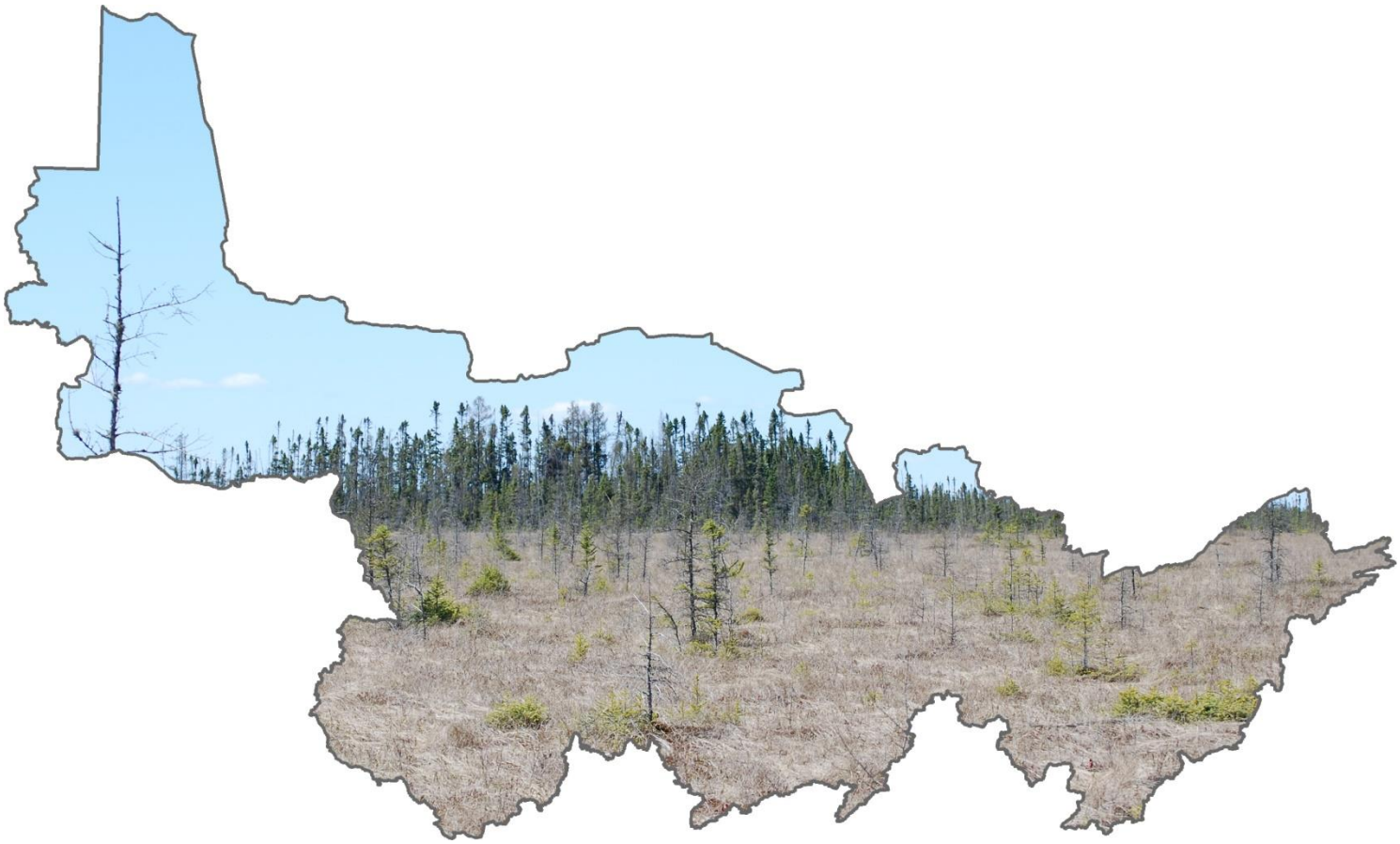

Bank Service Area 2
Compensation Planning Framework

Watershed Based Approach to Wetland Compensatory Mitigation

June 2024
Project No. 22-28029

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THANK YOU + ACKNOWLEDGEMENTS

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1. INTRODUCTION

This Compensation Planning Framework (CPF) provides documentation for a watershed-based approach to compensatory wetland mitigation in the Rainy River Wetland Bank Service Area, also referred to as Bank Service Area (BSA) 2, 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 and CPF 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 Rainy River Wetland Bank Service Area (BSA 2), which is part of the larger Souris-Red-Rainy Region Watershed Basin. The Rainy River Basin has a unique Hydrologic Unit Code (HUC) of 0903. BSA 2 spans approximately 7.2 million acres and eight counties in northern Minnesota. The boundary of BSA 2 ranges from the cities of Warroad to the west and Ely to the east. The Canadian border is to the north and the city of Hibbing to the south (Figure B-1). According to the National Land Cover Database (NLCD), in 2019 land cover in BSA 2 was primarily natural, undeveloped space. Wetlands cover approximately 54% of BSA 2, along with a mix of forest types covering 29% and open water covering 11% (Table 2-1). Only about 1.5% of BSA 2 is developed. The land use across the remaining area includes shrub/scrub, cultivated crops, grassland, pasture/hay and barren land. BSA 2 contains nine major watersheds (HUC 8) including Rainy River – Headwaters (Major Watershed number 72; HUC8 ID 09030001), Vermilion River (73; 09030002), Rainy River – Rainy Lake (74; 09030003), Lower Rainy River – Black River (75; 09030004), Little Fork River (76; 09030005), Big Fork River (77; 09030006), Rapid River (78; 09030007); Lower Rainy River – Baudette (79; 09030008), and Lake of the Woods (80; 09030009). 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**
Woody Wetlands	44%
Mixed Forest	14%
Open Water	11%
Emergent Herbaceous Wetlands	8%
Deciduous Forest	8%
Evergreen Forest	6%
Shrub/Scrub	2%
Developed	2%
Cultivated Crops	1%
Grassland/Herbaceous	1%
Pasture/Hay	1%
Barren Land	< 1%
Land cover data from the National Land Cover Database (NLCD) for BSA 2	

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 but only two of those provinces intersect with BSA 2: Laurentian Mixed Forest and Prairie Parkland. 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 four are present in BSA 2. 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, nine of the subsections are represented within BSA 2. Maps of the provinces, and subsections can be found in Figure B-2. Each province and subsection are 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.

LAURENTIAN MIXED FOREST PROVINCE

The Laurentian Mixed Forest province spans the largest area within BSA 2, covering 99.99% (approximately 7.2 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.-e). There are eight subsections within BSA 2.

Agassiz Lowlands Subsection

The Agassiz Lowlands subsection covers about 2.1 million acres of the western portion of BSA 2. It spans five major watersheds including Big Fork River, Lake of the Woods, Lower Rainy River – Baudette, Lower Rainy River – Black River, and Rapid River. 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.-a, n.d.-j).

Littlefork-Vermillion Uplands Subsection

The Littlefork-Vermillion Uplands subsection covers approximately 1.5 million acres in the central portion of BSA 2. It spans five major watersheds including Big Fork River, Little Fork River, Rainy River – Black River, Rainy River – Rainy Lake, and Vermilion River watershed. 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.-g, n.d.-k).

Chippewa Plains Subsection

The Chippewa Plains subsection covers about 290,000 acres of the southern portion of BSA 2. It is located solely within the Big Fork River watershed. This subsection is characterized by level to gently rolling hills and large lakes. 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.-d).

St. Louis Moraines Subsection

The St. Louis Moraines subsection is heavily forested and has many lakes and wetlands. This subsection is on the southern side of BSA 2 and spans about 270,000 across two of the major watersheds: Big Fork River and Little Fork River. The glacial drift is thick, although less than in the Chippewa Plains Subsection. The majority of the soils in this subsection are loamy calcareous soils and are moderately well drained. Although the soils are mostly well-drained, there are a large number of lakes, rivers, and wetlands because the drainage network is poorly developed. Wetlands are scattered throughout the subsection and include both forested and emergent wetlands (MnDNR, n.d.-l).

Border Lakes Subsection

The northeastern area of BSA 2 is the Border Lakes subsection. This subsection contains the most acres compared to any other subsection within BSA 2 at about 2.3 million acres. Four major watersheds including Little Fork River, Rainy River – Headwaters, Rainy River – Rainy Lake, and Vermilion River watershed intersect this subsection. Lakes, rocky ridges, exposed bedrock, and forests growing on thin, glacial till soil characterize this subsection. Deep stream valleys cutting through bedrock and large lakes are common throughout. Wetlands are

not as common in this subsection because of the lack of soil and exposed bedrock. The area is almost entirely covered by forest, some of which was never logged due to inaccessibility (MnDNR, n.d.-c).

Laurentian Uplands

The Laurentian Uplands subsection is located in the southeast region of BSA 2. All 320,000 acres within BSA 2 are entirely contained within the Rainy River – Headwaters. This subsection is unique in that some sections drain south to Lake Superior and other sections drain north to Rainy Lake. It is characterized by brown glacial sediment deposits. Soils are predominantly well drained sandy loam with pockets of peat in the low-lying wetland areas. Most of the subsection is forested and there is some mining activity, although it is not within BSA 2 (MnDNR, n.d.-f).

Nashwauk Uplands Subsection

The Nashwauk Uplands subsection covers a large swath of land in the southeastern portion of BSA 2. It comprises approximately 410,000 acres, spanning three major watersheds: Little Fork River, Rainy River – Headwaters, and Vermilion River watersheds. One of the defining characteristics of this section is Giants Ridge, a high, narrow ridge of exposed bedrock. This subsection is rich in iron ore and mining is prevalent. Conifer forests grow on top of well-drained soils. Most pockets of wetlands in this area are conifer bogs and swamps. Giants Ridge and the Continental Divide make up the southern border of the subsection. Water from this subsection either flows north to the Hudson Bay or west to the Mississippi River (MnDNR, n.d.-h).

North Shore Highlands Subsection

Covering the smallest area within the Laurentian Mixed Forest Provence of BSA 2, about 6,000 acres, is the North Shore Highlands subsection. There are pockets of this subsection on the very eastern border of BSA 2. A thin layer of brown and red glacial till on top of bedrock is characteristic of this subsection, where textures range from sand to clay. Bedrock is exposed in large sections of the area. Wetlands are not as extensive in this subsection but are still present. There tend to be numerous streams and small lakes (MnDNR, n.d.-i).

TALLGRASS ASPEN PARKLAND PROVINCE

The Tallgrass Aspen Parkland province spans a very small portion of BSA 2, covering less than 0.01% (approximately 1,300 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.-m). There is one subsection within BSA 2.

Aspen Parklands Subsection

The only subsection within the Tallgrass Aspen Parkland Province in Minnesota, the Aspen Parklands subsection covers ~1,300 acres in the Rapid River watershed. This subsection is the transition zone from peatlands to the East to prairie in the West. It is surrounded by peatlands in the Agassiz Lowlands subsection within BSA 2. 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 2										
Province:	**Laurentian Mixed Forest**								**Tallgrass Aspen Parklands**	
Section:	**Northern Minnesota and Ontario Peatlands**		**Northern Minnesota Drift and Lake Plains**		**Northern Superior Uplands**				**Lake Agassiz, Aspen Parklands**	
Subsection:	**Agassiz Lowlands**	**Littlefork-Vermillion Uplands**	**Chippewa Plains**	**St. Louis Moraines**	**Border Lakes**	**Laurentian Uplands**	**Nashwauk Uplands**	**North Shore Highlands**	**Aspen Parklands**	**Total**
Big Fork River	269,145	549,945	292,471	203,575	-	-	-	-	-	**1,315,136**
Lake of the Woods	736,495	-	-	-	-	-	-	-	-	**736,495**
Little Fork River	-	785,355	-	62,438	104,612	-	245,891	-	-	**1,198,296**
Lower Rainy River – Black River	302,600	25,536	-	-	-	-	-	-	-	**328,136**
Lower Rainy River – Baudette	196,579	-	-	-	-	-	-	-	-	**196,579**
Rainy River – Headwaters	-	-	-	-	1,252,632	324,816	23,637	6,091	-	**1,607,178**
Rainy River – Rainy Lake	-	110,110	-	-	472,455	-	-	-	-	**582,565**
Rapid River	602,564	-	-	-	-	-	-	-	1,280	**603,844**
Vermilion River	-	954	-	-	517,938	-	142,407	-	-	**661,299**
BSA 2 Total	**2,107,383**	**1,471,899**	**292,471**	**266,013**	**2,347,637**	**324,816**	**411,936**	**6,091**	**1,280**	**7,229,528**

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.

RAINY RIVER- HEADWATERS

The Rainy River – Headwaters watershed (HUC 09030001) is located along the northern most border of BSA 2. It includes three counties: Cook, Lake, and St. Louis. The population within the watershed, based on the 2010 U.S. Census, was 6,261. The watershed is primarily forested (40%), with 29% of the watershed having wetland cover and 14% of the watershed being open water (MnDNR, 2015e).

The watershed spans four different ecological subsections, including the Border Lakes, Laurentian Uplands, Nashwauk Uplands, and the North Shore Highlands. About one-quarter of the watershed is considered wetland. Emergent wetlands comprise about 6% of the wetland area and forested wetlands about 94% (MnDNR, 2017f). Soils in the Rainy River - Headwaters watershed are loamy with some areas high in sand and organic matter. The watershed receives an average of 29.0 inches of precipitation every year. Most of the precipitation (11.0 inches) falls during the summer (June through August) (MnDNR, 2019e).

VERMILION RIVER

The Vermilion River watershed (HUC 09030002) is located on the eastern side of BSA 2. It has a population of 5,977 according to the 2010 U.S. Census and covers one county: St. Louis. The watershed is primarily forested (48%) but also has a high number of wetlands, lakes, and streams(MnDNR, 2015i). Development is low across the watershed at less than 1%. Recreation and tourism are popular in this watershed, as well as the forest industry, and some mining and farming (MPCA, 2023).

Vermilion River covers three different ecological subsections including Border Lakes, Nashwauk Uplands, and Littlefork-Vermillion Uplands. Forested wetlands make up 86% of the wetland area, with emergent wetlands comprising 14%. The dominate soil types across the watershed are loamy with some areas of high sand and organic matter. Annually, Vermilion River watershed receives on average 27.2 inches of precipitation. The majority of the precipitation occurs during the summer months (11.2 inches) and the least occurs during the winter months (2.7 inches) (MnDNR, 2019h).

LITTLE FORK RIVER

The Little Fork River watershed (HUC 09030005) is in the center of BSA 2. It covers three different counties including St. Louis, Koochiching, and Itasca. Based on the 2010 U.S. Census the population in the watershed

was 7,319. This watershed has the highest population in BSA 2. The watershed is primarily wetland at 46% cover, with 37% of the watershed being forested (MnDNR, 2015c). Development in this watershed is less than 2%. There are no large cities in this remote watershed. Agriculture covers about 2% of the watershed and is primarily pasture and hay. The watershed has a history of timber harvesting and tourism (J. Anderson et al., 2006).

The ecological subsections included in this watershed include the Littlefork-Vermillion Uplands, Nashwauk Uplands, Border Lakes, and the St. Louis Moraines. Of the wetlands within this watershed, forested wetlands make up 87% of the wetland area and emergent wetlands make up 13% (MnDNR, 2017d). Soils in the Little Fork River watershed are loamy with some areas of high clay and some areas of high organic matter. The average annual precipitation is 26.8 inches. Summer receives the most precipitation at 11.2 inches and winter receives the least, 2.6 inches (MnDNR, 2019c).

RAINY RIVER – RAINY LAKE

The Rainy River – Rainy Lake watershed (HUC 09030003) is located along the northern border in the center of BSA 2. The 2010 U.S. Census listed the population as 5,103. It crosses two counties, including St. Louis and Koochiching. There are no large cities in this remote watershed. The watershed is primarily forested (45%), with 32% of the watershed being wetland cover and 17% of the watershed being open water. Only 1% of the watershed is developed(MnDNR, 2015g).

The ecological subsections in the Rainy River – Rainy Lake watershed include the Border Lakes and the Littlefork-Vermillion Uplands. Forested wetlands comprise 83% of the wetland areas with emergent wetlands making up 17% of the wetland areas (MnDNR, 2017h). Soils across the watershed range from sand and loams to organic. The watershed receives about 27.3 inches of precipitation per year. The summer average precipitation is 11.2 inches, and, in the winter, it is 3.0 inches (MnDNR, 2019f).

BIG FORK RIVER

The Big Fork River watershed (HUC 09030006) is located in the center of BSA 2. According to the 2010 U.S. Census the population in this watershed was 5,079. It includes two counties, Koochiching and Itasca. There are no large cities in this remote watershed. The watershed's landscape is dominated by wetland (57%) with the next most abundant landscape being forest (30%) (MnDNR, 2015a).

The ecological subsections in the Big Fork watershed include the Littlefork-Vermillion Uplands, Chippewa Plains, Agassiz Lowlands, and the St. Louis Moraines. Wetland areas were comprised of forested wetlands (89%) and emergent wetlands (9%). Soils range across the watershed from sand and loams to organic (MnDNR, 2017b). The watershed receives about 26.3 inches of precipitation per year. In the summer the average is 11.2 inches and in the winter, it is 2.5 inches (MnDNR, 2019a).

RAINY RIVER – BLACK RIVER

The Rainy River – Black River watershed (HUC 09030004) is located on the western side of BSA 2. In the 2010 U.S. Census, there were 5,788 people. This watershed is located entirely within Koochiching County. The largest

city is International Falls with a population of 6,424. The watershed is dominated by wetland cover making up 88% (MnDNR, 2015f).

The watershed covers two different ecological subsections, Agassiz Lowlands and Littlefork-Vermillion Uplands. Wetlands in the Rainy River – Black River watershed dominated by forested wetlands making up 88%, with emergent wetlands making up 11%. Soils are mostly silty loam with organic soils (MnDNR, 2017g). The Rainy River – Black River watershed receives on average 26.2 inches of precipitation annually. The summer receives the most precipitation, 11.2 inches, and the winter receives the least, 2.7 inches (MnDNR, 2019i).

RAPID RIVER

The Rapid River watershed (HUC 09030007) is located on the western border of BSA 2. It covers three counties: Lake of the Woods, Koochiching, and Beltrami. The 2010 U.S. Census listed the population in the watershed at 182. The landscape of the watershed is mostly dominated by wetland, making up 94%. There are no large cities in this remote watershed (MnDNR, 2015h).

The majority of the Rapid River watershed is located in one ecological subsection, the Agassiz Lowlands. A small portion, about 1200 acres, of the watershed is in the Aspen Parklands. There are roughly 540,000 acres of wetlands in the watershed with the dominant type being forested wetlands (65%) with emergent wetlands making up 35%. Soils vary across the watershed but are predominantly sandy loam with areas of silt loam that has higher organic material. The watershed receives about 24.5 inches of precipitation a year. In the summer the average is 11.1 inches, and in the winter, it is 2.1 inches (MnDNR, 2019g).

RAINY RIVER - BAUDETTE

The Rainy River – Baudette watershed (HUC 09030008) is located on the northern border on the west side of BSA 2. It is located within Lake of the Woods County. The 2010 U.S. Census listed the population in the watershed as 2,372. The landscape of the watershed is mostly wetland (77%), followed by cropland (13%). There are no large cities located within this remote watershed (MnDNR, 2015d).

The Rainy River – Baudette watershed is located entirely within the Agassiz Lowlands ecological subsection. Forested wetlands make up 64% of the wetland areas, with emergent wetlands making up 36% (MnDNR, 2017e). Soils throughout the watershed are predominantly sandy loam with areas of silt loam that has higher organic material. The watershed receives about 24.4 inches of precipitation a year. In the summer the average is 11.1 inches and in the winter it is 2.1 inches (MnDNR, 2019d).

LAKE OF THE WOODS

The Lake of the Woods watershed (HUC 09030009) is located on the western side of BSA 2. In the 2010 U.S. Census, there were 6,516 people. This watershed stretches across two counties, Lake of the Woods and Roseau. There are no large cities located within this watershed. The watershed has equal amounts of wetland and open water, with each making up 42% of the landscape (MnDNR, 2015b).

The watershed is located entirely within the Agassiz Lowlands ecological subsection. Wetland areas in the Lake of the Woods watershed are mostly forested wetlands (69% of the wetland areas) with 31% of the wetland areas

being emergent wetlands (MnDNR, 2017c). Soils are sandy with some areas of high silt and organic matter. (MnDNR, 2017a). The Lake of the Woods watershed receives on average 24.3 inches of precipitation annually. The summer receives the most precipitation, 10.9 inches, and the winter receives the least, 2.2 inches (MnDNR, 2019b).

3. BASELINE CONDITIONS

The baseline conditions section analyzes and describes the current conditions of water resources across BSA 2. 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. The dominant vegetation categories across BSA 2 include surface water, permanently wet areas (coniferous swamps and bogs), coniferous forest, mixed forest, and deciduous forest. The major watersheds on the east side (Rainy River – Headwaters, Vermilion River, Rainy River – Rainy Lake) are predominantly forested, while the watersheds on the west side (Little Fork River, Big Fork River, Lower Rainy River – Black River, Rapid River, Lower Rainy River – Baudette, Lake of the Woods) transition to almost entirely wetland.

Table 3-1. Summary of Pre-Settlement Vegetation for BSA 2												
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**
Big Fork River	5%	1%	63%	10%	-	17%	4%	-	-	-	-	-
Lake of the Woods	41%	1%	45%	6%	-	3%	4%	-	-	-	-	-
Little Fork River	2%	1%	48%	12%	-	22%	14%	-	-	-	-	-
Lower Rainy River – Baudette	1%	1%	83%	6%	-	6%	4%	-	-	-	-	-
Lower Rainy River – Black River	1%	1%	80%	6%	-	9%	3%	-	-	-	-	-
Rainy River – Headwaters	14%	3%	24%	24%	-	30%	4%	1%	-	-	-	-
Rainy River – Rainy Lake	15%	2%	26%	21%	-	32%	3%	-	-	-	-	-
Rapid River	0%	0%	91%	3%	-	3%	2%	-	-	-	-	-
Vermilion River	13%	0%	25%	23%	-	34%	5%	-	-	-	-	-
BSA 2 Total	**11%**	**1%**	**47%**	**14%**	**-**	**20%**	**6%**	**-**	**-**	**-**	**-**	**-**
Category Total	**11%**	**48%**		**40%**								

Wetlands

The current extent of wetlands in BSA 2 is based on the 2019 update of the Minnesota National Wetland Inventory (NWI) provided by the MnDNR (Kloiber et al., 2019). BSA 2 has approximately three million acres of palustrine wetlands (Figure B-4). Riverine and Lacustrine wetlands were not included in this analysis because they are commonly associated with non-wetland deepwater habitat in the Cowardin classification system. Approximately 42% of the entire BSA 2 is palustrine wetlands, which is higher than the statewide percentage of 20%. The two most prevalent classes or types of wetlands in BSA 2 include forested wetlands (1,562,922 acres; 55% of the wetlands in BSA 2) and scrub shrub wetlands (1,108,690 acres; 26% of the wetlands in BSA 2). Emergent wetlands account for about 16% of the wetlands in BSA 2 (327,206 acres). Unconsolidated shore, unconsolidated bottom, and aquatic bed wetlands account for only about 3% (40,271 acres). On the watershed level, the Big Fork River watershed has the greatest area of wetlands with 692,273 acres. The Little Fork River

and the Rapid River watershed has the second highest acreage of wetlands (539,465 acres) and the highest percentage of its watershed area covered by wetlands (89%). All of the watersheds within BSA 2 have more than 20% of the watershed area taken by wetlands. It is a water and wetland rich BSA. Table 3-2 includes the exact numbers and a comparison with the whole BSA 2 and statewide numbers.

ORGANIC SOILS

Organic soils are a unique feature in BSA 2. 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 2, 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 2 in order to achieve a holistic analysis.

Organic soils within BSA 2 cover approximately 41% of the BSA area (2,971,955 acres; Figure B-5). The majority of the organic soils are located in the western portion of the center of the BSA, within the Big Fork River major watershed (771,787 acres). As you travel east 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 bedrock outcroppings in the eastern section of BSA 2. The Rainy River – Headwaters watershed has the lowest watershed area covered by organic soils (18% 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*		
Big Fork River	1,315,136	56,652	435,520	192,494	7,607	692,273	53%
Lake of the Woods	736,646	35,306	117,471	122,621	628	276,026	37%
Little Fork River	1,198,296	40,550	291,372	135,870	7,701	475,493	40%
Lower Rainy River - Baudette	196,592	14,832	49,398	74,049	333	138,612	71%
Lower Rainy River - Black River	329,207	24,273	126,827	105,963	305	257,367	78%
Rainy River - Headwaters	1,607,853	41,223	203,962	93,385	14,773	353,342	22%
Rainy River - Rainy Lake	582,765	23,843	93,620	32,112	3,822	153,397	26%
Rapid River	603,844	66,939	159,041	313,001	484	539,465	89%
Vermilion River	661,299	23,589	83,713	39,194	4,619	151,115	23%
BSA 2 Total	**7,231,639**	**327,206**	**1,560,922**	**1,108,690**	**40,271**	**3,037,089**	**42%**
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
Big Fork River	1,315,136	771,787	59%
Lake of the Woods	736,646	200,469	27%
Little Fork River	1,198,296	521,734	44%
Lower Rainy River - Baudette	196,592	103,738	53%
Lower Rainy River - Black River	329,207	248,686	76%
Rainy River - Headwaters	1,607,853	282,283	18%
Rainy River - Rainy Lake	582,765	203,363	35%
Rapid River	603,844	477,188	79%
Vermilion River	661,299	162,707	25%
BSA 2 Total	**7,231,638**	**2,971,955**	**41%**
Organic soils 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 2 has approximately 790,116 acres of lakes (Figure B-6). Approximately 11% of the BSA area is lakes. The Lake of the Woods watershed has the largest acreage of lakes with 305,983 acres. The majority of the lake acreage in this watershed is taken up by Lake of the Woods. Only about 500 acres cover other lakes. The watershed with the second highest lake acreage is the Rainy River – Headwaters watershed. The Superior National Forest and the Boundary Waters Canoe Area Wilderness are both located within this watershed and are lake heavy. The area of lakes in all watersheds can be found in **Error!**

Reference source not found.4. The three largest lakes in BSA 2 are Lake of the Woods (~305,000 acres, bounded by the Minnesota state border), Rainy Lake (~45,000 acres), and Lake Vermilion (~39,000 acres). Each lake is located within a different watershed: Lake of the woods, Rainy River – Rainy Lake, and Vermilion River watersheds respectively.

Table 3-4. Summary of Lake Area (Acres) for BSA 2

Major Watershed	Watershed Acres	Lake Acres[1]	Lake Area %
Big Fork River	1,315,136	60,815	5%
Lake of the Woods	736,646	305,983	42%
Little Fork River	1,198,296	24,205	2%
Lower Rainy River - Baudette	196,592	440	0.2%
Lower Rainy River - Black River	329,207	305	0.1%
Rainy River - Headwaters	1,607,853	216,159	13%
Rainy River - Rainy Lake	582,765	99,712	17%
Rapid River	603,844	551	0.1%
Vermilion River	661,299	81,946	12%
BSA 2 Total	**7,231,639**	**790,116**	**11%**

[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 **Error! Reference source not found.**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 2. The majority of the watercourses within BSA 2 are categorized as Natural – Perennial (4,989 miles; Figure B-7). The watershed with the most watercourse miles is the Rainy River – Headwaters watershed. As the name suggests, the Rainy River starts in this watershed. The Lower Rainy River – Baudette watershed has the highest density of watercourses with a density of 1.4.

Table 3-5. Summary of Watercourses (Miles) for BSA 2						
Major Watershed	**Drainage Ditch**	**Natural – Unknown Flow Regime**	**Natural-Intermittent**	**Natural-Perennial**	**Total**	***Watercourse Density**
Big Fork River	227	337	182	760	**1,506**	**0.7**
Lake of the Woods	309	44	158	135	**646**	**0.6**
Little Fork River	98	303	303	1,085	**1,789**	**1.0**
Lower Rainy River - Baudette	145	31	131	112	**419**	**1.4**
Lower Rainy River - Black River	97	27	62	180	**366**	**0.7**
Rainy River - Headwaters	1	397	130	1,400	**1,929**	**0.8**
Rainy River - Rainy Lake	40	64	43	575	**722**	**0.8**
Rapid River	720	73	60	228	**1,081**	**1.1**
Vermilion River	23	308	99	423	**853**	**0.8**
BSA 2 Total	**1,661**	**1,584**	**1,168**	**4,898**	**9,311**	**0.8**
*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 natural, which means they have not been altered (Figure B-8). There is a very small amount of impounded watercourses with Pine River watershed having the most. Within the altered category, the Rapid River watershed has the greatest amount. Exact lengths of altered watercourses and their categories for each watershed can be found in **Error! Reference source not found.**6.

Table 3-6. Summary of Altered Watercourses (Miles) in BSA 2				
Major Watershed	**Altered**	**Impounded**	**Natural**	**No Definable Channel**
Big Fork River	293	2	1,155	57
Lake of the Woods	386		219	40
Little Fork River	198	2	1,464	127
Lower Rainy River - Baudette	189	0	138	92
Lower Rainy River - Black River	149		192	25
Rainy River - Headwaters	18	4	1,566	346
Rainy River - Rainy Lake	51	7	602	63
Rapid River	778	2	265	36
Vermilion River	33	2	653	165
BSA 2 Total	**2,094**	**20**	**6,254**	**949**

Water Quality

Water quality in BSA 2 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 2, 1,247 lakes were assessed, and 16 lakes were found to be impaired (Figure B-9). Of the impaired lakes, two (2) lakes were located partially or wholly on tribal land. The Big Fork River and Vermilion River watershed had the high number of impaired lakes (6 lakes each). Lake of the Woods and Rainy River – Headwaters only had one lake assessed each but those lakes were also found to be impaired. See Table 3-9 for assessed and impaired Lake acres and percentages in 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. There are five lakes in BSA 2 that are nearly impaired, one lake within the Rainy River - Headwaters watershed, three lakes within the Vermilion River watershed, and one lake in the Big Fork River watershed. There are four lakes that are barely impaired, one lake within the Rainy River - Headwaters watershed, one lake in the Vermilion River watershed, and two lakes in the Big Fork River 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**	
Big Fork River	53,244	318	17,013	6	2%
Lake of the Woods	304,779	2	304,779	2	100%
Little Fork River	12,097	86			0%
Lower Rainy River - Baudette	0.00094	1	0.00094	1	100%
Lower Rainy River - Black River	-	-	-	-	-
Rainy River - Headwaters	194,147	737	125	1	0%
Rainy River - Rainy Lake	94,211	41	-	-	0%
Rapid River	-	-	-	-	-
Vermilion River	76,226	62	29,881	6	10%
BSA 2 Total	**734,705**	**1,247**	**351,798**	**16**	**1%**
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**
Rainy River – Headwaters	38-0735-00	Sand	481	Barely
	69-0117-00	Johnson	450	Nearly
Vermilion River	69-0498-00	Trout	7,369	Nearly
	69-0741-00	Susan	277	Nearly
	69-0755-00	Marion	182	Barely
	69-0806-00	Moose	922	Nearly
Big Fork River	31-0813-00	Bowstring	9,189	Barely
	31-0853-00	Little Sand	341	Nearly
	31-0913-00	Island	2,934	Barely

Regarding streams, there were 329 individual stream reaches assessed across BSA 2 and 33 of those reaches were found to be impaired (10%). Four (4) of the impaired stream reaches were located partially or wholly on tribal land. The Lake of the Woods watershed had the highest percentage of its stream reaches impaired at 17%. The Rainy River – Headwaters watershed was by far the lowest with none of 86 stream reaches assessed being impaired. See Table 3-99 and Figure B-10 for assessed and impaired stream miles and percentages in each watershed.

Nearly/barely data for streams was also analyzed. Two stream reaches within the St. Louis River watershed are nearly impaired for one or more Aquatic Life impairments (DO, TSS, nutrients, fish bioassessment, or macroinvertebrate assessment) including a 10.6-mile reach of the Pine River and a 6.5-mile reach of Barber Creek.

Table 3-9. Assessed and Impaired Streams					
Major Watershed	**Assessed**		**Impaired**		**% Impaired**
	Miles	**Count***	**Miles**	**Count***	
Big Fork River	530	56	60	9	16%
Lake of the Woods	190	36	71	6	17%
Little Fork River	628	64	118	9	14%
Lower Rainy River - Baudette	106	16	3	2	13%
Lower Rainy River - Black River	176	10	< 0.5	1	10%
Rainy River - Headwaters	2,006	86	-	-	0%
Rainy River - Rainy Lake	1,714	19	29	2	11%
Rapid River	191	16	1	1	6%
Vermilion River	234	26	45	3	12%
BSA 2 Total	**5,777**	**329**	**327**	**33**	**10%**
*Count is the number of stream reaches not individual streams Data includes streams wholly and partially on tribal lands					

Land Cover

The National Land Cover Dataset (NLCD) was used to analyze the current land cover across BSA 2. 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 2. Table 3-10 includes the landcover classification breakdown within each individual watershed.

The majority of land cover in BSA 2 is classified as *Wetlands* (52%) with the second highest category being *Forest* at 31% (Figure B-11). The difference in wetland area as mapped in the NWI and the NLCD (42% and 52% of BSA 2 respectively), is a result of different mapping methods, scales, and accuracy. On a watershed level, *Wetlands* are the highest land cover in the Big Fork River, Lake of the Woods, Little Fork River, Lower Rainy River – Black River, Lower Rainy River – Baudette, and Rapid River watersheds. *Forest* is the highest in the eastern watersheds, Rainy River – Headwaters, Rainy River – Rainy Lake, and Vermilion River watersheds.

Table 3-10. Land Cover Percentage of Each Watershed in 2019							
Major Watershed	**Agriculture**	**Barren**	**Developed**	**Forest**	**Grassland**	**Water**	**Wetlands**
Big Fork River	1%	< 1%	2%	27%	1%	5%	64%
Lake of the Woods	10%	< 1%	1%	1%	< 1%	42%	45%
Little Fork River	1%	0.63	2%	36%	2%	2%	55%
Lower Rainy River – Baudette	13%	-	3%	1%	1%	1%	83%
Lower Rainy River – Black River	4%	< 1%	1%	2%	1%	1%	90%
Rainy River – Headwaters	< 1%	< 1%	1%	52%	2%	14%	31%
Rainy River – Rainy Lake	1%	< 1%	1%	44%	1%	17%	36%
Rapid River	2%	< 1%	1%	< 1%	< 1%	< 1%	97%
Vermilion River	< 1%	< 1%	2%	55%	1%	13%	29%
BSA 2 Total	**2%**	**< 1%**	**2%**	**31%**	**1%**	**11%**	**52%**
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 3-11, 6.2 million acres are in *Perennial* cover compared to 220,000 acres in *Non-perennial* cover. Perennial cover ranges from 82% in the Lakes of the Woods watershed to greater than 98% in the Big Fork River, Rainy River – Headwaters, Rainy River – Rainy Lake, and Rapid River watersheds.

