DEPARTMENT OF NATURAL RESOURCES

HABITAT RESTORATION AND PROTECTION

ST. LOUIS RIVER AREA OF CONCERN, MINNESOTA

October 2020

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EXECUTIVE SUMMARY

The St. Louis River Area of Concern (AOC) was listed in 1987 under the Great Lakes Water Quality Agreement between the United States and Canada due to a history of contamination and habitat degradation. The Wisconsin Department of Natural Resources (WDNR) and the Minnesota Pollution Control Agency (MPCA) are the lead state agencies responsible for implementing actions necessary to move the AOC towards de-listing. A Stage One Remedial Action Plan (RAP) was developed in 1992 (MPCA and WDNR 1992) by a broad coalition of agencies and citizen advisors. The Stage One RAP identified nine Beneficial Use Impairments (BUIs) to be addressed before the AOC could be considered for delisting. In 1995, a RAP update identified recommended actions to begin progress toward delisting (MPCA and WDNR 1995). The 2013 RAP Update established the complete list of Management Actions necessary to remove the nine BUIs and delist the AOC. Subsequent RAP updates have refined and revised this list of necessary Management Actions. Both state agencies maintain websites with information and resources related to the AOC delisting process (see MPCA and WDNR AOC websites).

Implementation of projects designed to restore degraded fish and wildlife populations (BUI 2) and lost fish and wildlife habitat in the AOC (BUI 9) began prior to the 2013 RAP update. Additionally, projects outside the AOC delisting effort but related to the removal goals for these BUIs continue to be identified and implemented in the AOC by resource management agencies and organizations in Minnesota and will extend beyond the time when the AOC is delisted. This report contains a summary of habitat restoration and protection work completed in Minnesota's portion of the AOC to date (June, 2020) related to these BUIs but not identified as necessary Management Actions for BUI removal and not otherwise captured as part of the RAP updates.

The Minnesota Department of Natural Resources (MNDNR) and many partner agencies and organizations have made significant progress towards improving and restoring habitat and restoring healthy fish and wildlife populations in the AOC in Minnesota. The accomplishments summarized in this report include ten protection projects and 22 restoration projects totaling approximately 27,170 acres. This includes the 22,500-acre acquisition and protection of riparian land in the St. Louis River watershed, of which approximately 1,075 acres are within the AOC boundary. The remainder are located in the upper St. Louis River watershed on or near the St. Louis, Cloquet, and Whiteface Rivers. Restoration projects account for approximately 65 acres of the overall total. Projects for which restored acreage is not an applicable metric (e.g., such as research into appropriate sources of plant material for restoration projects or plan development) are described but not mapped or included in the total acres of habitat restored. Similarly, acres of impact were not estimated for projects that have broadly dispersed on-the-ground impact across large geographic scales (e.g., Duluth Riparian Plantings, invasive species control, or Best Management Practice (BMP) implementation).

INTRODUCTION

The St. Louis River Area of Concern (see Figure 1), located in the western arm of Lake Superior and including the twin port cities of Duluth, Minnesota, and Superior, Wisconsin, is listed as one of 43 Great Lakes AOCs identified in accordance with Annex 2 of the Revised Great Lakes Water Quality Agreement of 1978 (IJC 1987). Historical actions such as unregulated municipal and industrial waste disposal and unsustainable land use practices, including dredging and filling of aquatic habitat and damaging logging and manufacturing practices, contributed to the complex set of environmental challenges facing the AOC at the time it was listed. The Stage One Remedial Action Plan (MPCA and WDNR, 1992) determined that nine of 14 possible Beneficial Use Impairments (BUI) existed in the AOC including:

- BUI 1: Fish Consumption Advisories
- BUI 2: Degraded Fish and Wildlife Populations
- BUI 3: Fish Tumors and Other Deformities – Removed in 2019
- BUI 4: Degradation of Benthos
- BUI 5: Restrictions on Dredging
- BUI 6: Excessive Loading of Sediment and Nutrients – Removed in 2020
- BUI 7: Beach Closings and Body Contact Restrictions
- BUI 8: Degradation of Aesthetics – Removed in 2014
- BUI 9: Loss of Fish and Wildlife Habitat

The Remedial Action Plan (RAP) is a bi-state document produced by the AOC Coordinator Team comprising representatives of Fond du Lac Resource Management Division, Minnesota Department of Natural Resources (MNDNR), Minnesota Pollution Control Agency (MPCA), and Wisconsin Department of Natural Resources (WDNR). Input from AOC partners and stakeholders is sought through the St. Louis River Alliance and BUI-specific technical teams to document the status and progress of BUI removal.

A broad coalition of AOC partners identified an initial set of recommendations to address BUIs in 1995 (MPCA and WDNR 1995). Following development of the Great Lakes Restoration Initiative (GLRI) in 2010 (CEQ 2010), AOC partners made substantial progress toward setting clear delisting goals in 2011 (MPCA and WDNR 2011) and developing of a complete set of "Management Actions" in the 2013 RAP Update (MPCA and WDNR 2013). This Management Action list, also known as the "Roadmap to Delisting", established the full set of Management Actions needed to remove each BUI and identified a timeline for delisting the AOC. These Management Actions include on-the-ground restoration and remediation projects, monitoring and assessment efforts, and stakeholder engagement processes. All of the Management Actions identified in this RAP are now either complete or underway (MPCA and WDNR 2019).

Significant habitat protection and restoration work was achieved in both Wisconsin and Minnesota prior to publication of the 2013 RAP Update. Much of the work in Wisconsin completed prior to the 2013 RAP update was summarized in a report compiled by the Wisconsin Department of Natural Resources (Wick 2015). This report also documented both past and ongoing efforts to manage invasive species. Habitat restoration and protection projects completed in Minnesota before the 2013 RAP update have not previously been summarized.

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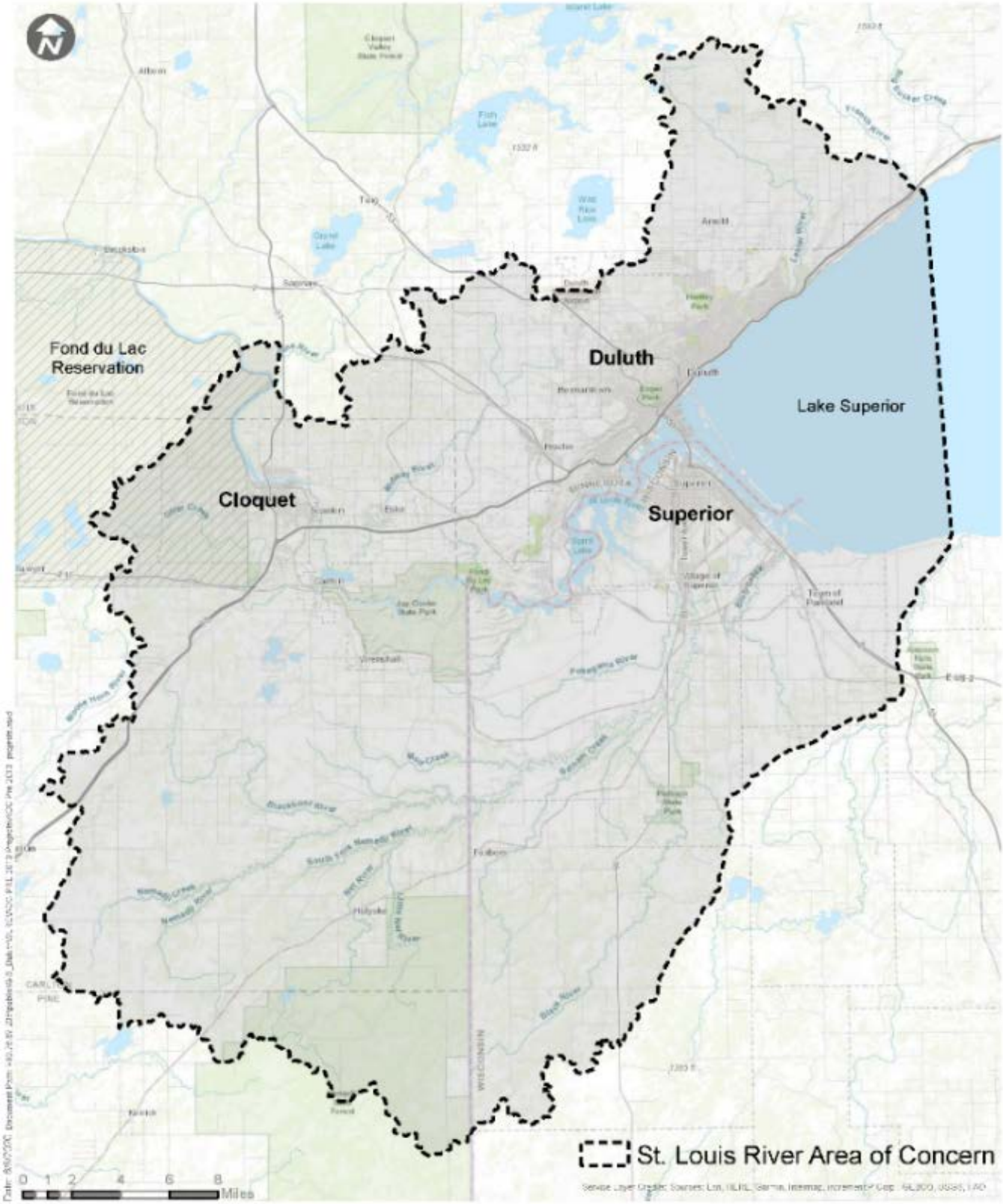
Figure 1: St. Louis River Area of Concern



