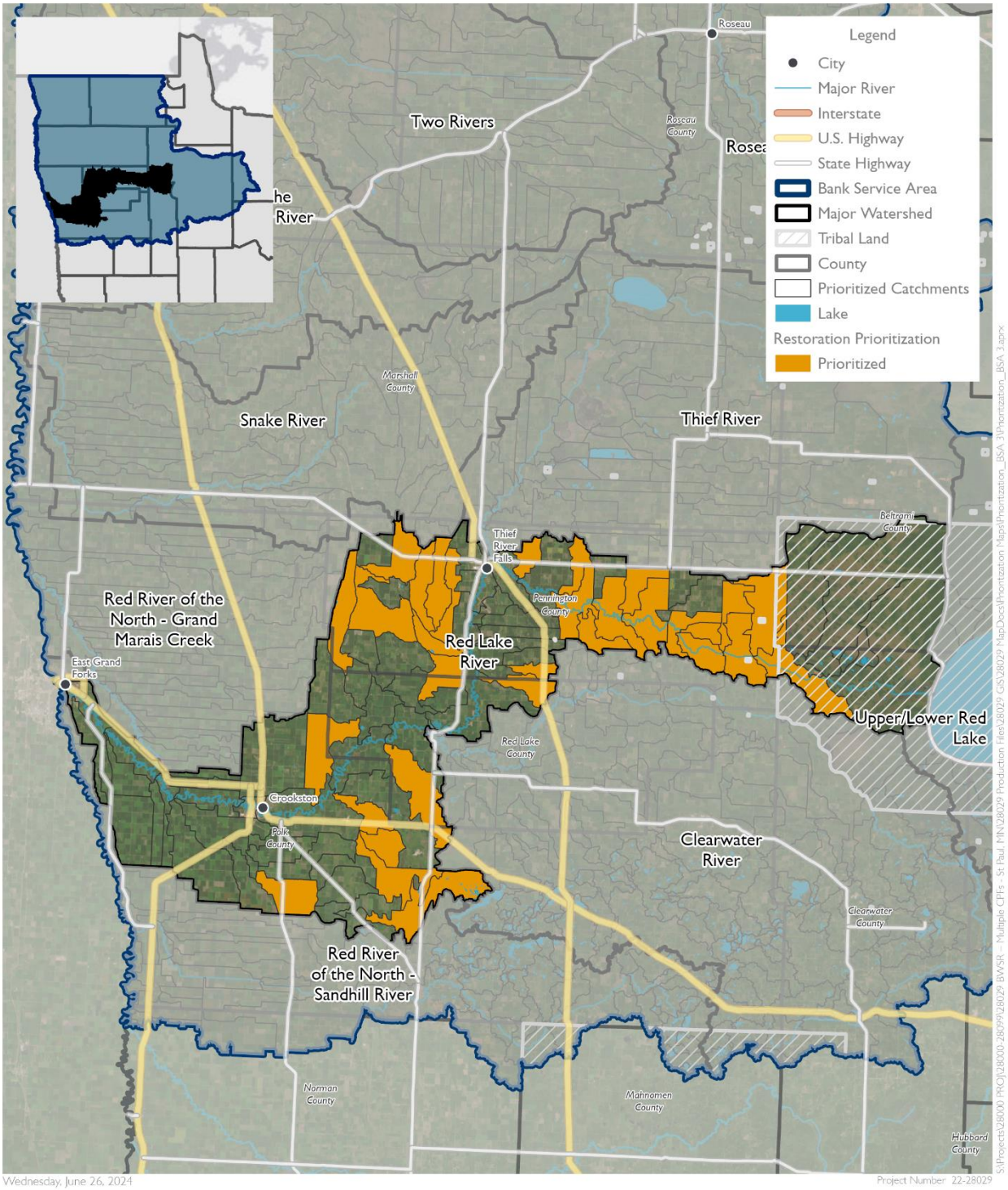


Figure D-10. Final Restoration Catchment Prioritization – RRN – Grand Marais River Watershed

