DEPARTMENT OF NATURAL RESOURCES

Silver Lake Management Plan
DOW #81004400 & #81011900
DRAFT – July 28, 2023

Send comments to:

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General Lake Information

Location: Silver Lake is in Sections 17, 18 and 19, Township 106 North, Range 23 West (Wilton Township), Waseca County, Minnesota. It is approximately 4 miles northeast of Waldorf and 8 miles southwest of Waseca (Figure 1).

Size: The meandered area of Silver Lake is approximately 417 acres. A 42-acre emergent marsh sub-basin (DOW 81-0119-00) extends from the northeastern portion of the lake.

Shoreline: There are about 4.0 miles of shoreline. Approximately 88 percent is bordered by a narrow fringe of trees with the remainder principally marshlands. Residential development is limited to a few residences/farmsteads located near the lake. Uplands surrounding the lake are gently to moderately rolling with a steep drop to the lake basin along much of the shoreline. Figure 2 is an aerial photo from 2021 showing Silver Lake, the inlet marsh and nearby land use.

Access: There is no developed public access to Silver Lake.

Watershed: Silver Lake is in the Little Cobb River watershed within the LeSueur River watershed in the Minnesota River basin. The Silver Lake catchment is about 4.1 square miles (including the lake basin) and is illustrated in Figure 3. The primary land use within this catchment is agricultural row crops. Silver Lake is a headwater tributary to Bull Run Creek which flows to the Little Cobb River into the Cobb then Le Sueur Rivers. The drainage ratio is about 6:1 which is adequate to maintain water levels in years with normal precipitation. The lake is classified as having a semi-permanent water regime. While water recedes from substantial portions of the basin during more severe natural droughts, the lake rarely goes completely dry.

Inlets: At least 3 surface inlets enter the lake. The 42-acre marsh outlets to the basin from the east at the northeastern end of the lake, a short ditch that flows from the north also outlets in the northeastern corner of the lake, and a small marsh outlets to the southeastern shoreline. An unknown number of short drainages and agricultural tiles also drain to the lake from surrounding lands.

Outlet: The outlet of Silver Lake is on the west end. The State of Minnesota owns a "Type C" concrete dam built in 1938 (figure 4). The dam has four (4), 5' wide stoplog bays providing 20' of spillway. According to a MNDNR hydrographic survey from 2021, the elevation of the sill of the dam is 1049.95 feet (all elevations are expressed as 1929 NGVD unless otherwise noted). The authorized stop log setting is 1.3 feet above the sill of this dam or about 1051.3 feet. The abutments and earthen embankments have been undermined and deteriorating for some time. The structure currently is not capable of impounding water in the lake and stop logs have been removed to help slow erosion of the earthen embankments. The MNDNR measured the runout elevation in 2021 at about 1050.3 feet on sand build up approximately 350 to 400 feet upstream of the dam. Flows from Silver Lake travel down a channel which crosses 60th Street (County Road 21) approximately 1000 feet downstream through an 80 inch x 60 inch corrugated metal pipe. Flows combine with Bull Run Creek downstream of the culvert. The invert of this first downstream culvert is 1049.37 feet. In the past a carp screen has been attached to the downstream side of the water control structure, but it has been removed.

Ordinary High Water Level: The established ordinary high water (OHW) level for Silver Lake is 1051.6 feet.

Land Use: The majority of the land in the lake's watershed area is devoted to row crop agriculture followed by natural habitats include lake, wetlands, forests, small groves and grasslands. Approximately 1 mile to the southwest of Silver Lake is Mott Lake (DOW# 81007600), another shallow lake, which lies within the boundaries of Mueller Wildlife Management Area (WMA). Buffalo Lake (DOW# 81008300), a designated wildlife management lake, is located about 6 miles northwest of Silver Lake (Figure 3).

Water Quality

Available data suggests Silver Lake is nutrient enriched. Water samples from the Minnesota Department of Natural Resources (MNDNR) wildlife lake habitat surveys suggest Silver Lake is a hard water lake with water chemistry suitable to support abundant growth of aquatic vegetation (table 1). In 1949 sulfate ion concentration was just 0.5 parts per million (ppm) suggesting the lake could support wild rice at that time. Total phosphorous was 194 μg/l in the 2009 survey. Phosphorous is an important plant nutrient, but high levels in aquatic ecosystems are detrimental. Excessive levels of phosphorous are associated with algal blooms, increased turbidity, loss of submersed aquatic macrophytes and loss of macrophyte species diversity especially when fish are present.

The average Secchi disk reading recorded during the 2009 wildlife lake habitat survey was 0.9 feet with a maximum of 1.5 feet. Water cloudiness could be attributed to algae and abundant carp and/or other rough fish and wind action which caused fine bottom soils to be held in suspension. In the older surveys the lake was noted has having clear water to the bottom in 1949 and as mostly clear in 1958.