The AOC boundary includes the lower 39-miles of the St. Louis River, from upstream of Cloquet, Minnesota to its mouth at the Duluth/Superior Harbor, the lower portion of the St. Louis River watershed, and the entire Nemadji River watershed. It also includes the tributary watersheds and open waters of western Lake Superior defined on its eastern edge by a line drawn from the eastern edge of the Dutchman Creek watershed in Wisconsin where it intersects the Lake Superior shoreline; north to the eastern edge of the Talmadge Creek watershed boundary where it intersects with the Lake Superior shoreline in Minnesota. (MPCA and WDNR 2014).

The Stage One RAP (MPCA and WDNR 1992) additionally considered how conditions in the entire watershed area of the St. Louis, Whiteface, and Cloquet rivers affected conditions in the St. Louis River estuary. The upper watershed area was evaluated to determine which beneficial use impairments may be present in the AOC and to determine potential legacy issues and stressors responsible for the impairments. The Stage One RAP identified a broad geographic scope stating that "… any factor within the St. Louis River watershed contributing to problems of the water resource will be considered in the plan" (MPCA and WDNR 1992).

While much of the habitat protection and restoration work completed since the St. Louis River was listed as an AOC has been focused in the Lower St. Louis River and Nemadji River watersheds, earlier efforts documented in the 1995 Remedial Action Plan Progress Report (MPCA and WDNR 1995), encompass the upper watershed and are therefore included in this report. The St. Louis River AOC, encompassing a 1,020-square mile area, is the second largest U.S.-based AOC. It includes parts of Minnesota, Wisconsin, and the Fond du Lac Reservation of the Fond du Lac Band of Lake Superior Chippewa. As the largest tributary to Lake Superior, the St. Louis River is vital to the regional economy and encompasses the Port of Duluth-Superior, an essential port for Great Lakes shipping (USEPA 2020).

PURPOSE STATEMENT

This report summarizes past projects to protect (Table 1, Figure 2) and restore (Table 2, Figure 3) fish and wildlife habitat related to the ongoing effort to delist the St. Louis River AOC. Projects summarized here either represent work completed after the AOC was listed and prior to the establishment of the 2013 Management Action list or are otherwise relevant to the objectives of the AOC but are, for various reasons, not included as Management Actions in the RAP. The summaries are intended to be used in support of the decision making process to evaluate the removal of Beneficial Use Impairment 9 (BUI 9): Loss of Fish and Wildlife Habitat following the completion of the necessary Management Actions specified in the RAP. Habitat Restoration is also related to removal goals for the Degraded Fish and Wildlife Populations impairment (BUI 2) and consideration of the outcomes from projects summarized here may be warranted as that BUI is evaluated for removal.

TABLE 1 Habitat Protection Projects Not Included As AOC Management Actions

MAP CODE	NAME	ACRES
P1	Minnesota Point Pine Forest SNA Designation	18.0
P2	Southworth Marsh Lake Superior Wetlands Preserve Establishment	10.0
P3	Spirit Island Acquisition	6.6
P4	Anderson (Bald Eagle) Island Acquisition	4.2
P5	Upper River (St. Louis, Cloquet, Whiteface) Riparian Land Acquisition	22,500.0
P6	Magney-Snively Natural Area Designation	1,800.0
P7	Hartley Natural Area Designation	600.0
P8	St. Louis River Natural Area Designation	1,200.0
P9	Aquatic Management Areas Designation	960.4
P10	Miller Creek Easement Acquisition	6.0
	TOTAL AREA PROTECTED:	27,104.8

TABLE 2 Habitat Restoration Projects Not Included As AOC Management Actions

MAP CODE	NAME	ACRES
NA[1]	Lower St. Louis River Habitat Plan Preparation	NE[2]
NA	Minnesota Point Beach Dune Restoration	NE
R1	Dune Protection and Restoration	15.0
NA	American Beach Grass Restoration Research	NE
R2	Hearding Island Restoration	13.5
R3	Interstate Island Colonial Waterbird Habitat Restoration	5.5
R4	Grassy Point Wetland Restoration (1996)	4.5
R5	Sturgeon Spawning Habitat Restoration at Fond du Lac Dam	6.0
R6	Upper Miller Creek Riparian Vegetation Planting	10.0
R7	Miller Creek Watershed Guardian Program Establishment	2.0
R8	Miller Creek Sediment Trap Construction	0.1
R9	Ditched Channel Restoration	0.4
R10	Sargent Creek Dump Site Remediation	3.0
R11	Sargent Creek Stream Restoration	1.0
NA	Duluth Riparian Plantings	NE
R12	Upper East Amity Creek Restoration	1.0
R13	East Amity Creek Bank Stabilization and Channel Restoration	1.0
R14	East Amity Creek Tributary Bank Stabilization and Channel Restoration	0.7
R15	Chester Creek Restoration	1.0
NA	Invasive Species Control	NE
NA	Best Management Practices Implementation	NE
NA	Post 2012 Flood Restoration on Duluth Trout Streams	NE
	TOTAL AREA RESTORED:	64.7

[1]Projects without a defined area of restored habitat were not mapped and do not have codes.

[2]Acres of impact were not estimated for project sites that were not mapped.