Table 3-11. Acres of Perennial and Non-Perennial Cover in 2019			
Major Watershed	**Perennial**	**Non-Perennial**	**Total**
Big Fork River	1,228,145	27,246	1,255,391
Lake of the Woods	353,454	76,366	429,820
Little Fork River	1,135,332	33,148	1,168,480
Lower Rainy River – Baudette	172,370	22,208	194,578
Lower Rainy River – Black River	314,440	10,763	325,203
Rainy River – Headwaters	1,365,857	19,925	1,385,782
Rainy River – Rainy Lake	476,397	8,152	484,549
Rapid River	594,037	9,532	603,568
Vermilion River	561,595	15,648	577,243
BSA 2 Total	**6,201,626**	**222,987**	6,424,614
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 2, approximately 4.3 million acres (60% of the total area of BSA 2) was surveyed for biodiversity significance (Figure B-13). The majority of sites (25%) were ranked as *High* across the BSA. At the watershed level, five watersheds had the majority of sites ranked *High* (Little Fork River, Lower Rainy River – Black River, Rainy River – Headwaters, Rainy River – Rainy Lake, and Vermilion River) and four watersheds had the majority of sites ranked *Moderate* (Big Fork River, Lake of the Woods, Lower Rainy River – Baudette, and Rapid River). The Rainy River – Headwaters watershed has over 500,000 acres ranked as *Outstanding*, comprising 32% of that major watershed. Lower Rainy River – Baudette had no sites ranked as *Outstanding*. The watersheds with the most sites ranked *Below* were both Big Fork River and Little Fork River at 5%. Lower Rainy River – Baudette and Rapid River did not have any sites ranked as *Below*. Acres and percentages for each watershed and BSA wide can be found in Table 3-12.

Table 3-12. Acres of Areas of Biodiversity Significance and Rank

Major Watershed	Below		Moderate		High		Outstanding		Grand Total	
Big Fork River	65,248	5%	345,230	26%	307,017	23%	114,270	9%	**831,765**	**63%**
Lake of the Woods	6,577	1%	123,730	17%	31,643	4%	62,809	9%	**224,759**	**31%**
Little Fork River	62,171	5%	165,456	14%	177,558	15%	70,860	6%	**476,044**	**40%**
Lower Rainy River – Baudette	-	-	57,202	29%	38,158	19%	-	-	**95,360**	**49%**
Lower Rainy River – Black River	1,792	1%	44,188	13%	99,625	30%	66,936	20%	**212,541**	**65%**
Rainy River – Headwaters	31,039	2%	185,805	12%	605,031	38%	508,759	32%	**1,330,634**	**83%**
Rainy River – Rainy Lake	318	0%	26,648	5%	288,821	50%	678	<1%	**316,465**	**54%**
Rapid River	-	-	254,393	42%	94,081	16%	145,621	24%	**494,095**	**82%**
Vermilion River	5,657	1%	130,980	20%	170,301	26%	21,048	3%	**327,987**	**50%**
BSA 2 Total	**172,802**	**2%**	**1,333,631**	**18%**	**1,812,235**	**25%**	**990,982**	**14%**	**4,309,650**	**60%**

Data updated 2023

Landownership

A unique characteristic in BSA 2 and an important consideration for this report is the landownership. To summarize landownership the most up to date parcel information was used. It was then categorized based on the owner into 10 categories which can be seen in Table 3-13. To further define the landownership parcels owned by City, County, Education, Federal, State or Tribal were all categorized as Public. Parcels that were Industry, Private, Private Conservation, Utility, and ones missing a label (NULL) were categorized as Private (Figure B-14).

The vast majority of the land is publicly owned (75% of the BSA or 4.8 million acres). The remaining 25% is owned by private entities or individuals. Within the publicly owned land, the State owns approximately 2.2 million acres, and the federal government owns 1.8 million acres. The rest of the publicly owned land is distributed between tribes, county, city, and universities. Of the privately owned land the vast majority is owned by individuals (1.2 million acres). Industry owns approximately 340,000 acres and the remaining is for utilities or private conservation. On a watershed level, six watersheds have more than 70% of the land owned by public entities. The remining three watersheds have between 50 and 60% of the watershed owned by public entities. These watersheds, Lake of the Woods, Little Fork River, and Rainy River - Baudette, have the highest percentage of privately owned land with 41%, 41%, and 42% respectively.

Table 3-13. Landownership

Major Watershed	Public							Private					Grand Total
	City	County	Education	Federal	State	Tribal	**Public Total**	Industry	Private	Private Conservation	Utility	**Private Total**	
Big Fork River	1,099	199,522	148	184,795	592,096	4,909	**982,569**	58,399	216,920	1,668	217	277,204	**1,259,773**
Lake of the Woods	625	1,940		14,086	171,229	68,756	**256,635**		176,299		66	176,365	**433,000**
Little Fork River	1,165	206,569		87,210	329,911	68,182	**693,037**	142,340	323,923	15,989	264	482,516	**1,175,553**
Rainy River-Baudette	138	500		835	104,904	6,417	**112,794**		81,006		25	81,031	**193,825**
Rainy River Black River	662	21,528		43,225	161,115	1,743	**228,272**	30,375	65,889		25	96,288	**324,560**
Rainy River Headwaters	2,338	34,600	361	1,077,764	165,048	160	**1,280,272**	34,631	99,519	4,646	560	139,357	**1,419,629**
Rainy River Rainy Lake	487	35,184	46	176,911	143,552		**356,182**	69,673	59,757	211	17	129,658	**485,839**
Rapid River	286	2,539		12,435	483,826	44,874	**543,960**	3,384	56,203			59,588	**603,548**
Vermilion River	3,073	114,781	158	188,642	98,028	2,651	**407,333**	1,964	159,473	11,730	47	173,214	**580,547**
BSA 2 Total	**9,872**	**617,163**	**714**	**1,785,904**	**2,249,710**	**197,692**	**4,861,055**	**340,766**	**1,238,988**	**34,244**	**1,222**	**1,615,220**	**6,476,275**

Permitting Analysis

Permits issued under the U.S. Army Corps of Engineers (USACE) Regulatory Program were reviewed for the five-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 3-14 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.

Considering these caveats, the Rainy River – Headwaters and Lake of the Woods watersheds experienced the greatest amount of wetland impacts over this period. The remaining watersheds have significantly less impacts as impacts are generally correlated with the level of development.

Table 3-14. Acres of Permitted Wetland Impact

Major Watershed	Acres of Impact
Big Fork River	8.0
Lake of the Woods	20.2
Little Fork River	12.6
Lower Rainy River – Baudette	0.9
Lower Rainy River – Black River	-
Rainy River – Headwaters	22.6
Rainy River – Rainy Lake	11.2
Rapid River	-
Vermilion River	6.5
BSA 2 Total	**82.0**

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 entire BSA 2. 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 3.7 million acres of wetland in BSA 2 prior to European settlement. Compared to the current extent of wetlands, there has been an 18% loss. The greatest losses have occurred in the Lake of the Woods, Little Fork River, and Vermilion River watersheds with 24% of the wetlands lost in each watershed. The Rapid River watershed has experienced the least amount of wetland loss with only 6%. **Error! Reference source not found.** summarizes the total wetland loss for BSA 2 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 2 they found approximately 3.4 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 7% loss in wetland acreage. See **Error! Reference source not found.** for detailed numbers for each watershed.

Tables 4-1 and 4-2 show the percent lost in BSA 2 from Anderson & Craig (1984) is 7% and the percent lost based on hydric soils and the current NWI is 18%. There are several reasons for this difference including mapping methodologies and the level of accuracy of each method. The difference could also be the result of the recent urbanization of BSA 2. Anderson & Craig (1984) data is accurate as of 1984. It is expected that with urbanization and other land cover changes, there has been an increase of wetland loss between 1984 and 2019 (the date of the latest update of the NWI).

Table 4-1. Wetland Loss Based on Hydric Soils and NWI

Major Watershed	Pre-settlement Acres	Current Acres*	Wetland Loss (acres)	Percent Lost
Big Fork River	850,656	692,295	158,361	19%
Lake of the Woods	363,545	275,997	87,548	24%

Table 4-1. Wetland Loss Based on Hydric Soils and NWI				
Major Watershed	**Pre-settlement Acres**	**Current Acres***	**Wetland Loss (acres)**	**Percent Lost**
Little Fork River	624,625	475,381	149,244	24%
Lower Rainy River – Baudette	175,140	138,612	36,529	21%
Lower Rainy River – Black River	289,140	257,380	31,759	11%
Rainy River – Headwaters	420,721	353,224	67,497	16%
Rainy River – Rainy Lake	191,170	153,309	37,861	20%
Rapid River	575,284	539,507	35,777	6%
Vermilion River	197,607	151,077	46,529	24%
BSA 2 Total	**3,687,888**	**3,036,783**	**651,106**	**18%**
*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**
Big Fork River	777,036	755,409	3%
Lake of the Woods	482,160	377,932	22%
Little Fork River	609,251	589,003	3%
Lower Rainy River – Baudette	124,159	110,019	11%
Lower Rainy River – Black River	279,078	273,530	2%
Rainy River – Headwaters	278,678	266,528	4%
Rainy River – Rainy Lake	283,139	273,205	4%
Rapid River	397,356	367,314	8%
Vermilion River	185,565	174,216	6%
BSA 2 Total	**3,416,421**	**3,187,155**	**7%**
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 2, 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 2. 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 2 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 2 is the second least active BSA in Minnesota generating an average annual credit demand of 18 credits during the period of analysis. BSA 2 accounts for approximately 3% of the credits withdrawn statewide each year.

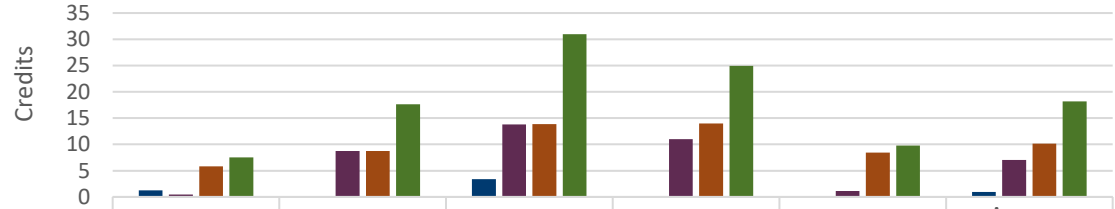
Withdrawal data for BSA 2 was further analyzed to determine the individual type contributions (MnDOT, LGRWRP, and standard) for each year. The results of this analysis are summarized in Figure 4-1. Transactions from the standard bank represent most of the credit withdrawal activity in this BSA followed by LGRWRP accounts and then MnDOT. On an average annual basis, they represent 56%, 39%, and 5% 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 2 Wetland Credit Withdrawals
by Account Type 2018-2022



	2018	2019	2020	2021	2022	Average Annual
MnDOT	1.2267	0.0945	3.395	0	0.186	0.9804
Road Program	0.479	8.7756	13.7711	10.986	1.162	7.0347
Standard	5.8048	8.7686	13.8336	13.9717	8.4119	10.1581
Total	7.5105	17.6387	30.9997	24.9577	9.7599	18.1733

CURRENT STATUS

Standard wetland bank ledger information in BSA 2 was compiled and reviewed to provide a snapshot of the amount of credits currently available. This analysis focused 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 2 is 21.6916 credits spread amongst 7 sites and 8 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 2 has a moderate supply of publicly available wetland credits with at least a 2-year supply based on the average annual demand for standard credits calculated in Table 4-3.

MnDOT and LGRWRP credit balances in this BSA are sufficient to meet expected demand for at least the next six years. MnDOT presently has a balance of 20.7436 credits across three accounts that will meet their program demand for at least the next twenty years based on the five-year annual average calculated for this analysis. The LGRWRP has an approximate 19-year supply of credits with a total available balance of 134.0950 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. No area within BSA 2 falls in the study region for the DWQA, as it focuses on depressional wetlands in southern Minnesota. 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). The majority of BSA 2 has high quality wetlands with low pressure from stressors. The western half of BSA 2 experiences higher pressure from stressors and has slightly lower quality wetlands.

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 BSA 2 has largely stayed the same since the first baseline assessment in 2011.

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 2 reflects the regional trends in both wetland quality and extent, with a lot of high-quality wetlands across the region with wetlands on the western edge experiencing more stressors.

Description of Threats

Wetlands across Minnesota are under threat from many different stressors. In BSA 2, wetlands are threated specifically by land use change and invasive species. These threats are based on the conditions established in the Baseline Conditions section as well as conversations with stakeholders. Although BSA 2 wetlands are relatively high quality, it is important to recognize current and future threats, as well as the impact threats have on prioritizing areas for wetland restoration and protection.

INVASIVE SPECIES

Invasive species are a serious problem for the future of our wetlands and can cause economic and ecological harm. Invasive species like Purple Loosestrife (*Lythrum salicaria*), and Emerald Ash Borer (*Agrilus planipennis*) put native species in Minnesota, and specifically in BSA 2, 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 1 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. The Emerald Ash Borer in particular, targets black ash which is an essential dominant tree species in Black Ash Swamps. These swamps are essential for timber, habitat biodiversity, carbon storage, and cultural resources. There currently are no tree species that could replace Black Ash should they be drastically impacted by Emerald Ash Borer

LAND USE CHANGE

BSA 2 has experienced changes in land use with an increase in development in the city centers. According to the NLCD from 2001 to 2016, 40% of the catchments in BSA 2 experienced an increase in development. The average increase in development was 47 acres. Most of the development was centered around the major cities along the Rainy River and Canadian Border, in addition to minor cities and towns spread throughout the BSA.

Changes in land use and loss of wetland areas can have economic impacts and impact the ecosystems for wildlife that rely on these wetland habitats. Loss of habitat results in less biodiversity as species can struggle to survive when relying on food and shelter in a wetland. These changes are impactful to wetlands and surrounding areas by depleting areas of water storage, which can cause flooding events, and changing landscapes due to

erosion and sediment transport. Loss of wetlands can also have societal and ecological impacts as wetlands have recreational value.

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 2. 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 SWCDs, Counties, BWSR, and the MnDNR. Discussions during the meeting highlighted the shared concern for identifying priority areas and the challenges that may be associated with private versus public lands. At the meeting, stakeholders identified two additional baseline conditions, peatlands/organic soils and landownership, to be included in the report. The stakeholders also added a nearly/barely impaired waterbodies to the baseline condition for water quality. 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 new conditions, peatlands/organic soils and land ownership, which were added based on the first meeting. The cumulative impact analysis as well as the BSA 2 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 SWCDs, Counties, BWSR, and the MnDNR. A list of the attendees and the material presented is provided in Appendix C-2. Feedback provided during the meeting included: consider invasive species presence using EDDMapS to tease out high or low functioning perennial cover for the perennial cover prioritization metric and to consider using Drinking Water Supply Management Area (DWSMA) locations and relative sensitivity to the groundwater criteria. Ultimately, perennial cover and DWSMAs were not used for prioritization criteria.

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 previous two meetings. Those that attended included individuals from SWCDs, Counties, BWSR, and the MnDNR. During the meeting, there was concern shared from attendees about the lack of private ownership in this BSA and formal and informal initiatives to avoid increasing the amount of public land area and feedback about updated local plan information that should be reflected in the final prioritization criteria scores. Ultimately, the discussion concluded with the understanding that landownership considerations will come down to project specific considerations

which are outside of the scope of this project. 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 catchments. 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 2 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 2 is made up of 1,018 catchments distributed across the nine major watersheds as follows: Big Fork River has 196 catchments, Lake of the Woods has 44 catchments, Little Fork River has 137 catchments, Rainy River – Baudette has 21 catchments, Rainy River – Black River has 28 catchments, Rainy River – Headwaters has 396 catchments, Rainy River – Rainy Lake has 58 catchments, Rapid River has 31 catchments, and Vermilion River has 107 catchments (Figure 7-1).

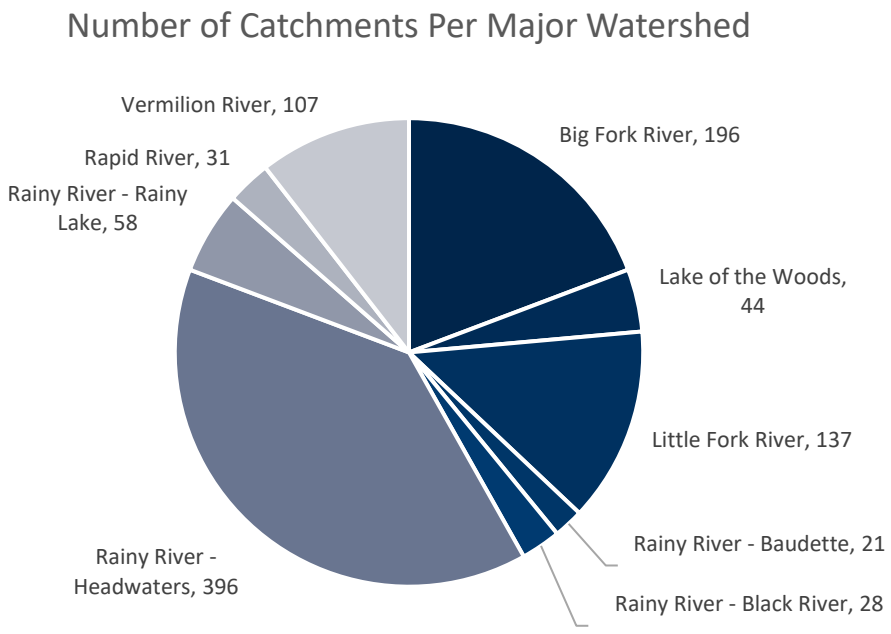


Figure 7-1. Chart showing the number of catchments within each major watershed.

In previous CPF Reports, prioritization of catchments focus solely on wetland restoration. This CPF is unique because of the inclusion of preservation in the prioritization process. In BSA 2, preservation plays a large role because of the intact wetlands already on the landscape and small amounts of urbanization or other anthropogenic impacts 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 may be 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 in Appendix D.

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. A difference in the analysis between restoration and preservation is the number of criteria considered. For example, preservation considers several more criteria. This is reflective of the important and intact habitats that are unique to BSA 2, such as white cedar forests, and local priorities. A list and description of the restoration criteria can be seen in Table 7-1. Preservation criteria and descriptions can be seen in **Error! Reference source not found.**. There was a concerted effort to not duplicate criteria between restoration and preservation. This is due to the difference in nature and priorities between the two.

RESTORATION CRITERIA

A total of eight different criteria were selected for restoration prioritization. They include *Altered Streams,, Drained Wetlands, Ground Water Pollution, Lake and River Impairments, Lake Phosphorus Sensitivity (LPSS), Local Plans, 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.
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.

Criterion	Description
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 restoration generally mentioned as important but there are few specifics, and 1: wetland restoration is not mentioned at all.
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 11 criteria were included in the prioritization of catchments for wetland preservation. 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 **Error! Reference source not found.**. 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; *Partial Restoration*: watersheds with less than 25% of their area protected, and more than 60% disturbance, are too expensive and difficult to restore water

Criterion	Description
	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 2. 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.

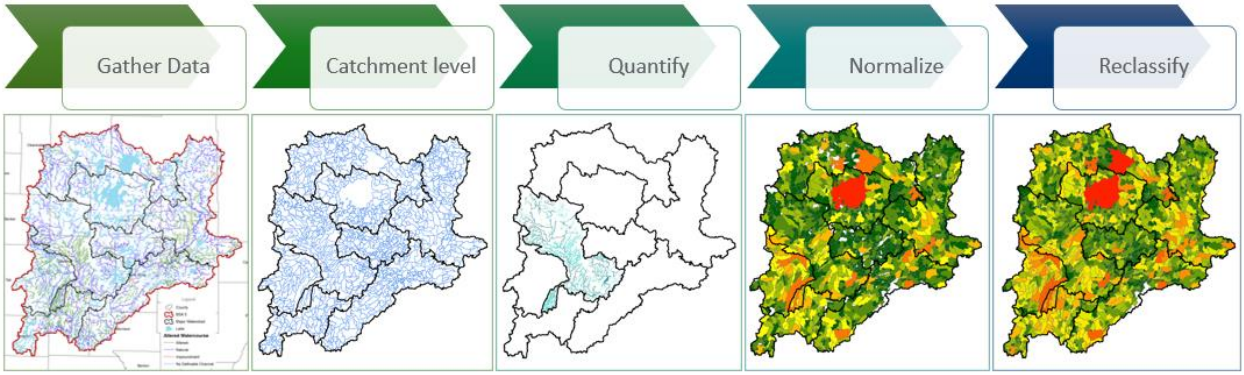


Figure 7-2. Data transformation process.

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 **Error! Reference source not found.**. 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 eight responses to the survey. The results of the survey, which were the rank priority of the criterion, 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 value was multiplied by the respective criterion score for each criterion. All of the weighted criterion scores were summed together to get the final prioritization score for each catchment. 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	0.2222
2	Ground Water Pollution	0.1944
3	Altered Streams	0.1667
4	Local Plans	0.1389
5	LPSS	0.1111
6	Impairments	0.0833
7	Wetland Loss	0.0556
8	WRAPS	0.0278

Table 7-4. Preservation Ranks Assigned by Stakeholders and Resulting Weights		
Rank	**Criterion**	**Weight**
1	Areas of Biological Significance	0.2
2	Current Protection	0.1778
3	White Cedar Forest	0.1556
4	Development Pressure	0.1333
5	Lakes of Biological Significance	0.1111
6	Wild Rice Waters	0.0889
7	Local Plans	0.0667
8	Trout Streams and Lakes	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, areas currently being mined, 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 98% or more of land that was Federally owned (where conservation easements cannot by conveyed to the State) were removed from prioritization. Similarly for mining, catchments with 85% or more of their area within active mines were removed from prioritization. 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 2, all catchments with prioritization scores in the top third of the distribution for each major watershed that also passed all three opportunity filters were identified as a high priority area. Using this method, a total of 540 catchments were prioritized, 145 catchments were identified as high priority areas for both restoration and preservation, 197 catchments were prioritized for preservation only, and 198 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 2,914,143 acres of BSA 2 were prioritized. The watershed with the largest area prioritized was Rainy River - Headwaters, with 580,710 acres. The watershed with the least area prioritized was Lower Rainy River - Baudette, with 62,889 acres. Maps for individual watersheds showing the prioritized catchments for restoration can be seen in Figures D-8 through D-16. 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 4,532,396 acres of BSA 2 were categorized as high priority. The watershed with the largest area prioritized was Rainy River - Headwaters, with 967,637 acres. The watershed with the least area prioritized was Lower Rainy River - Baudette, with 119,851 acres. Maps showing the prioritized catchments for preservation for each individual watershed can be seen in Figures D-17 through D-25.

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

Major Watershed	Preservation Only	Restoration Only	Both	Total
Big Fork River	39	39	27	**105**
Lake of the Woods	12	12	3	**27**
Little Fork River	31	31	15	**77**
Lower Rainy River – Baudette	5	5	2	**12**
Lower Rainy River – Black River	7	8	2	**17**
Rainy River – Headwaters	69	69	63	**201**
Rainy River – Rainy Lake	9	9	11	**29**
Rapid River	8	8	3	**19**
Vermilion River	17	17	19	**53**
BSA 2 Total	**197**	**198**	**145**	**540**

Table 7-6. Area of Prioritized Catchments Per Watershed				
Major Watershed	**Preservation**		**Restoration**	
	Acres	**Percent of BSA Area**	**Acres**	**Percent of BSA Area**
Big Fork River	826,989	11%	567,886	8%
Lake of the Woods	560,864	8%	108,464	1%
Little Fork River	681,668	9%	406,638	6%
Lower Rainy River – Baudette	119,851	2%	62,889	1%
Lower Rainy River – Black River	161,665	2%	98,787	1%
Rainy River – Headwaters	967,637	13%	580,710	8%
Rainy River – Rainy Lake	416,592	6%	380,623	5%
Rapid River	362,669	5%	333,337	5%
Vermilion River	434,461	6%	374,809	5%
BSA 2 Total	**4,532,396**	**63%**	**2,914,143**	**40%**

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 2. 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
EDDMapS	Early Detection and Distribution Mapping System
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