Fish and Wildlife Habitat

Silver Lake is in a landscape having habitats important to wildlife that utilize shallow lakes such as Silver for their life needs. In addition to Buffalo Lake, a designated wildlife management lake, several State Wildlife Management Areas (WMA) are located within a 10-mile radius of Silver Lake including Mueller, Willard and Lois Manthey, Kanne Marsh, Lundquist, Quade, Linde, Lembke, Hobza, Lost Marsh, Thompson Slough, Latourelle, Young Bull, Dean Christianson Memorial, and Senn-Rich. Other nearby conservation lands include Felber Waterfowl Production Area and numerous private conservation lands enrolled in short term and permanent conservation programs provide additional protected habitats.

All of Silver Lake is littoral. The lake is regarded as important for waterfowl, other water and marsh birds, turtles and amphibians, and aquatic furbearers. Silver Lake is an unstable habitat for fish and primarily serves as a seasonal habitat and/or habitat for species tolerant of hostile conditions such as shallow water, low dissolved oxygen, silty substrates, thermal extremes and high turbidity. The lake is connected to permanent habitats downstream and fishes regaining access quickly become abundant after mortality events.

The central part of the lake is mostly devoid of emergent vegetation (that which grows and extends above the water surface), except waterlilies. The lake supports a fringe of robust emergent plants encircling the open water area. Presently, the emergent marshes are dominated by cattails. Waterlilies are abundant in areas of the lake. During and after drought periods emergent vegetation expands and diversifies with the addition of species such as softstem bulrush, arrowhead and nutsedge. The

submersed aquatic vegetation (SAV) component is variable with the year-to-year changes primarily attributed to the inter-related effects of nutrient enrichment, turbidity and common carp. The lake will have abundant SAV and clearer water after winterkills or droughts then transitions toward a turbid state when carp recolonize.

The MNDNR has conducted 3 formal wildlife lake habitat surveys of this lake in 1949, 1958 and 2009. These surveys have documented natural variability of the lake and changes through time. Some results from these surveys are summarized in table 1. Average water depths ranged from 0.25 ft. in 1958 an unusually dry year (the water level was noted to be about 2 feet below normal) to 2.5 ft. in 1949. In 2009 water levels were low, but not as low as in 1958 and reflected the loss of dam integrity. General bottom types are noted as muck or mud with some sand in limited locations.

In 1949 giant burreed and waterlily were the dominant emergents. Common cattail and arrowhead were sparse. Burreed was abundant and mostly found in a narrow fringe near shore.

The 1958 survey was conducted during a low water period and documented early marsh succession with emergent plants estimated to cover about 60% of the basin. Fifteen species of emergents were recorded including mudflat annuals and early successional species that normally disappear after a few years of inundation.

The 2009 habitat survey documented SAV in open water areas. Except for waterlilies, this survey provided only limited documentation of emergent vegetation. Waterlily was found in extensive stands especially along the south shore. Some results from the 2009 survey, including presence and absence of vegetation and water depths are shown in figure 5.

None of the 3 surveys included the marsh basin east of the main lake. Narrative reports, general observations and air photo interpretations are also used to provide additional information about aquatic habitats.

Cattails, especially narrow-leaved and hybrid varieties, are common in the emergent fringe around the lake. The increased prevalence of cattail around the margins of the lake is the result of several factors including the dam failure and a reduction in the use of shoreline areas for pasture. Currently, the lake level is too low to be well suited for overwintering muskrats. Cattails are less prone to loss through grazing and muskrat house building activities. Overtime, cattails can gain competitive advantage over other desired emergent vegetation such as sedges, bulrushes, arrowhead and burreed. With a lack of grazing from livestock and muskrats or other disturbances dense stands of near monotypic cattails can persist indefinitely in the shallow margins of the lake.

Submersed aquatic vegetation was documented in all surveys although species richness (i.e., the number of plant species found) was limited (table 1). The greatest species richness of SAV (7) was sampled in the 2009 survey. Submersed plants were noted as common around the lake perimeter and mostly absent from the center of the basin in 1949. In 1958 and 2009 SAV was well distributed across the open water areas of the lake.

Table 1. Summary of selected results from Wildlife Lake Surveys for Silver Lake.