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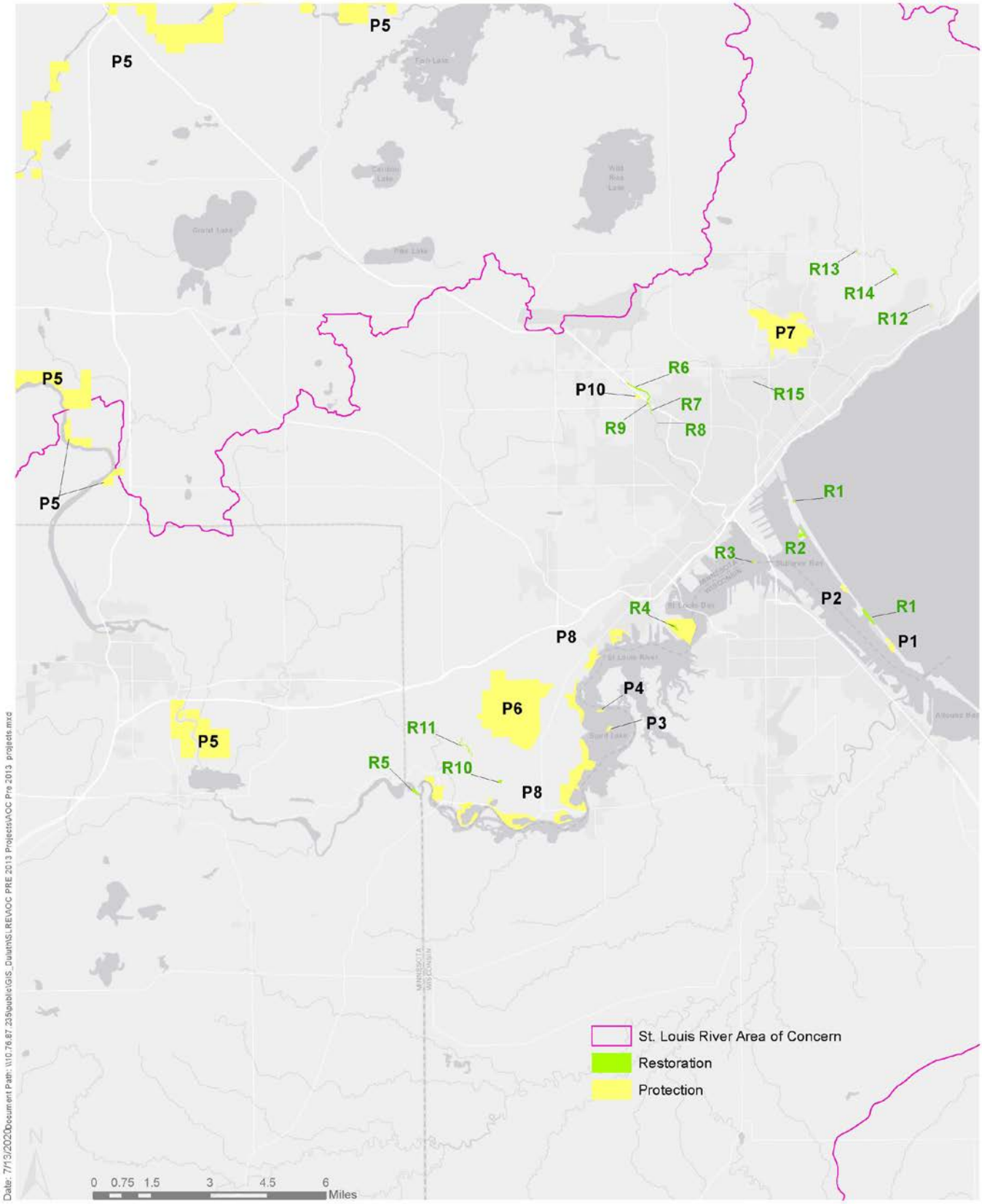
Figure 2: Past Land Protection and Restoration Efforts



PROJECT SUMMARIES

Minnesota's Habitat Restoration and Protection Projects

1. **Lower St. Louis River Habitat Plan Preparation** - The 1995 RAP update included 43 recommendations for action. Recommendation 38 – Habitat Plan applied directly to the Loss of Fish and Wildlife Habitat in BUI 9 and identified the need to "Design and implement a coordinated comprehensive plan for the protection and furtherance of biodiversity and ecological diversity within the AOC, without seeking to restore the estuary to its presettlement condition, through the creation, restoration, reclamation, enhancement and management of a desired mix of ecosystems and habitats." (MPCA and WDNR 1995, Appendix A, page A-99). This recommendation included preliminary management concepts and guiding principles. In addition, it addressed the variability of sub-areas within the estuary by identifying coarse-scale ecological values, goals and management concepts for eight separate habitat planning areas within the AOC.

   The Lower St. Louis River Habitat Plan (SLRCAC 2002) was completed in 2002 with funding by the United States Environmental Protection Agency (USEPA), The Nature Conservancy (TNC), the U.S. Fish and Wildlife Service (USFWS), and MNDNR through Minnesota's Lake Superior Coastal Program (MLSCP). The plan brought together a broad stakeholder group to establish a shared vision to guide the planning process, describe threats to habitat, and identify strategies for habitat protection and restoration throughout the estuary.

   The Lower St. Louis River Habitat Plan ("Habitat Plan") vision for the Lower St. Louis River is of "a thriving human community connected to the aquatic and terrestrial ecosystems of the river. The river ecosystems are diverse, productive and healthy, with natural processes (such as hydrologic regimes, biological productivity, and nutrient cycling) operating within the natural range of variation. The diversity of plants and animals and the composition of natural communities present at the time of European settlement is reflected in the sustainable ecosystems of today."

   The 18 strategies in the Habitat Plan were developed to mitigate the threats to habitat and have since been further advanced through the creation of strategies implementation planning worksheets (SLRA 2011) by local resource experts and partners who comprise the Habitat Workgroup. These strategies implementation planning worksheets ("Strategies Worksheets") were used to identify priority actions and projects necessary to address legacy habitat impairments and remove BUI 9 in the 2013 RAP. They have also been used to advance other priority actions for habitat protection and restoration that go beyond the scope of what is necessary for delisting the AOC. The Habitat Workgroup and partner organizations continue to update, refine, and implement the Strategies Worksheets.

2. **Beaches and Dunes** - Protection and restoration of beach and dune habitat on Minnesota Point has been an objective of multiple projects. Strategies Worksheets were developed to address the need to protect and preserve the forest communities and to maintain and restore the forested and non-forested baymouth bar communities occurring on this relatively young geomorphic feature (Breckenridge et al. 2016, Loy 1963). The following actions were taken to protect and preserve Minnesota Point baymouth bar habitats:

   A. Minnesota Point Beach Dune Restoration - Old Growth Forest Protection - In May, 1997, the Minnesota State Legislature passed the Minnesota Point Protection Act. This law (ML 1997 CHAPTER 216-H.F.No. 2150 Sec. 154.) directed the commissioner of natural resources to work with the City of Duluth, the Duluth Airport Authority, and other federal, state, and local parties to

"identify and delineate the land subject to the 1939 conveyance on Minnesota Point and develop a management plan that will provide a level of protection sufficient to ensure the continued ecological integrity of the area and to prohibit further cutting of the old growth forest area" (State of Minnesota 1997).

In July, 1997, the Park Point Community Club received a $75,000 grant through the State of Minnesota Legislative Commission on Minnesota Resources fund (1997 Minnesota Laws, Ch, 216, Sec. 15, Subd. 17(g)) to identify and protect environmentally-sensitive areas along the Minnesota Point Peninsula. The grant award states, "[t]he objective of this project is to protect a unique ecosystem at Minnesota Point in Duluth, which includes a 45-acre stand of old growth white and red pine forest, a bird sanctuary, beach dunes and other habitats from partial destruction by the Duluth Airport Authority." This project resulted in the development of a management plan and erosion study. A portion of this grant was appropriated to The Natural Resources Research Institute (NRRI) of the University of Minnesota for professional services contributing towards the protection of Minnesota Point including digitized mapping of Minnesota Point, habitat assessments, plant and bird surveys, evaluating erosion mitigation measures, and documenting historical events influencing current habitat conditions. (Johnston et al. 1999, see also: Zenith City.com)

In addition, the grant supported the completion of several distinct restoration and protection projects, detailed below.

B. Dune Protection and Restoration (*R1, Figure 2*) – The City of Duluth and the Park Point Community Club led efforts to reduce the impact of foot traffic on the dunes and dune vegetation by constructing dune bridges to provide access to the beach, fencing sensitive areas and replanting damaged dunes on approximately 15 acres of city-managed parkland.

From the recreation area and ballfields to Sky Harbor Airport, revegetation and fencing was used to control dune access and native vegetation including American beach grass (*Ammophila breviligulata* ssp. *Breviligulata),* sand cherry (*Prunus pumila*), red pine (*Pinus resinosa*) and white pine (*Pinus strobus*) was planted to restore dune blowouts. At Franklin Park, locally known as the "S-curve", pedestrian access control structures were built to reduce foot traffic impacts to the beach dune plant communities. The site was also replanted with beach grass.

Projects were funded from multiple sources including Minnesota's Lake Superior Coastal Program (Poyhonen 2019), City of Duluth, Duluth Rotary, and Park Point Community Club.

C. American Beach Grass Restoration Research - The American beach grass population on Minnesota Point is the only occurrence of this species in the state and is the western-most natural population of the species' range (MNDNR 2019). Eastward it occurs on sand dunes on the shore of Lake Superior, other Great Lakes and the Atlantic coast. Where it occurs it is a dominant beach and foredune species (MSU 1998, Albert 2000). Its extensive rhizome system binds the sand, promoting additional dune formation.

Minnesota Point appears to be the only place in Minnesota where suitable habitat exists. The North Shore of Lake Superior in Minnesota is rocky or gravelly, which does not allow the establishment of this species. In contrast, the southern shore of Lake Superior in Wisconsin and

Michigan, has many broad, sandy beaches that support a number of discontinuous beach grass populations.