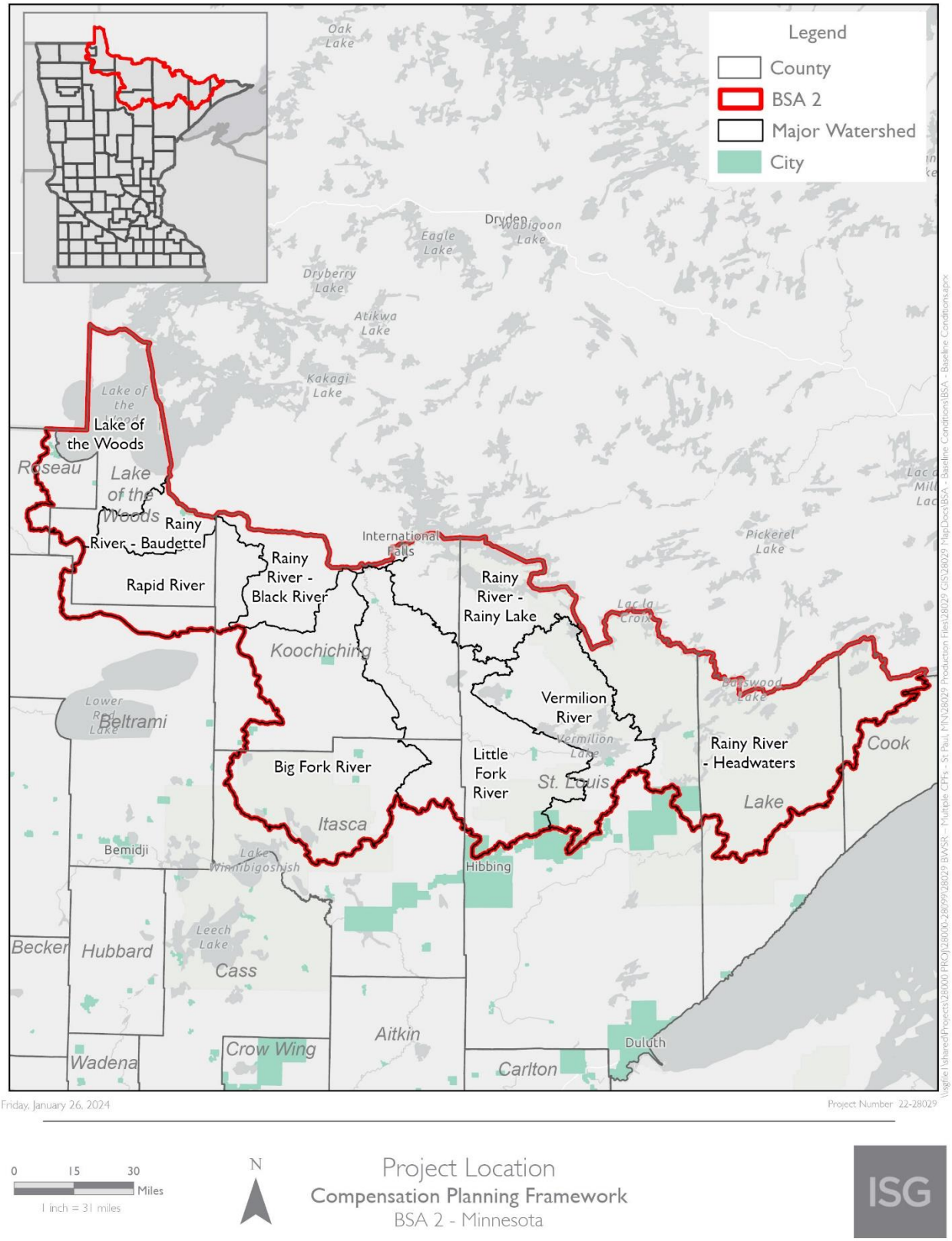


Figure B-2. Ecological Classification

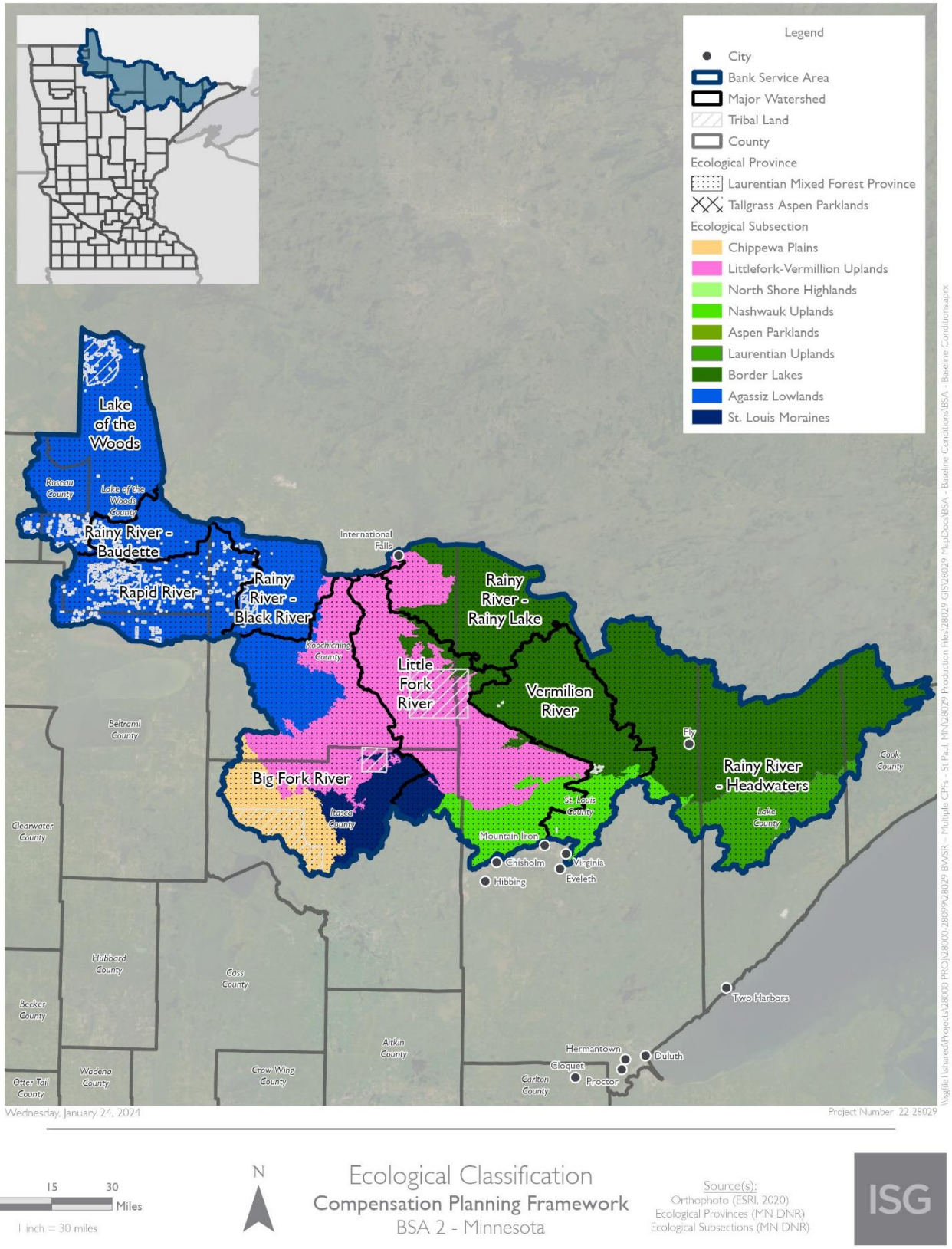


Figure B-3. Pre-settlement Vegetation

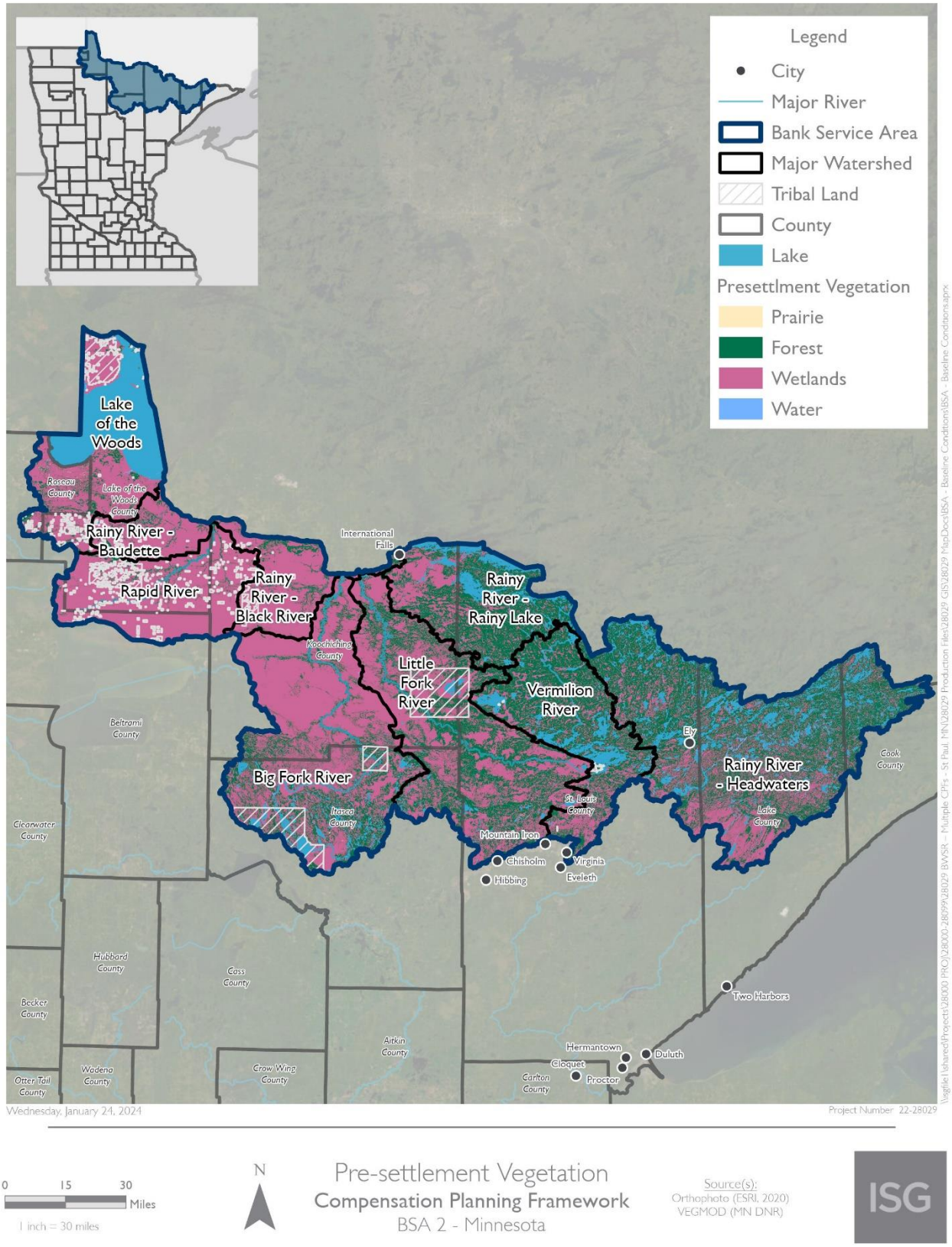


Figure B-4. Wetlands

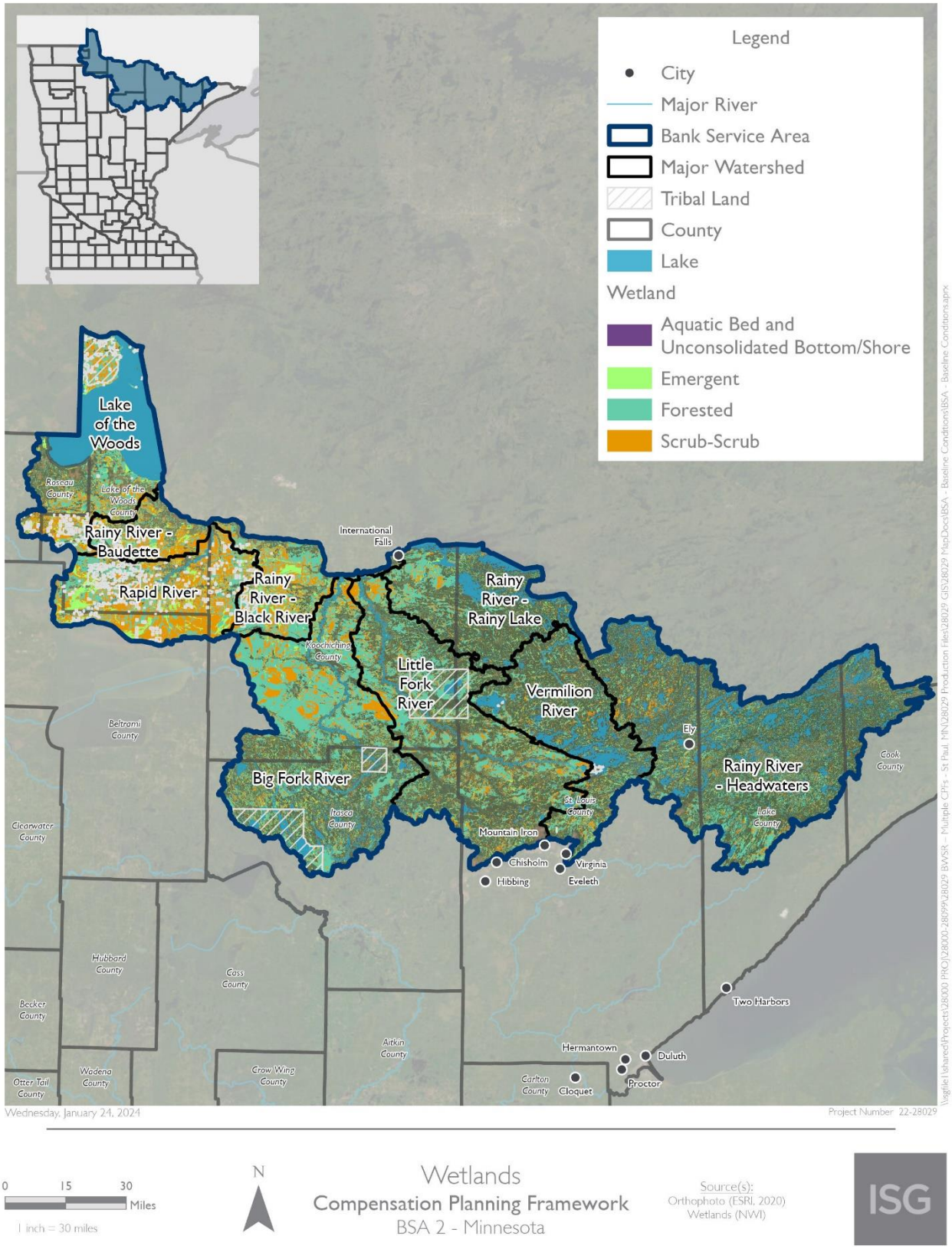


Figure B-5. Organic Soils

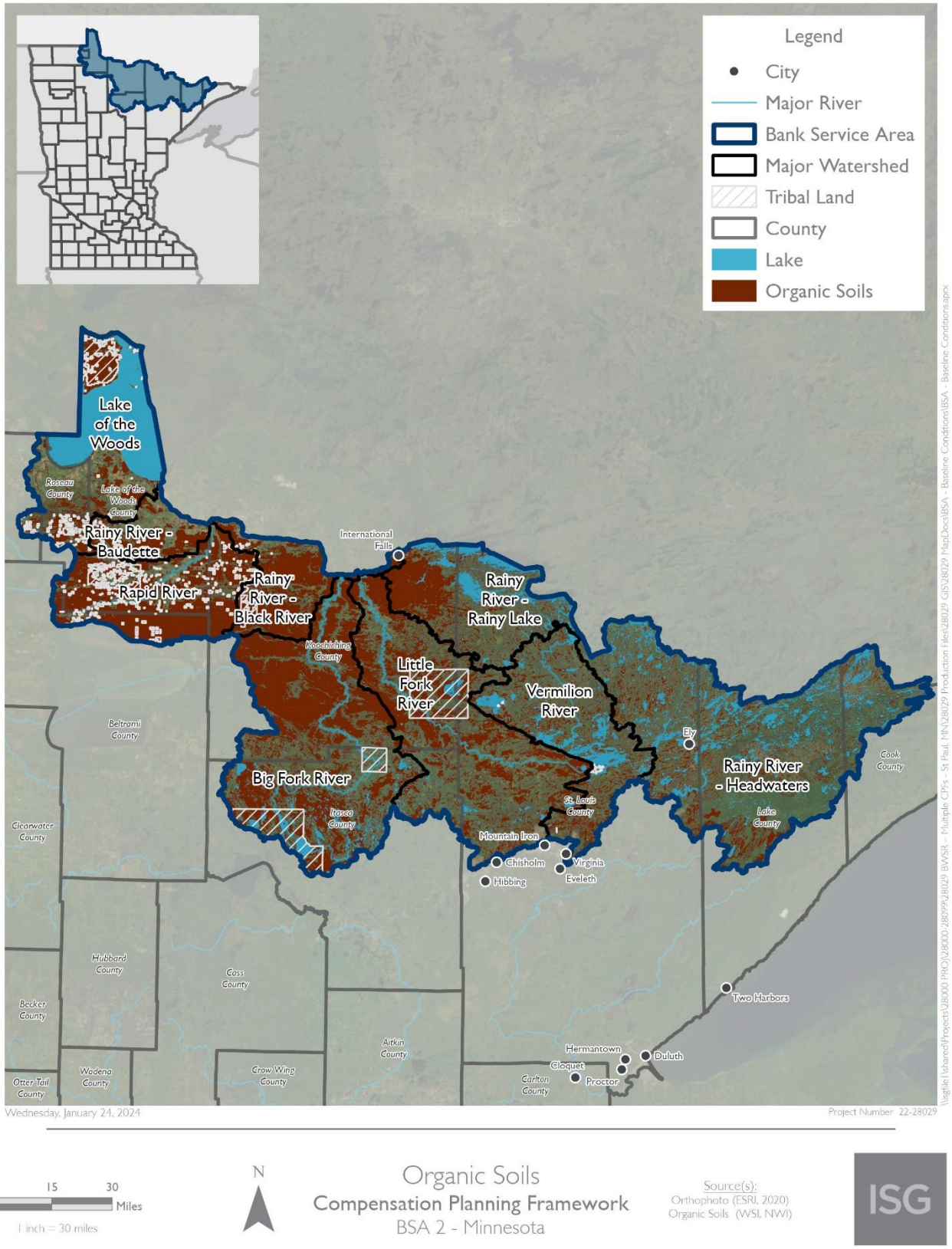


Figure B-6. Lakes

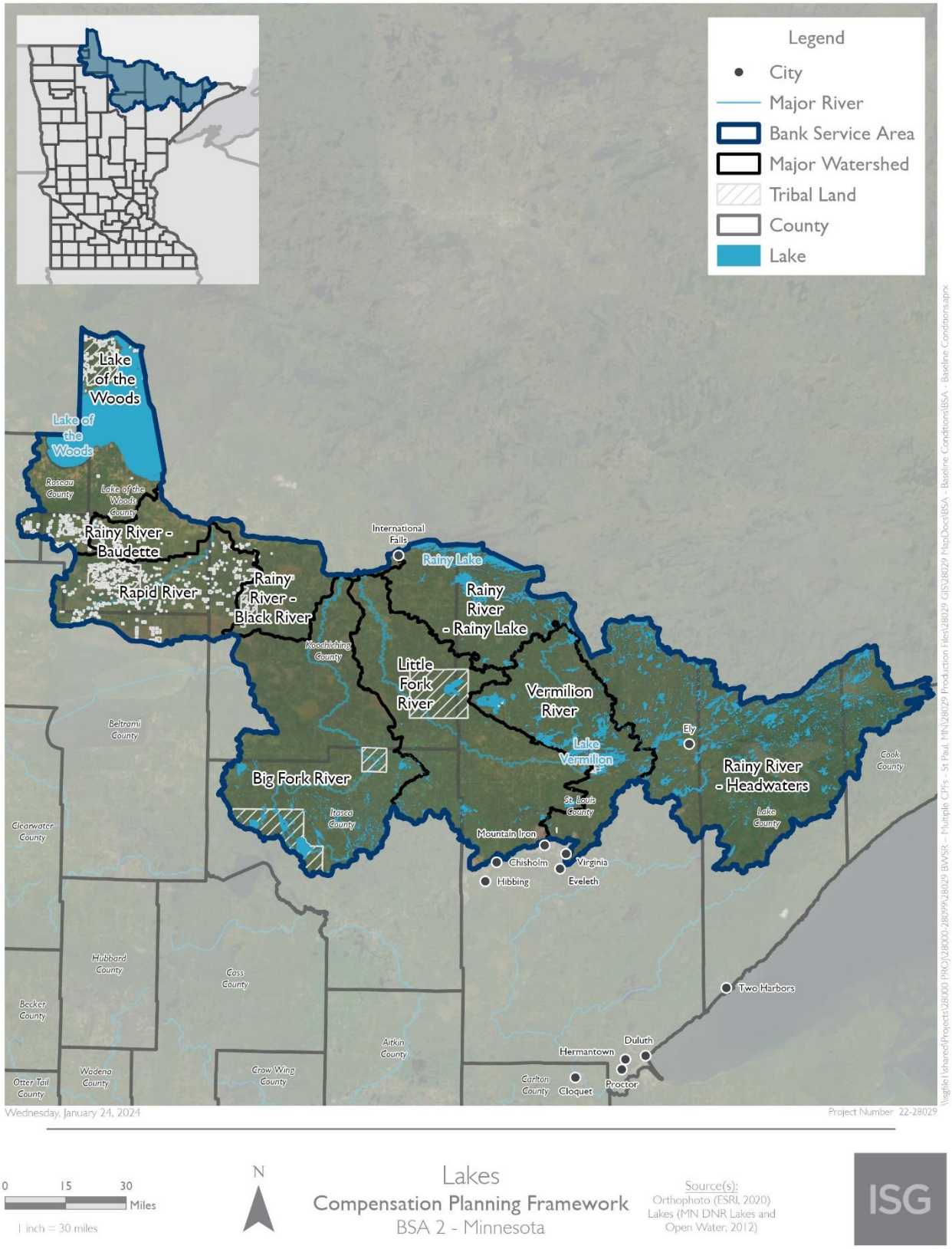


Figure B-7. Watercourses

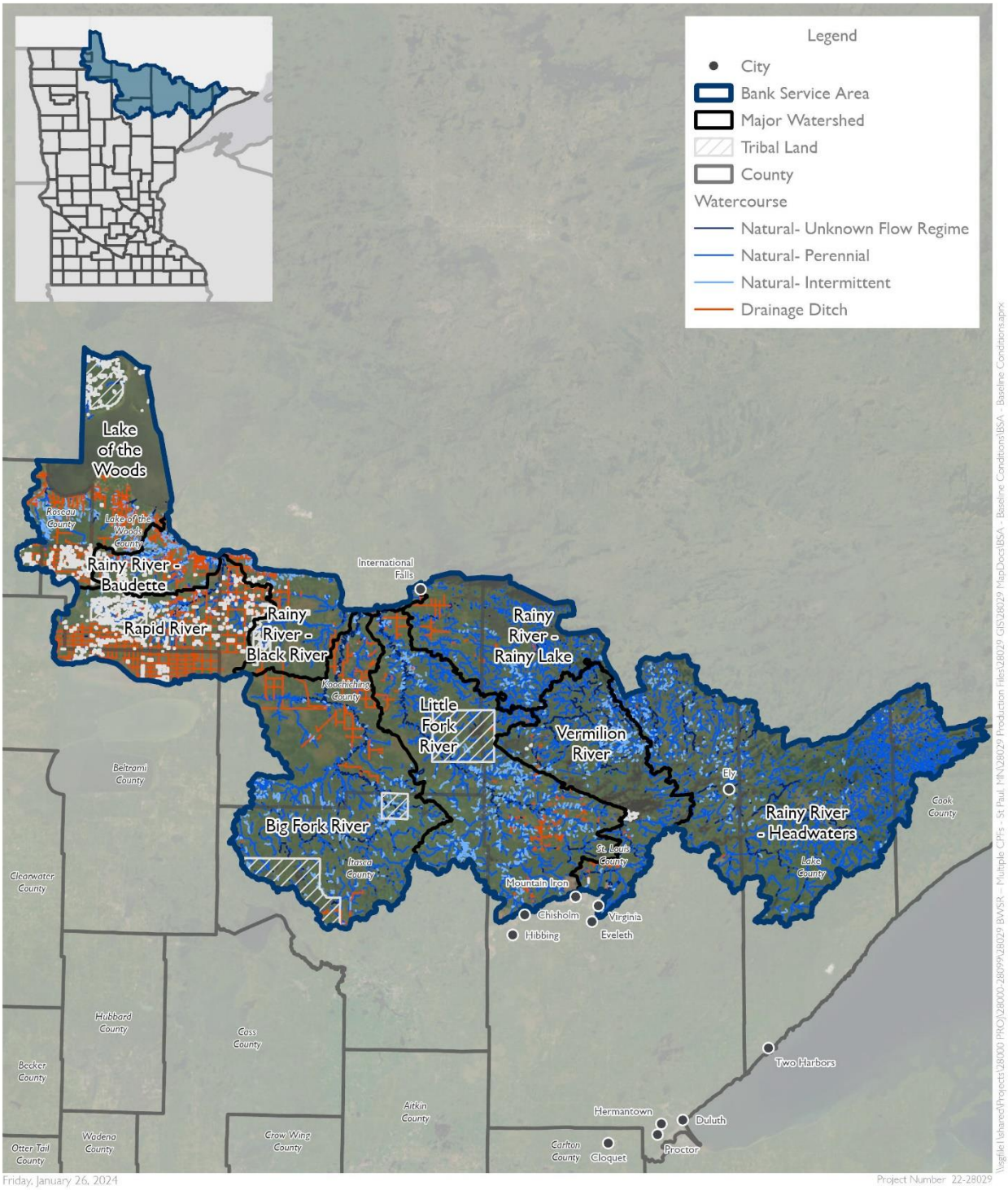


Figure B-8. Altered Watercourses

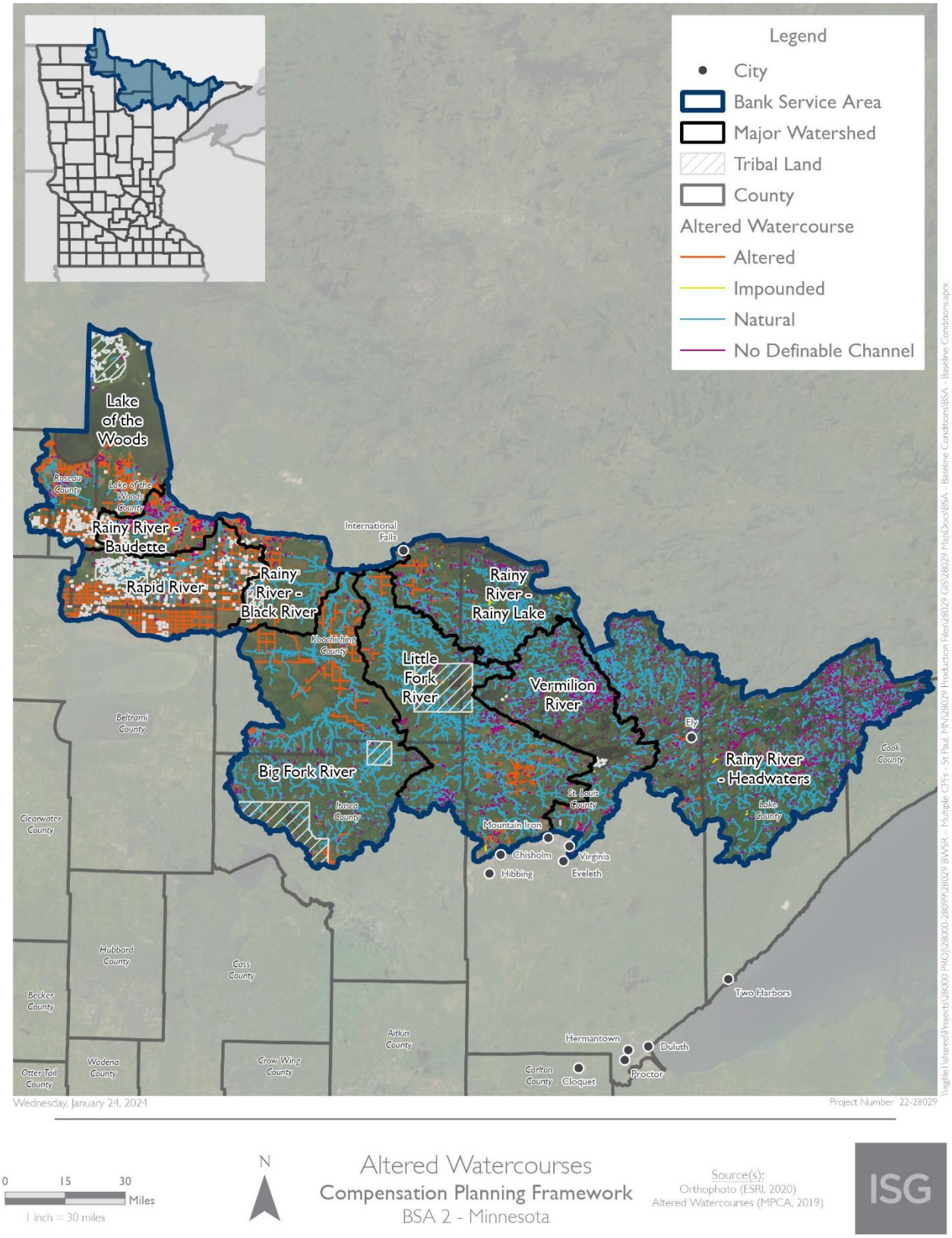


Figure B-9. Water Quality- Lakes

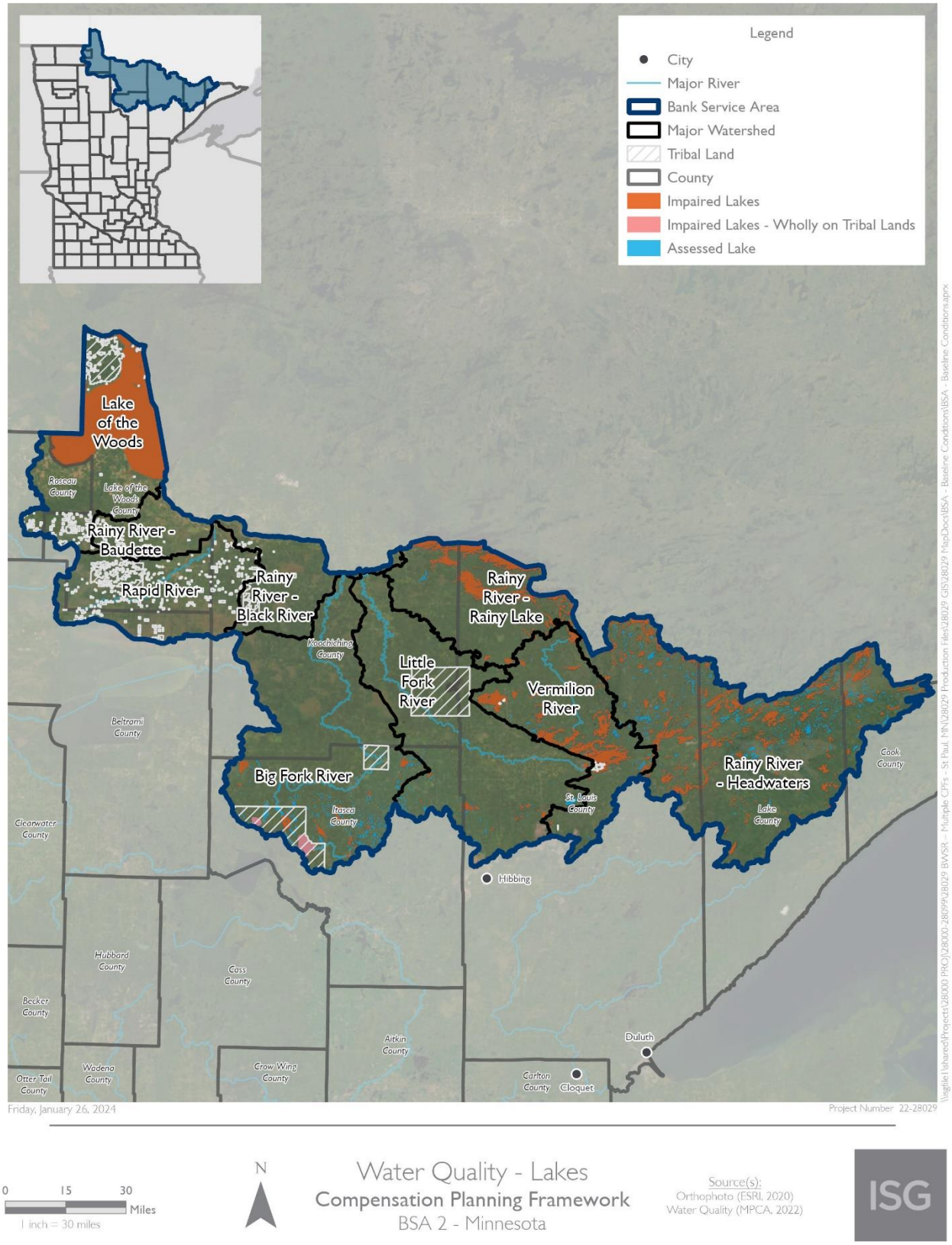


Figure B-10. Water Quality- Streams

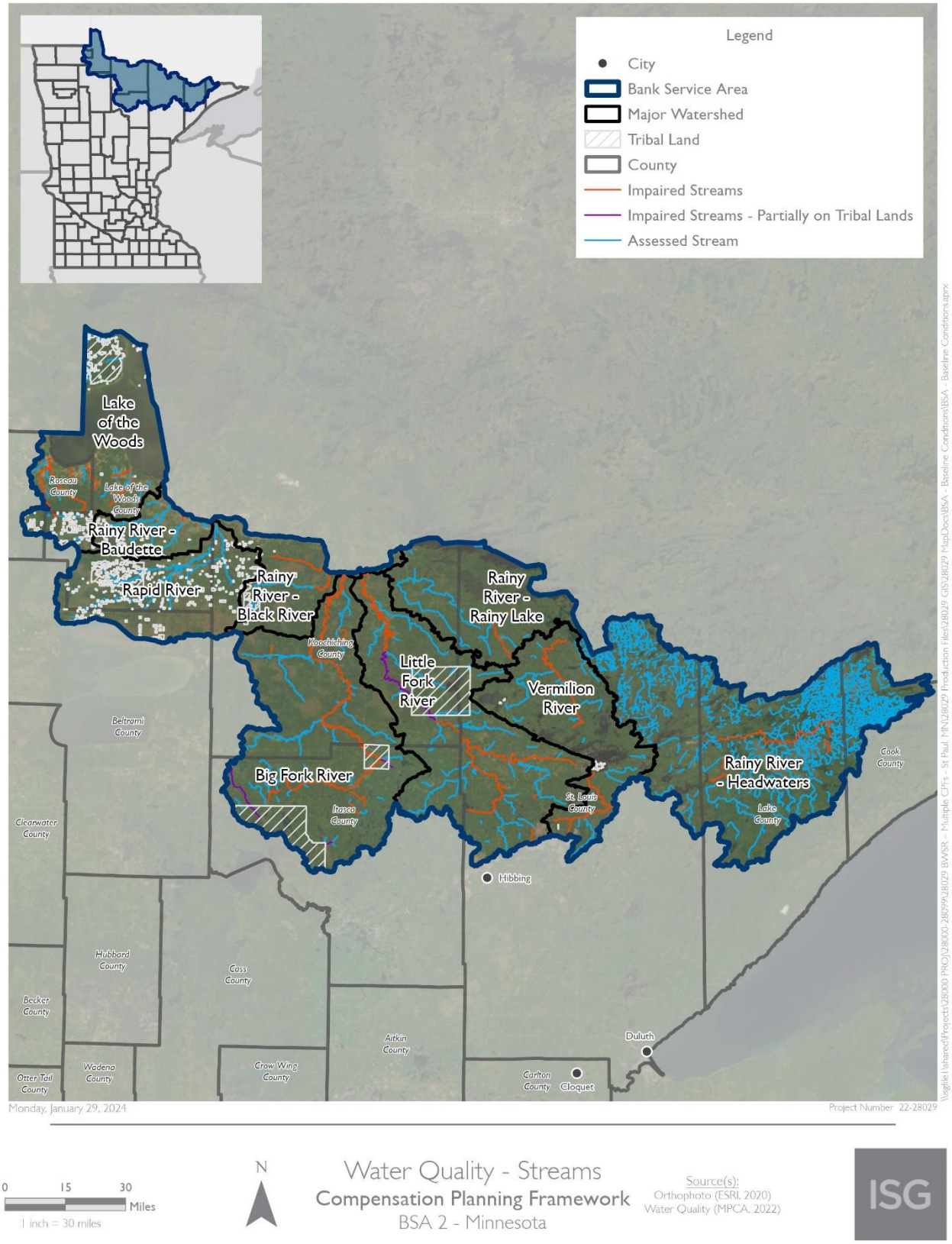


Figure B-11. Land Cover

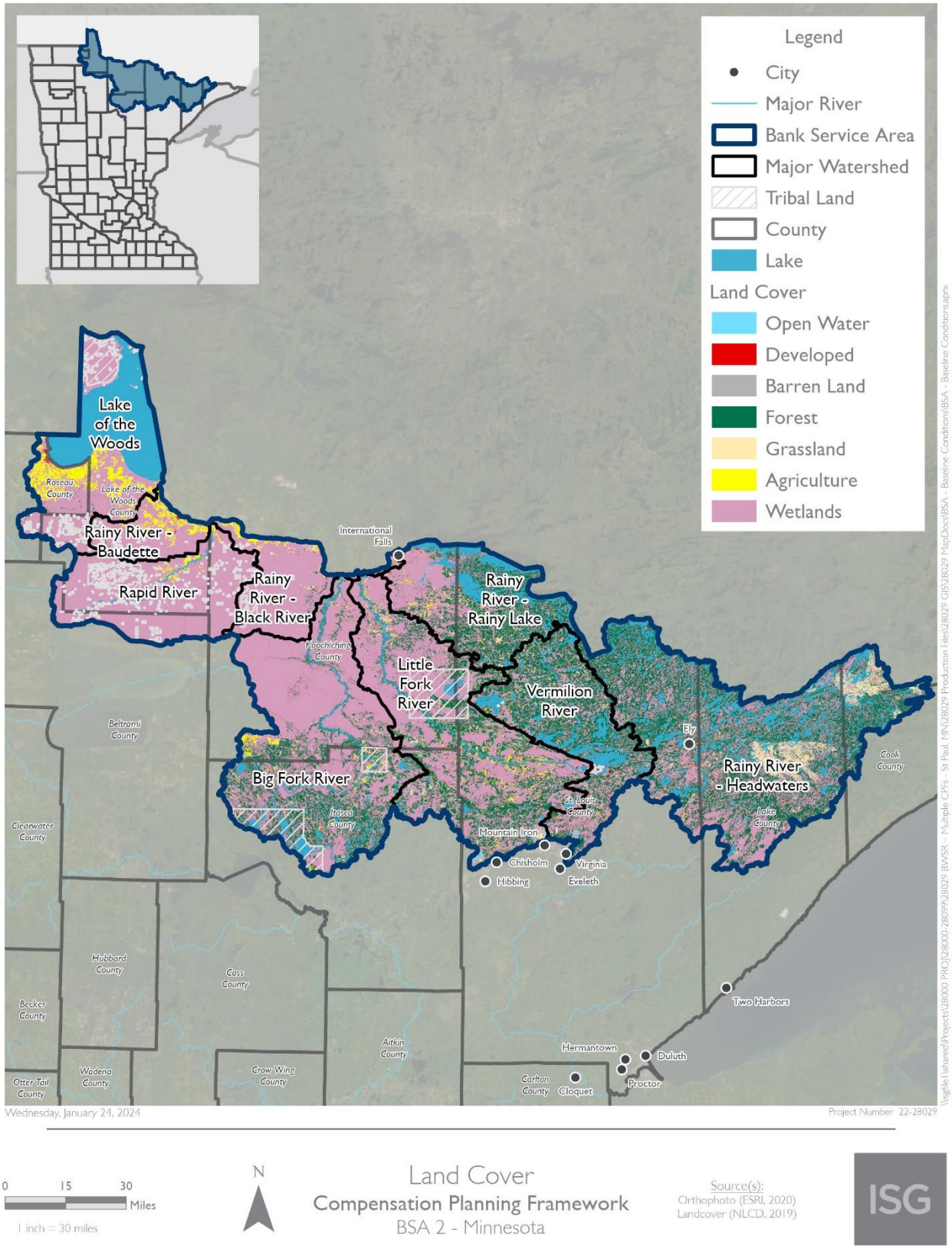


Figure B-12. Perennial Land Cover

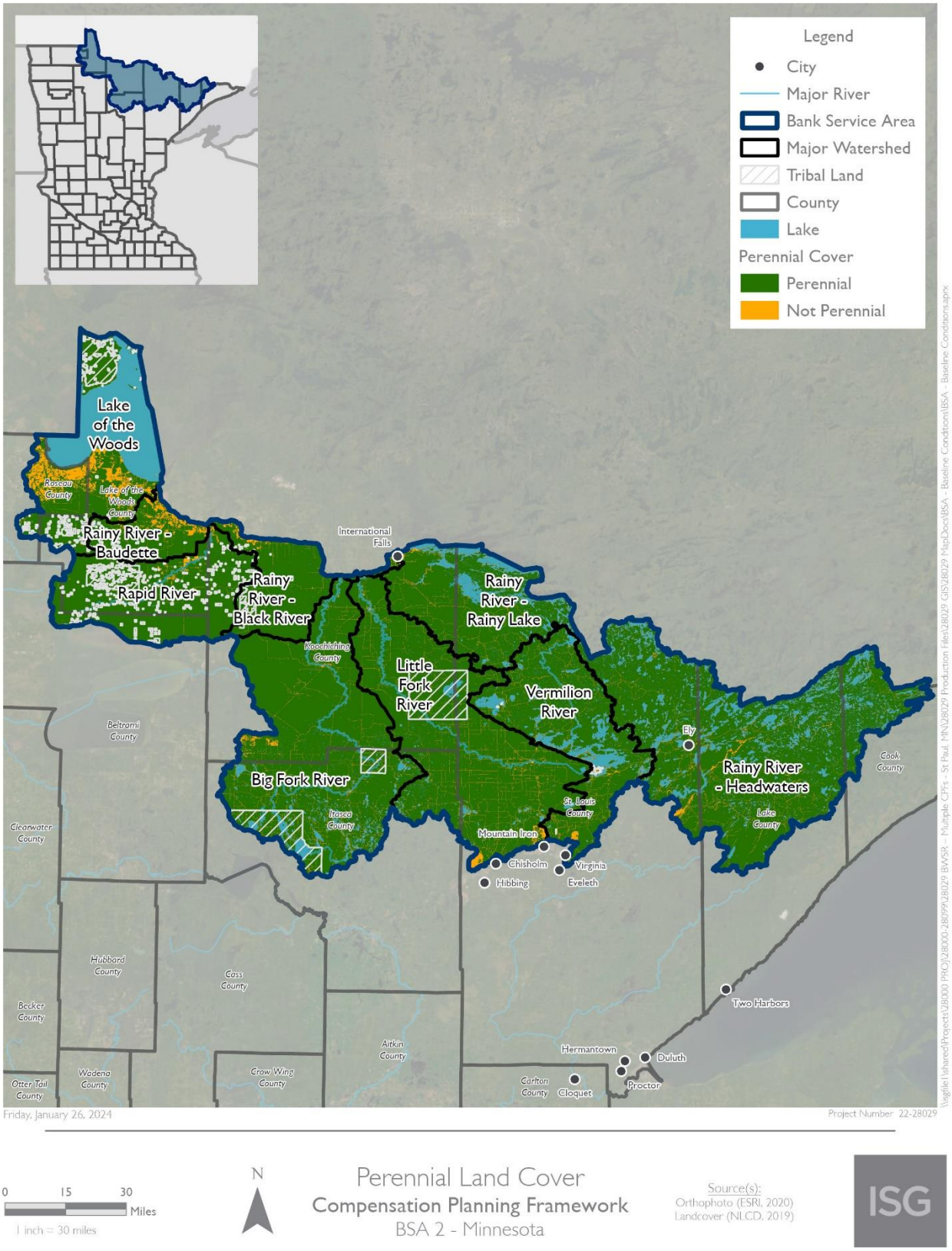


Figure B-13. Areas of Biodiversity Significance

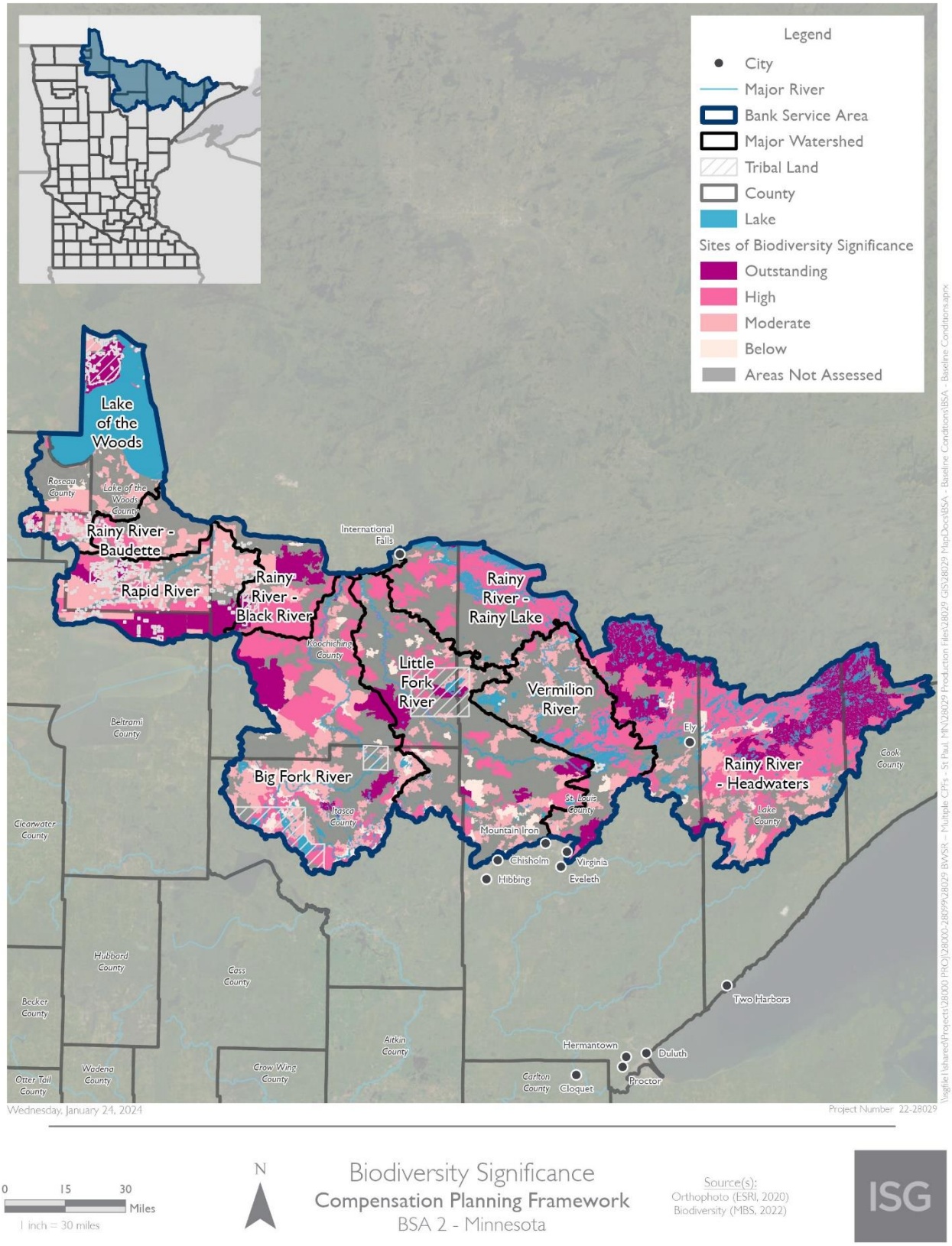
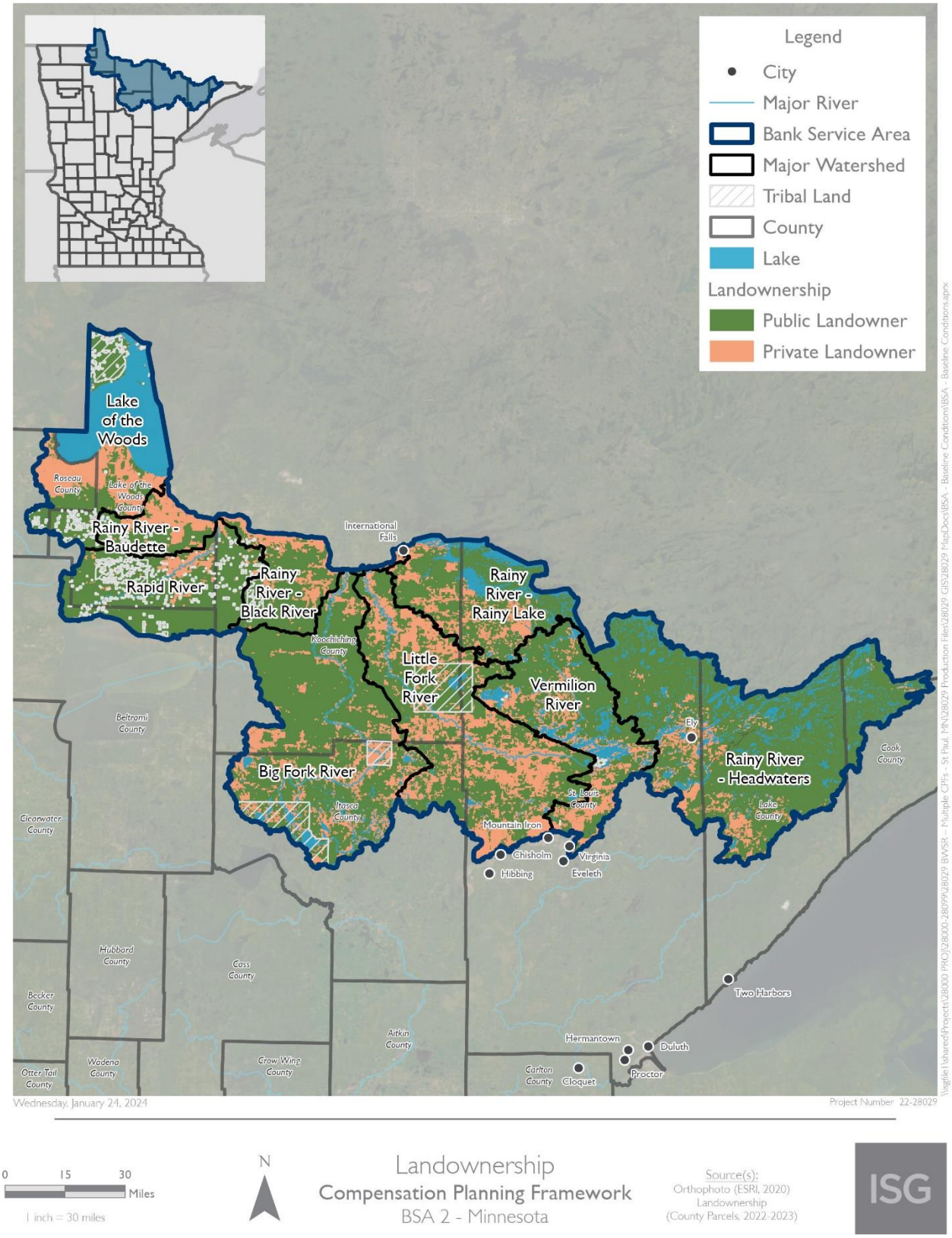


Figure B-14. Landownership

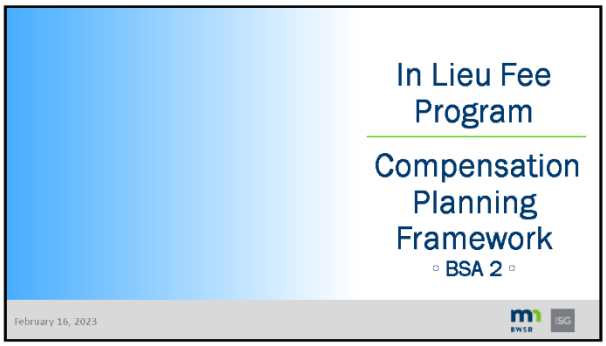


Appendix C: Stakeholder Meeting Attendees and Presentations

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

First Name	Last Name	Email	Organization
Brandon	Caltrider	Brandon.Caltrider@co.lake.mn.us	WCA - Lake County
Matthew	Gouin	matt.gouin@co.koochiching.mn.us	WCA - Koochiching County
Erin	Loeffler	erin.loeffler@state.mn.us	BWSR
Phil	Norvitch	phil@nslswcd.org	North St. Louis SWCD
Derrick	Passe	derrick.passe@co.lake.mn.us	Lake County
Lynda	Ponting	lynda.ponting@state.mn.us	BWSR
Whitney	Sims	whitney.sims@co.koochiching.mn.us	Koochiching County
Jennie	Skancke	jennie.skancke@state.mn.us	IRT (DNR)
Josh	Stromlund	josh_s@co.lotw.mn.us	Lake of the Woods SWCD
Mitch	Travis	mitch.travis@co.cook.mn.us	WCA - Cook County

C-1. Meeting 1- February 2023 Stakeholder Meeting Presentation



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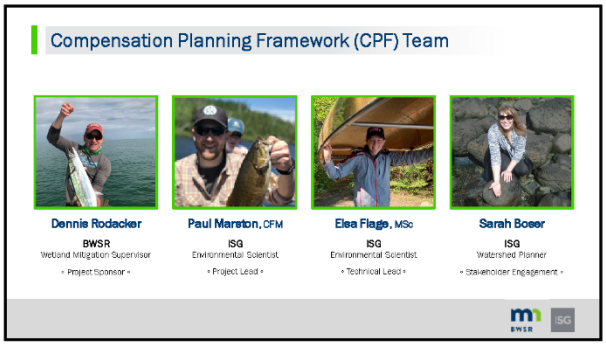

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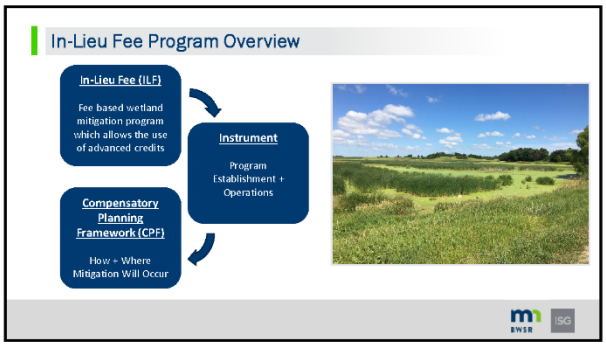

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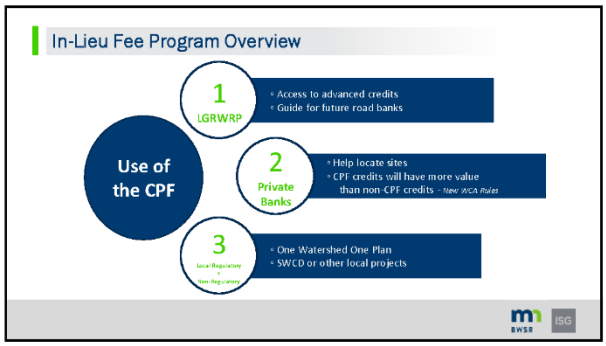

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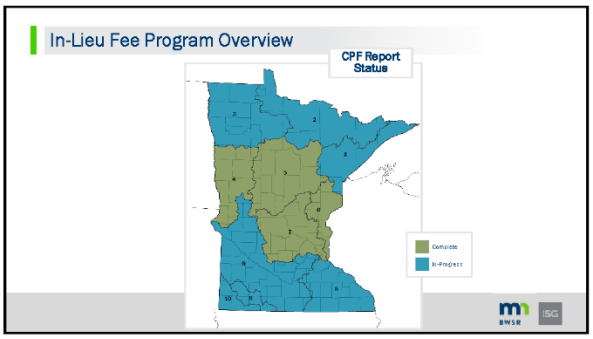
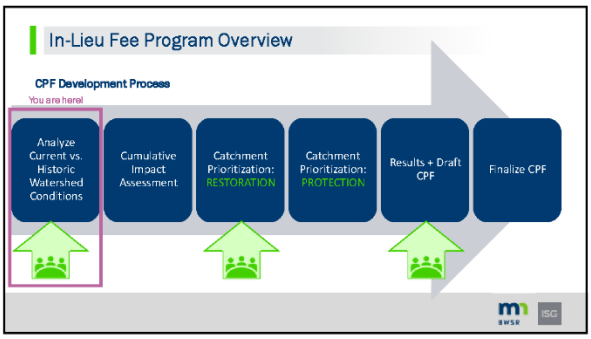

In-Lieu Fee Program Overview
CPF Report Status
Complete
In-Progress

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

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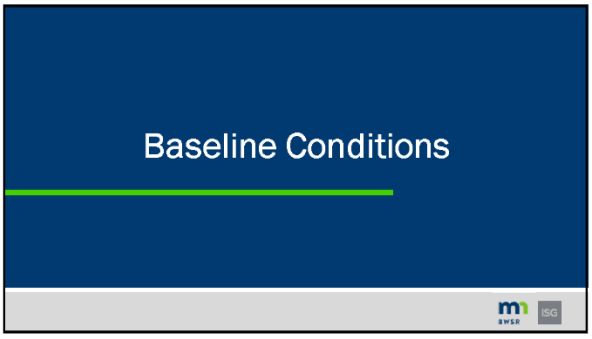
Baseline Conditions

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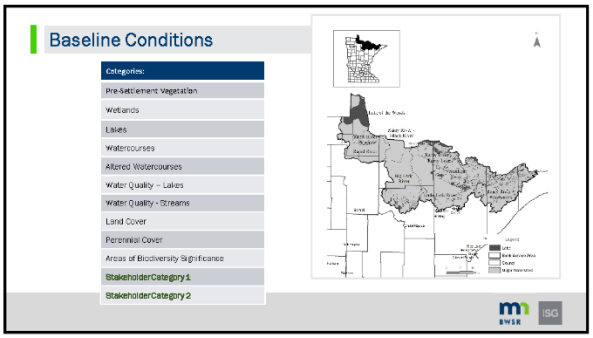
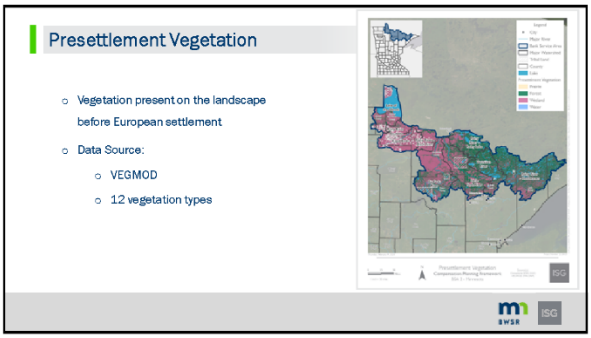
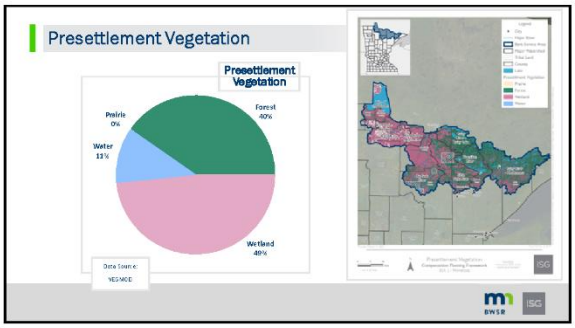

Baseline Conditions
Categories:
Pre-Settlement Vegetation
Wetlands
Lakes
Watercourses
Altered Watercourses
Water Quality – Lakes
Water Quality - Streams
Land Cover
Perennial Cover
Areas of Biodiversity Significance
StakeholderCategory1
StakeholderCategory2

11


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

12



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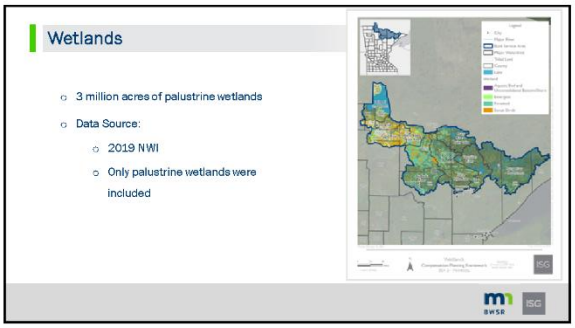

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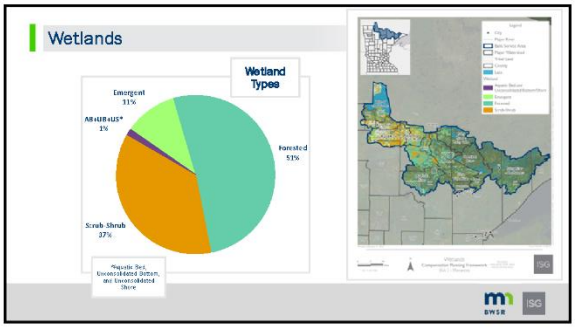

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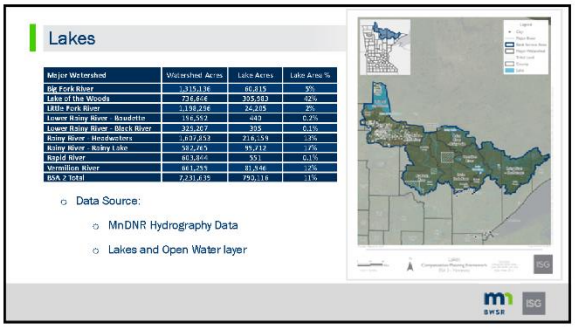