Year	Avg. Depth (ft.)	Max. Depth (ft.)	Average Secchi Depth (ft.)	Max. Secchi Depth (ft.)	Conductivity (umhos)	Total Phosphorous (ppb)	Sulfate (ppm)	Total Alkalinity	Chloride (ppm)	Plant Species Richness	SAV Species Richness
1949	2.5	3	Clear to bottom	Clear to bottom	--	--	0.5	195	17.1	7	2
1958	0.25	0.4	Bottom visible at all stations	Bottom visible at all stations	--	--	--	--		20	3
2009	1.1	2.0	0.9	1.5	405	194	--	--		7*	6

*The 2009 survey generally avoided the emergent fringe around the lake perimeter; therefore, emergent plants in the lake margins are not included in the species richness. White waterlily was the only emergent plant recorded.

Wildlife Use

Frequent wildlife observations and survey information for the lake is lacking. However, waterfowl, waterbirds and other wetland associated wildlife are drawn to shallow lakes such as Silver Lake when water levels and food conditions are optimum. Silver Lake is part of a shallow lake and wetland complex. It is well documented that shallow lakes within habitat complexes receive greater used than isolated basins.

The 1949 survey was conducted in early summer. The crew recorded mallards (including 2 mallard broods), pintails, ruddy ducks, and lesser scaup. An estimated 470 ducks including about 400 blue-winged teal, 20 wigeon, 50 mallards were seen on the lake in September 1958 by the survey crew. They also noted signs of deer, pheasants, raccoon, mink and shorebirds in the vicinity of the lake. The 2009 survey was conducted in mid-summer. Waterfowl noted include Canada geese (including 1 brood), mallards, wood ducks, blue-winged teal and other ducks that were not identified. Other wildlife observed included white pelicans, double-crested cormorants, great blue herons, common egrets, black and Forster's terns, and unidentified gulls.

Fishery

Silver Lake is prone to winter kill but is rarely fish free. The fish community is comprised of tolerant species such as common carp, fathead minnows, brook sticklebacks, and black bullheads. Common carp rapidly recolonize the lake after fish kills and then exploit the warm shallows as reproductive habitat.

The 1949 and 2009 surveys indicated that carp and bullheads were present. These fish had minimal impact in 1949 but were likely responsible for the more turbid conditions in 2009.

Wildlife biologists have consistently noted the deleterious effect of common carp and the need to control reentry of these fish to Silver Lake following fish kills. Damage caused by these fish is not only the direct destruction caused to plants by uprooting or other damage, but also increased turbidity due to changes in invertebrates and plankton, nutrient flows and suspension of fine sediments. Examination of air photos indicates the lake frequently switches from having relatively clear conditions during the

open water season to years when the lake is turbid and algae is dominant. A fish barrier had been maintained for a time at the dam, but it has been absent for decades.

Management Goals and Objectives

Goal: Provide quality breeding and migration habitat for waterfowl, marsh birds, aquatic furbearers and other wildlife and an area for the enjoyment of nature and understanding natural ecosystems.

Objective 1: Promote growths of aquatic plants which provide food and cover for waterfowl, aquatic furbearers and other wildlife.
Objective 2: Provide nesting and brood habitat for ducks and other marsh birds.
Objective 3: Provide an area for wildlife-based recreation including hunting, trapping, bird watching and other wildlife viewing, and the study of marshland ecology by educational institutions and interested individuals.

Proposed Management Actions to Achieve Objectives

Action 1a: Replace the existing dam with a structure allowing for restoration of water levels and future lake drawdowns. The outlet dam for Silver Lake has deteriorated and earthen embankments are in poor condition. A functional dam is necessary to maintain more optimum water levels in the lake.

- **Obtain final dam design plans, an operational plan, and any other requirements needed to allow dam replacement and water management to benefit water and habitat quality.**
- **Replace the Silver Lake dam with a new variable-crest dam so water level management and temporary drawdowns can be implemented. The new structure should pass the same amount of water as the existing dam.**
- **Construction and operation of the dam will require necessary permits from the State and Federal Governments.**

Action 1b: Incorporate a fish barrier on the outlet stream in cooperation with Waseca County. A horizontal fish screen or velocity-tube fish barrier is feasible downstream of the lake outlet at County Highway 21 (60th Street). An existing culvert can be replaced and modified such that it becomes a barrier to upstream fish movement.

- **Replace the existing County 21 road crossing of an un-named tributary of Bull Run Creek with a new culvert having characteristics to deter upstream migrations of common and other invasive carp.**
- **Installation of a culvert/fish barrier requires permits and permissions to maintain a barrier to the movements of fish and other aquatic species.**

Action 2: Maintain water levels near the authorized runout elevation of 1051.3 feet during non-drawdown intervals. When possible, water levels should be maintained near the authorized runout to provide attractive habitat for muskrats, other aquatic furbearers, overwintering turtles and amphibians, waterfowl and other marsh birds.

- **Manage stop logs to vary flows as needed.**

Management Threshold: Silver Lake water level is greater than 1051.6 feet and receiving waters are below flood action stages.