Concern over the use of non-local sources of beach grass for revegetating Minnesota Point dunes led to the investigation of the genetic and phenotypic characteristics of the non-local strain to determine its appropriateness for restoration plantings. It was determined that the non-local strain, introduced from Michigan, has the potential to hybridize and outcompete the native strain (Anderson 2006, Fant et al. 2008, Holmstrom et al. 2010). The research, funded by Minnesota's Lake Superior Coastal Program and the University of Minnesota, Duluth, examined the extent and impact of hybridization of beach grass on Park [Minnesota] Point. The results provided site managers with information to make sound decisions regarding the conservation status of the Minnesota population and to guide future management and restoration of Lake Superior coastal populations. This project investigated hybrid outbreeding depression, identified differing morphological traits of MN and MI plants on Park Point, and produced a map of Park Point based on historical records and field surveys showing stands of established non-local beach grass (Poyhonen 2019). As a result of this investigation, use of non-local source beach grass for restoration planting was discontinued.

D. Minnesota Point Pine Forest SNA Designation (*P1, Figure 2*) – In 1998, Superior Water Light and Power donated 18-acres of forest and beach on Minnesota Point to the Minnesota Land Trust for conservation. After recording a permanent conservation easement on the property in October of 1999, the land was donated to MNDNR for designation as a Scientific and Natural Area (SNA). The Minnesota Point Pine Forest SNA was designated in April, 2002. A revised SNA designation was issued in February 2015 to allow for additional public uses.

The SNA includes two non-contiguous parcels, each surrounded by other public lands. One parcel spans the 0.3-mile width of the Point. Its north side is exposed to the wind and waves of Lake Superior while its south (bay) side is more protected. Bands of vegetation correspond to the increasingly stable conditions as one moves inland from the high-energy lakeshore. Wave-washed shoreline and open beach transition to grassy dunes, then to dune shrubland, and finally, to the pine forest of the interior. (MNDNR 2020). Rare species that occur here include beach-heather (*Hudsonia tomentosa*), pointed moonwort (*Botrychium acuminatum*), Michigan moonwort (*Botrychium michiganense*), pale moonwort (*Botrychium pallidum*), least moonwort (*Botrychium simplex*), slender hair grass (*Deschampsia flexuosa*), American beach grass, hairy-necked tiger beetle (*Cicindela hirticollis* rhodensis), and piping plover (*Charadrius melodus*) (VanNingen 2017). Old-growth red and white pines, many between 120 and 200 years old, are the dominant forest canopy trees. The SNA also provides important habitat for migrating birds in spring and fall and up to 16 species of breeding forest birds (MNDNR 2020).

Following acquisition and designation of the SNA, MNDNR has managed the property to preserve the old growth forest and rare species by controlling invasive species and removing a cabin. The cabin was the last of several structures that served as seasonal recreational cabins at a location known as Peabody's Landing (Nelson and Dierckins 2017, Zenith City 2019).

In cooperation with the City of Duluth and the Duluth Airport Authority, MNDNR is in the process of expanding the SNA to include an additional 10-acres. The additional land, which is primarily old growth forest, is anticipated to be added to the Minnesota Point Pine Forest SNA in 2020 with funding from the State of Minnesota (MN Laws 2016, Chapter 186, Section 2Subd. 09b.).

E. Southworth Marsh Lake Superior Wetlands Preserve Establishment (*P2, Figure 2*) - The City of Duluth designated a 10-acre parcel on the Superior Bay side of Minnesota Point as a preserve in 1999 in honor of Mira M. Southworth, a local educator and photographer (Nelson and Dierckins 2017). The wetland was created by placement of dredge materials from the development and maintenance of navigational channels in the Duluth-Superior Harbor by the U.S. Army Corps of Engineers (USACE) in 1935 (Lakela 1939). The plant community established itself naturally on the dredged materials and is now a wooded wetland (Lakela 1939, Bernard and Davidson 1969). It provides habitat for breeding and migratory birds.

While the City's Unified Development Code does not have a definition for Lake Superior Wetland Preserve or Wetland Preserve, the entire property is owned by the City of Duluth and zoned P-1, Park. It is considered part of the park system which provides significant protection (Fulton 2019).

3. Islands

A. Hearding Island Restoration (*R2, Figure 2*) - Hearding Island is a Wildlife Management Area (WMA) owned and managed by MNDNR. The 33-acre island was created by USACE in 1934 (Lakela 1947) as a dredge material deposit site. In 1983, 5.2-acres were cleared of vegetation to create open sand beaches for common tern (*Sterna hirundo*) nesting habitat (Penning 1993). The WMA was closed to visitors during the nesting season (Penning and Cuthbert 1989, Penning and Cuthbert 1990). Common tern decoys and recorded tern vocalizations were used at the site from 1983 to 1988 in an attempt to attract terns to the island. Pre-season trapping of mammalian predators was conducted in 1987. However, continual harassment of nesting terns, vandalism, and predation by mink (*Mustela vison*) resulted in poor nesting success and a decision was made to halt management efforts on the island in 1989 (Penning 1993).

In 1996 MNDNR revised the management plan to focus on establishment of native plant community habitats including grassy dunes and pine forest. A 13.5-acre restoration project using funds from USEPA's Great Lakes National Program Office (GLNPO) cleared alder that was encroaching on the dune habitat and planted native conifers in the forested portion of the island.

B. Interstate Island Colonial Waterbird Habitat Restoration (*R3, Figure 2*) - Interstate Island was constructed by USACE on the state line between Minnesota and Wisconsin prior to 1940 by the placement of dredge material from the excavation and maintenance of navigational channels in the Duluth – Superior Harbor (Penning 1993). After its creation, the island became dominated by balsam poplar (*Populus balsamifera*) and eastern cottonwood (*Populus deltoides*). The first removal of vegetation at Interstate Island took place in 1984. In 1985, 50 pairs of common terns attempted to nest on the island. It is believed that predation by a Great Horned Owl (*Bubo virginianus*) caused total nesting failure of the new colony. In an effort to reduce risk of predation, all the vegetation was removed from the island in 1989 by scraping to expose bare sand. In addition, the windward north and east sides of the island were rip-rapped. In 1989 terns colonized the island and since 1990, the entire breeding population of common terns in the estuary has nested on the island. In 1989, tern chicks (64) fledged from the harbor for the first time since 1984. In 1990, 168 chicks fledged (Penning and Cuthbert 1990). From 1989 to 2019, an average of 183 pairs of terns have nested on the island, producing an annual average of 154 chicks fledged.

As a result of the habitat manipulation, the island has become an attractive nesting site for ring-billed gulls (*Larus delawarensis*). Because ring-billed gulls initiate nesting earlier than common terns, they are able to out compete the terns for limited nesting sites and gradually take over

colony sites (Nisbet 1973, Morris and Hunter 1976, Davis and Niemi 1980, Courtney and Blokpoel 1983, Maxwell and Smith 1983, Davis 1983, Miller 1987). Gull nest destruction was initiated in 1990 to prevent encroachment into the tern nesting area (Penning and Cuthbert 1989, Penning and Cuthbert 1990).

Ongoing management of Interstate Island Wildlife Management Area (WMA) remains an intensive effort. Gull nesting is monitored annually and gull nesting is controlled in the tern nesting area. Exclusion fencing and an aerial string grid are maintained to discourage use of the tern nesting area by gulls. Tern nesting effort and reproductive success is monitored annually. Vegetation is managed to provide suitable nesting areas and avoid attraction of predators. Predator monitoring and control is used as needed.

In September and October of 2015 a habitat restoration project was completed to repair erosion-caused damage to the approximately 5.5-acre WMA. Funding from the USFWS and Minnesota's Outdoor Heritage Fund (OHF) was used to place 730-linear feet of temporary silt fencing, 3,276-cubic yards of clean beach sand, 610-cubic yards of cobble rip-rap, 28-cubic yards of surface amendments (pebbles & gravel), and 620-linear feet of sediment control log on the island to restore the nesting area and prevent further erosion.

MNDNR and WDNR staff and volunteers removed all fenced gull exclosures and string grids prior to construction and replaced them in the spring of 2016 prior to the return of ring-billed gulls and common terns to the island.