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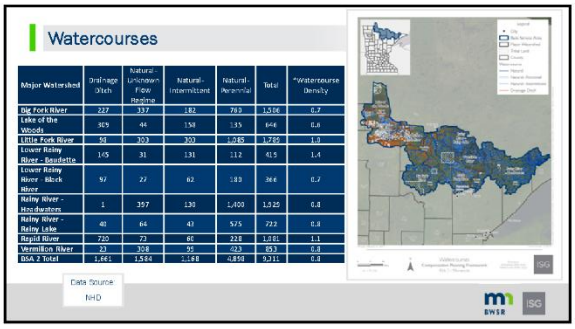

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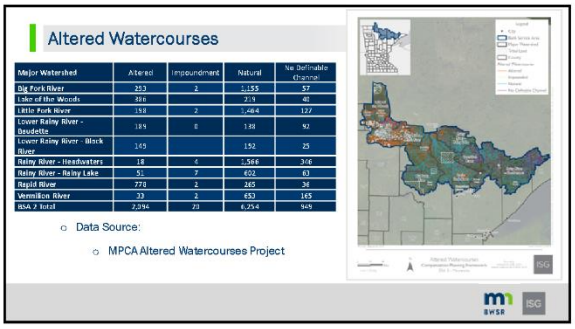

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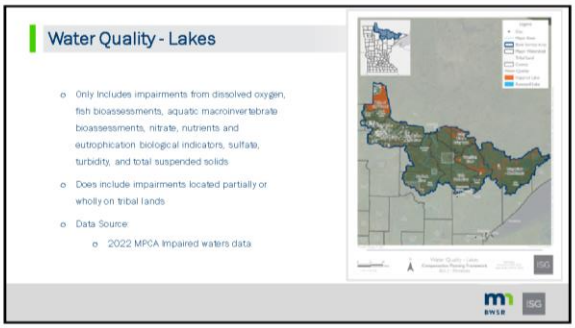

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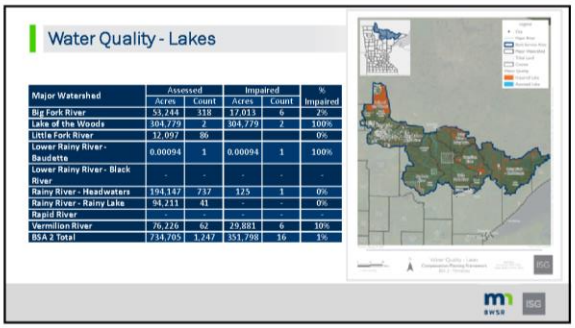

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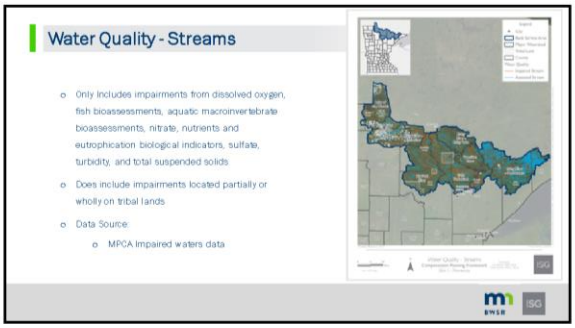

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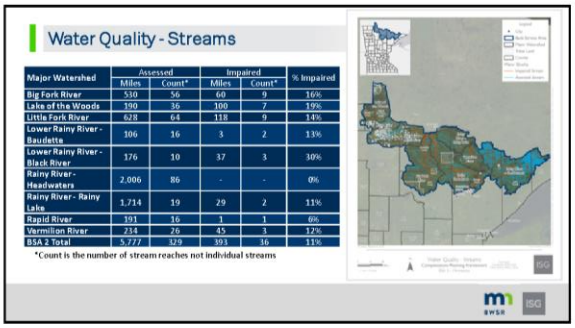

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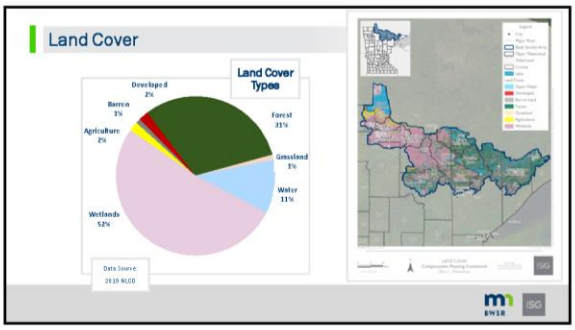

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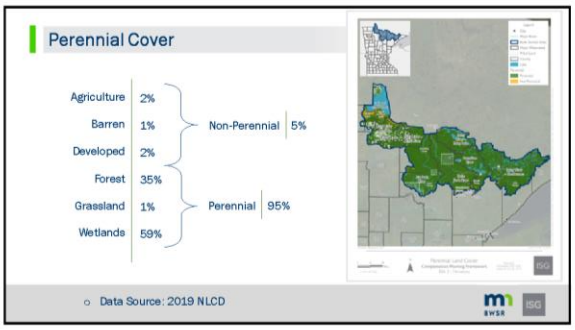

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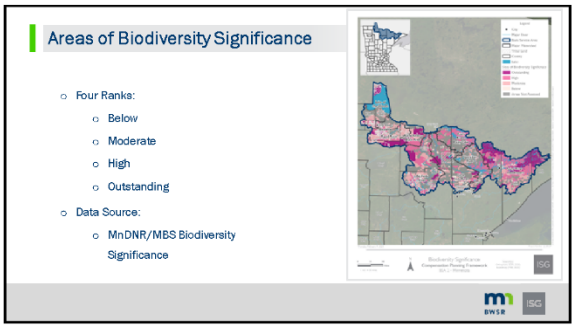

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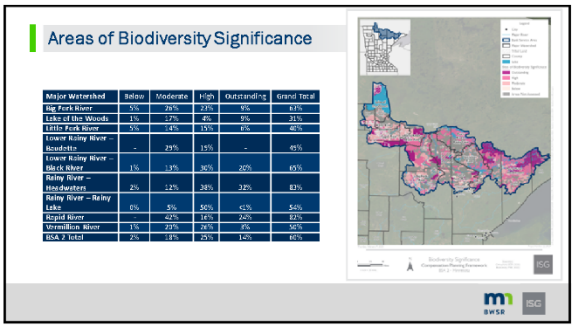

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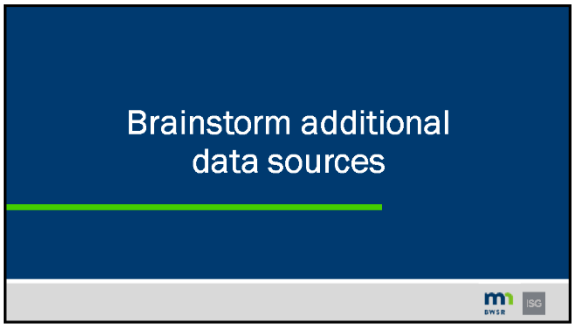

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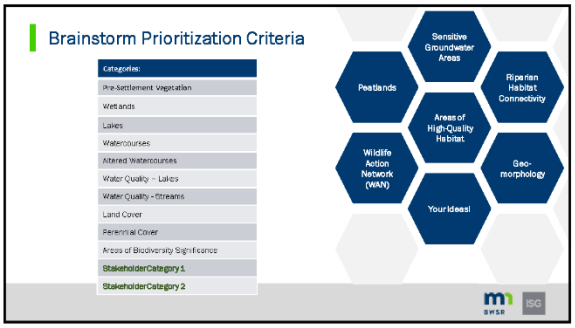

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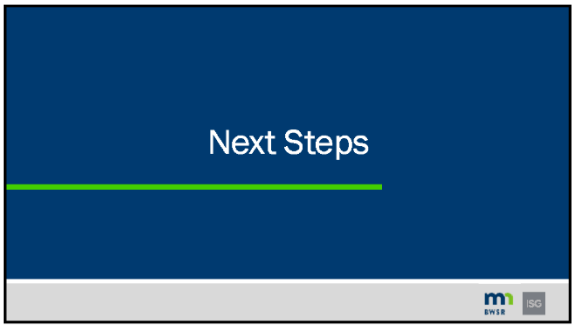

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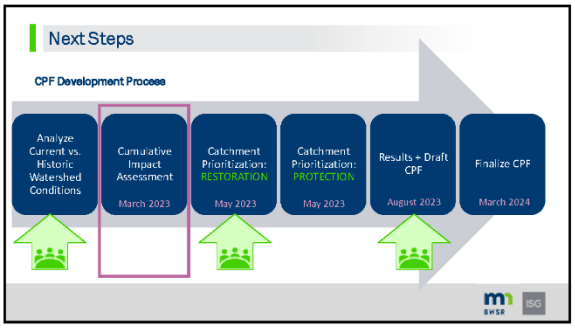

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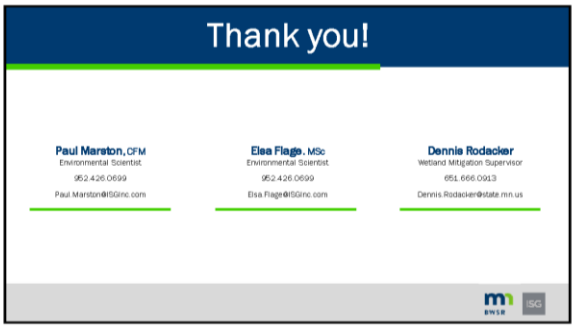
Thank you!
Paul Marston, CFM
Environmental Scientist
952.426.0699
Paul.Marston@ISGinc.com
Elsa Flage, MSc
Environmental Scientist
952.426.0699
Elsa.Flage@ISGinc.com
Dennis Rodacker
Wetland Mitigation Supervisor
651.666.0913
Dennis.Rodacker@state.mn.us
ISG

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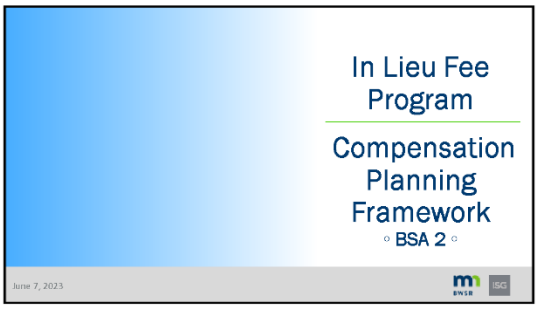
C-2. Meeting 2- June 2023 Stakeholder Meeting List of Attendees

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

C-2. Meeting 2- June 2023 Stakeholder Meeting Presentation



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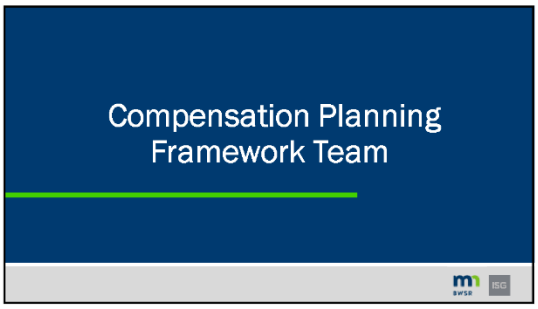

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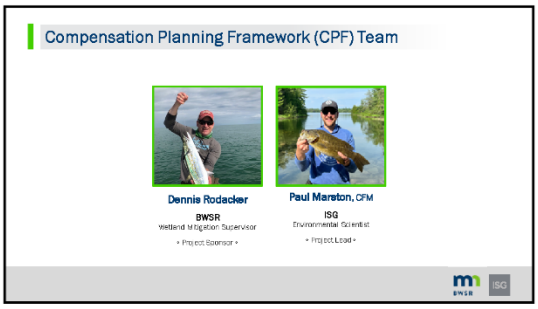

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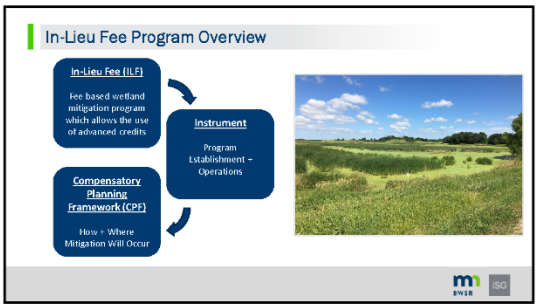

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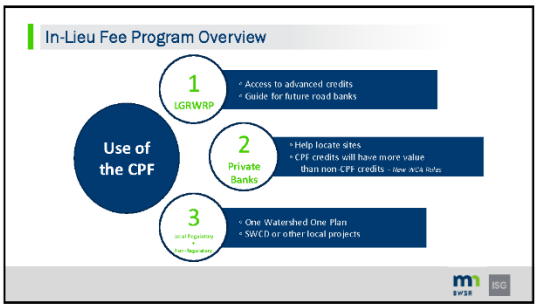

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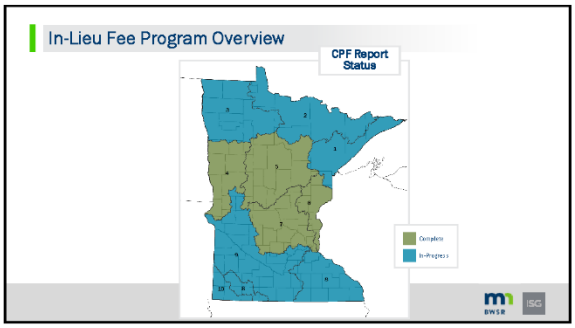
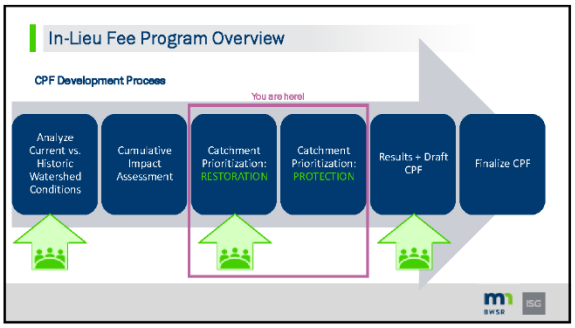

In-Lieu Fee Program Overview
CPF Report Status

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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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

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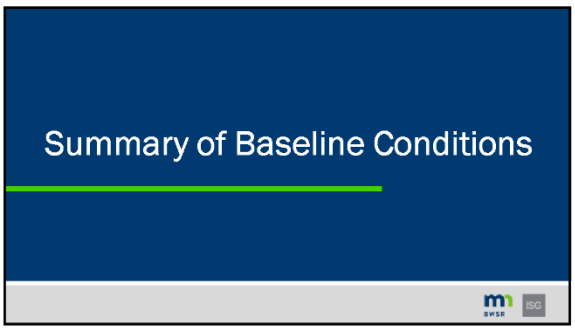
Summary of Baseline Conditions

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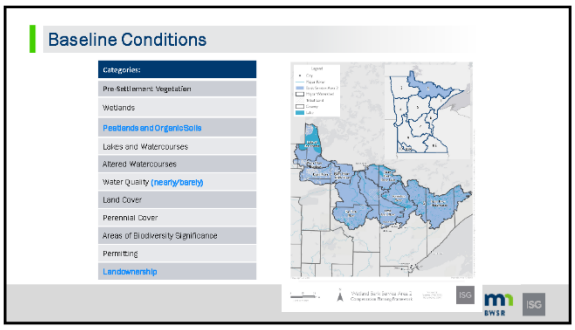
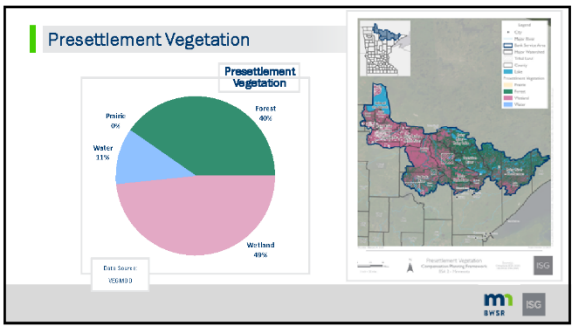
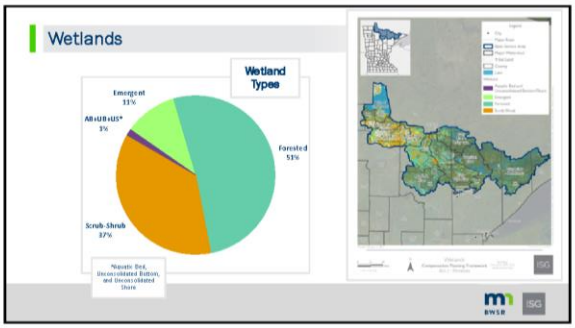

Baseline Conditions
Categories:
Pre-Settlement Vegetation
Wetlands
Peatlands and Organic Soils
Lakes and Watercourses
Altered Watercourses
Water Quality (nearly/barely)
Land Cover
Perennial Cover
Areas of Biodiversity Significance
Permitting
Landownership

11


Presettlement Vegetation
Presettlement Vegetation
Forest 40%
Prairie 9%
Water 11%
Wetland 40%