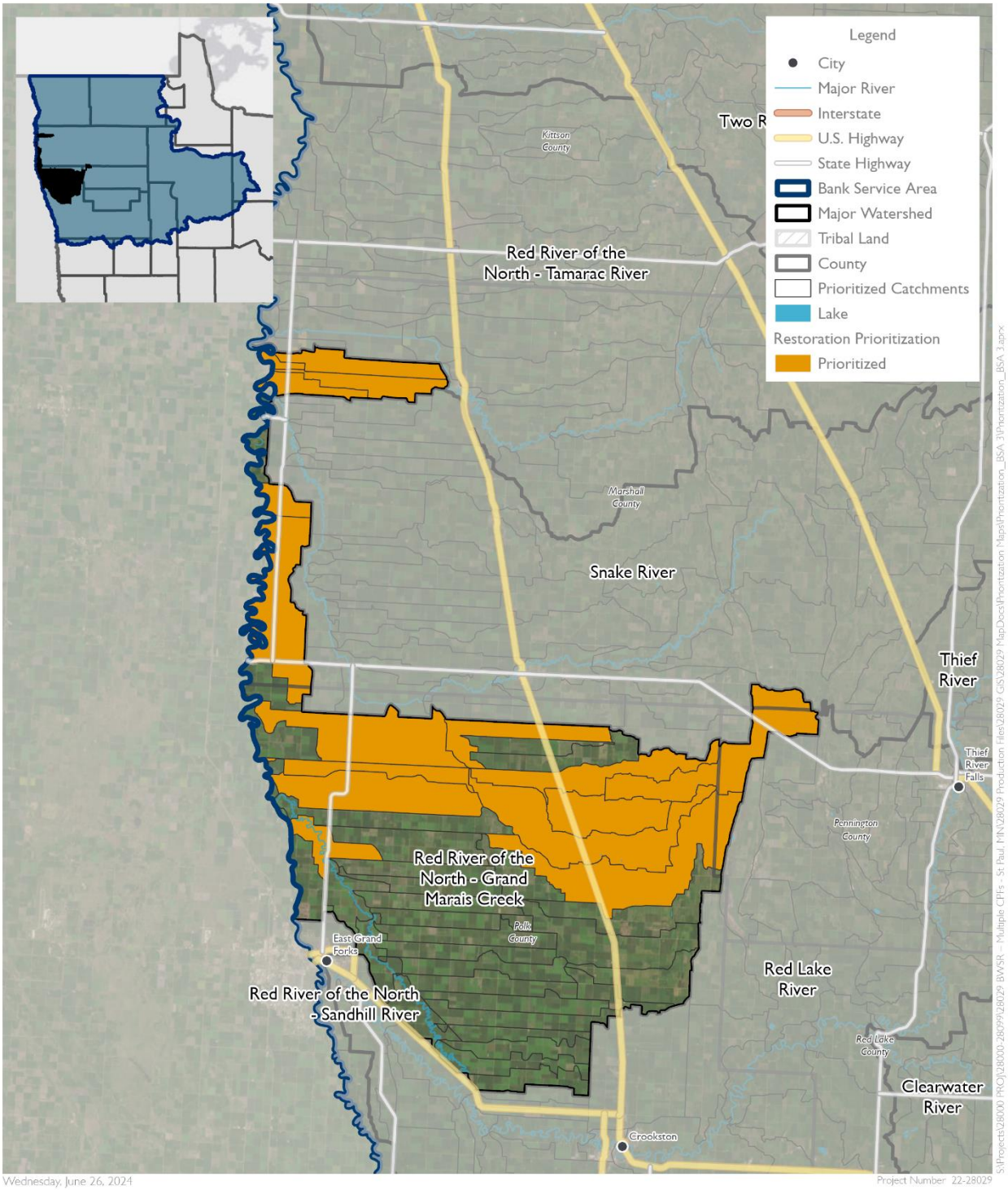


Figure D-11. Final Restoration Catchment Prioritization – RRN – Sandhill River Watershed

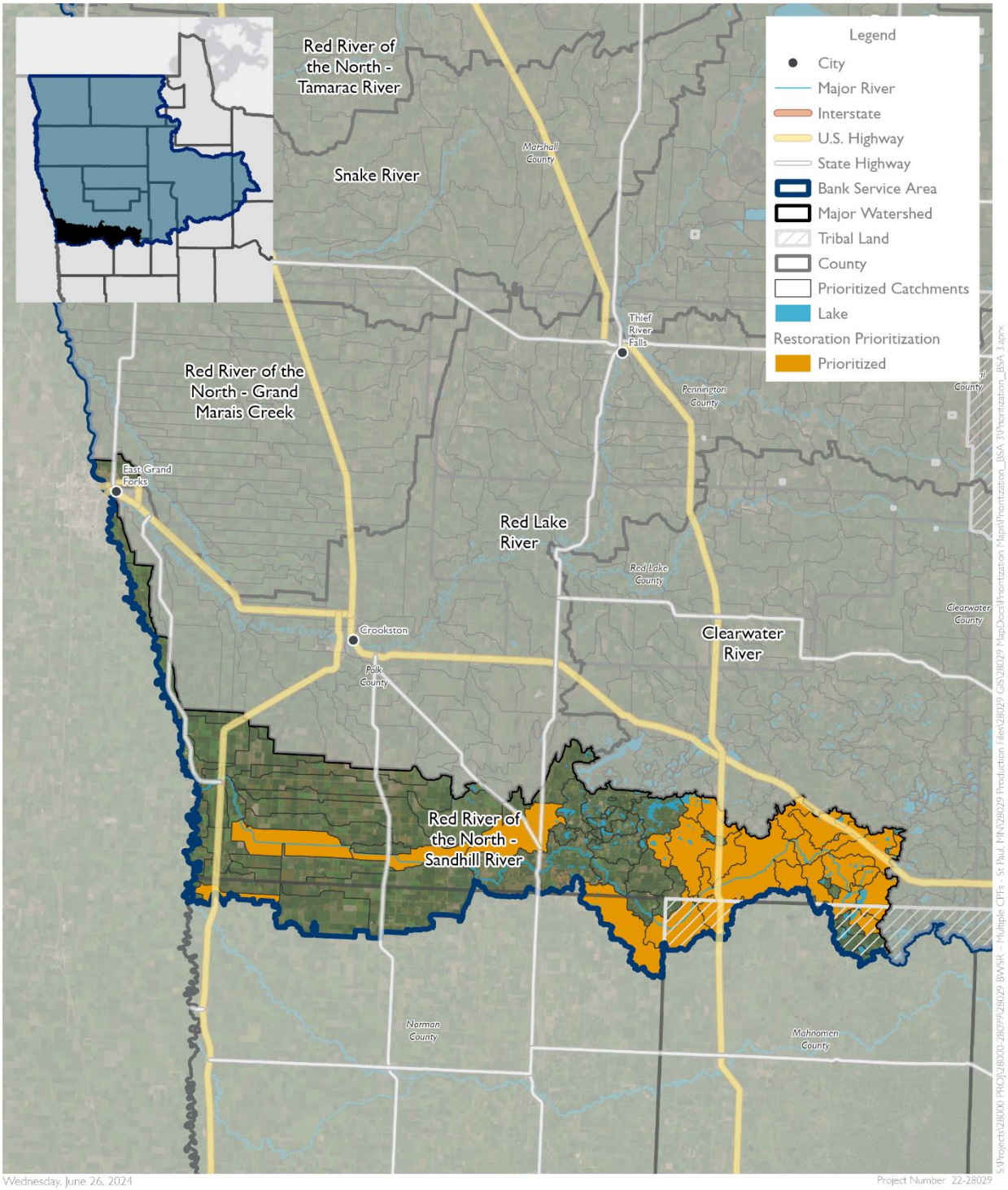


Figure D-12. Final Restoration Catchment Prioritization – RRN – Tamarac River Watershed