Desired Outcomes: Protection and restoration of critical habitats are important tools for sustaining water quality. Benefits will accrue to lake through a reduction in destructive high water, wave or ice action and uprooting emergent plants. Food resources and other habitat improvements will result in greater utilization of the lake by aquatic and semi-aquatic wildlife, and increased wildlife and water-based recreation.

Action 3: Temporarily lower water levels for water quality improvements. Minnesota statutes and rules provide options for processes to facilitate the use of temporary drawdowns to improve water quality and aquatic habitats for lakes. Management and permitting will be based on an approved, comprehensive management plan.

- **Obtain legal authority to allow drawdowns to improve water quality and aquatic habitat.** Minnesota Statute 103G.408 allows drawdowns when the public water is a shallow lake to be managed for fish, wildlife, or ecological purposes by the Commissioner of the Department of Natural Resources after giving notice and holding a public hearing.

Ongoing and Long-Range Procedures

Lake habitat conditions may decline over time requiring active monitoring and management. To maintain good water quality and aquatic habitats the following procedures are recommended to maintain or restore habitat improvements. Thresholds are identified that would trigger future actions.

Action 3a: Conduct a drawdown to improve water quality and regenerate aquatic vegetation. Maximum managed drawdown would be to the sill of the dam or elevation 1049.95 feet., but intermediate drawdowns may be used as indicated by habitat conditions. Stable, high water levels can be deleterious to water quality and wildlife habitats. Lake levels would be lowered to encourage establishment of desired native aquatic vegetation. A drawdown will have multiple benefits of restructuring the fish community, improving water clarity, and improving in-lake wildlife habitats. Managed drawdowns replicate the drawdown effects of natural droughts. As occurs under natural conditions, a management drawdown may be partial (water levels unusually low, but some water remains in deeper parts of the basin) or full (the basin is dry or nearly so). Drawdowns may vary in length and be seasonal or be maintained for up to 2 years to accomplish different or multiple objectives. Drawdowns resulting in mudflats during the growing season are used to stimulate new growth of emergent aquatic plants and reduce internal nutrient loading.

As feasible, managed drawdowns will consider life histories of wildlife dependent on shallow lake and marsh habitats. It is desirable to initiate winter drawdowns in late summer after species such as pied-billed grebes have completed brood rearing but before resident aquatic wildlife have initiated overwintering. Lower water levels in early fall will provide shallow water and mudflats attractive for staging puddle ducks while encouraging muskrats, turtles and frogs to use alternative habitats for overwintering.

After a major drawdown somewhat lower water levels may need to be maintained during the first year of refilling to encourage new growths of desired vegetation. As plants mature lake levels can return to normal.

Management Thresholds: Drawdowns to the maximum extent possible may be conducted when any one of the following conditions is met:

- Submersed vegetation is found at <60% of standard sample points in open water (figure 6).
- Maximum summer Secchi disk readings <80% of maximum depth.
- Presence of carp or other undesirable fish is apparent.

Desired Outcomes: Objectives from which to measure management effectiveness may include:

- Aquatic vegetation being found at ≥80% of the sample stations established in 2009.
- Secchi disk measurements remain ≥90% of average depth during mid-summer.
- Total phosphorus <90 μg/l.

Action 3b: Remove the existing fish community. Certain fish species including common carp can have a deleterious impact on water and habitat quality. This action identifies active removal of undesirable fishes to improve water quality. **If triggers are met, lower water levels in fall and/or winter as much as possible (>15 inches) and maintain drawdown through winter to remove fishes and manage aquatic vegetation. This action may be used in conjunction with other treatments to eradicate undesirable fish populations.** A mixture of approaches ranging from natural winterkills to water treatments with fish toxicants (e.g., rotenone) can effectively remove fish stocks.

Desired Outcomes: **Protection and restoration of critical habitats are important tools for sustaining water quality and wildlife habitats. Benefits to the lake will accrue through a reduction in destructive fish populations allowing beneficial submersed aquatic plants and invertebrate populations to flourish. Food resources and other habitat improvements will result in greater utilization of the lake by aquatic and semi-aquatic wildlife, and increased wildlife and water-based recreation.**

Action 4: Stock the lake with predatory fish in efforts to produce a fish community that is not dominated by bottom-(benthic) feeding fish and planktivorous fish. Relative abundance of fish species and predator-prey relationships can affect the lake environment. Fishery management will target control of rough fish and improving lake water quality. Additionally, Silver Lake is vulnerable to both winter and summer conditions that can adversely affect the fishery and lead to declines in water clarity and habitat quality. An effective fish barrier at the outlet of the lake will restrict fishes from naturally recolonizing, so stocking may be desirable. Fish stocked may also provide benefits to down-stream fisheries.