12



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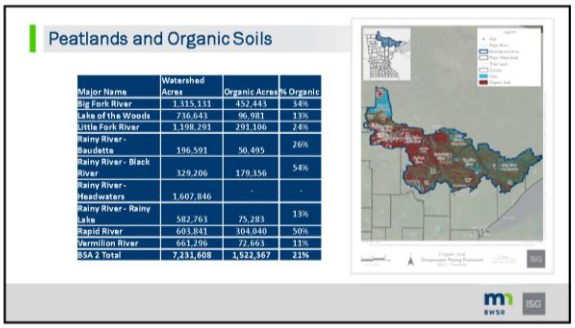
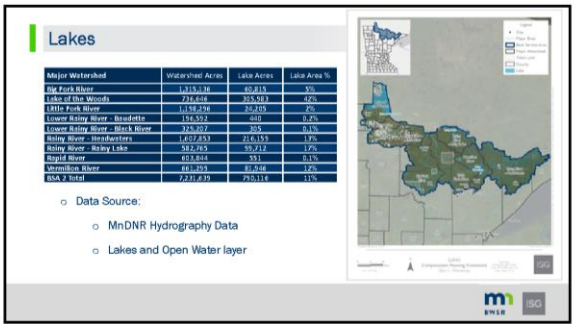


Major Name	Watershed Acres	Organic Acres	% Organic
Big Fork River	1,315,133	452,443	34%
Lake of the Woods	736,643	96,981	13%
Little Fork River	1,198,291	291,106	24%
Rainy River - Baudette	196,591	50,495	26%
Rainy River - Black River	329,206	179,356	54%
Rainy River - Headwaters	1,607,846	-	-
Rainy River - Rainy Lake	582,761	75,283	13%
Rapid River	601,841	304,040	50%
Vermilion River	661,296	72,661	11%
BSA 2 Total	7,231,608	1,522,367	21%

14



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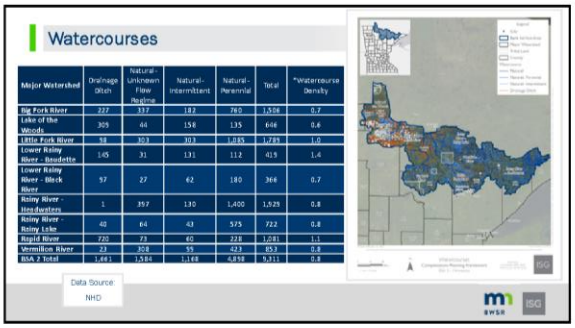

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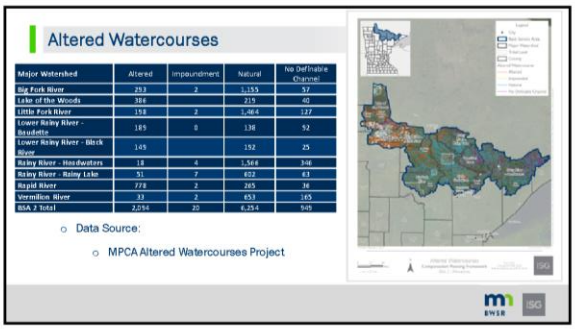

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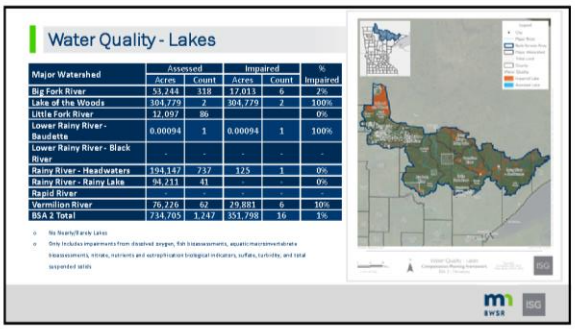

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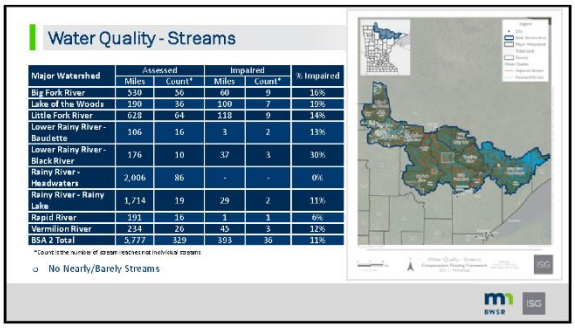

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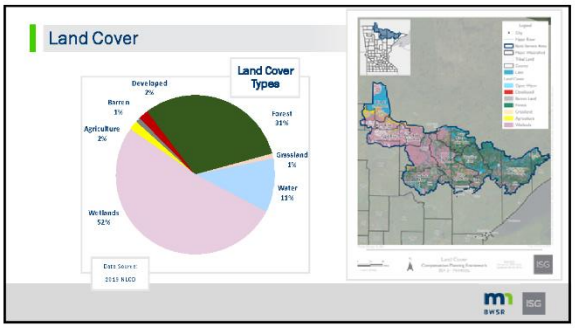

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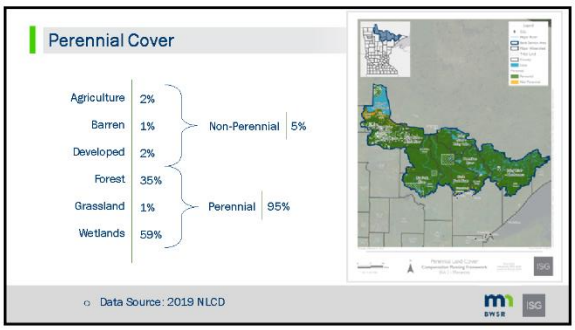

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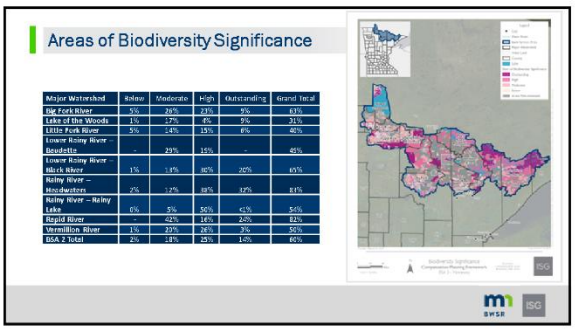

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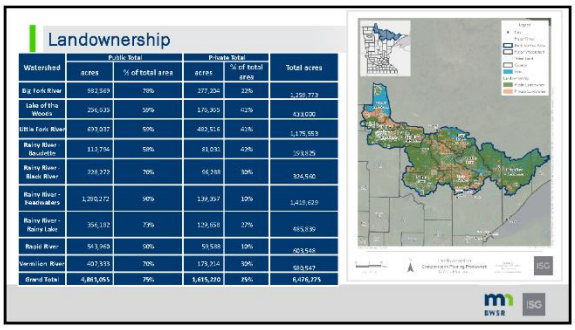

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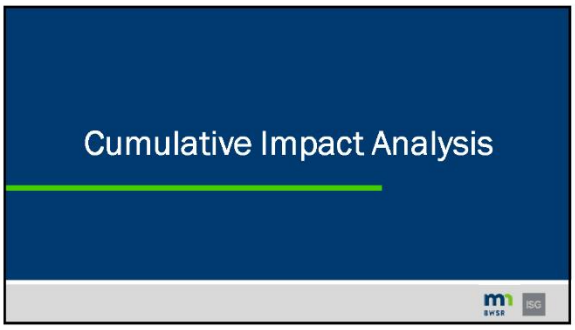

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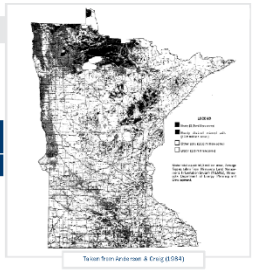
Cumulative Impact Analysis

Wetland Loss

	Total Watershed Acres	Presettlement Wetlands (soils + NWI)	Current Wetlands (NWI)	Wetland Loss	% Loss
BSA 2 Total	7,231,639	3,687,888	3,036,783	651,106	9%



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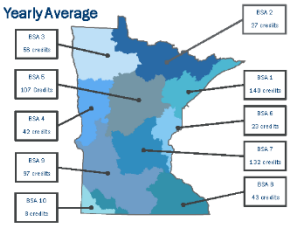
Cumulative Impact Analysis

Credit Usage – Yearly Average



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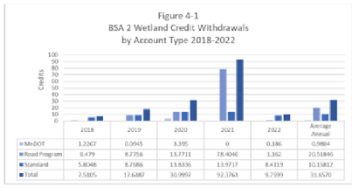
Cumulative Impact Analysis



27

BSA
Trends and Threats

28

Trends

Quantity

MnDNR Survey

Baseline (2006):

- 10.62 million acres wetland in Minnesota

2009 and 2012:

- Increase in wetland area
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- Does not cover Northern Lakes and Forests or Northern Minnesota Wetlands Ecoregions
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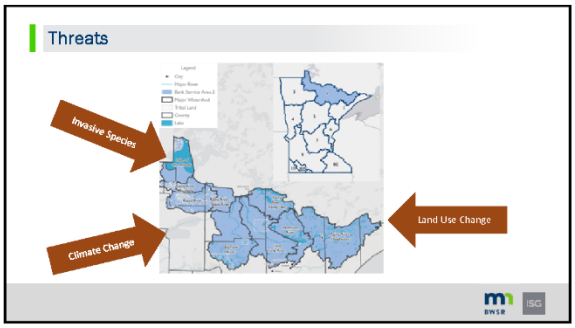
30



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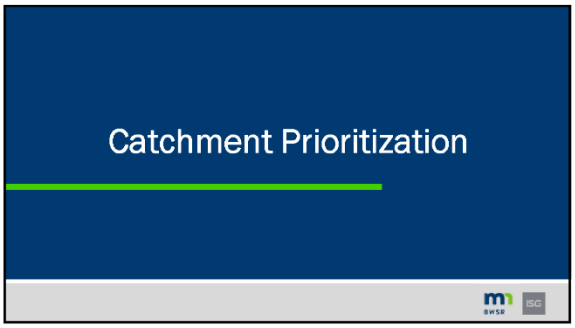

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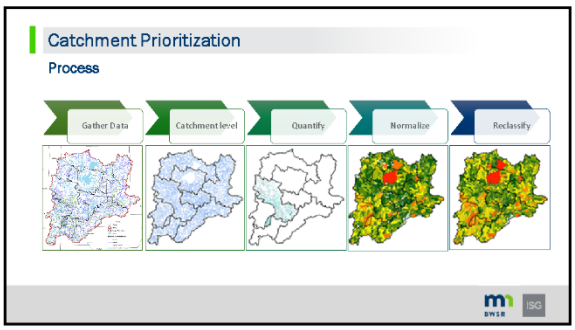

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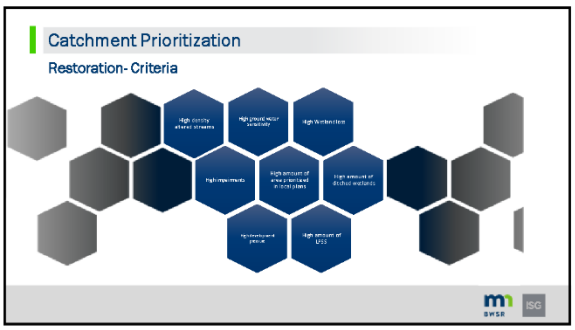

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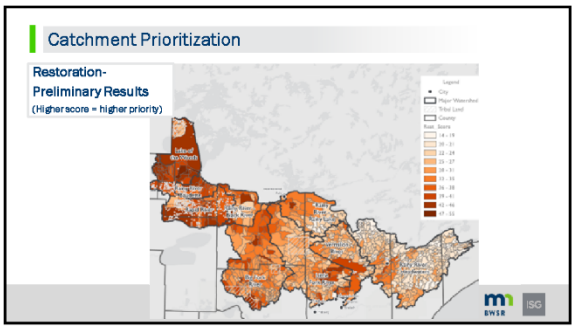

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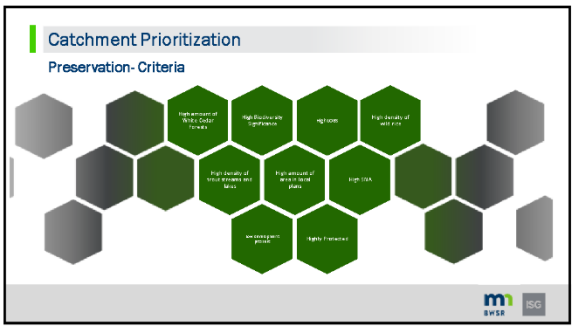

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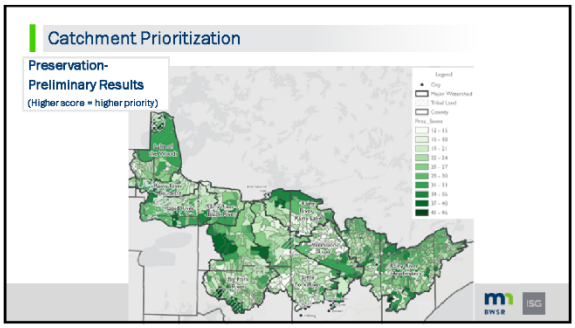

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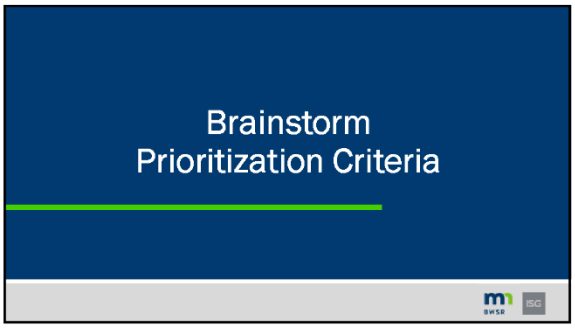

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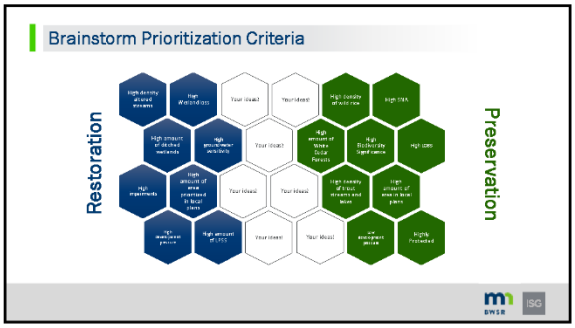

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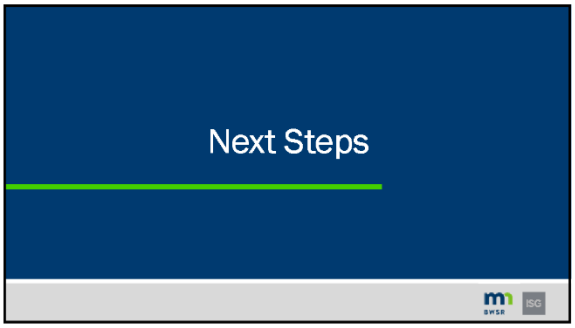

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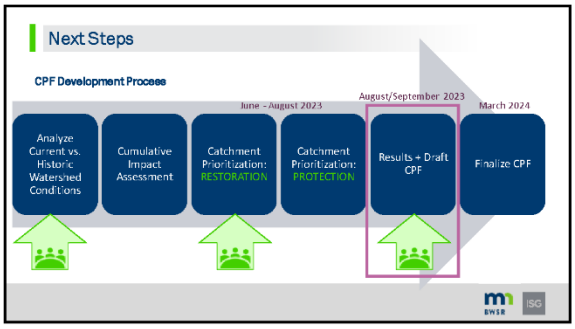

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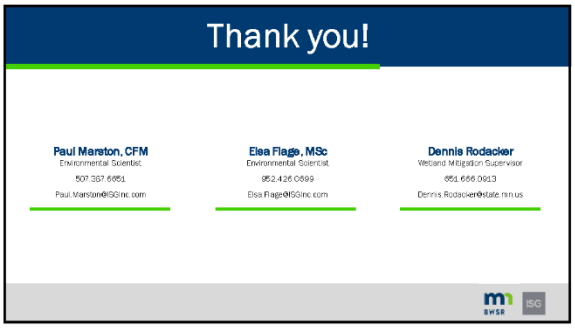

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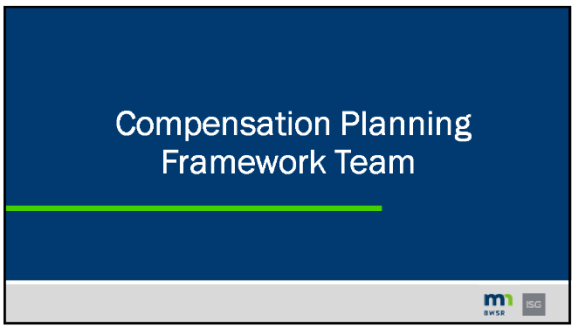
C-3. Meeting 3- October 2023 Stakeholder Meeting List of Attendees

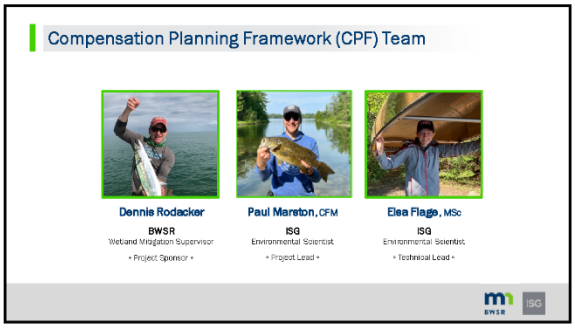
First Name	Last Name	Email	Organization
Kari	Hedin	kari.hedin@co.lake.mn.us	WCA - Lake County
Sam	Martin	samuel.martin@state.mn.us	MnDNR Area Hydrologist
Marcie	Peeters	marcie.peeters@co.koochiching.mn.us	Koochiching SWCD
Lynda	Ponting	lynda.ponting@state.mn.us	BWSR
Becca	Reiss	becca@nslswcd.org	North St. Louis SWCD
Chad	Severts	chad.severts@state.mn.us	BWSR
Tara	Solem	tara.solem@co.lake.mn.us	Lake County SWCD
Josh	Stromlund	josh_s@co.lotw.mn.us	Lake of the Woods SWCD
Stacy	Zeigler	stacy.zeigler@llojibwe.net	Leech Lake Band of Ojibwe


In Lieu Fee Program
Compensation Planning Framework
◦ BSA 2 ◦
October 12, 2023

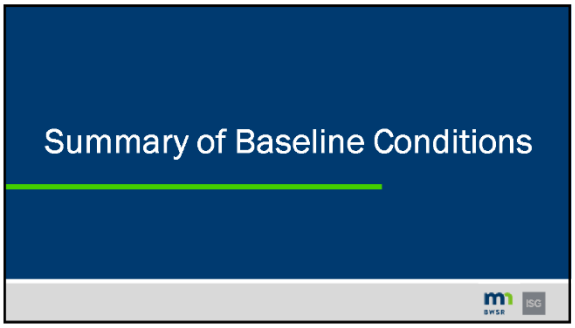
1


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 •

3


Summary of Baseline Conditions

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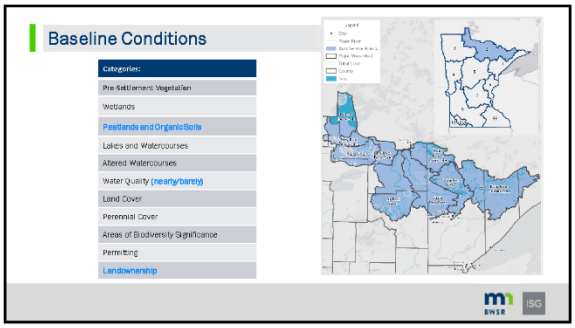
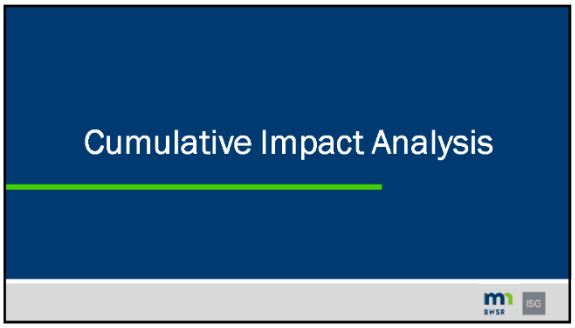

Baseline Conditions
Categories:
Pre-Settlement Vegetation
Wetlands
Peatlands and Organic Soils
Lakes and Watercourses
Altered Watercourses
Water Quality (nearly/barely)
Land Cover
Perennial Cover
Areas of Biodiversity Significance
Permitting
Landownership

5

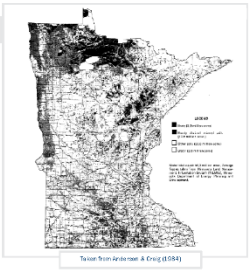

Cumulative Impact Analysis

6

Cumulative Impact Analysis

Wetland Loss

Methodology	Presettlement Wetlands (Acres)	Current Wetlands (Acres)	% Loss
Anderson and Craig (1984)	3.4 Million	3.1 Million	7%
Soils + NWI Analysis	3.7 Million	3 Million	9%



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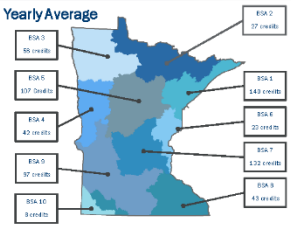

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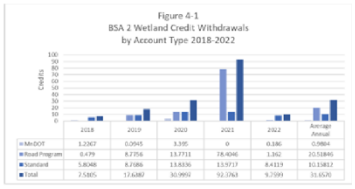

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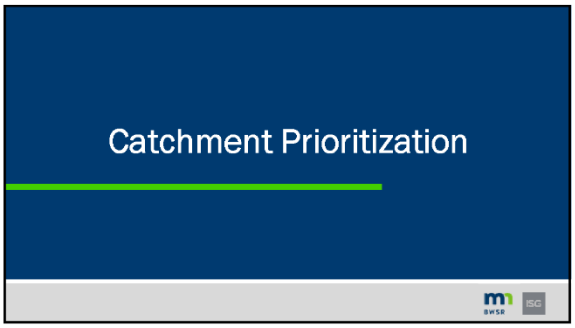

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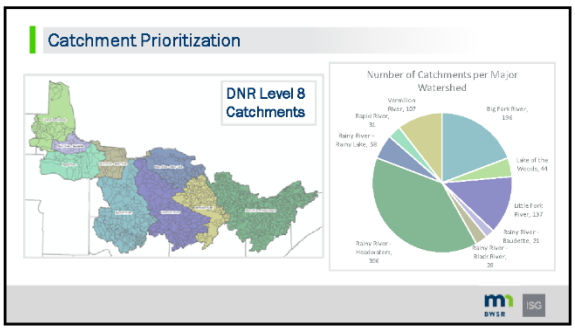

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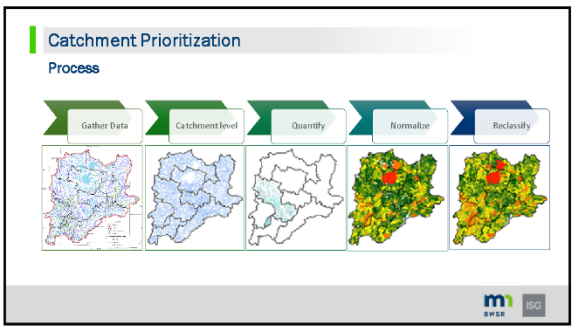

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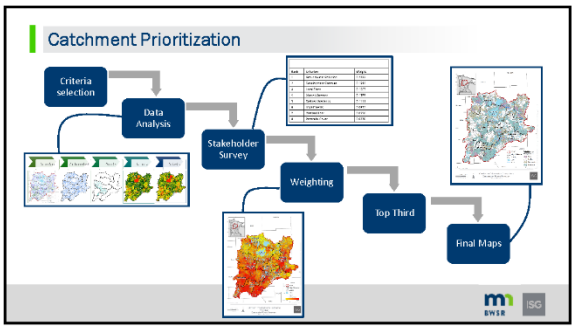

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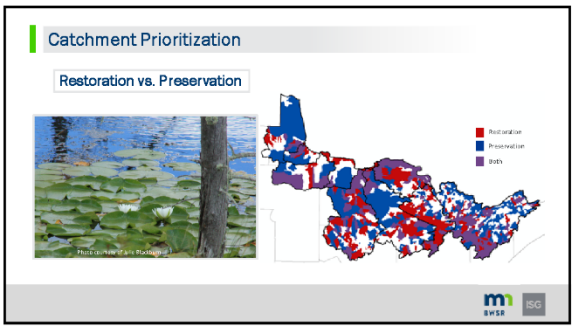

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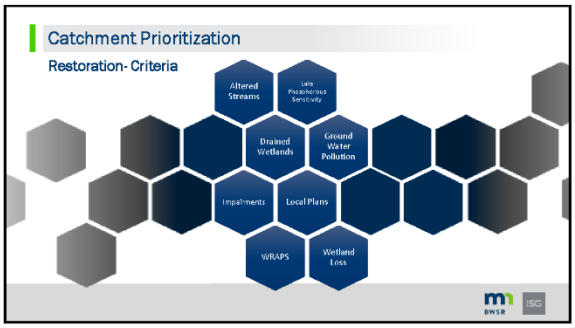

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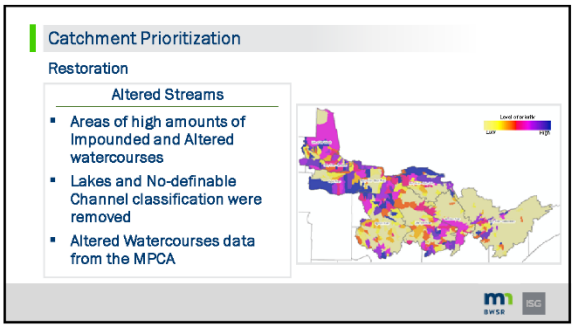

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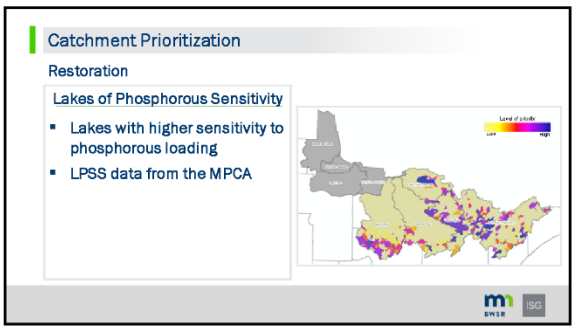

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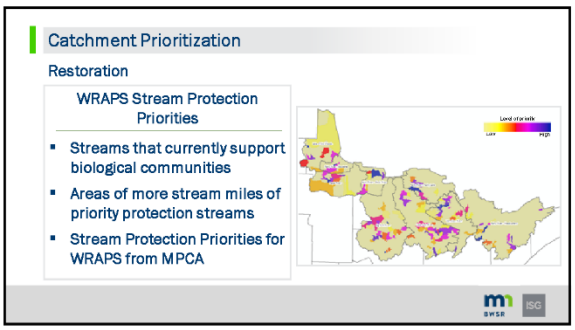

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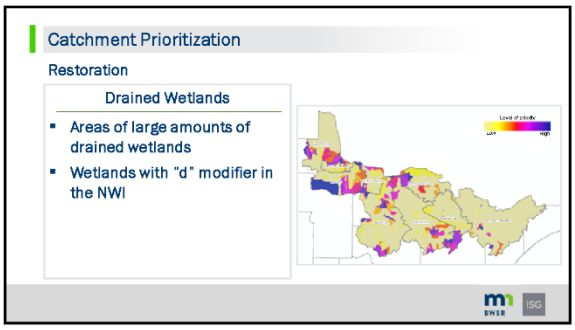

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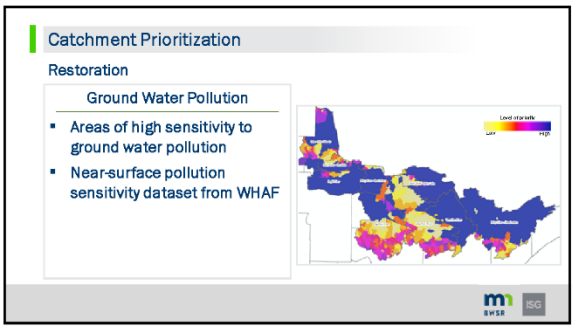

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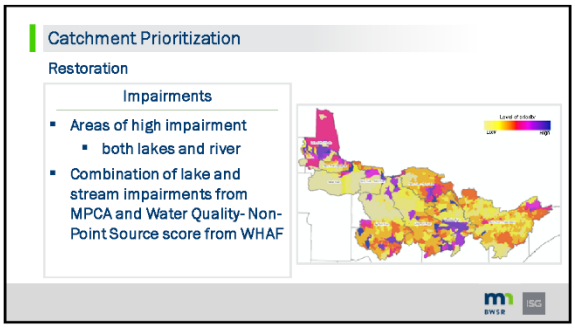

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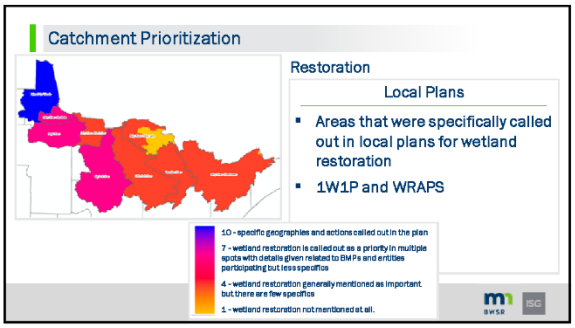

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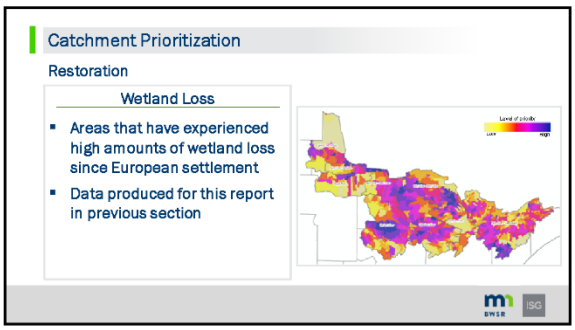

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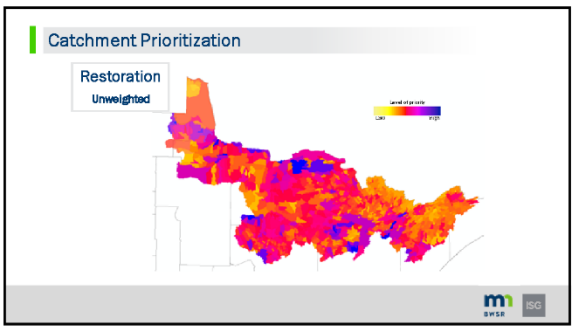

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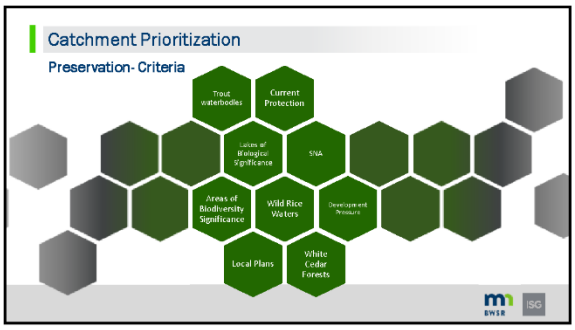

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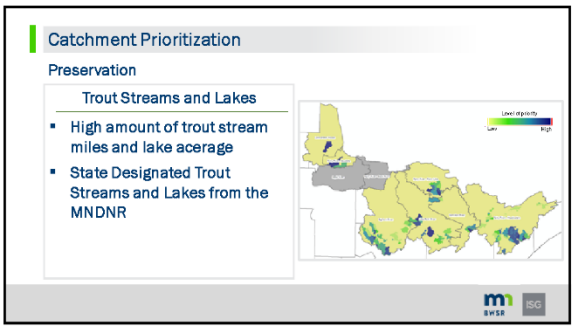

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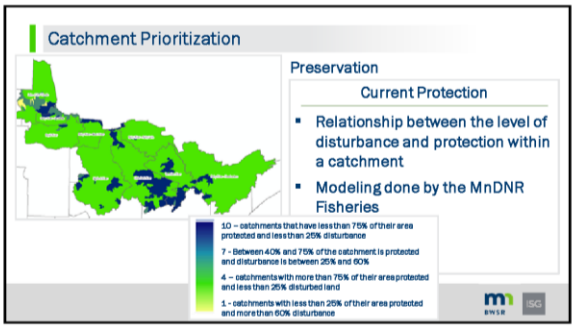

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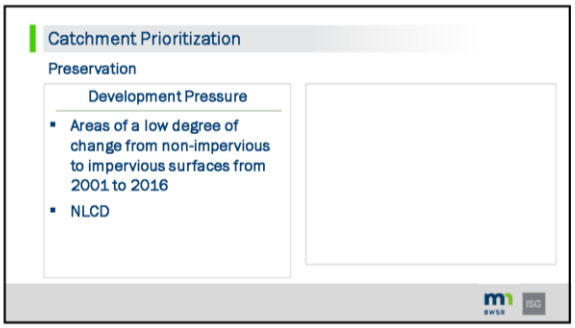

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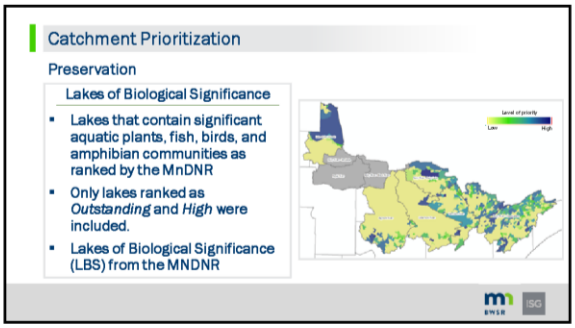

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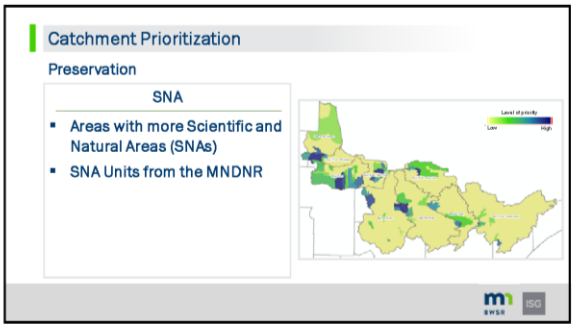

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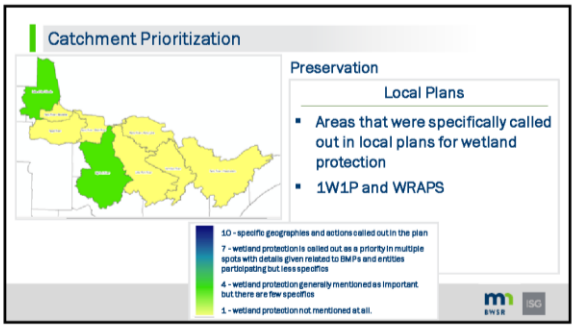