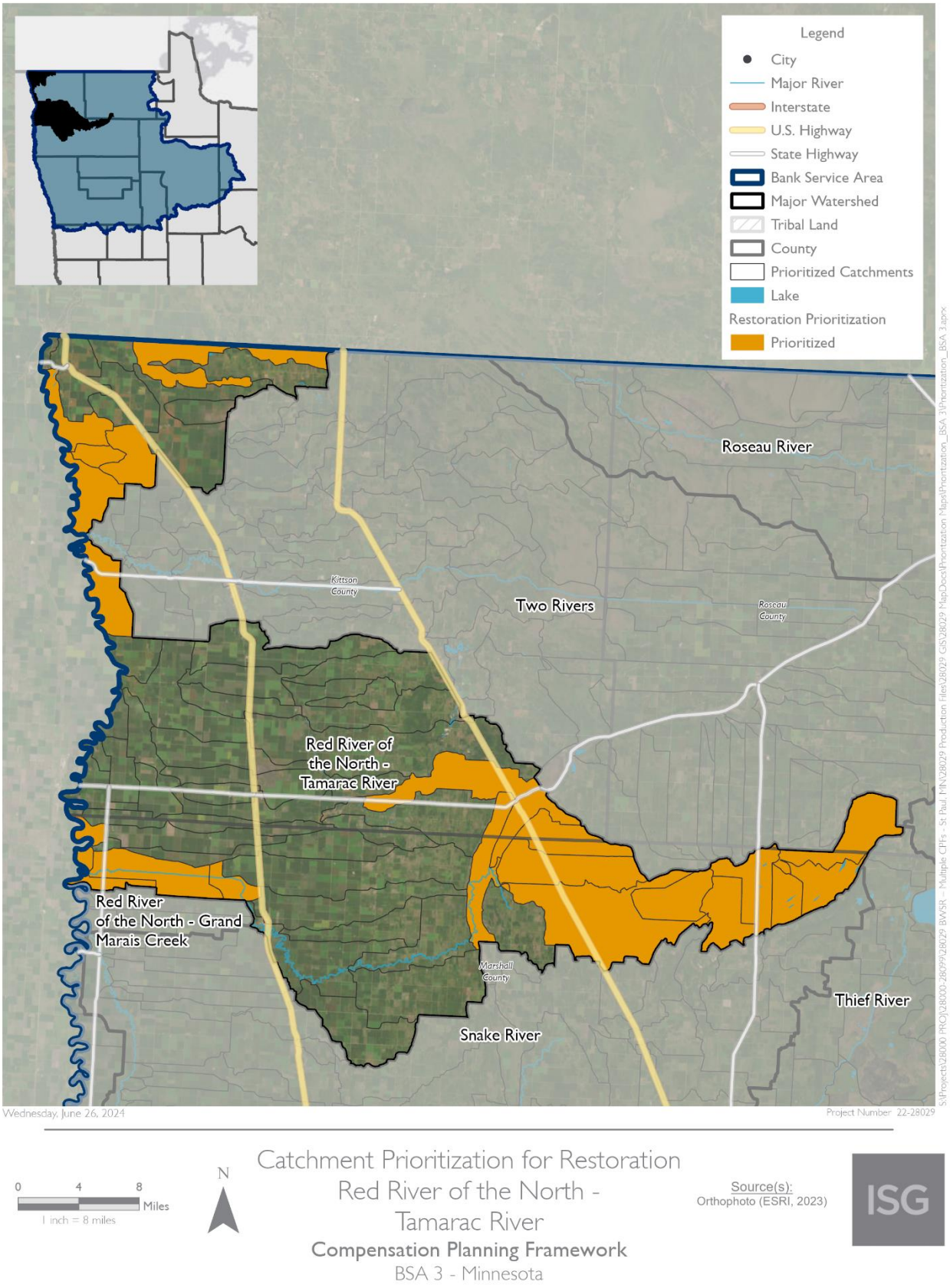


Figure D-13. Final Restoration Catchment Prioritization – Roseau River Watershed