C. Spirit Island Acquisition (*P3, Figure 2*) - The Fond du Lac Band of Lake Superior Chippewa acquired Spirit Island, in the Spirit Lake area of the St. Louis River estuary in 2011 to protect the island's natural and cultural heritage (Krohn 2020). The Fond du Lac Resource Management Division has begun invasive species control. They also led trips there for historical, educational and ceremonial purposes (WTIP 2011, Hoeg 2016.) The island is 6.6-acres in size and has approximately 2,200-feet of shoreline. Platted lots included in this acquisition total 42.6-acres, much of which is open water.

D. Anderson (Bald Eagle) Island Acquisition (*P4, Figure 2*) – In 2016, the Fond du Lac Band of Lake Superior Chippewa acquired a pair of small islands between Spirit Island and Clough Island (Krohn 2020). Known locally as Bald Eagle Island or Anderson Islands, the land area of these islands totals approximately 4.2-acres with the area of platted parcels totaling 20.76-acres. Surrounding the islands are stands of emergent and submerged aquatic vegetation. The islands are remnants of a long river levee and wetland complex that once nearly encircled Sprit Lake. A bald eagle nest has been active on one of the islands for several years.

4. Estuarine aquatic and wetland habitats

A. Grassy Point Wetland Restoration (*R4, Figure 2*) – MNDNR completed a demonstration project In 1996 to restore aquatic habitat at Grassy Point by removing sawmill waste from approximately 4.5 acres of wetland. With funding from EPA's GLNPO, MNDNR assessed the amount and distribution of wood waste through a subsurface exploration effort before initiating a collaborative design process to enhance hydrologic conditions in the wetland and improve fish habitat throughout the site.

Approximately 11,000-cubic yards of wood waste from sawmills operating on the site from approximately 1890 through 1918 (Mulholland et al. 1995) was excavated and moved off-site. Fish community sampling completed after construction documented high use of the area by a diverse assemblage of fish species and life stages.

The habitat restoration work catalyzed additional site improvements by the City of Duluth and St. Louis River Alliance to enhance public access at the site and provide natural history interpretation through development of a parking area, signs, and trails.

B. Sturgeon Spawning Habitat Restoration at Fond du Lac Dam (*R5, Figure 2*) - The Western Lake Superior lake sturgeon (*Acipenser fulvescens*) population, which was historically centered on the spawning ground and nursery areas within the St. Louis River estuary, was extirpated by human activity in the beginning of the 20th century. Minnesota and Wisconsin DNRs established 14 year classes of sturgeon to the estuary by stocking 145,000 fingerlings and 800,000 fry between 1983 and 2000 (MNDNR 2011).

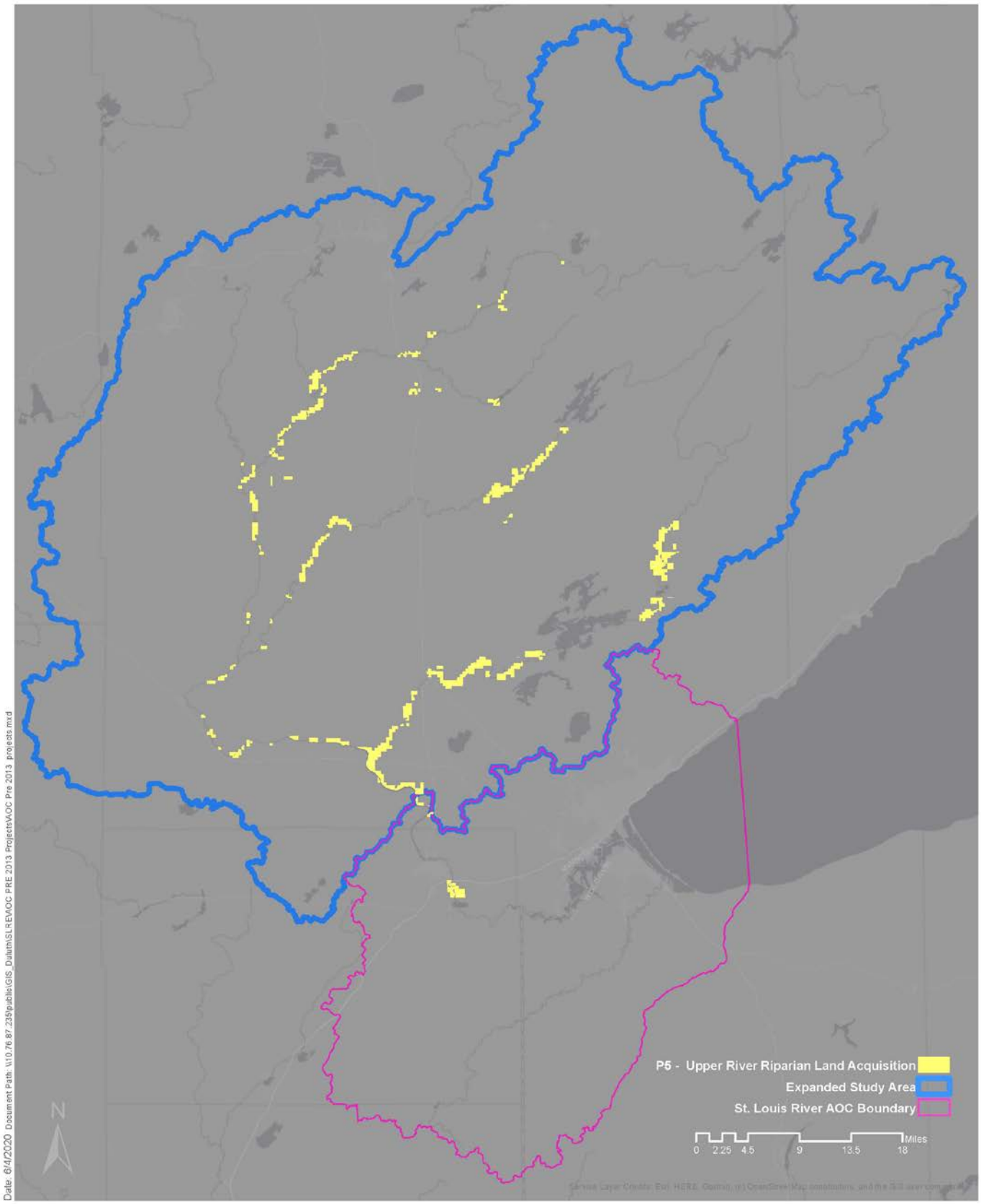
The St. Louis River sturgeon habitat restoration project was a cooperative effort between TNC and the MNDNR to eliminate the negative impacts of human activities within an important sturgeon spawning area immediately below the Fond du Lac dam. Project partners utilized information developed during the St. Louis River RAP process and contained within the Lower St. Louis River Habitat Plan during implementation of the project. The goal of eliminating the negative impacts of a "wing dam" placed within the river channel was accomplished by removing the wing dam and replacing it with a sequence of three riffles and pools. The 6-acre constructed riffle-pool sequence was completed in 2009 and has reduced water velocities and increased spawning habitat over a wide range of flow conditions (MNDNR 2011).

Construction of the riffles resulted in pooling of water above each of the three riffles and the distribution of flow across the stream channel. Each riffle contained a continuous series of rubble filled, rectangular cells of boulders that greatly increased the amount of micro-habitat available for spawning within the project area. The increase was primarily a result of spawning cells placed within the riffles, which provide very specific and beneficial physical conditions for spawning lake sturgeon. The cells will also benefit other fish species including walleye (*Sander vitreus*), smallmouth bass (*Micropterus dolomieu*), and longnose sucker (*Catostomus catostomus*).

5. Watershed Restoration and Protection

A. Upper River (St. Louis, Cloquet, Whiteface) Riparian Land Acquisition (*P5, Figure 3*) – MNDNR acquired approximately 22,500-acres of riparian lands comprising approximately 600 parcels on the St Louis, Cloquet and Whiteface rivers (Figure 3) from Minnesota Power following the recommendations of the St. Louis River Management Plan (SLRB 1994). The land was acquired over three years, using federal dollars from the Land and Water Conservation Fund, the MN Legislative Commission on Minnesota Resources (now the Legislative-Citizens Commission on Minnesota Resources) and three rounds of state bonding. Since acquisition, MNDNR has managed the acquired lands following recommendations and prescriptions of the 1994 St Louis River Management Plan even though the St. Louis River Board (SLRB) has been disbanded. The SLRB was supported by a grant through the Arrowhead Regional Development Commission (ARDC). Funding through the ARDC ceased in about 2006 and the SLRB became inactive. Current forest management guidelines provide additional protections that were not available in 1994. The status and applicability of the plan is currently under review.