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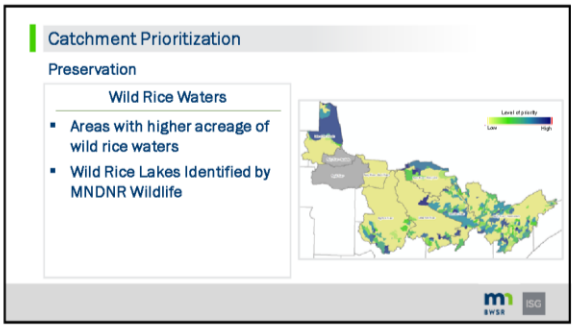

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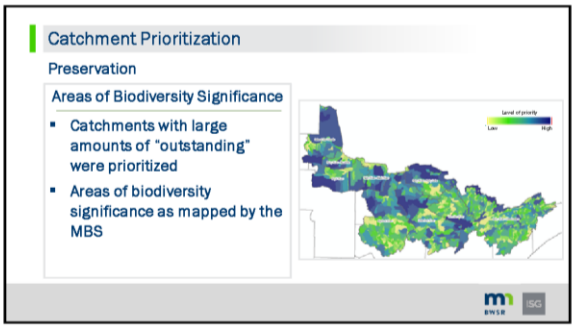

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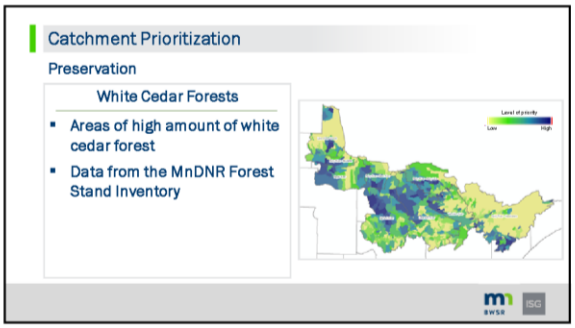

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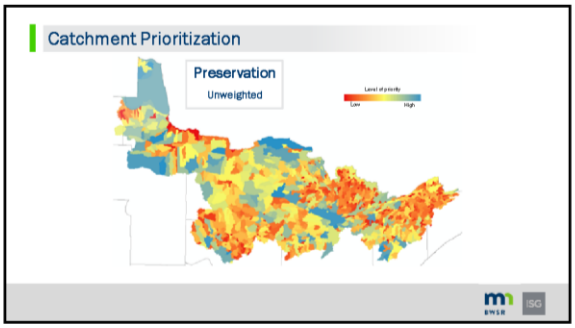

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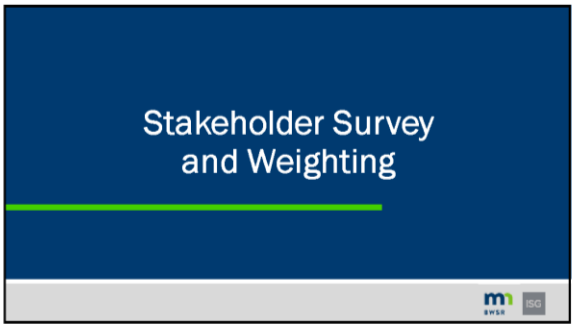

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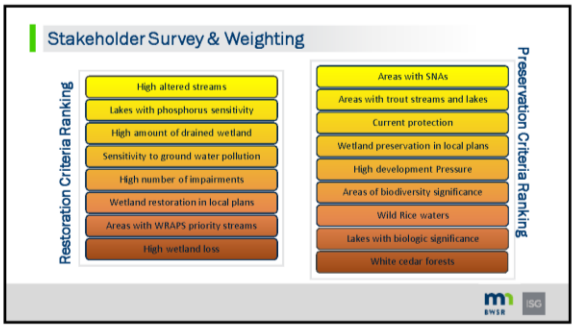

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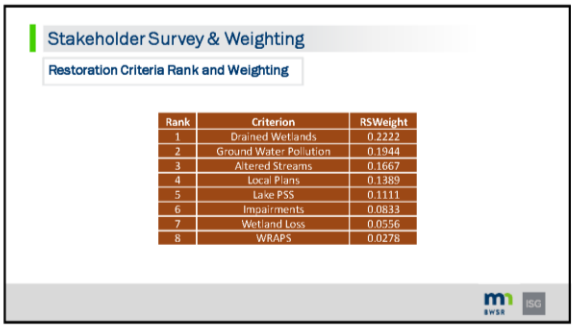
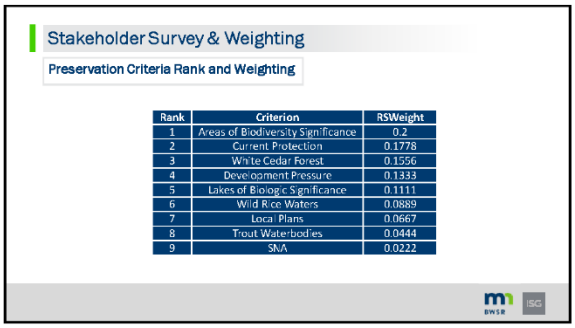


Rank	Criterion	RSWeight
1	Drained Wetlands	0.2222
2	Ground Water Pollution	0.1944
3	Altered Streams	0.1667
4	Local Plans	0.1389
5	Lake PSS	0.1111
6	Impairments	0.0833
7	Wetland Loss	0.0556
8	WRAPS	0.0278

42



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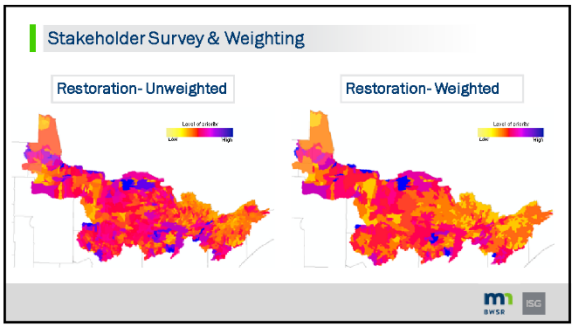

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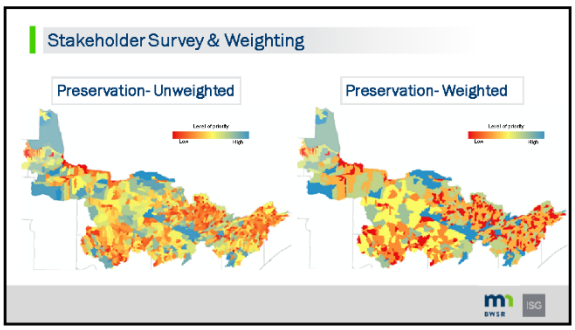

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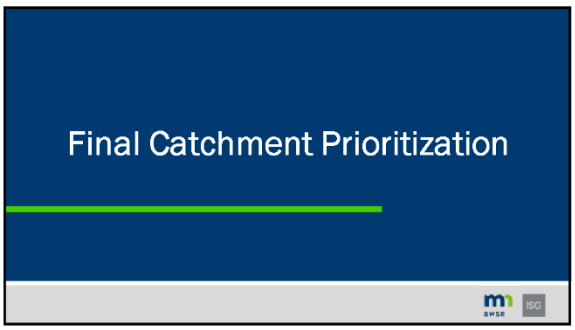

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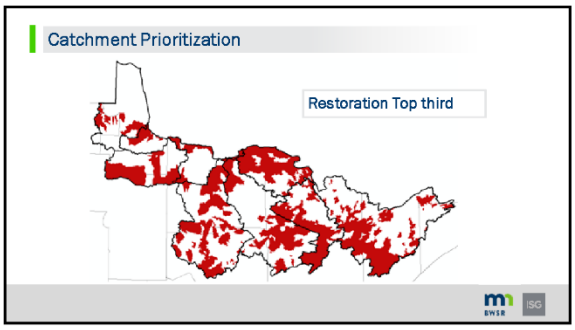

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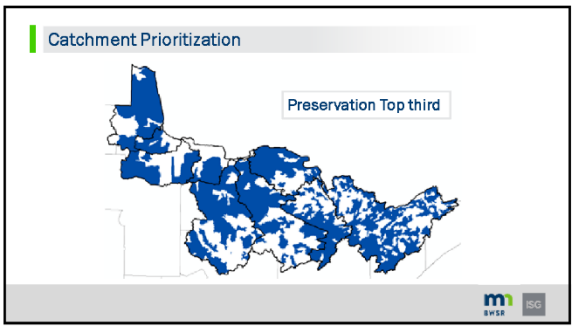

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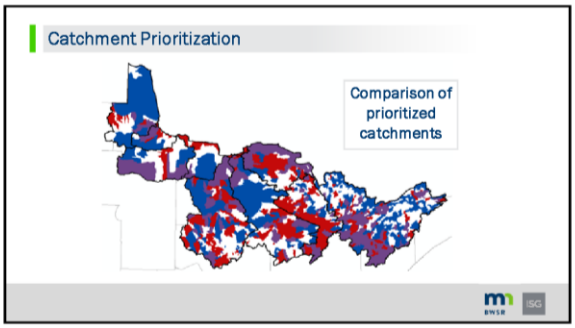
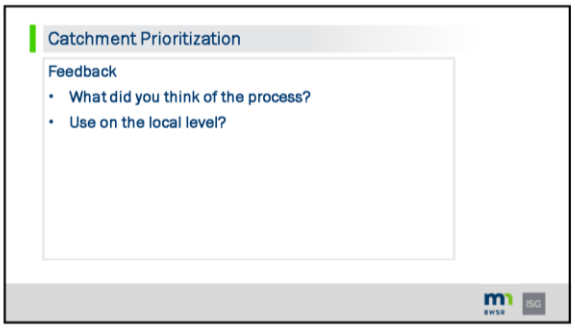
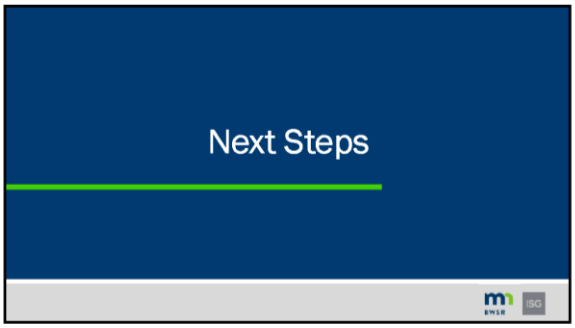

Catchment Prioritization
Comparison of prioritized catchments

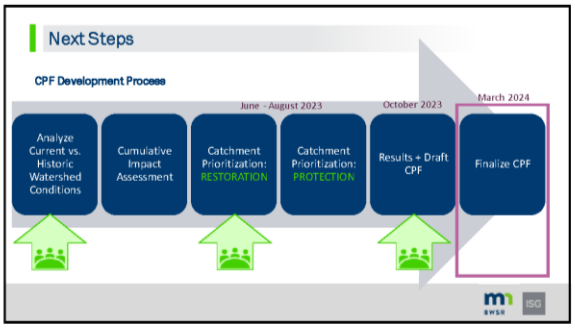
49


Catchment Prioritization
Feedback
• What did you think of the process?
• Use on the local level?

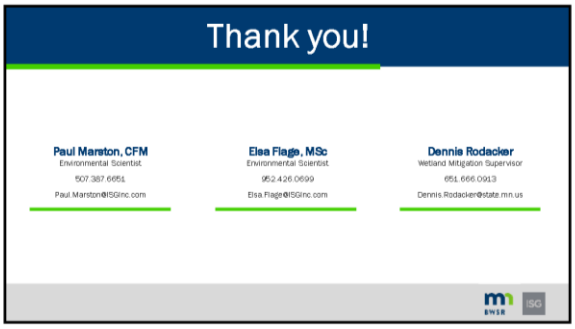
50


Next Steps

51


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

52


Thank you!
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Appendix D: Catchment Prioritization Maps

Figure D-1. Catchment Prioritization Comparison

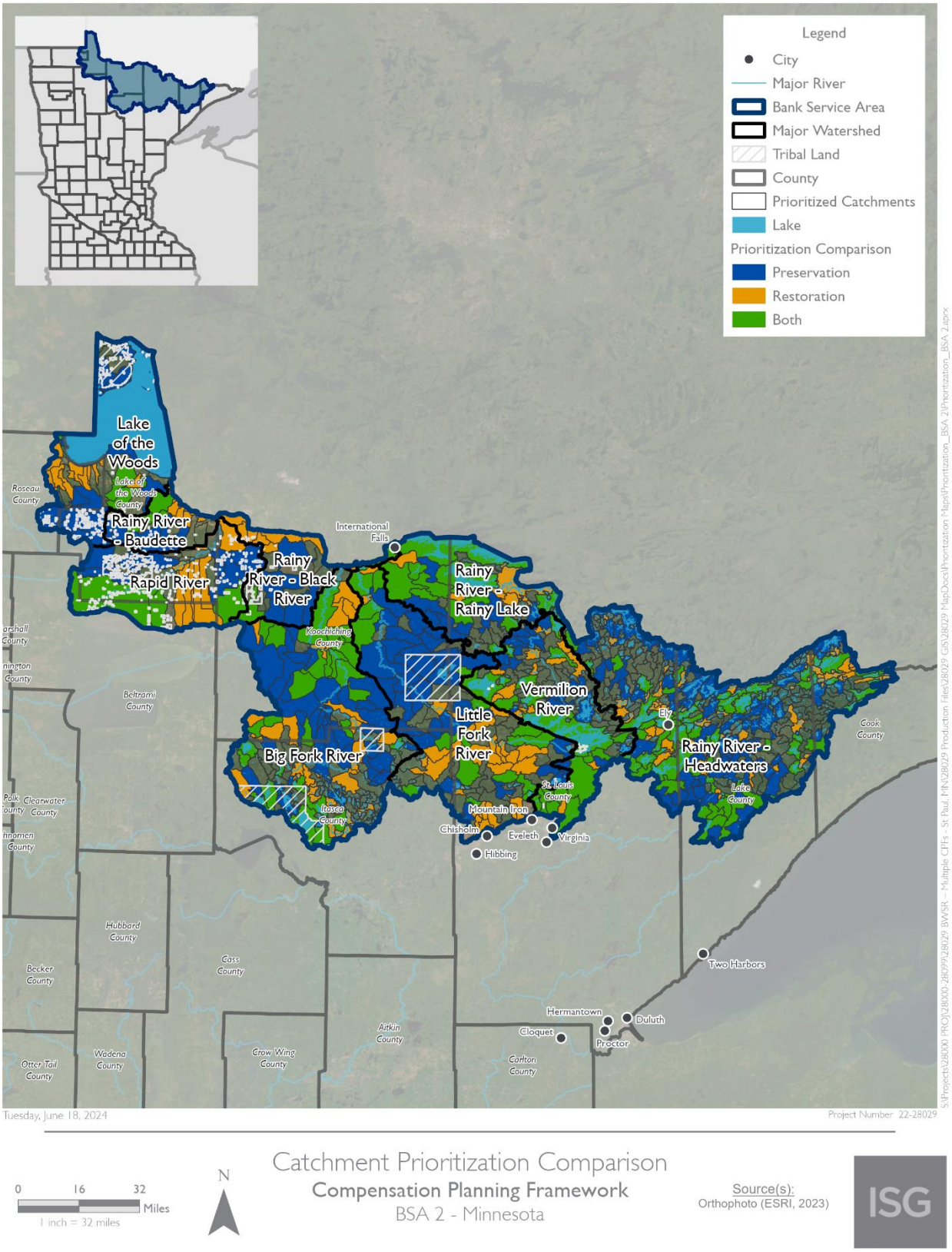


Figure D-2. Unweighted Restoration Catchment Prioritization

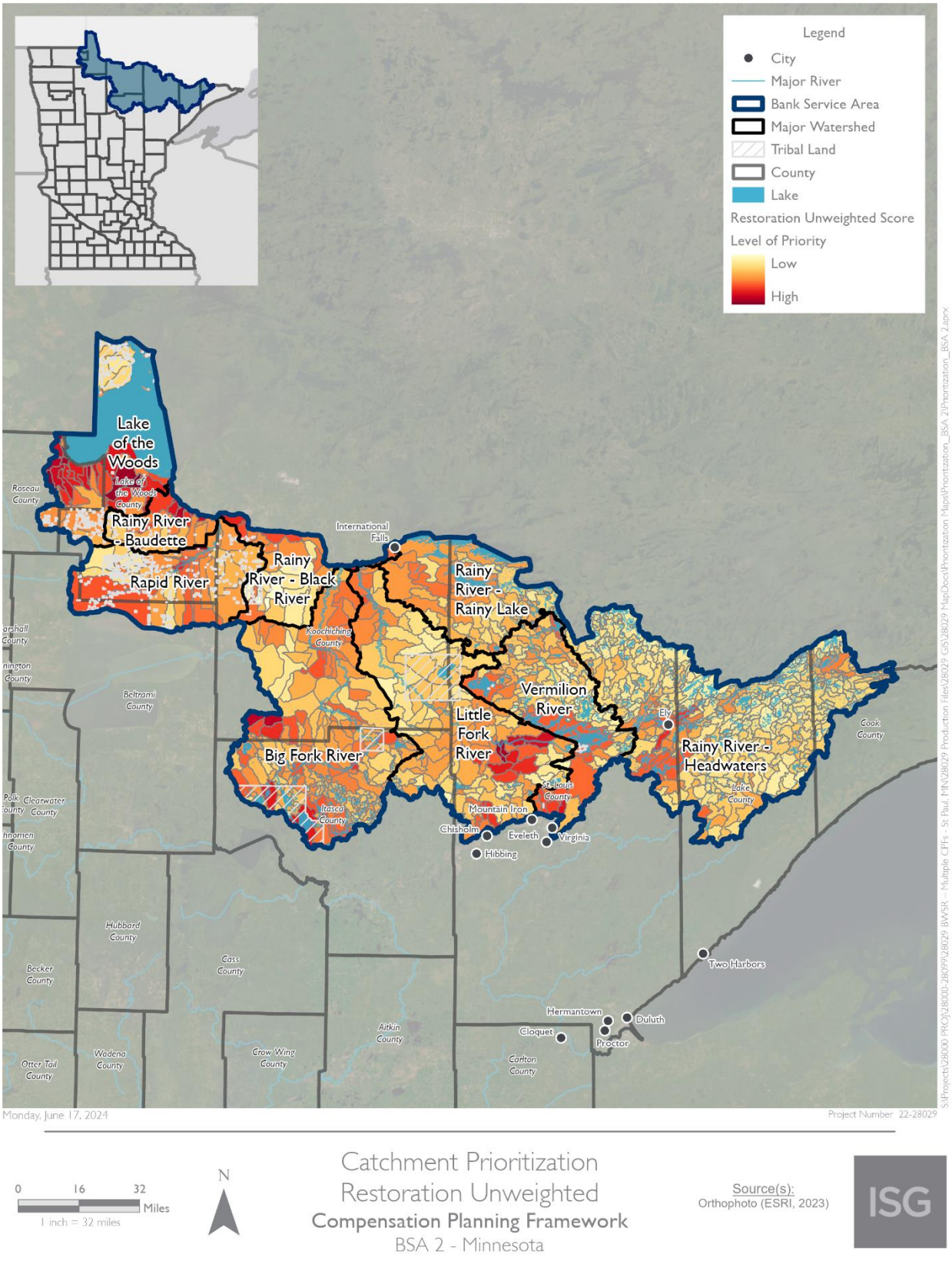


Figure D-3. Unweighted Preservation Catchment Prioritization

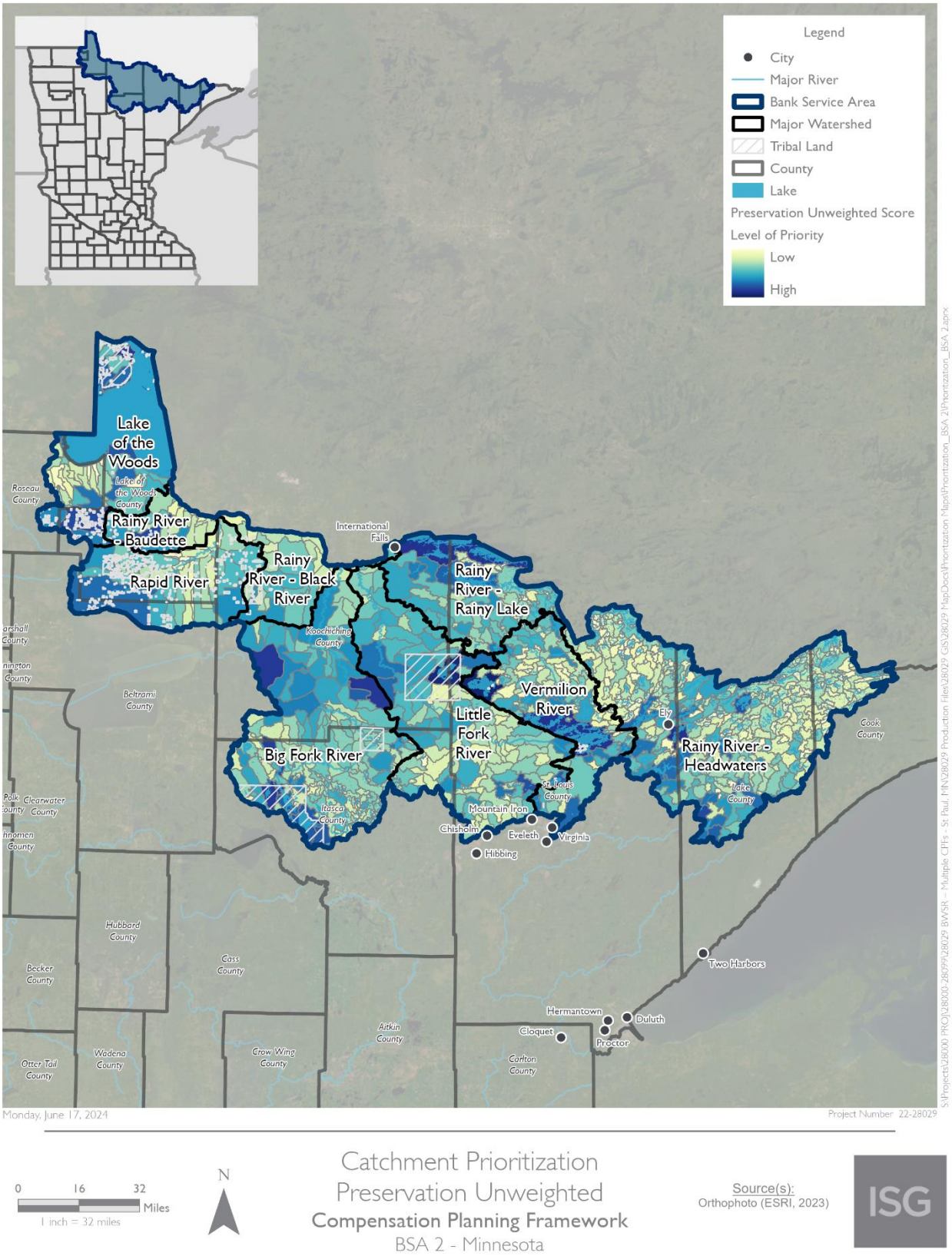


Figure D-4. Weighted Restoration Catchment Prioritization

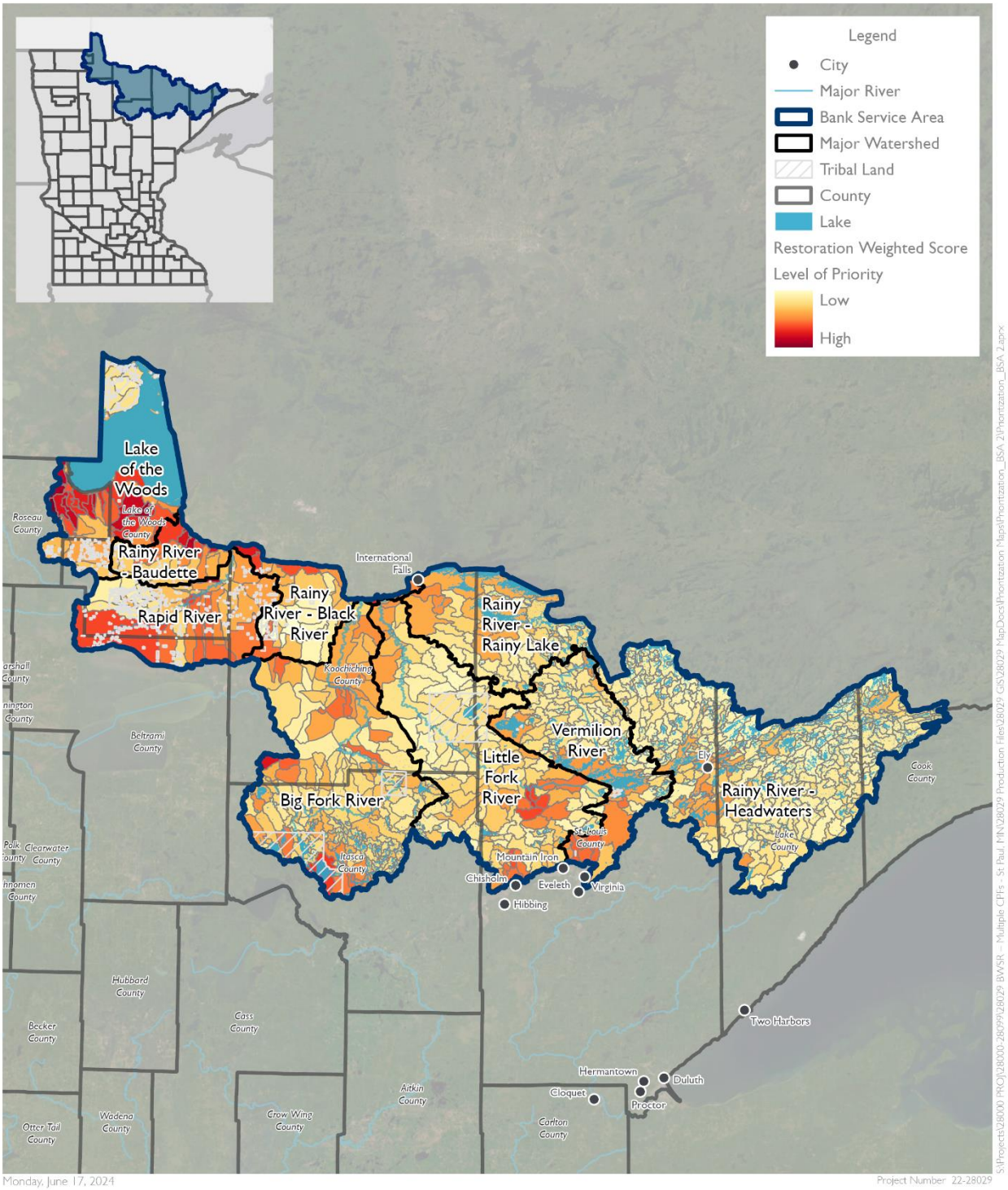


Figure D-5. Weighted Preservation Catchment Prioritization

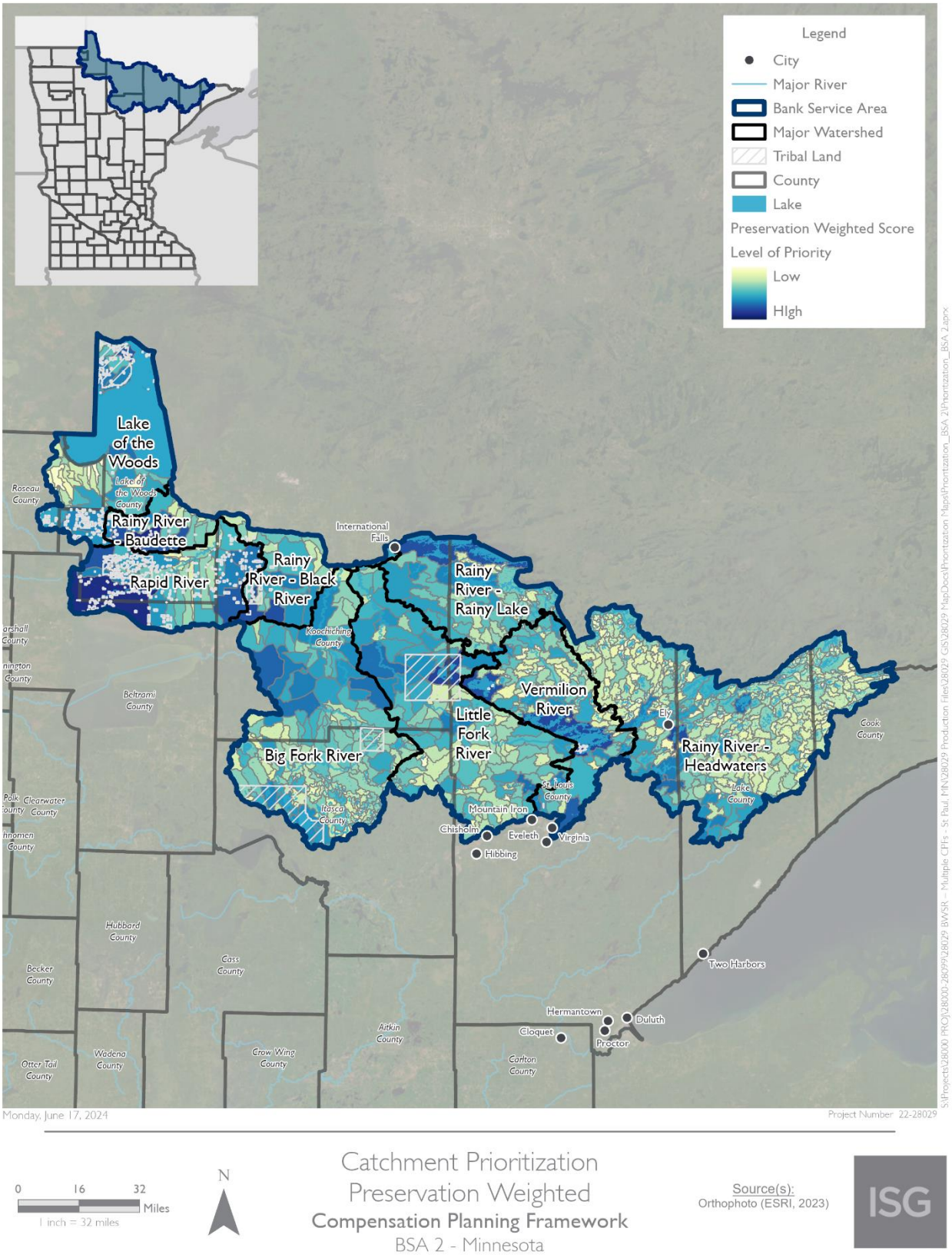


Figure D-6. Final Restoration Catchment Prioritization

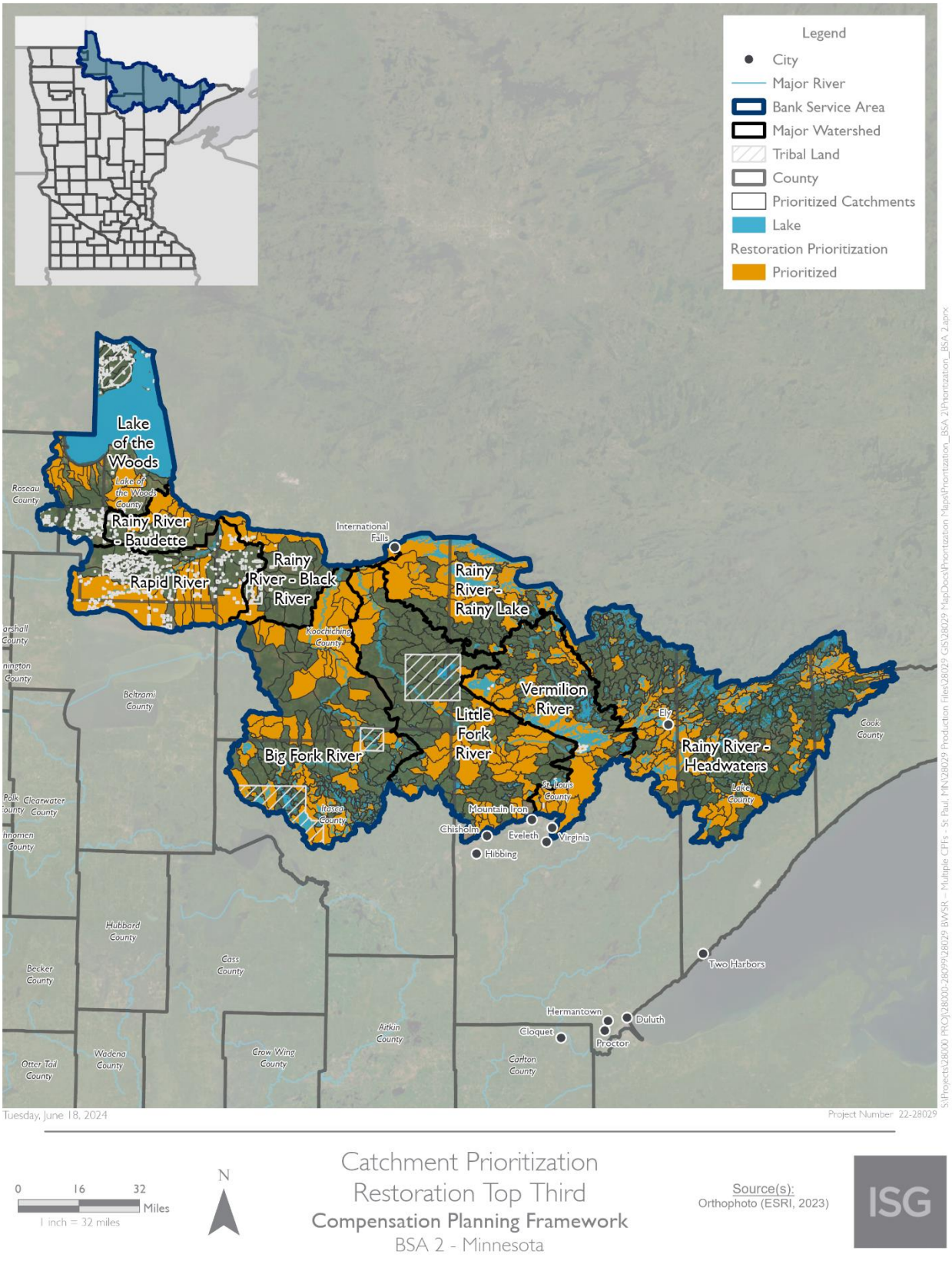


Figure D-7. Final Preservation Catchment Prioritization

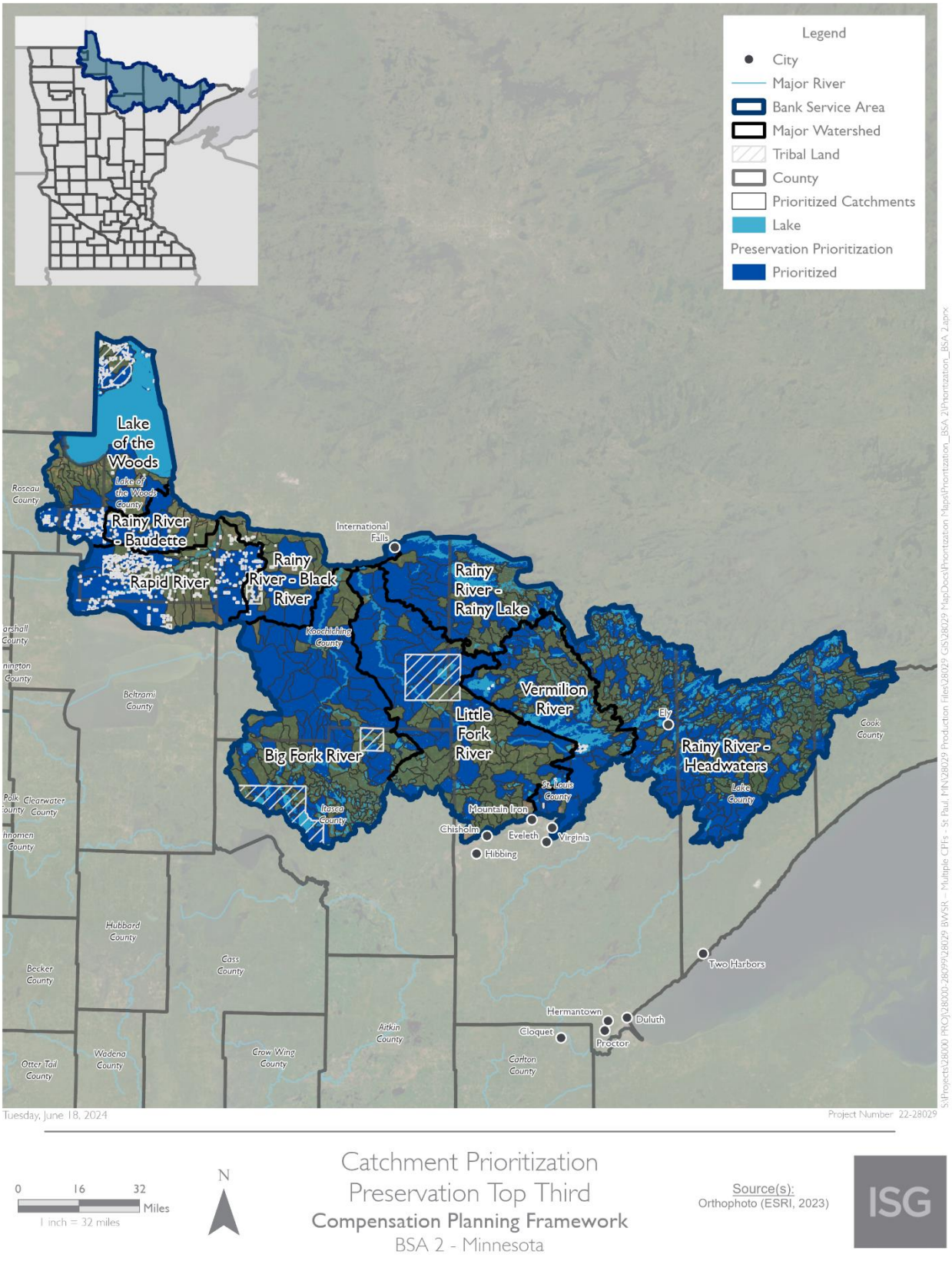


Figure D-8. Final Restoration Catchment Prioritization – Big Fork River Watershed