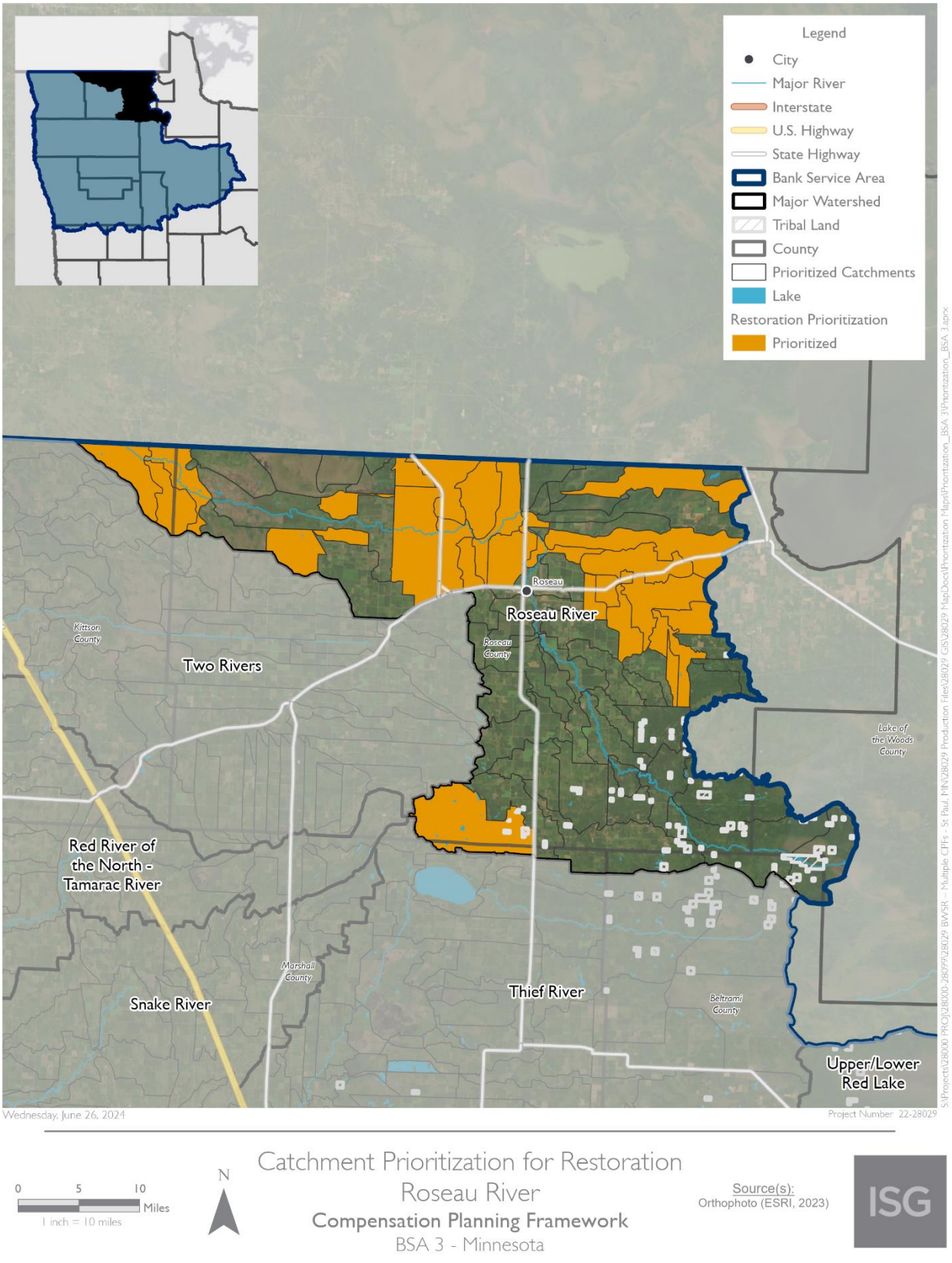


Figure D-14. Final Restoration Catchment Prioritization – Snake River Watershed

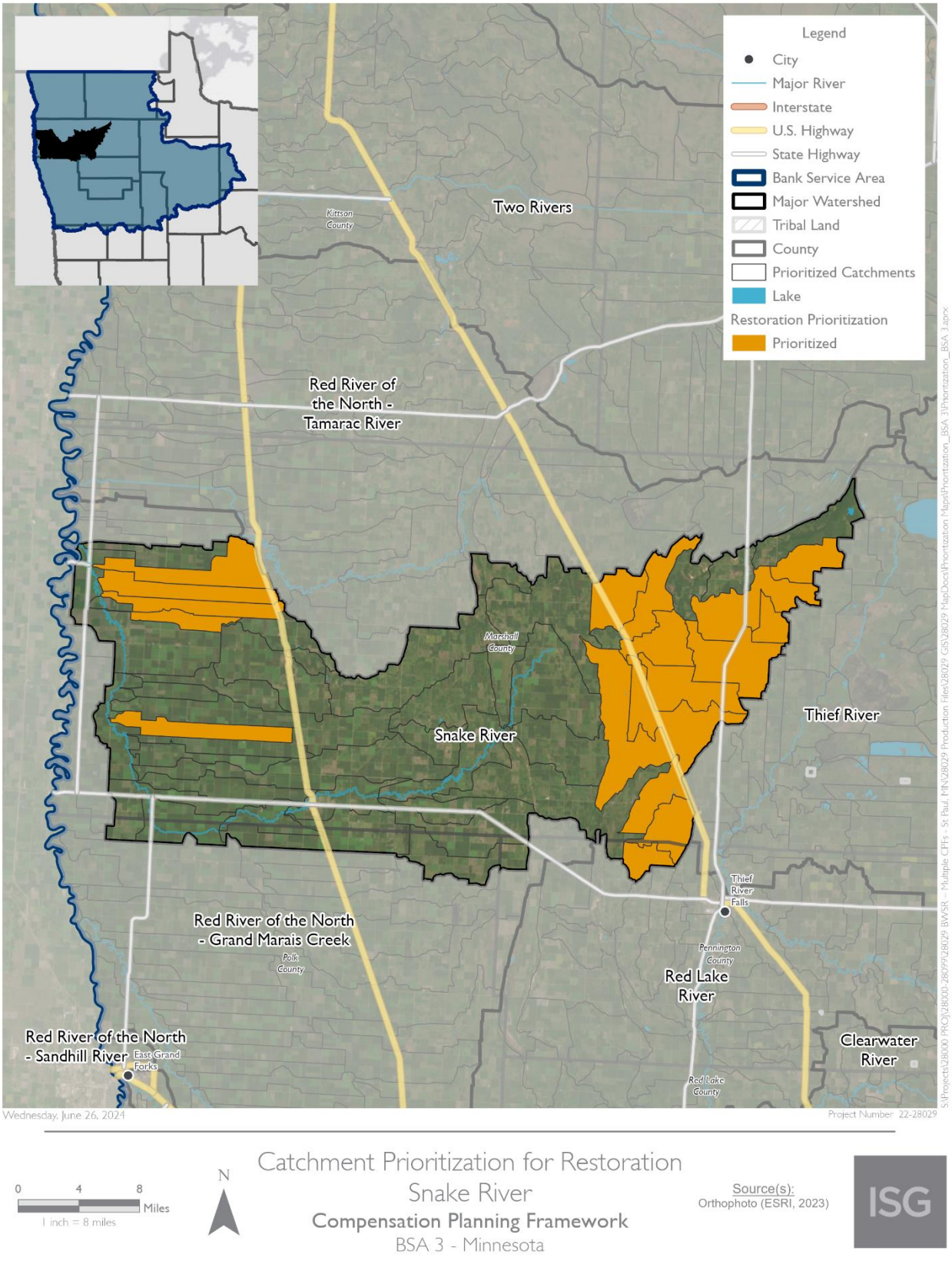