Figure 3: St. Louis River Watershed Land Acquisition Project



The 1995 RAP update (MPCA and WDNR 1995) included "Recommendation 38 – Habitat Plan included sub area VIII – St. Louis River Upstream of Cloquet" as a planning area. It referred to the St. Louis River Management Plan for the ecological values, goals and management concepts.

The SLRB was designated by the State of Minnesota as "Special stewards of the St. Louis, Cloquet and Whiteface Rivers. The SLRB has a special responsibility to represent the best interests of all the citizens of the state, with regards to planning for and management of this watershed."

The stated goal of the management plan is to protect the river system's natural beauty, environment, and cleanliness. The SLRB developed a plan for the St. Louis, Whiteface, and Cloquet Rivers to be adopted and implemented by the County and Township Boards of Carlton, St. Louis and Lake Counties, and other local units of government and the Fond du Lac Band of Lake Superior Chippewa.

River Classification Areas (Primitive, Remote, Rural/Agricultural, Recreational, and Urban) were determined for areas within one mile of each side of the river to buffer and protect the rivers' ecosystems. Maps were created for each classification type. Goals, management recommendations, land use regulations, and dimension standards were established for each classification.

In addition, the SLRB established a goal to purchase undeveloped, sensitive riparian lands from voluntary and willing sellers to be placed in state ownership for public use and protection. These lands were to be acquired to "help decrease uncontrolled development and increase the health of the rivers by maintaining and restoring vegetation, improving the filtering out of pollutants, cooling water temperatures, providing wildlife and aquatic species habitat, and preserving the natural beauty" (SLRB 1994). Criteria for the evaluation of land to be purchased included:

- Areas important for fish and wildlife
- Areas subject to development pressure
- Significant archaeological or historical sites/Scientific and Natural Areas
- Areas with scenic value
- Contiguous ownership
- Steep embankments with erodible soils
- Environmental study areas
- Economic value of land
- Traditional recreation use areas

Following approval of the management plan by the SLRB in February 1994, the Fond du Lac Reservation Business Committee, Carlton County Board of Commissioners, the Lake County Board of Commissioners, and the St. Louis County Board of Commissioners adopted the plan within their jurisdictions.

B. Magney-Snively Natural Area Designation (*P6, Figure 2*) – The City of Duluth created the Duluth Natural Areas Program (DNAP) in 2002 to "protect and preserve Duluth's natural heritage for the public good." (City of Duluth 2020, Duluth Natural Areas Program)

The first area designated under the program was the Magney-Snively Natural Area. The area comprises "approximately 1,800-acres of eleven different high quality native plant communities, one of which is the largest known Sugar Maple-Basswood forest in the area." (Magney-Snively Natural Area). It is a relatively large complex of natural communities including high-quality

wetlands, uplands, and rock outcrops. The designation formalizes the intent to manage a stand of mature hardwood forest that survived the Cloquet Fire of 1918 as a natural area as far back as the early 1920s (Nelson and Dierckins 2017).

C. Hartley Natural Area Designation (*P7, Figure 2*) – This area was given a preliminary designation in 2018 and full designation following development of a management plan in 2020. "The Hartley Natural Area consists of over 600-acres in northeast Duluth. Its wooded hills, fields, designated trout streams, and wetlands provide a variety of habitats that have a rich diversity of flora and fauna. The natural area is a community focus point for nature appreciation, education, preservation, and restoration" (From Hartley Natural Area).

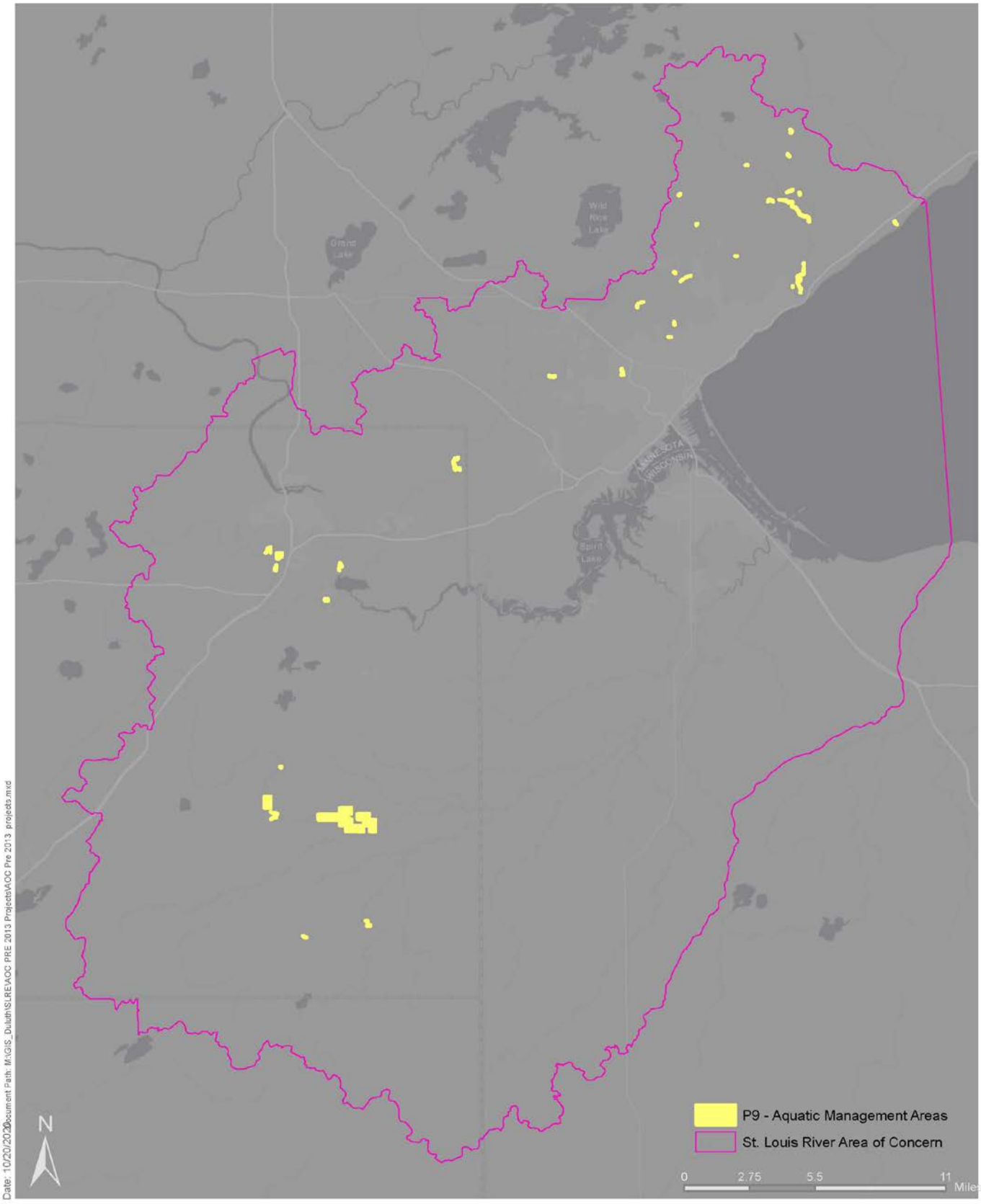
D. St. Louis River Natural Area Designation (*P8, Figure 2*) – The most recent addition to the DNAP was given a preliminary designation in 2019 and full designation following the completion of a management plan in 2020. "The St. Louis River Natural Area is comprised of nine places along the shoreline of the St. Louis River from Chambers Grove Park in the Fond du Lac neighborhood on the west, to Grassy Point in the Irving neighborhood on the east. The approximately 1,200-acres are home to a mix of 17 distinct native plant communities and over 150 species of birds. The natural area protects the waters of the St. Louis River estuary and provides river access for Duluth's residents and visitors" (From: St. Louis River Natural Area).