Consider stocking Silver Lake with compatible native piscivorous fishes following reclamation or natural kill events.

Management Threshold:

- The lake has a fish kill.

Action 5: Local, state and federal agencies and citizen and non-profit groups target implementation of conservation programs and practices in the watershed of Silver Lake.

The outlet of Silver Lake is Bull Run Creek which flows westerly and joins the Little Cobb and Le Sueur Rivers. In August 2015, the MPCA finalized the Le Sueur River Watershed Restoration and Protection Strategies (WRAPS) report summarizing water quality conditions and outlining conservation strategies to meet 10-year clean water targets. Within this report, watershed-wide strategies have been selected to

reduce excessively high flows, sediment, nitrogen, phosphorus, and E. coli concentrations. Conservation practices, including, but not limited to: conservation tillage, cover crops, water and sediment control basins, treatment wetlands, restored wetlands, grassed waterways and nutrient management are effective solutions that will benefit Silver Lake by making the results of in-lake management efforts last longer.

Watershed restoration and protection strategies can be enhanced, while also improving soil health and maintaining productive cropland through partnerships, education, outreach and funding mechanisms. Efforts to identify, target and implement projects and practices on private lands to increase ecological benefits associated with clean water, fish and wildlife habitat, recreational opportunities and sustainable agriculture will be an important long term management strategy. Silver Lake's wildlife resources will benefit most from conservation practices that convey a wide variety of environmental services and incorporate a habitat component. Building on the scientific guidance and with technical expertise from the Water Resources Center at Minnesota State University, Mankato, a Bull Run Subwatershed strategy document has been produced offering an inventory of opportunities for placement of conservation practices.

Desired Outcomes: Improve the health of Silver Lake by reducing nutrient inputs, improving soil health and increasing water storage and perennial vegetation on the landscape. Soil and water conservation practices, protecting and restoring critical habitats, and local partnerships are essential components to enhance water quality and improve fish and wildlife habitats.

Action 6: Work with local, state and federal agencies, non-profit groups and lakeshore owners to protect riparian and littoral habitats of Silver Lake. Certain land uses and development practices can have profound influences on the lake's environment and water quality. Riparian habitats are disproportionately valuable for water quality and fish and wildlife. Shoreland standards and voluntary efforts can protect near-shore areas and water quality. Shoreline management to improve wildlife cover can be accomplished through private land conservation practices, easements, or acquisitions.

Desired Outcomes: Natural lakeshore and littoral habitats dominated by native species. Shoreline areas are lightly developed and landscaped to preserve habitat values, prevent erosion and to limit nuisance wildlife problems. Aquatic plant management is limited but provides for recreational uses while protecting important wildlife habitats and water quality.

References

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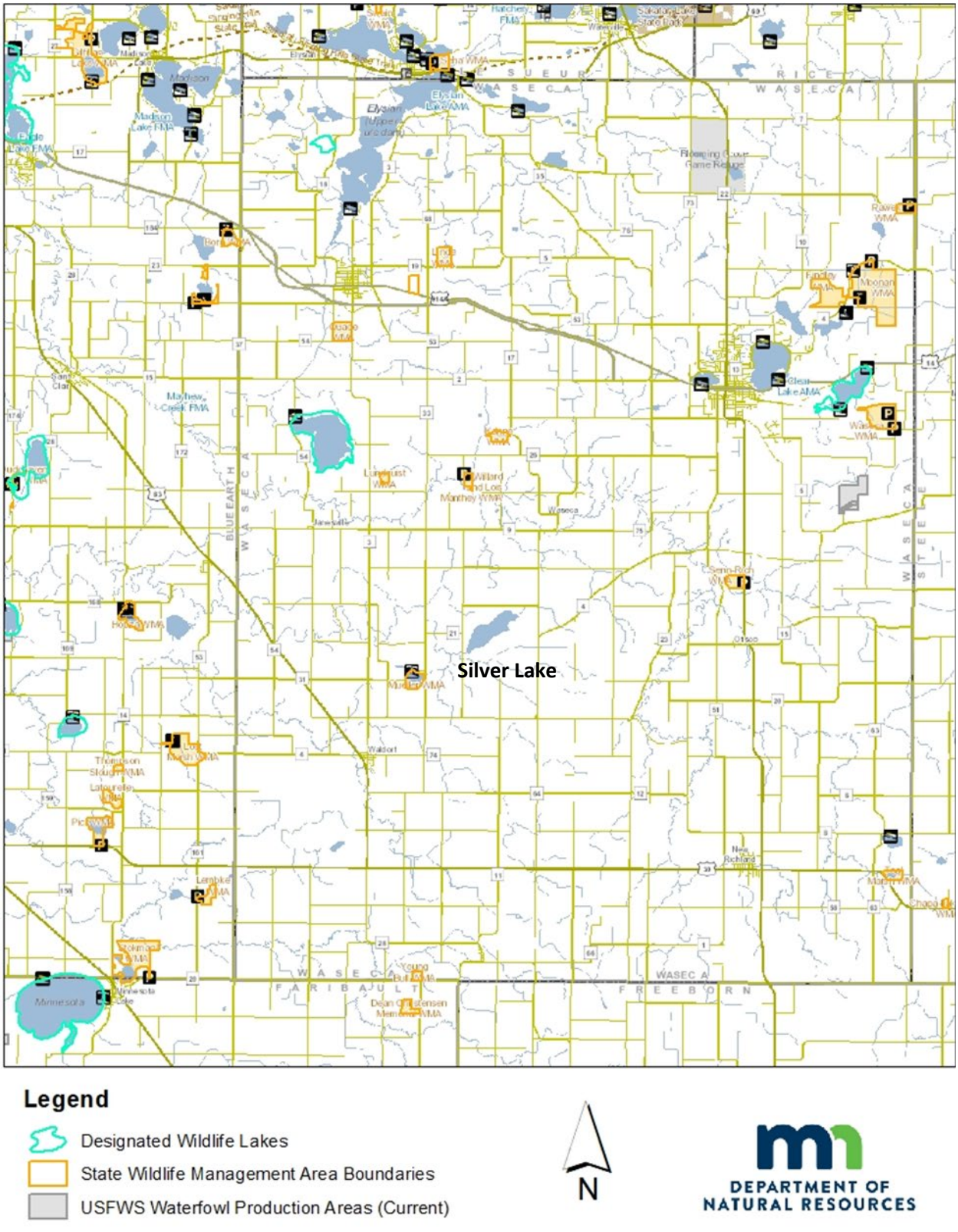