Figure D-15. Final Restoration Catchment Prioritization – Thief River Watershed

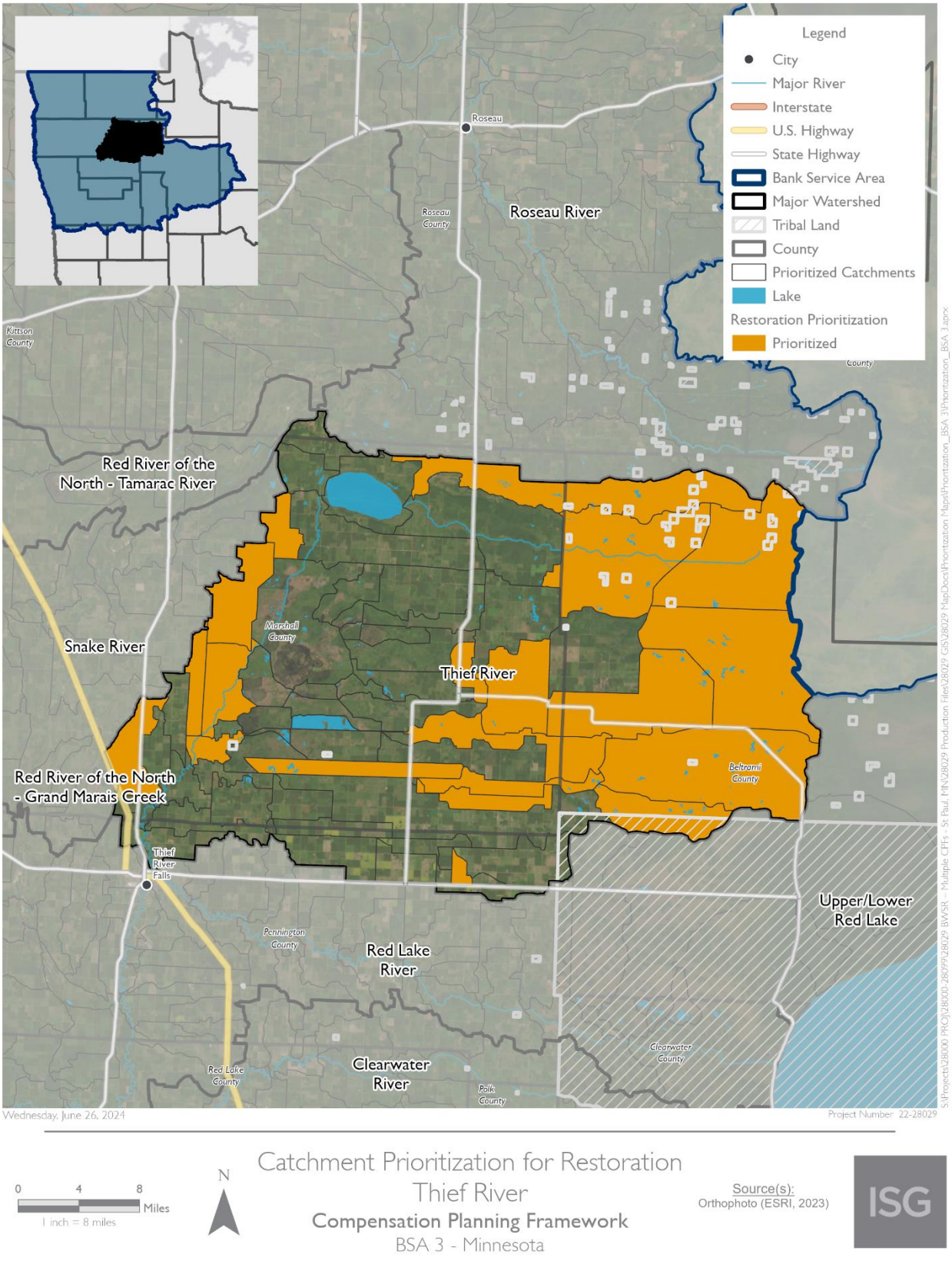