6. Tributary Streams

A. Aquatic Management Areas (AMA) Designation (*P9, Figure 4*) – Property included in the AMA program may be purchased outright (i.e., fee title acquisition) or protected through acquisition of a conservation easement. Approximately 960.4 acres of important habitat has been acquired and designated as an AMA in the AOC since 1987 (see Figure 3). Other AMAs have been designated in the AOC on lands owned by the public prior to 1987. Only acquisitions since the AOC was listed in 1987 (IJC 1987) are included in the summary statistics in this report.

B. Miller Creek – is a designated trout stream with a heavily urbanized watershed. It is on the State & Federal Impaired Waters List and suffers from rising temperatures, high sediment and turbidity levels, elevated levels of chlorides (from road salt), and elevated levels of mercury in fish tissue. Since 1998, when a Joint Powers Agreement (JPA) was signed between Duluth and Hermantown and the Miller Creek Task Force was formed, a number of studies were completed to investigate the causes of these problems. Prior to the expiration of the JPA in 2005, considerable volunteer and agency work was completed to prevent further degradation of the stream (Lake Superior Duluth Streams).

Figure 4: St. Louis River AOC Aquatic Management Areas



Projects completed to protect and restore Miller Creek habitat include:

i. Upper Miller Creek Riparian Vegetation Planting (*R6, Figure 2*) – Over the course of multiple years, beginning in 1994, the Miller Creek Task Force coordinated riparian tree planting to provide shade to the stream in the highly developed reaches between the Duluth International Airport and the Miller Hill Mall.

ii. Miller Creek Watershed Guardian Program Establishment (*R7, Figure 2*) – The SLRCAC (now the St. Louis River Alliance or SLRA) completed a riparian vegetation restoration project with funding from the Great Lakes Commission and the DuPont/American Greenways Award Program, via The Conservation Fund in the mid-1990s. The SLRCAC purchased potted evergreen trees for Miller Creek near the Kohls department store, organized volunteers to plant them, and subsequently had a contractor erect mesh fencing to protect them from browsing animals.

iii. Miller Creek Sediment Trap Construction (*R8, Figure 2*) - The South St. Louis County Soil and Water Conservation District (SWCD) designed and constructed a natural-bottom sediment trap below the Miller Hill Mall complex in 2004. The goal was to reduce excess sedimentation from winter parking lot and road sand. This involved widening and deepening a portion of the stream to slow stream flow allowing sediment to settle. (Axler, et al., 2011). Funding was provided to the SWCD from MLSCP.

iv. Miller Creek Easement Acquisition (*P10, Figure 2*) - Using funds from the MLSCP and with the assistance of the South St. Louis County Soil and Water Conservation District, the Miller Creek Joint Powers Board acquired a conservation easement on a 6-acre wetland parcel adjacent to Miller Creek in the City of Duluth. The purpose of the acquisition was to protect an undeveloped wetland area and preserve cooling inflows to Miller Creek. Following the dissolution of the Joint Powers Board, the City of Duluth became the easement holder.

v. Ditched Channel Restoration (*R9, Figure 2*) – In 2015, a 210-foot long portion of the stream channel in a narrow strip between Haines Road, U.S. Highway 53 and a commercial structure (U-Haul) that had been previously ditched and straightened was restored to a more natural channel configuration by the SWCD using a grant from Minnesota's Clean Water Fund (SWCD 2020a).

C. Sargent Creek – The watershed of this stream is relatively small and largely forested, with high steep banks along much of the stream. It is a designated trout stream that enters the St. Louis River Estuary near the Boy Scout Landing public water access site at Commonwealth Avenue.

i. Sargent Creek Dump Site Remediation (*R10, Figure 2*) – The City of Duluth, with funding from MLSCP, completed remediation of a former municipal landfill in and adjacent to Sargent Creek in 2004. The project was a complete remediation of the dump site located in a steep ravine that extended along 1.5-miles of the creek. The project included a Remedial Investigation, Development of a Remedial Design / Response Action Plan, and Implementation of the Response Action Plan. Material removed from the former landfill was relocated to the City's Rice Lake Landfill and placed in a disposal cell designed to meet current regulations. In 2004 and 2005 the City of Duluth also removed numerous discarded tires from the stream bed and riparian corridor using a specialized excavator designed to minimize damage to the creek bed.

ii. Sargent Creek Stream Restoration (*R11, Figure 2*) - A 2018 project conducted by the South St. Louis County SWCD restored 4,850-feet of Sargent Creek (SWCD 2020b) between Mission Creek Parkway and the Willard Munger State Trail. The SWCD targeted this part of

the stream for restoration after the flood of 2012 damaged the high, steep banks of this reach. The destabilized banks were contributing excess sediment to the stream and degrading the habitat for trout and other cold-water species. The project "restored the pattern, profile and dimension of the creek to a stable channel that could withstand high flows without causing further erosion of the adjacent banks" (SWCD 2020b).

D. Duluth Riparian Plantings – A partnership between the Duluth Stream Corps, Natural Resources Research Institute (NRRI) at the University of Minnesota-Duluth (UMD), and other partners used Great Lake Restoration Initiative funding to plant more than 18,000 trees and shrubs along 22-miles of Duluth stream shorelines to help prevent sediment and other pollutants from degrading stream habitat. The vegetated buffers along the streams provide shade to keep streams cool as well as food and shelter for aquatic organisms (HOW 2018).

E. Lester / Amity Creek Restoration - In 2005, a private gift to NRRI spawned the Weber Stream Restoration Initiative (Lake Superior Duluth Streams) with a goal of restoring and protecting Superior Basin trout streams using the Amity Creek watershed as a demonstration project for restoration, assessment, and extension education activities. Over a dozen projects were carried out by the Partnership from 2005–2011 and several new projects funded by the Great Lakes Restoration Initiative, MLSCP grants, and in-kind partner efforts began in 2011. Continuation of the project with GLRI grant funds included additional restoration of habitat for fish and other aquatic organisms by addressing elevated turbidity and/or temperature, assisting local governments in tributary restoration, and protecting Lake Superior near shore native fish communities by reducing sediment and nutrient loading. Habitat restoration projects include:
   i. Upper East Amity Creek Restoration (*R12, Figure 2*) (2007-2014) - Eroding banks were identified from NRRI surveys and the South St. Louis SWCD led an effort to mitigate two of the largest sediment sources.
   ii. East Amity Creek Bank Stabilization and Channel Restoration (*R13, Figure 2*) (2017) - The channel was restored to a stable shape and slope, a large eroding bank was stabilized, and trout habitat was enhanced. Funding was provided by the MN Board of Water and Soil Resources (BWSR) Disaster Recovery Assistance Program.
   iii. East Amity Creek Tributary Bank Stabilization and Channel Restoration (*R14, Figure 2*) Work was completed to restore habitat on an intermittent tributary to Amity Creek which is fed largely by residential stormwater. The project included two bank stabilizations, riparian zone re-vegetation, an in-stream flow diversion (J-vanes) on an upper watershed reach, and a neighborhood stormwater BMP retrofit project (see also: VeitUSA.com-Amity Creek Restoration).

F. Chester Creek Restoration (*R15, Figure 2*) - Sections of Chester Creek, one of Duluth's 14 designated trout streams, were greatly impacted by the flood of 2012. Restoration efforts began in 2017 and were concentrated in Duluth's Chester Park neighborhood. Restoration elements of the project included removal of two dams, re-aligning and reshaping the creek channel so sediment moves effectively, planting hundreds of trees and bushes, and creating trout habitat. Maintaining historic views, enhancing the natural beauty of the park, installing a new pedestrian bridge, preserving the ski run-out area, and meeting the goals of the City's mini-master plan were all part of the project design and implementation (SWCD 2020c).

7. **Invasive Species Control** – Partners throughout the State of Minnesota developed a Minnesota State Management Plan for Invasive Species in 2009 (MISAC 2009). The plan provides a long-term plan to coordinate invasive species research, management and prevention efforts. The Duluth Collaborative Invasive Species Management Area (CISMA) developed a Terrestrial Invasive Plant Management Plan "to provide a framework to coordinate and guide efforts to prevent the introduction, to reduce the spread, and to promote appropriate management of terrestrial invasive plant species populations within the Duluth CISMA Service Area/Geographical Boundary" (Duluth CISMA 2019).