Figure 1. Map showing the location of Silver Lake and other wildlife conservation areas in Waseca County and bordering areas.

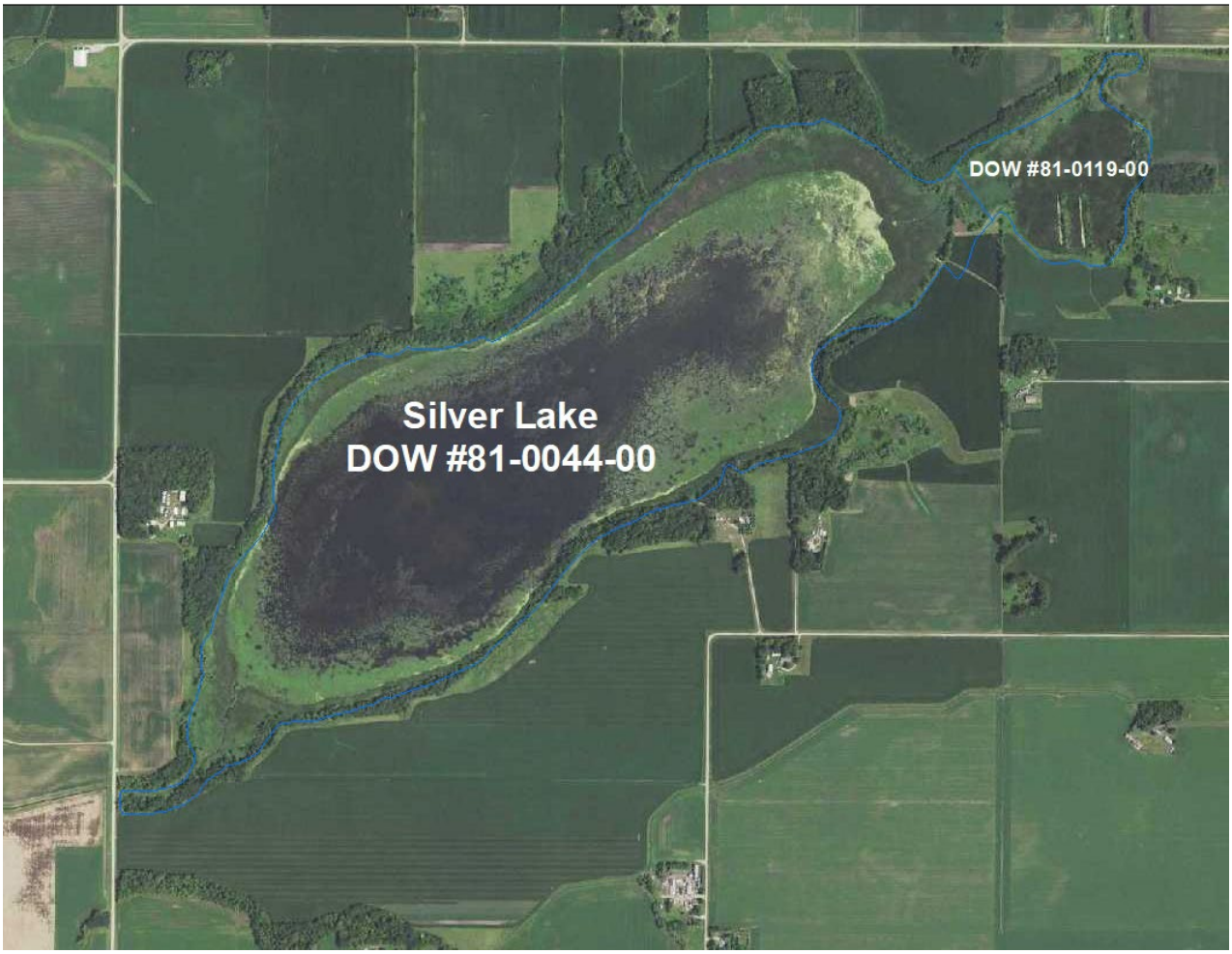