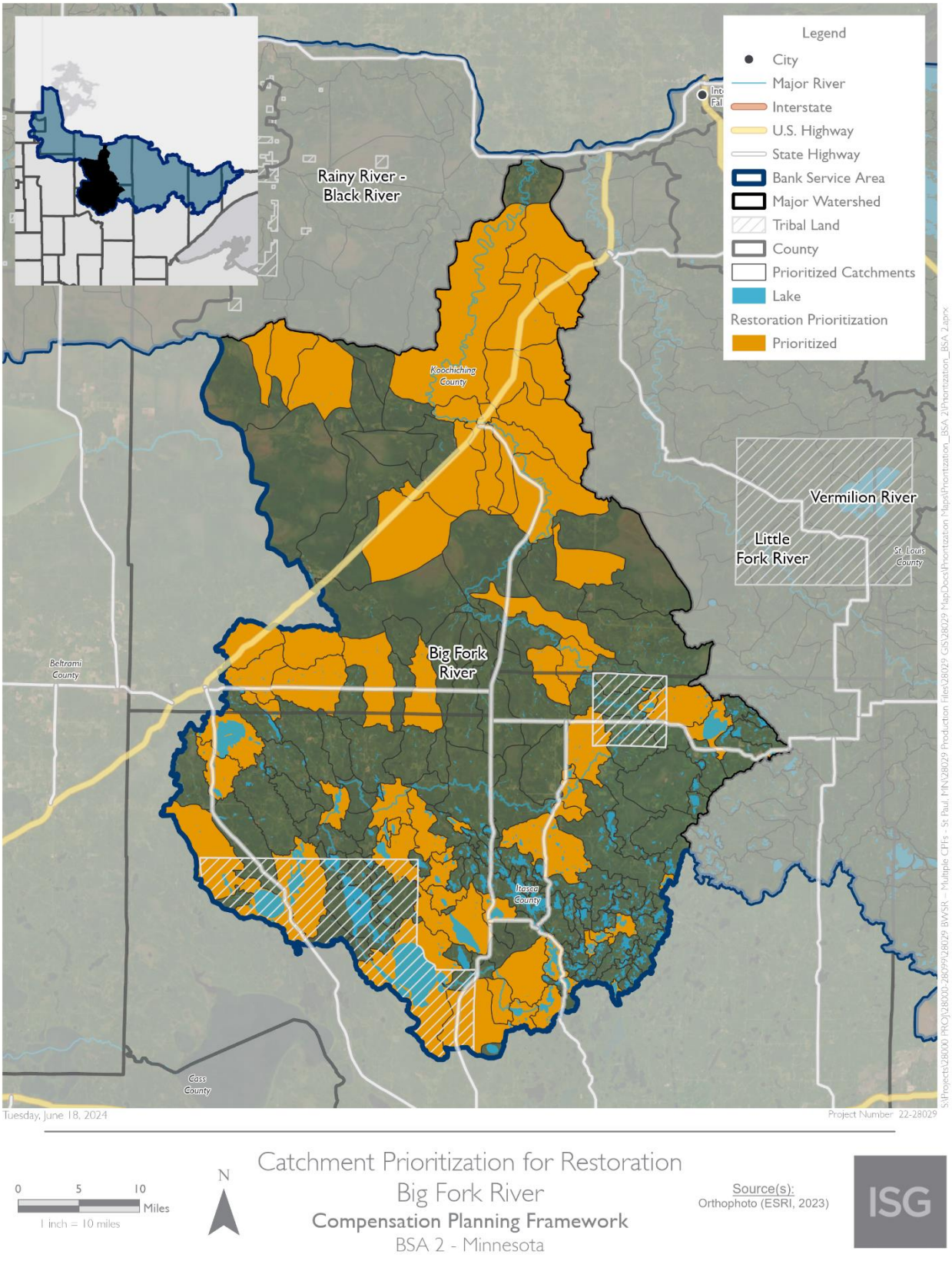


Figure D-9. Final Restoration Catchment Prioritization – Lake of the Woods Watershed

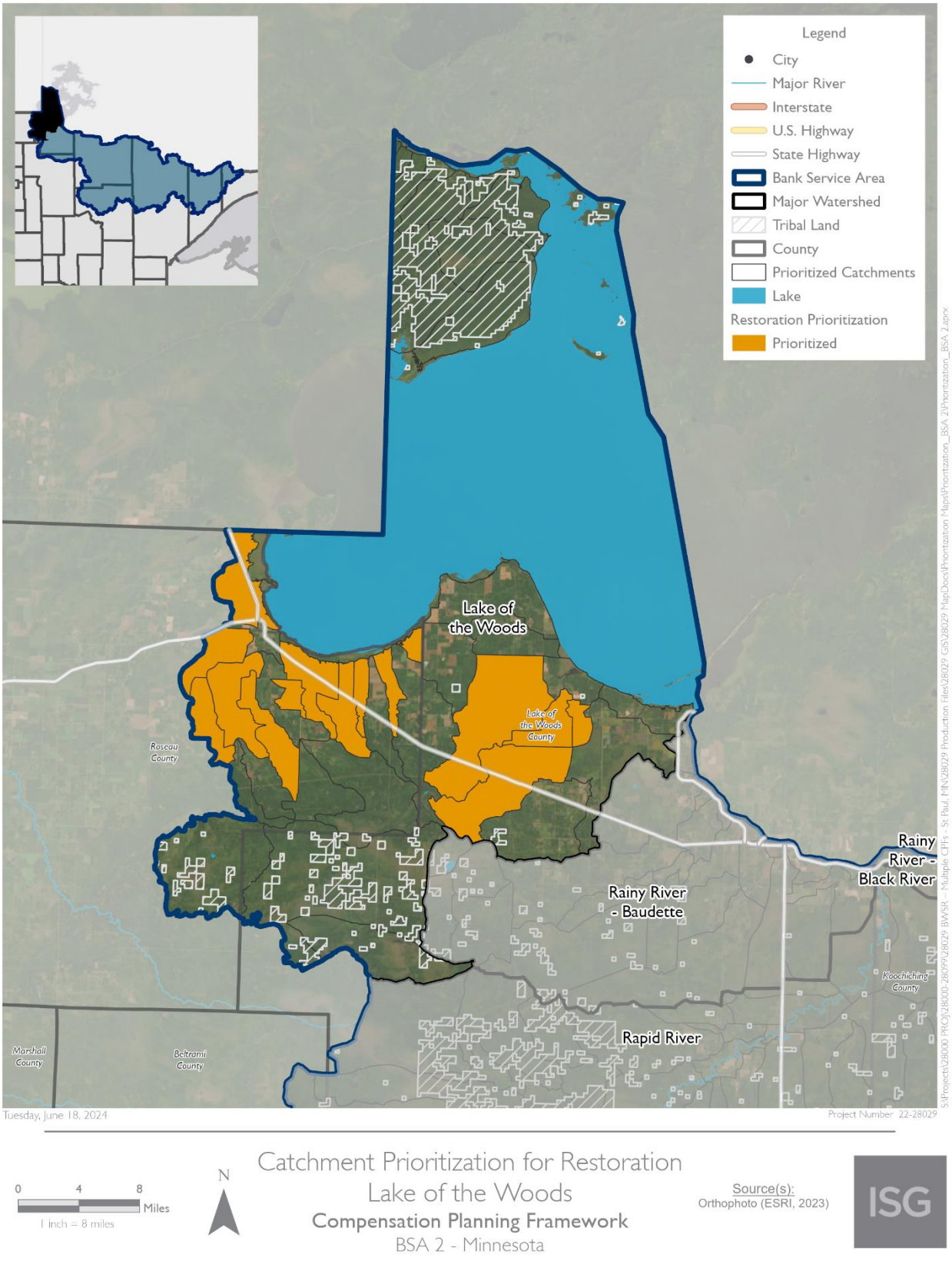


Figure D-10. Final Restoration Catchment Prioritization – Little Fork River Watershed

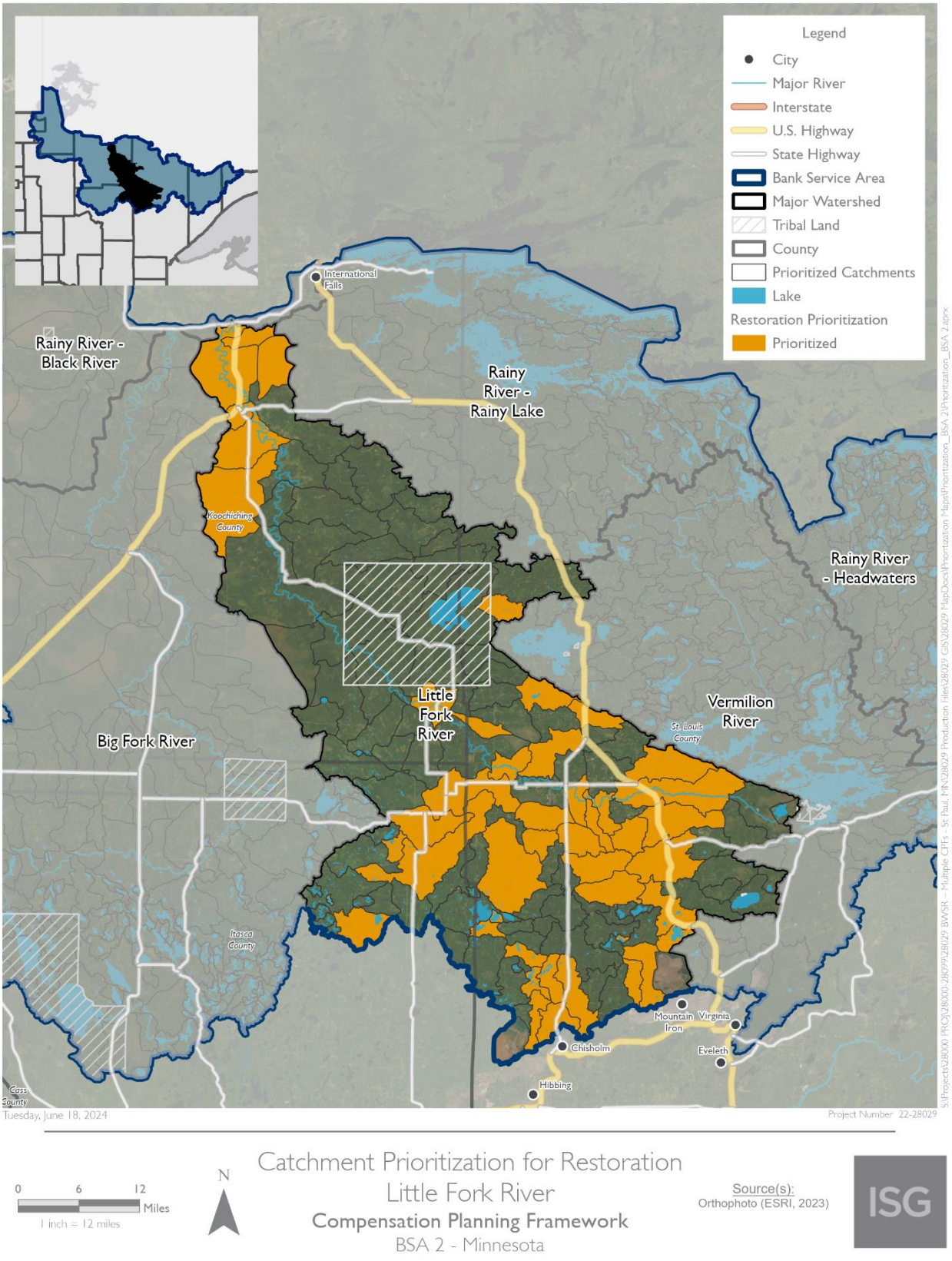


Figure D-11. Final Restoration Catchment Prioritization – Rainy River - Baudette Watershed

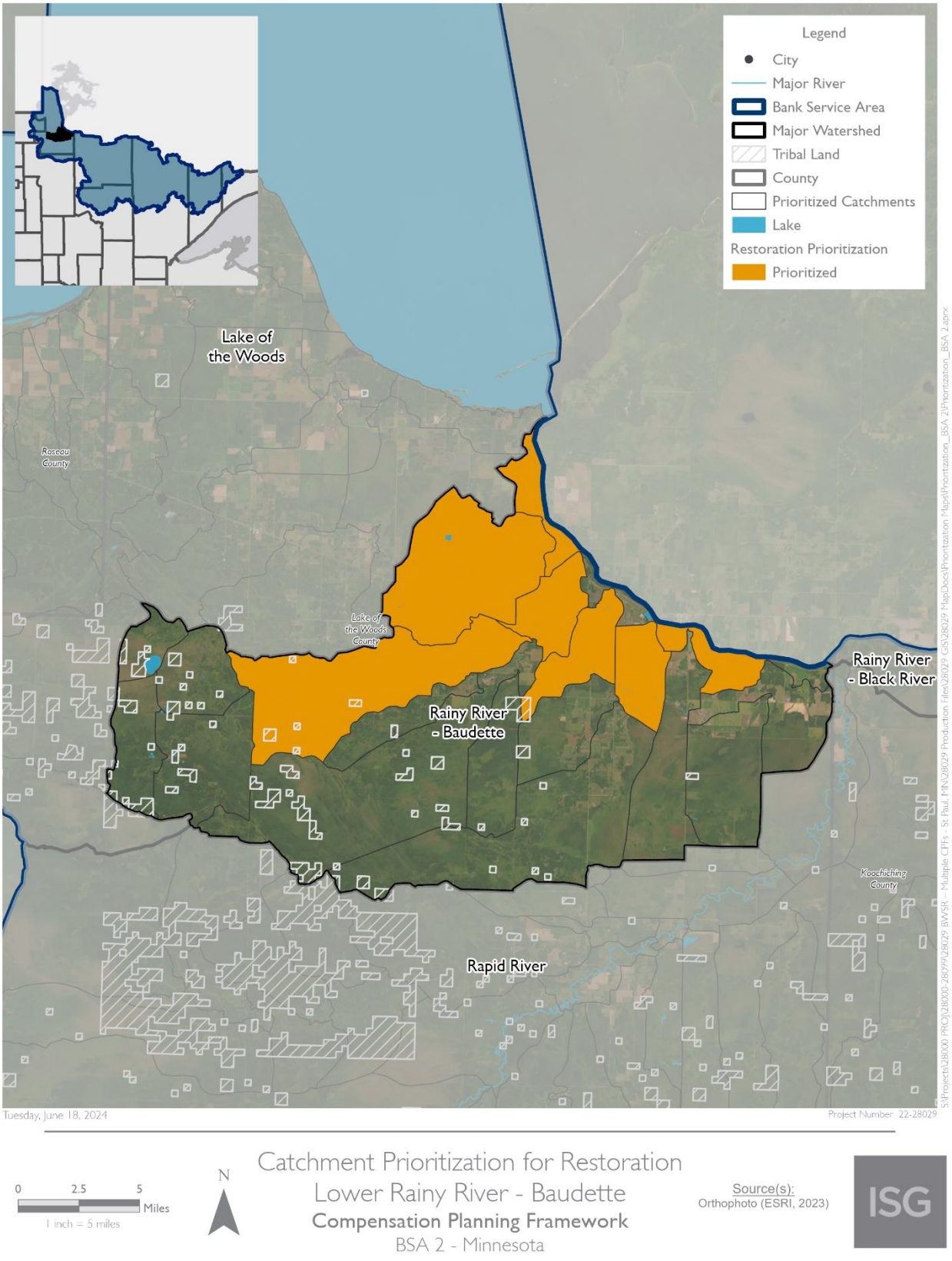


Figure D-12. Final Restoration Catchment Prioritization – Rainy River – Black River Watershed

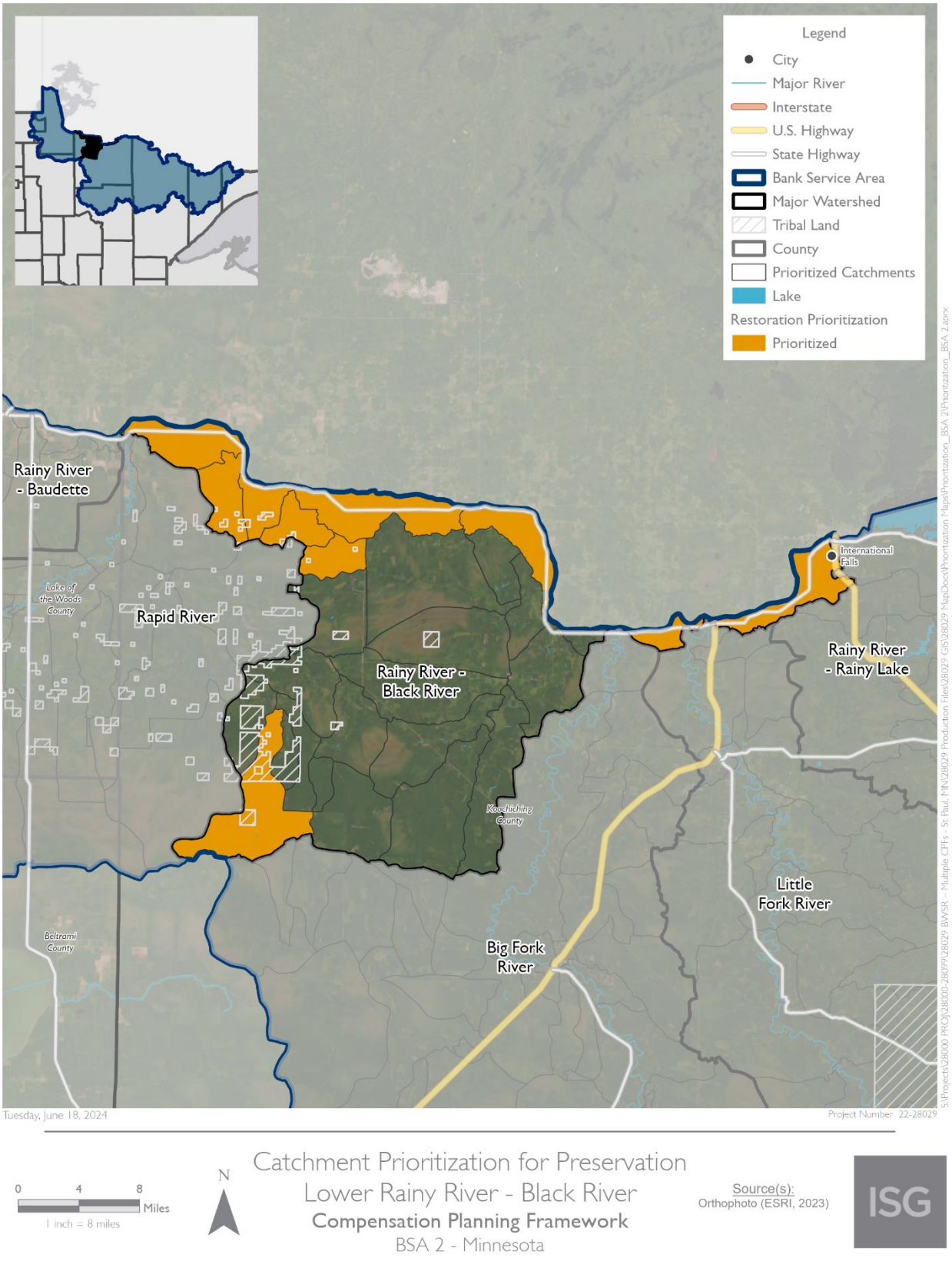


Figure D-13. Final Restoration Catchment Prioritization – Rainy River – Headwaters Watershed

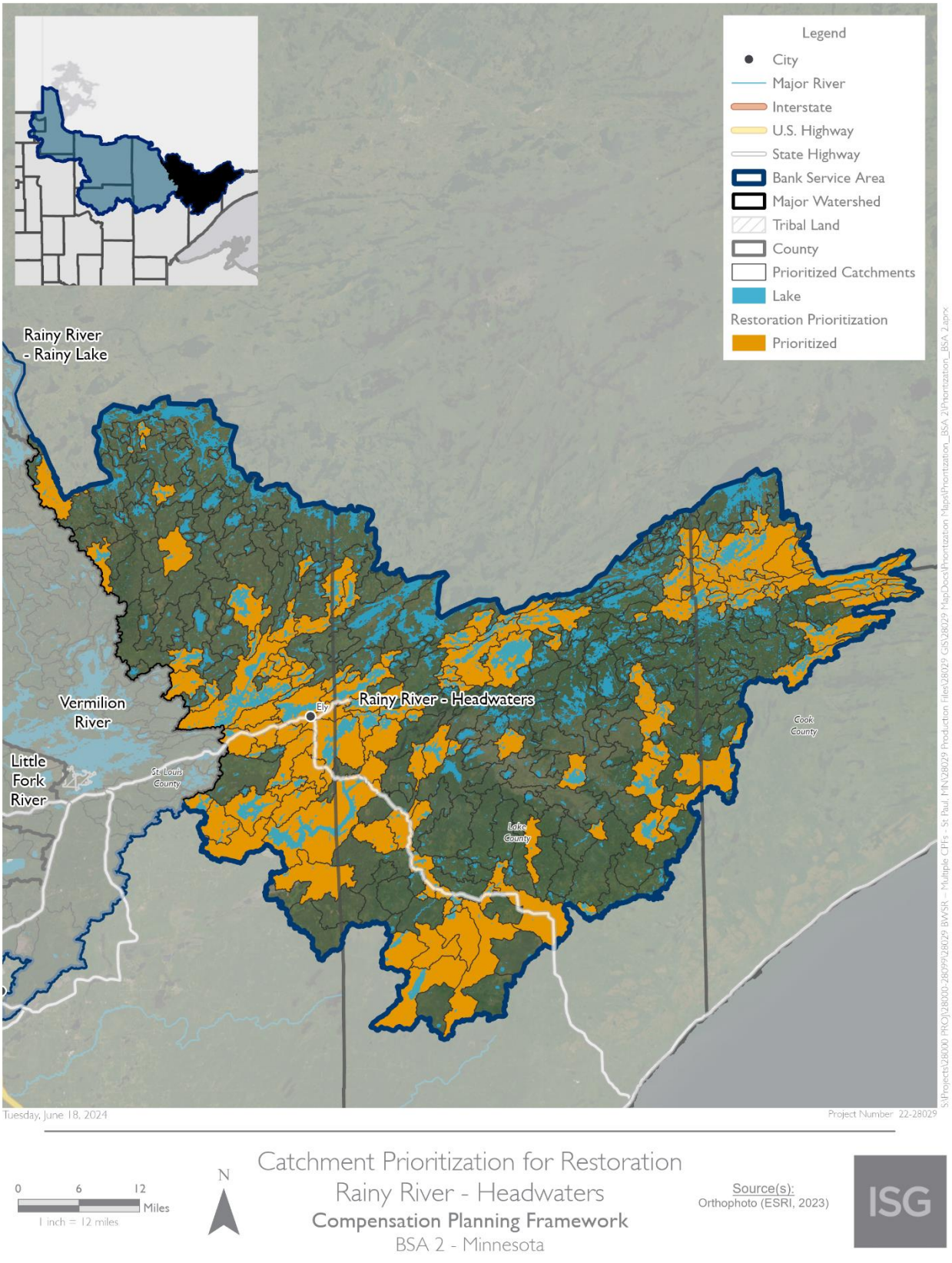


Figure D-14. Final Restoration Catchment Prioritization – Rainy River – Rainy Lake Watershed

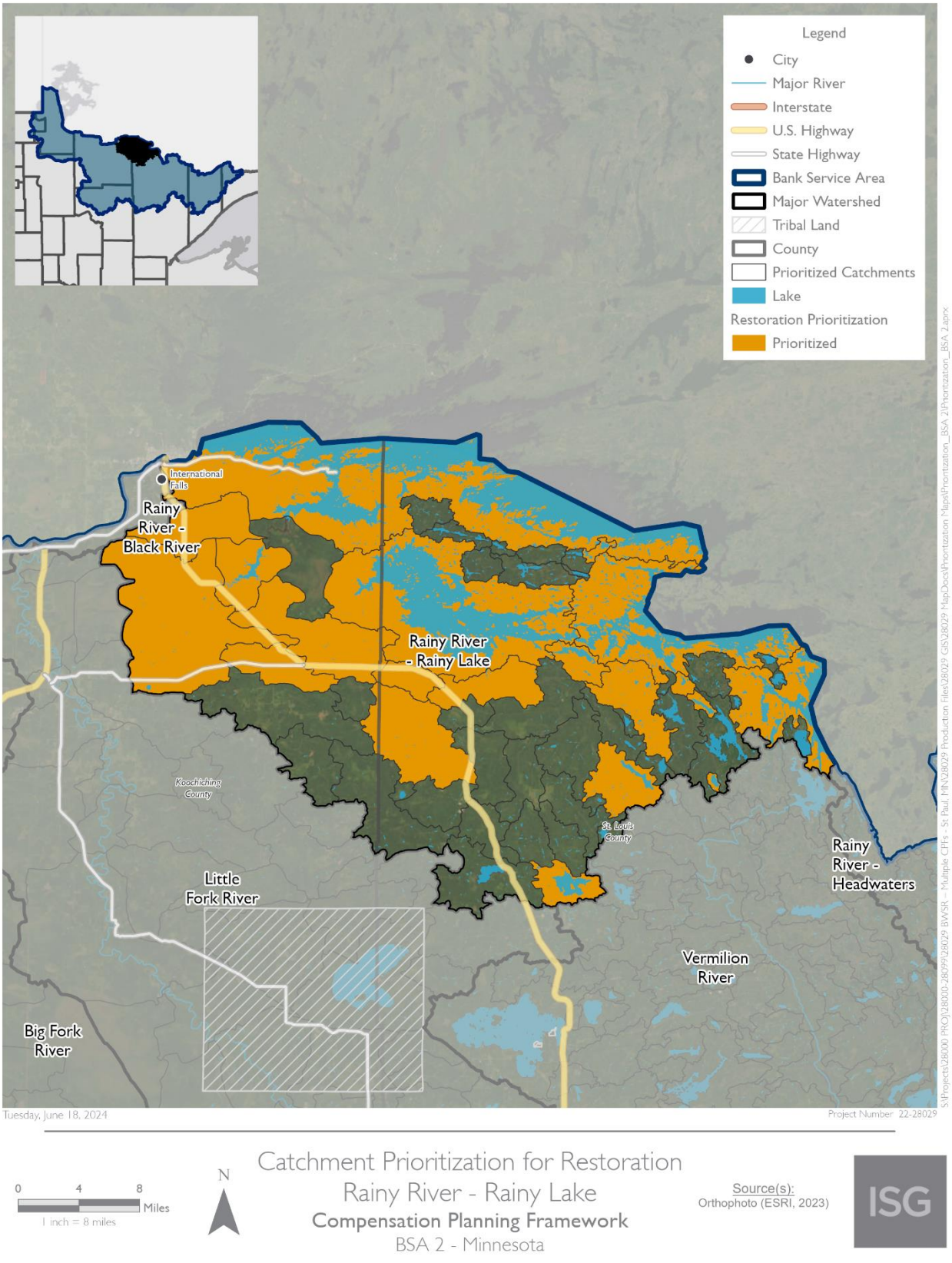


Figure D-15. Final Restoration Catchment Prioritization – Rapid River Watershed

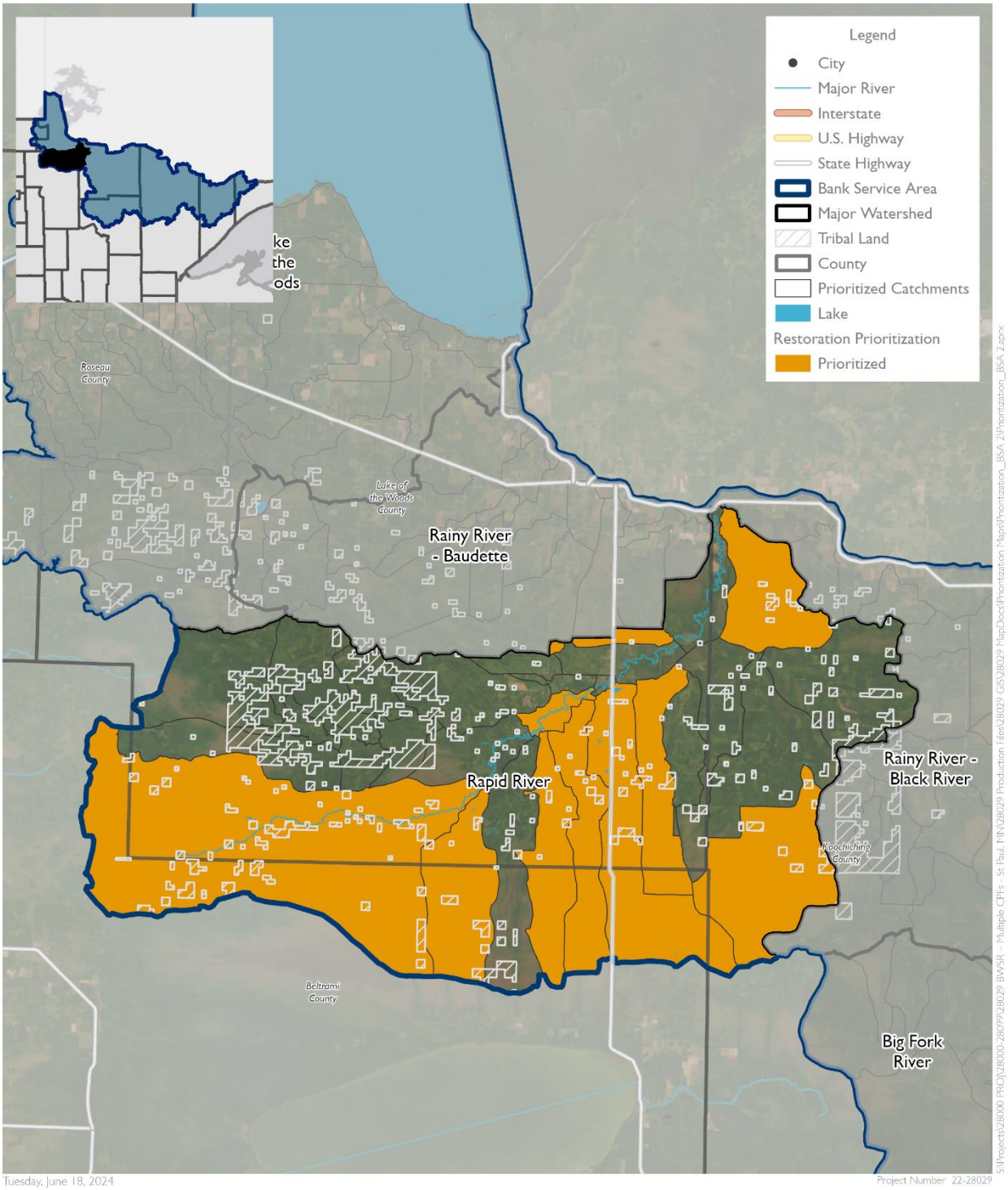


Figure D-16. Final Restoration Catchment Prioritization – Vermilion River Watershed