   State and federal (GLRI) funding for planning and implementation of invasive species control efforts occurs through a variety of agencies including:

   - 1854 Treaty Authority – Invasive Species
   - City of Duluth - Duluth Invaders
   - Duluth Area Collaborative Invasive Species Management Area
   - Great Lakes Indian Fish and Wildlife Commission - Invasive Species
   - MNDNR – Invasive Species in Minnesota
   - MN Sea Grant - Aquatic Invasive Species (AIS)

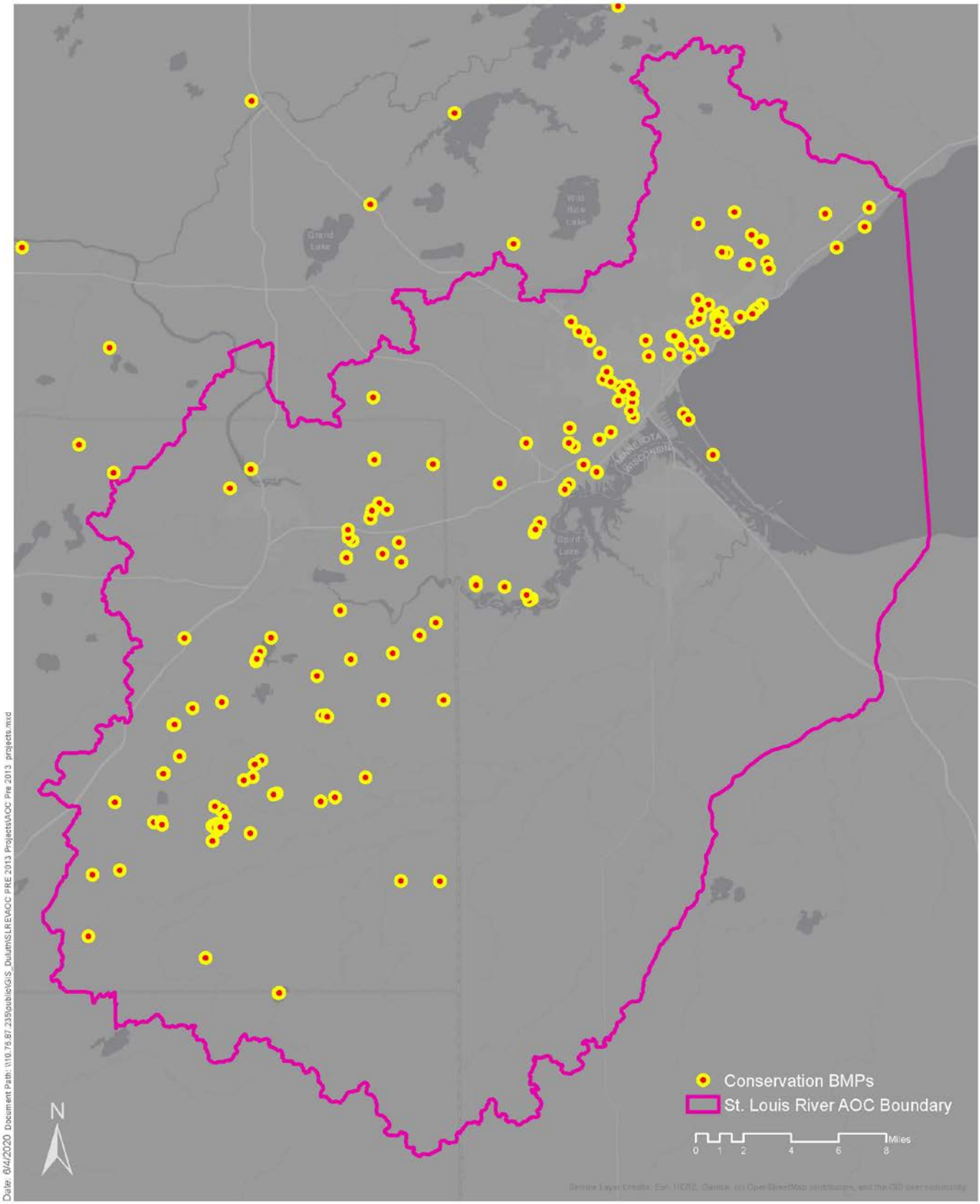
8. **Best Management Practices Implementation** – Conservation Best Management Practices (BMPs) comprise a broad suite of actions taken to protect, restore and enhance natural resources. Federal, State and Local initiatives to plan and construct BMPs began in the AOC prior to the inception of the RAP and are ongoing. The Minnesota Board of Water and Soil Resources (BWSR) has collected geospatial information on conservation BMPs funded through state conservation program efforts for more than 15-years (Figure 5). These data have been provided by local conservation partners using BWSR's grants reporting system. The number of conservation BMPs funded through BWSR programs has accelerated in recent years with increased appropriations to the Clean Water Fund though the Clean Water, Land, and Legacy Amendment. This statewide dataset currently contains over 34,000 BMPs that have been implemented in Minnesota using various State grant funds. In the St. Louis River and Nemadji River watersheds, 221 BMP projects have been reported via this mapping tool through July 2020. To make the data more accessible, BWSR recently posted conservation BMP geospatial data to the Minnesota Geospatial Commons (Conservation BMPs). These data can be downloaded for use in geographic information service (GIS) software or can be viewed through an online map service application. BWSR will update this data biannually and update the metadata as new features are added.

9. **Post 2012 Flood Restoration on Duluth Trout Streams** – Following the flood of 2012, the City of Duluth completed an inventory of damage on city property along the 16 trout streams within its jurisdiction. Sites impacted by the flood were ranked based on threat to human safety, threat to infrastructure (roads, bridges, utilities, and trails), recreational use, and whether there were Federal Emergency Management Agency (FEMA) funded repairs in the area. Based on the result of the inventory, funding was secured from a number of sources to complete restoration at these sites, with restoration prioritized at the highest ranking sites. The majority of funding came from the Minnesota Board of Water and Soil Resources (BWSR) for bank stabilization, MNDNR for debris removal, and Natural Resources Conservation Service (NRCS) for watershed protection. Additional funds came from Trout Unlimited for habitat improvement, from the Legislative-Citizen Commission on Minnesota Resources (LCCMR) for a project on Sargent creek, and the Federal

Emergency Management Agency (FEMA) contributed funds when there was infrastructure damage. The City partnered with the South St. Louis SWCD for work on private property. In total, the City led efforts totaled approximately $7.7M on 44 project sites via 11 different grants through July 2020.

Debris and sediment removal was completed at one of more sites on each of the following trout streams: Chester Creek, Merritt Creek, Mission Creek, Stewart Creek, and Sargent Creek. Bank stabilization was completed at one or more sites on each of the following trout streams: Amity Creek, Bent Creek, Chester Creek, Coffee Creek, East Amity Creek, Keene Creek, Kingsbury Creek, Miller Creek, Mission Creek, Sargent Creek, and Stewart Creek.

Figure 5: Conservation BMPs in the St. Louis River Area of Concern



CONCLUSION

Projects in Minnesota to restore and protect habitat in the St. Louis River AOC and the St. Louis River watershed after AOC listing in 1987 and prior to establishment of the AOC roadmap to delisting (MPCA and WDNR 2013) contribute meaningfully to improvements in fish and wildlife populations (BUI 2) and habitat (BUI 9.) Likewise, projects implemented more recently, but not included in the AOC's complete list of Management Actions (MPCA and WDNR 2019), benefit resources of concern in the AOC.

Minnesota projects have resulted in the protection of more than 27,105 acres of habitat in the AOC and St. Louis River watershed and the restoration of approximately 65 acres of AOC habitat. Completed and planned projects identified as AOC Management Actions will add significantly to the acres restored and protected in both Minnesota and Wisconsin.

A prior summary of habitat restoration and protection projects in Wisconsin (Wick 2015) documented 17,648 acres of habitat protected and 345 acres of habitat restored in the AOC in Wisconsin. Adding the area of Minnesota projects documented in this report results in a total of approximately 45,163 acres of habitat protected and restored for the benefit of fish and wildlife. Consideration of the impact of the projects listed in this report is therefore warranted as progress toward achieving removal targets is assessed and BUI removal is evaluated.

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