Figure D-16. Final Restoration Catchment Prioritization – Two Rivers Watershed

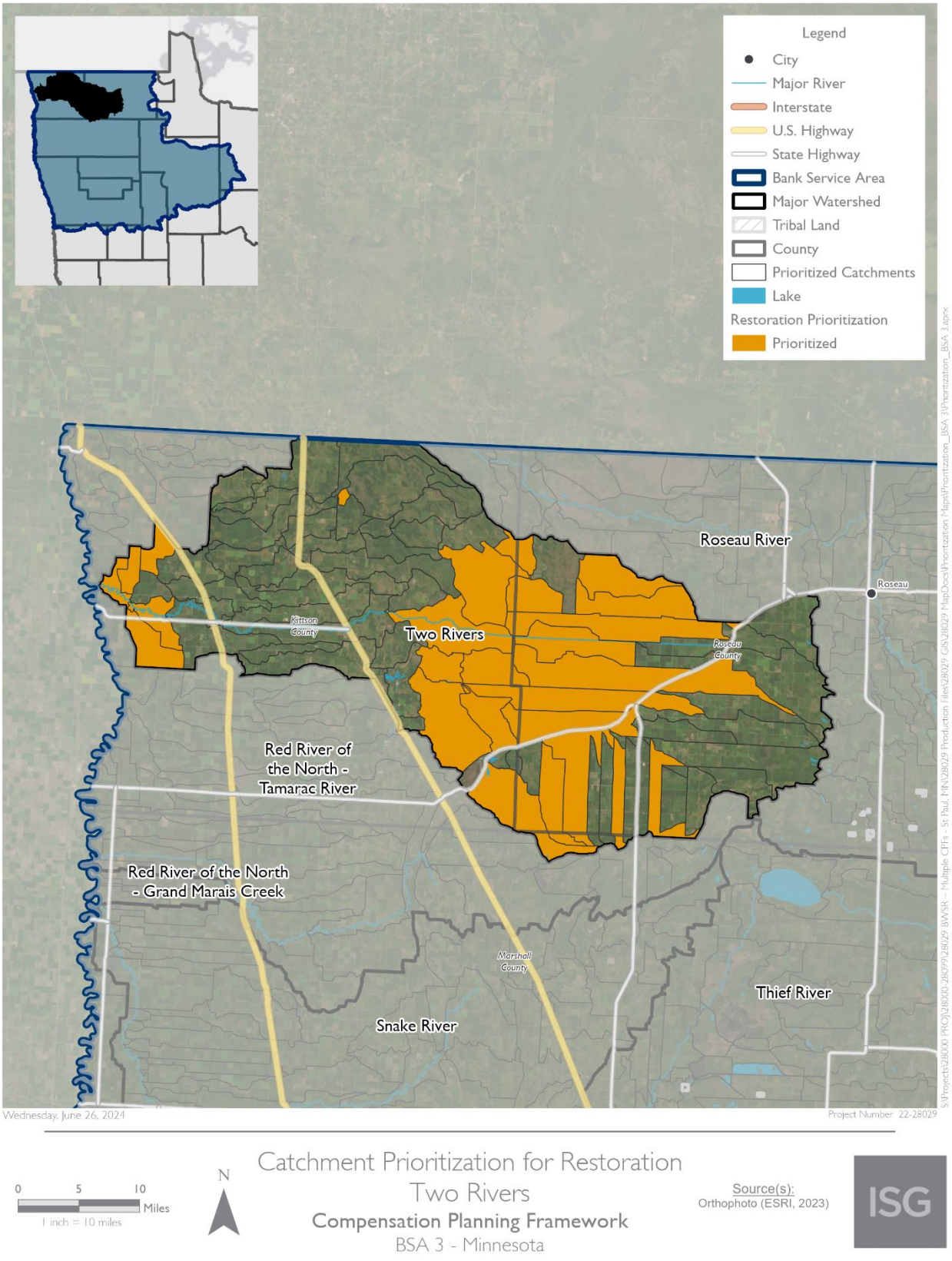


Figure D-17. Final Restoration