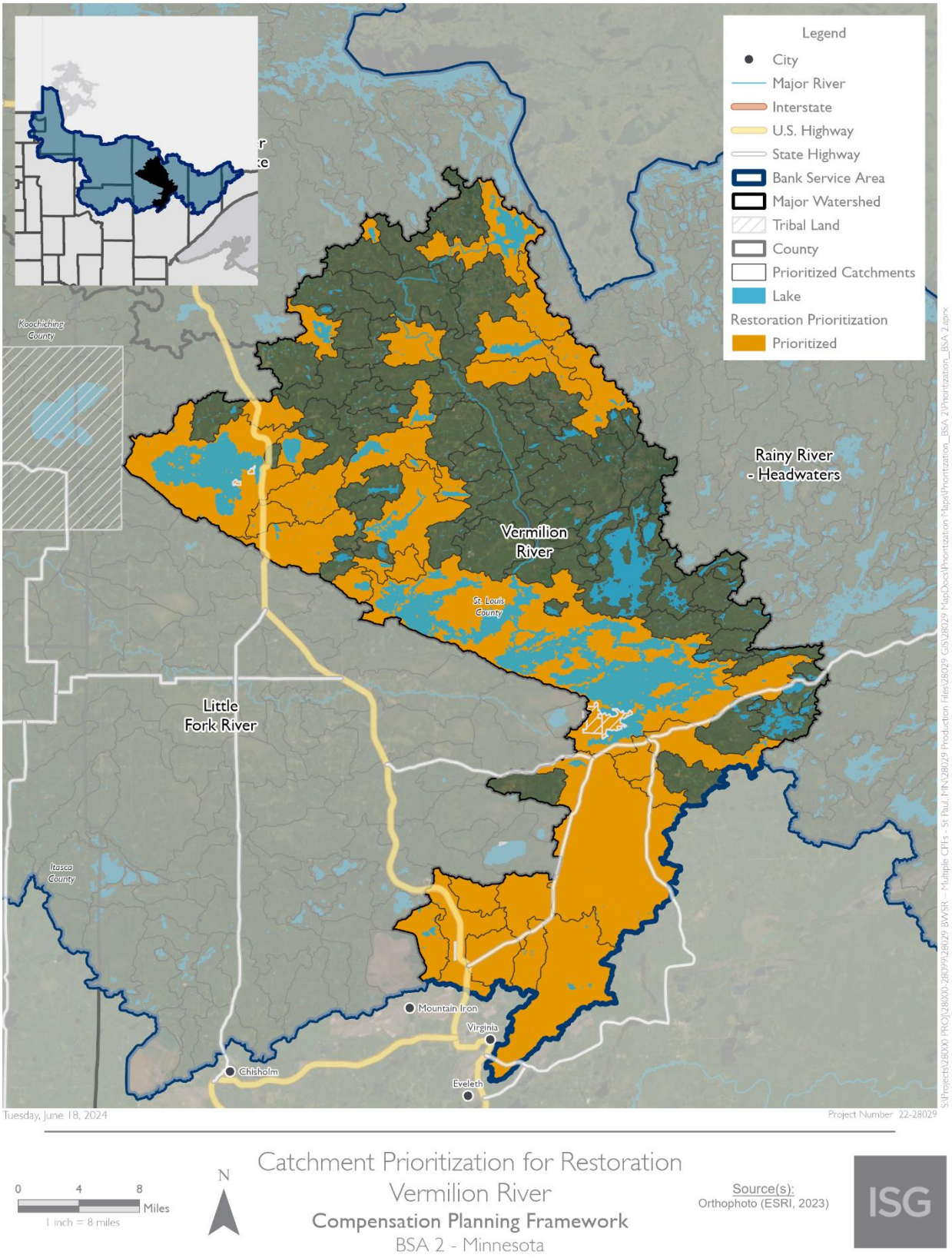


Figure D-17. Final Preservation Catchment Prioritization – Big Fork River Watershed

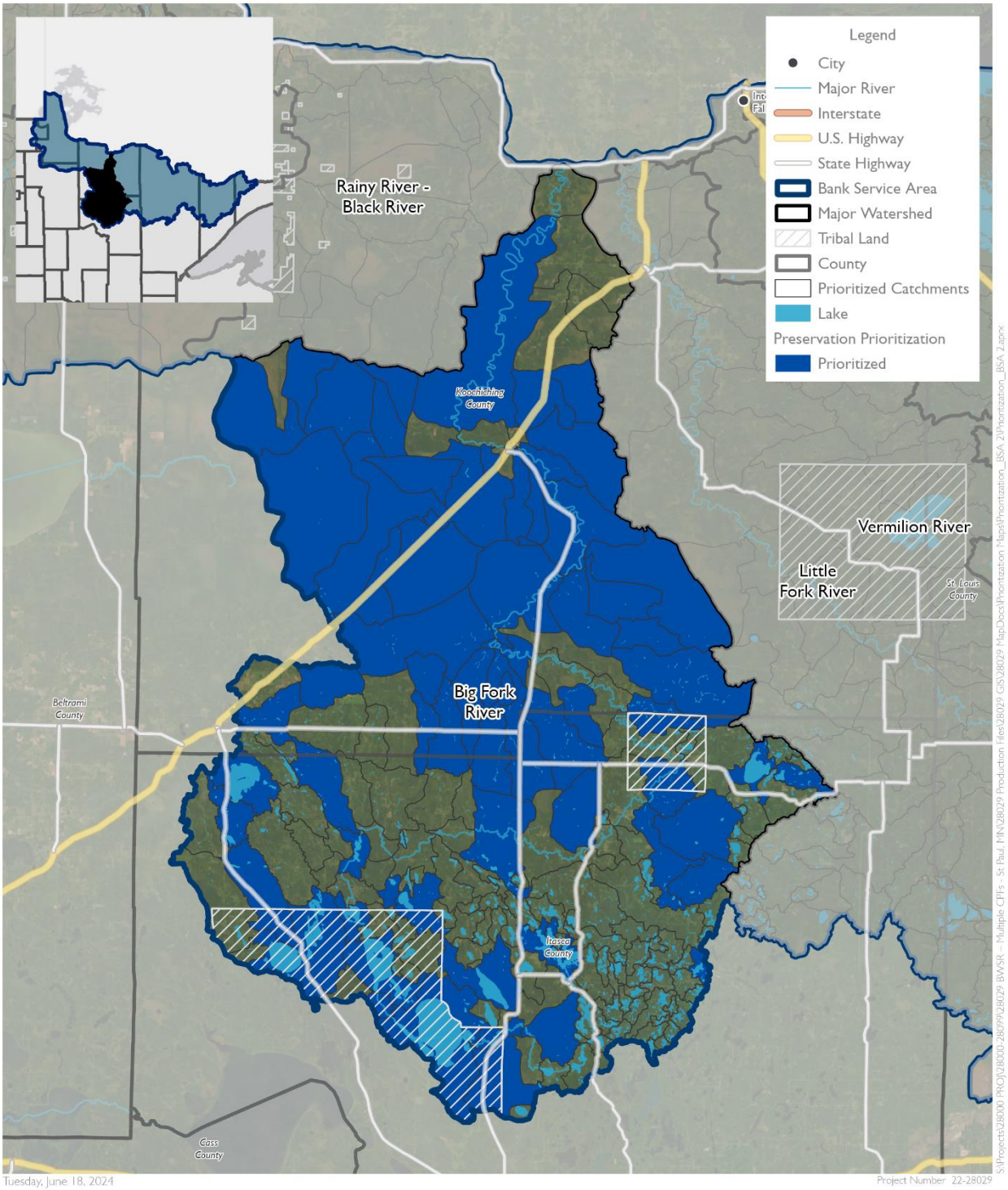


Figure D-18. Final Preservation Catchment Prioritization – Lake of the Woods Watershed

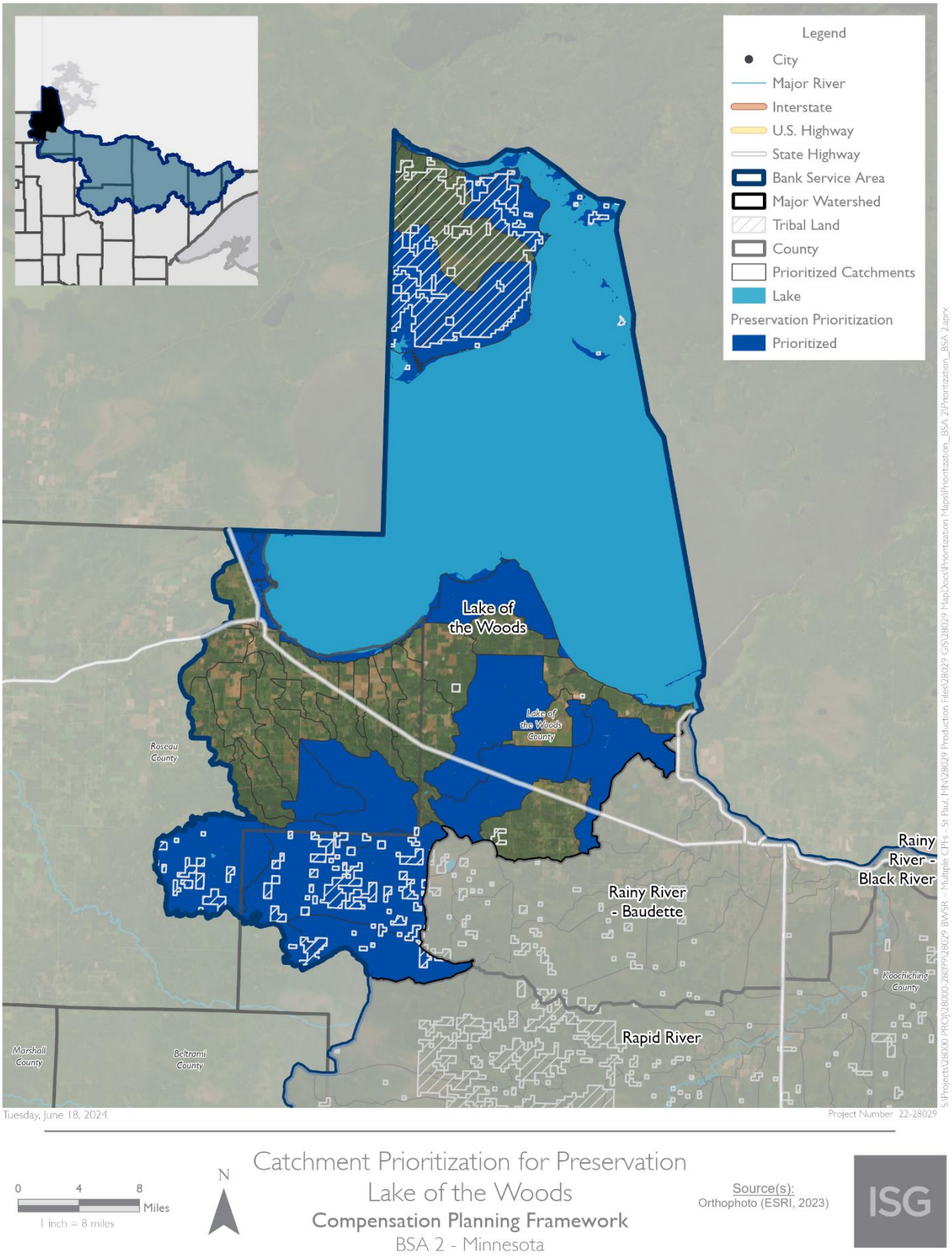


Figure D-19. Final Preservation Catchment Prioritization – Little Fork River Watershed

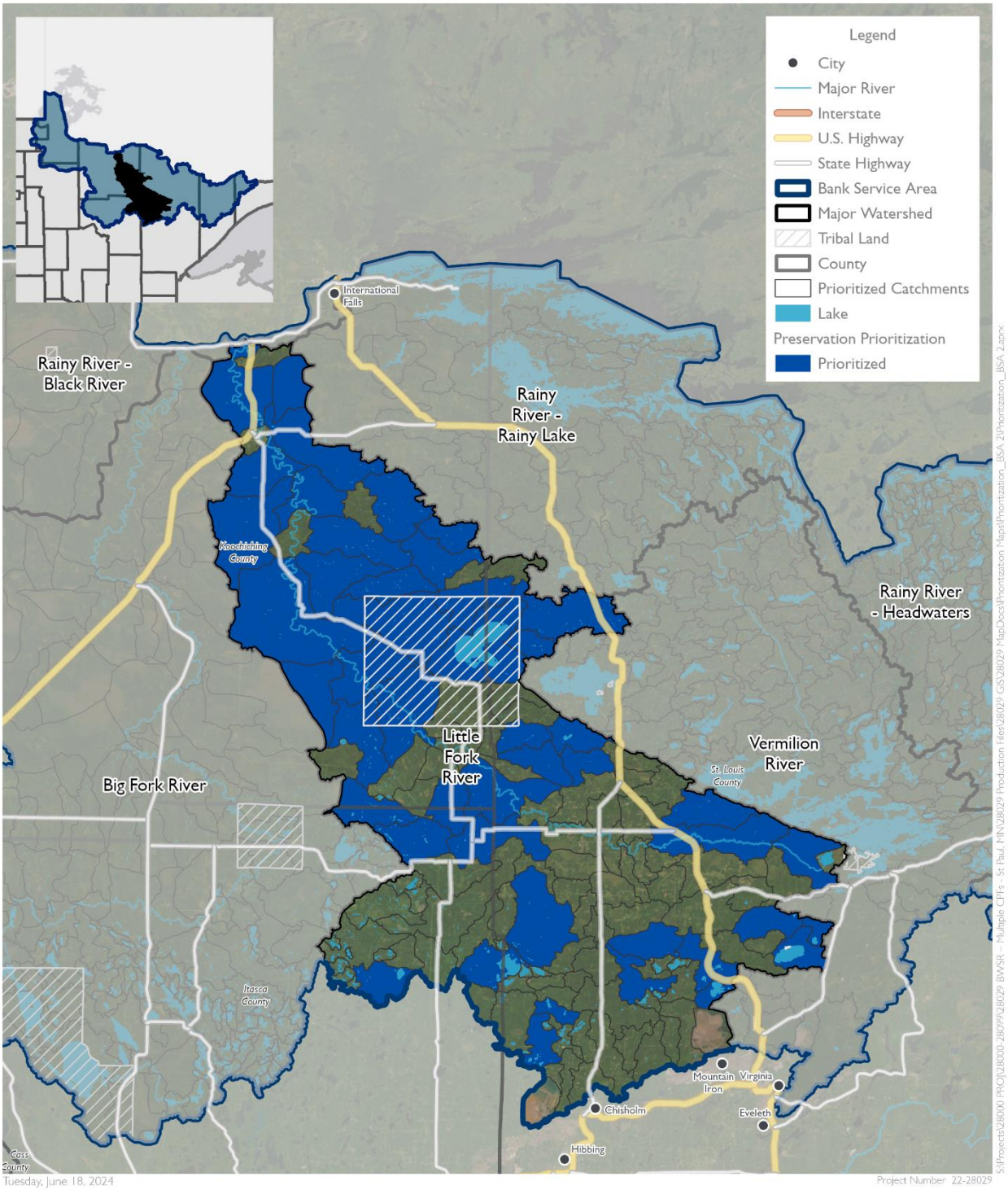
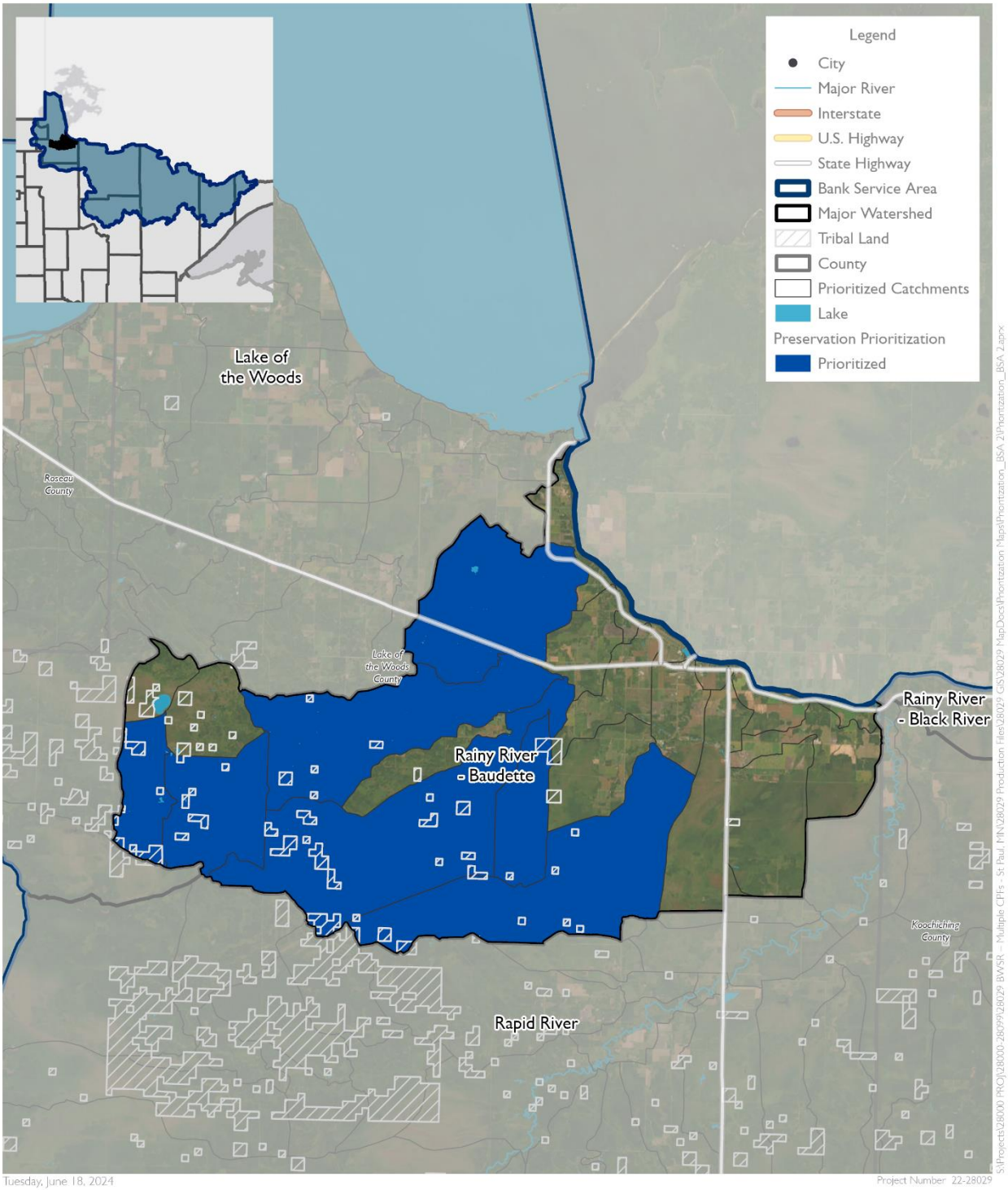


Figure D-20. Final Preservation Catchment Prioritization – Rainy River – Baudette Watershed



0 2.5 5 Miles
1 inch = 5 miles

N

Catchment Prioritization for Preservation
Lower Rainy River - Baudette
Compensation Planning Framework
BSA 2 - Minnesota

Source(s):
Orthophoto (ESRI, 2023)

ISG

Figure D-21. Final Preservation Catchment Prioritization – Rainy River – Black River Watershed

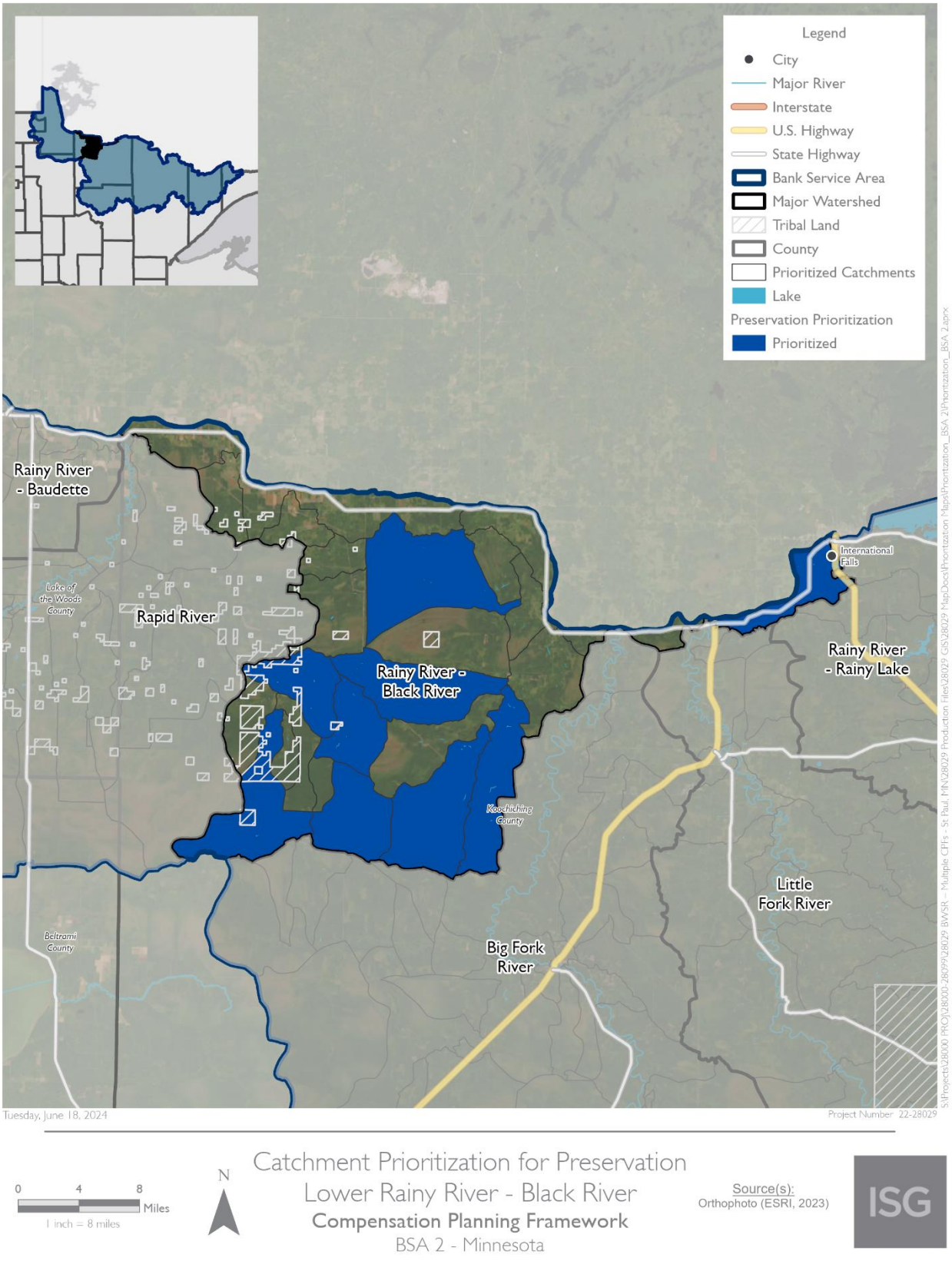


Figure D-22. Final Preservation Catchment Prioritization – Rainy River - Headwaters Watershed

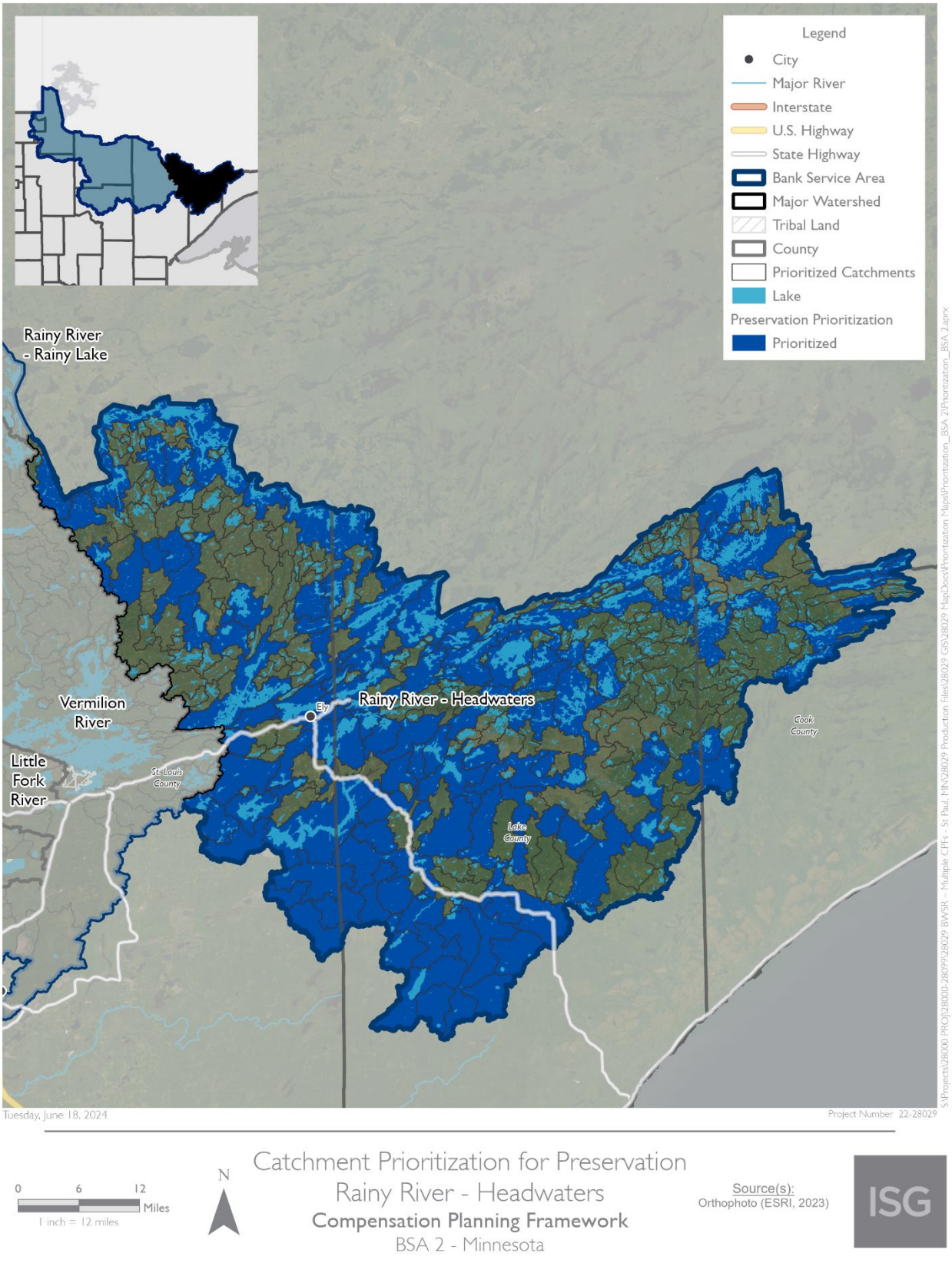


Figure D-23. Final Preservation Catchment Prioritization – Rainy River – Rainy Lake Watershed

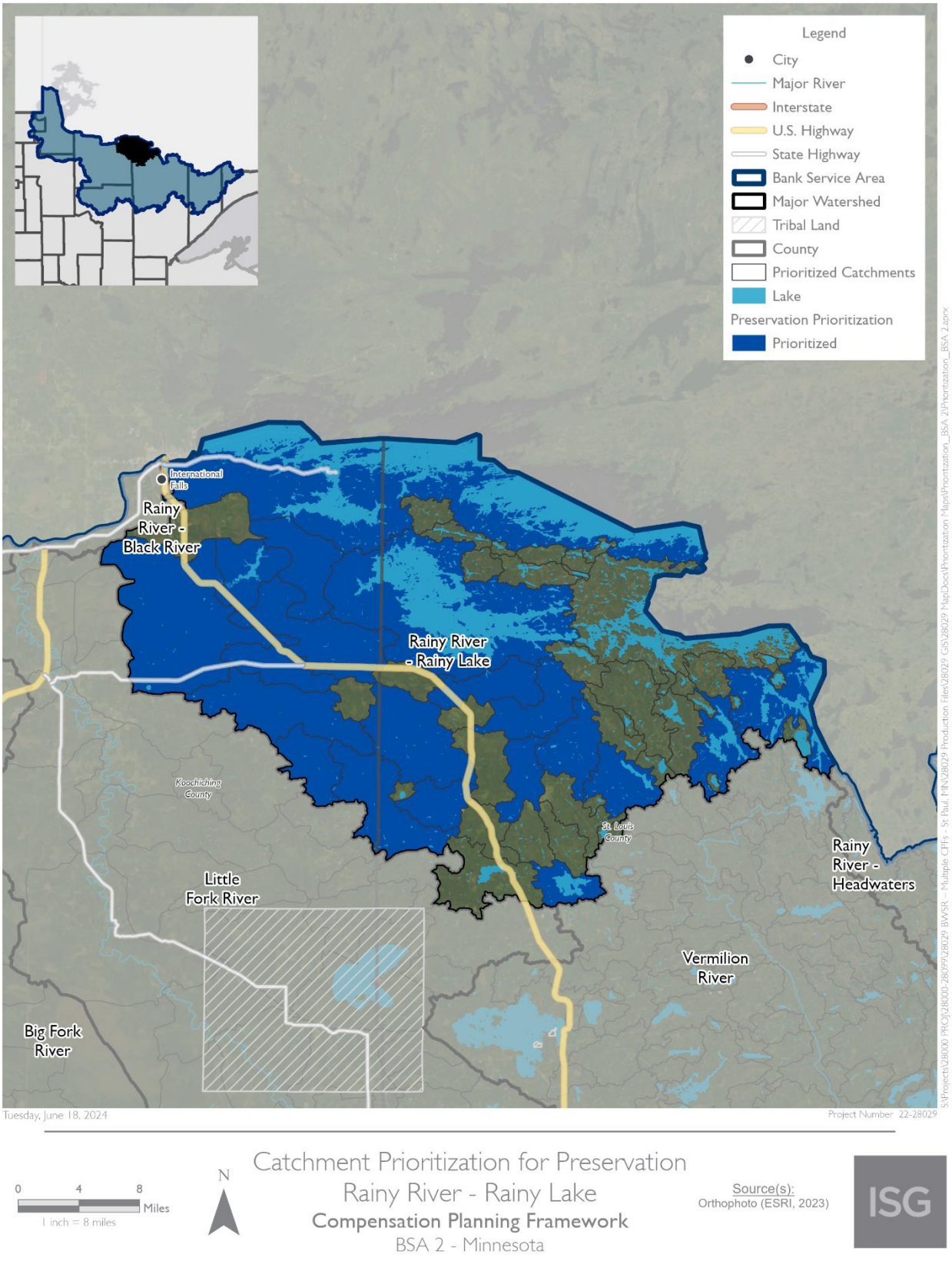


Figure D-24. Final Preservation Catchment Prioritization – Rapid River Watershed

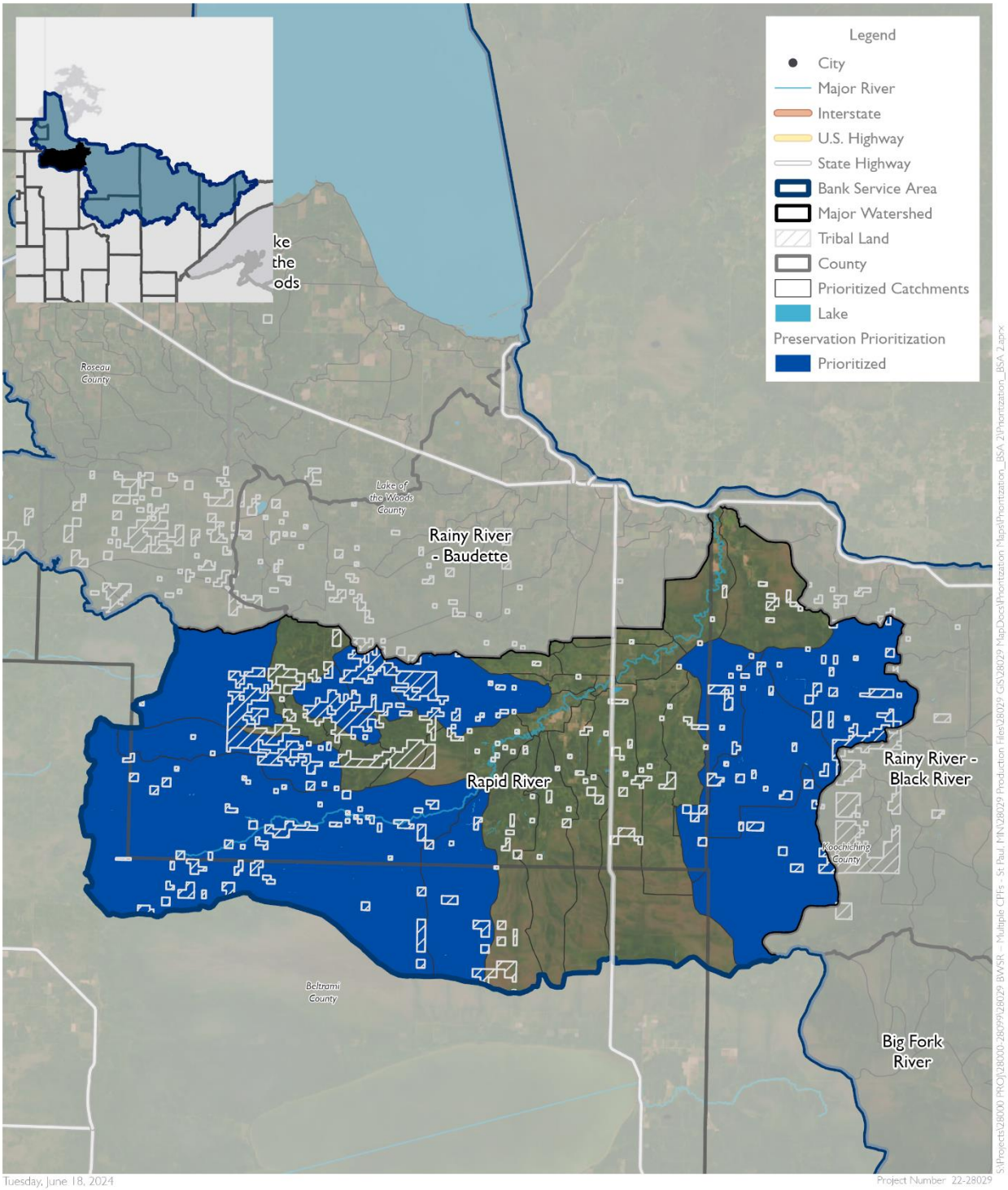


Figure D-25. Final Preservation Catchment Prioritization – Vermilion River Watershed