Figure 2. 2021 aerial photo showing Silver Lake, the inlet marsh and nearby lands.

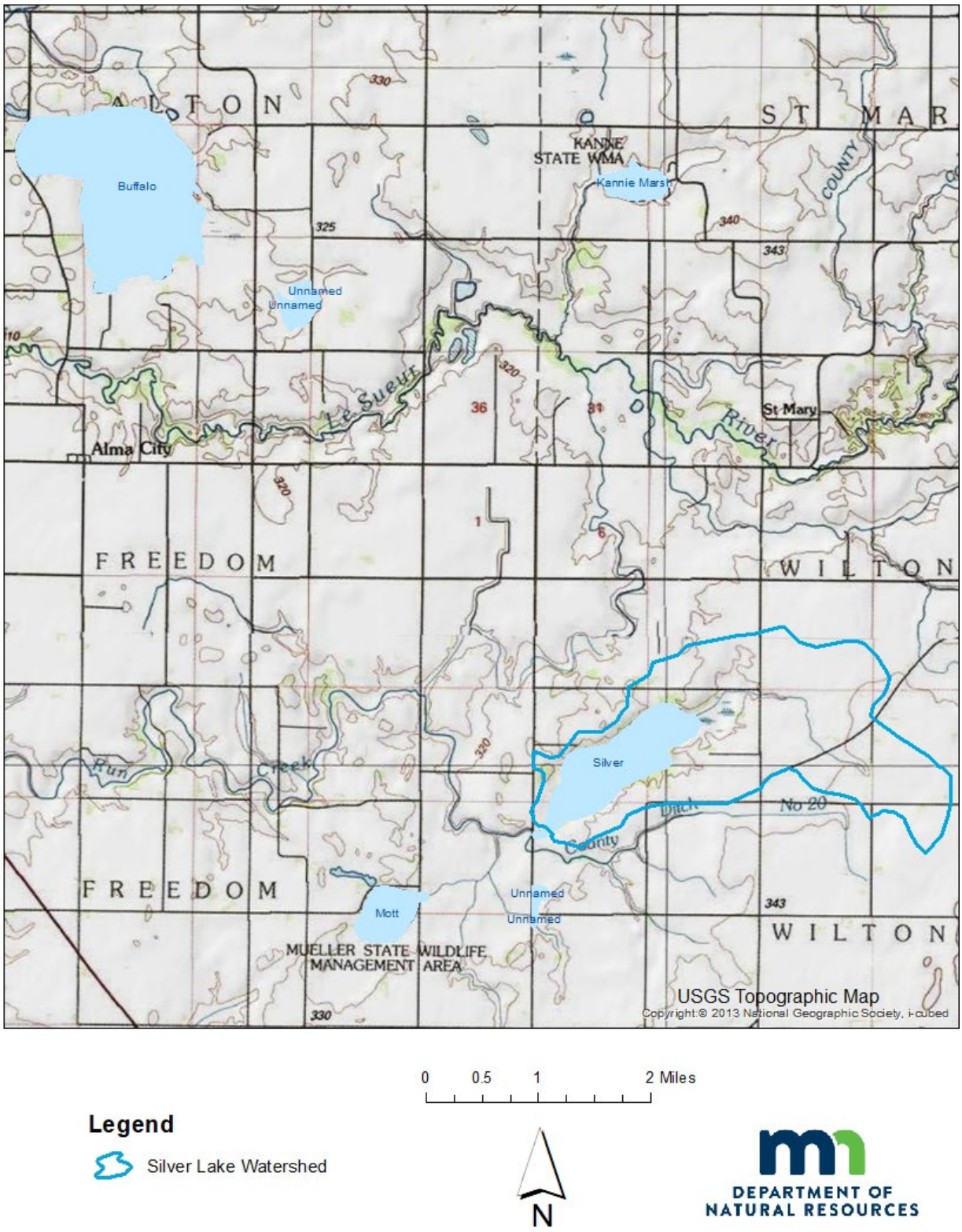

Figure 3. Silver Lake watershed and nearby shallow lakes and wildlife management areas.