Catchment Prioritization – Upper/Lower Red Lake Watershed

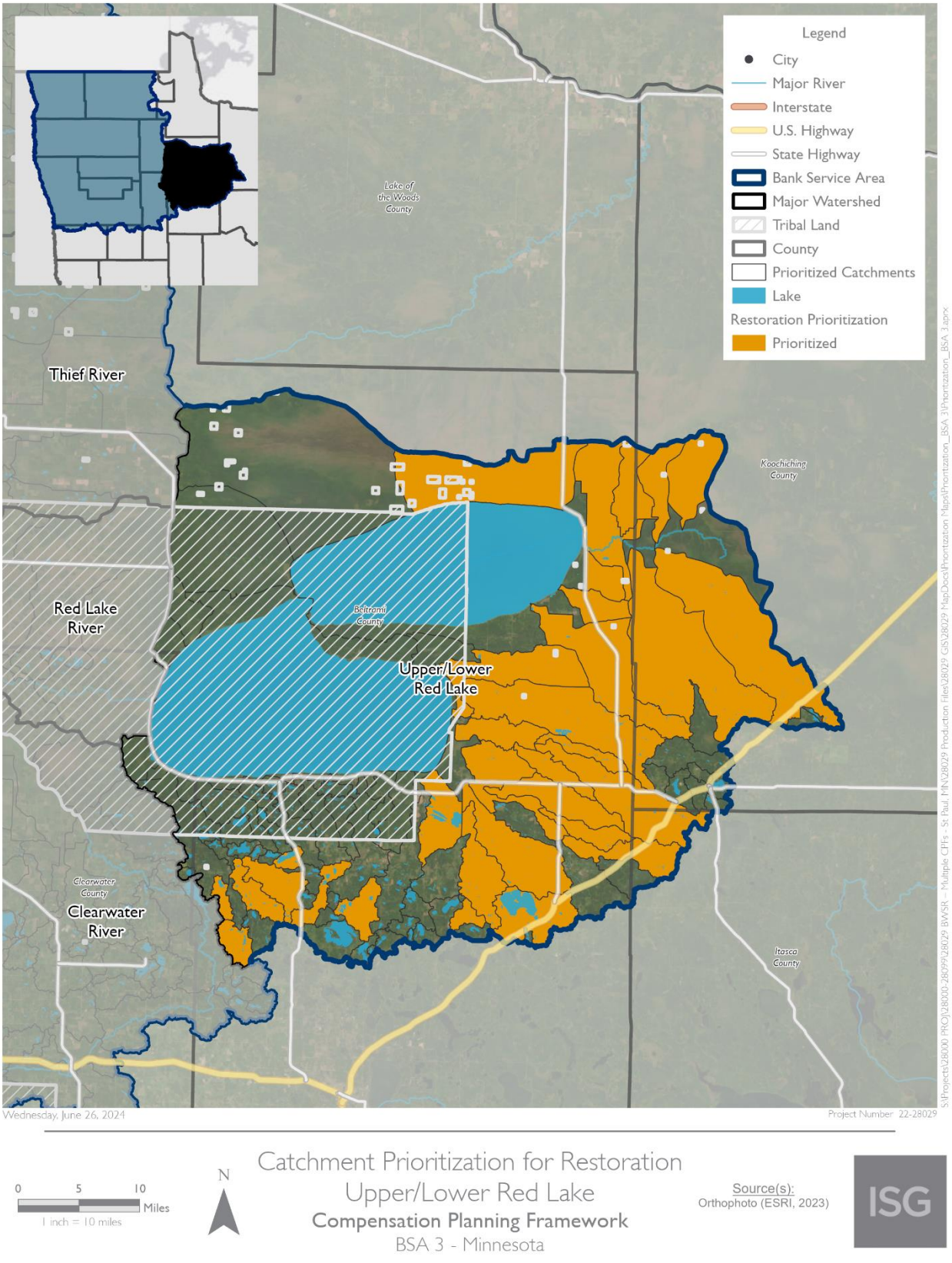
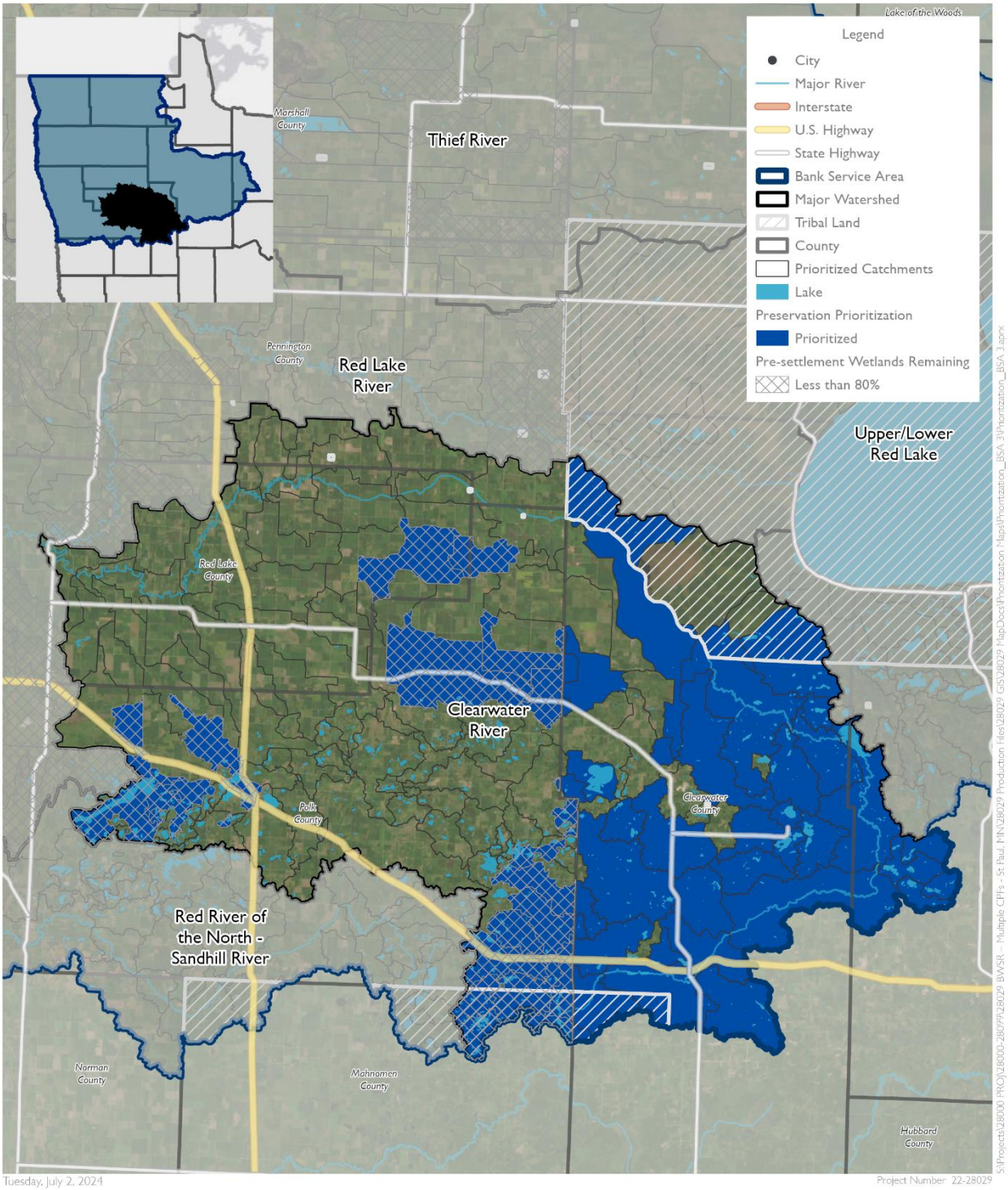


Figure D-18. Final Preservation Catchment Prioritization –Clearwater River Watershed



Catchment Prioritization for Preservation
Clearwater River
Compensation Planning Framework
BSA 3 - Minnesota

0 4 8 Miles
1 inch = 8 miles

N

Source(s):
Orthophoto (ESRI, 2023)

ISG

Figure D-19. Final Preservation Catchment Prioritization – Red Lake River Watershed

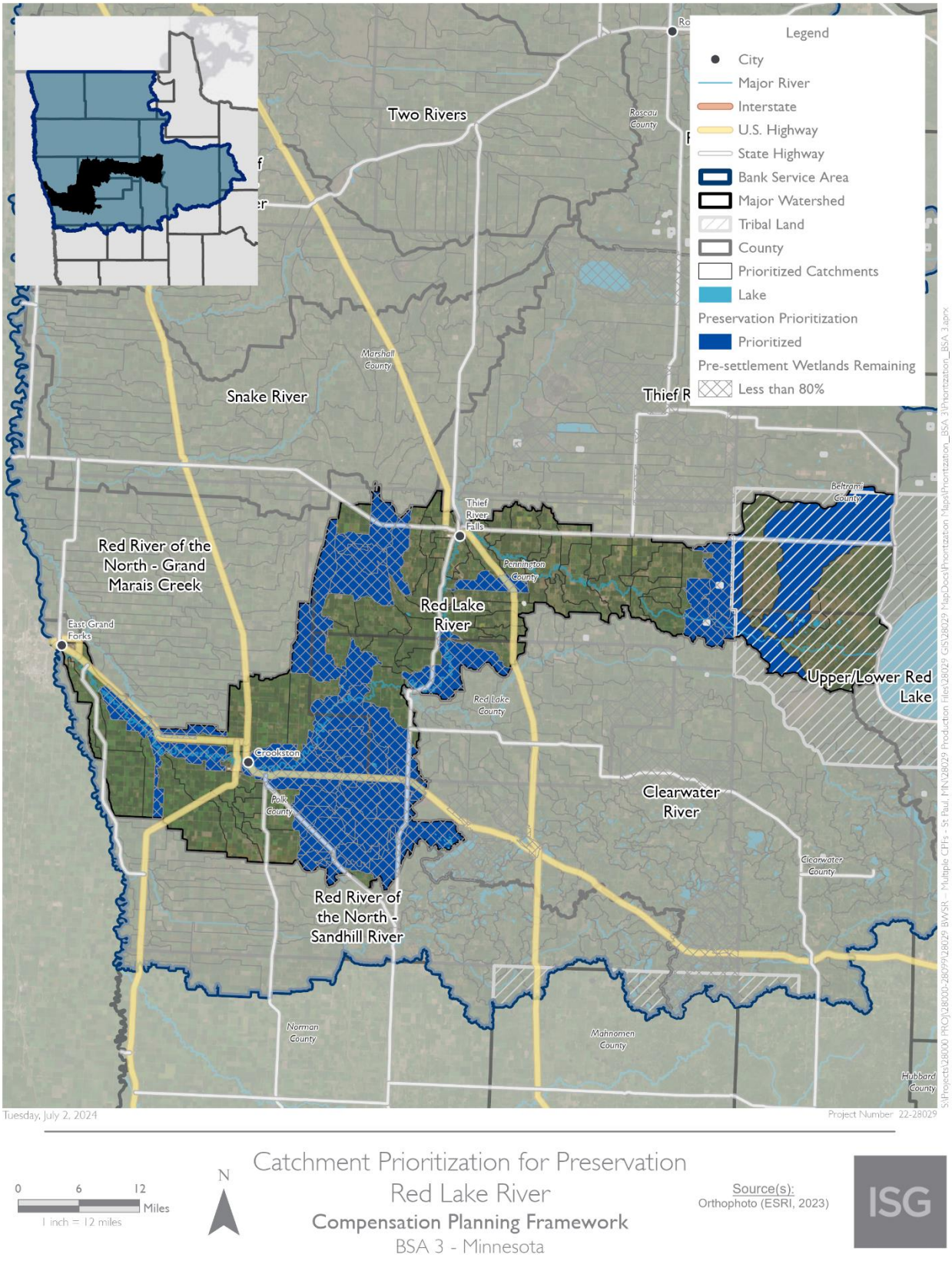


Figure D-20. Final Preservation Catchment Prioritization – Thief River Watershed

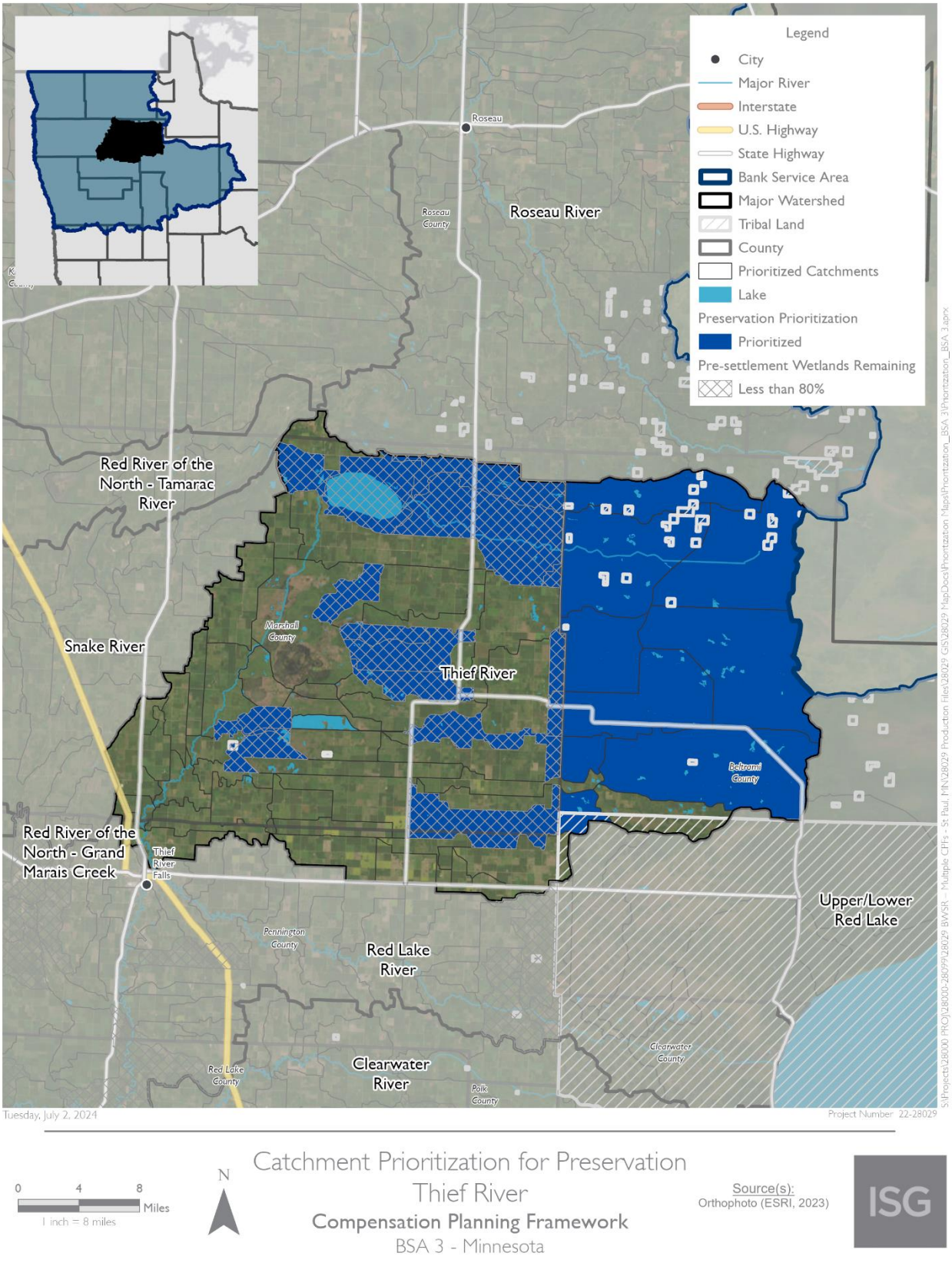


Figure D-21. Final Preservation Catchment Prioritization – Upper/Lower Red Lake Watershed