Figure 4. Photo of the Silver Lake outlet dam taken April 2023 looking north to south and showing deteriorated embankments.

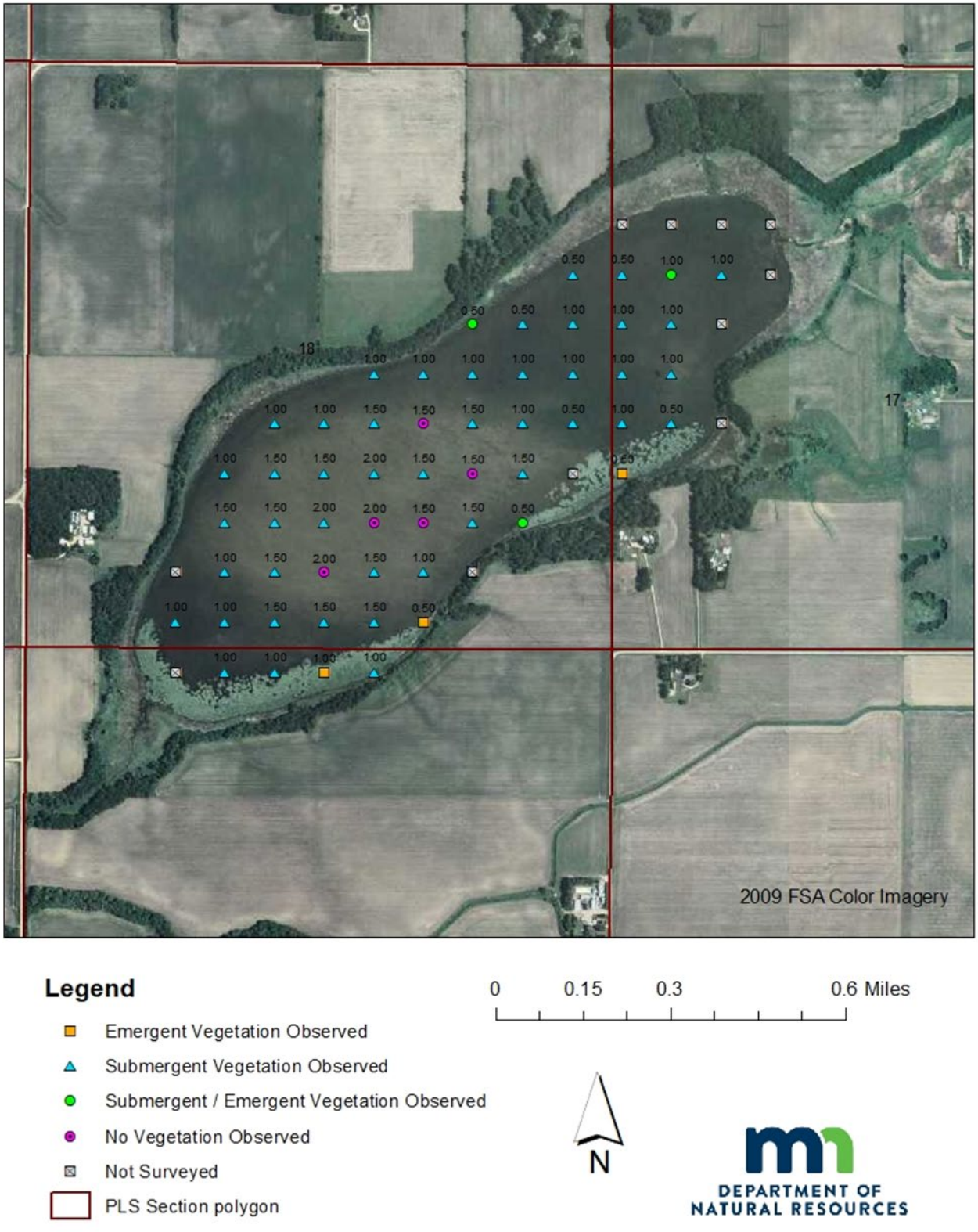

Figure 5. Results of 2009 Silver Lake wildlife habitat survey showing water depths recorded at each point and presence/absence of submersed and emergent vegetation.

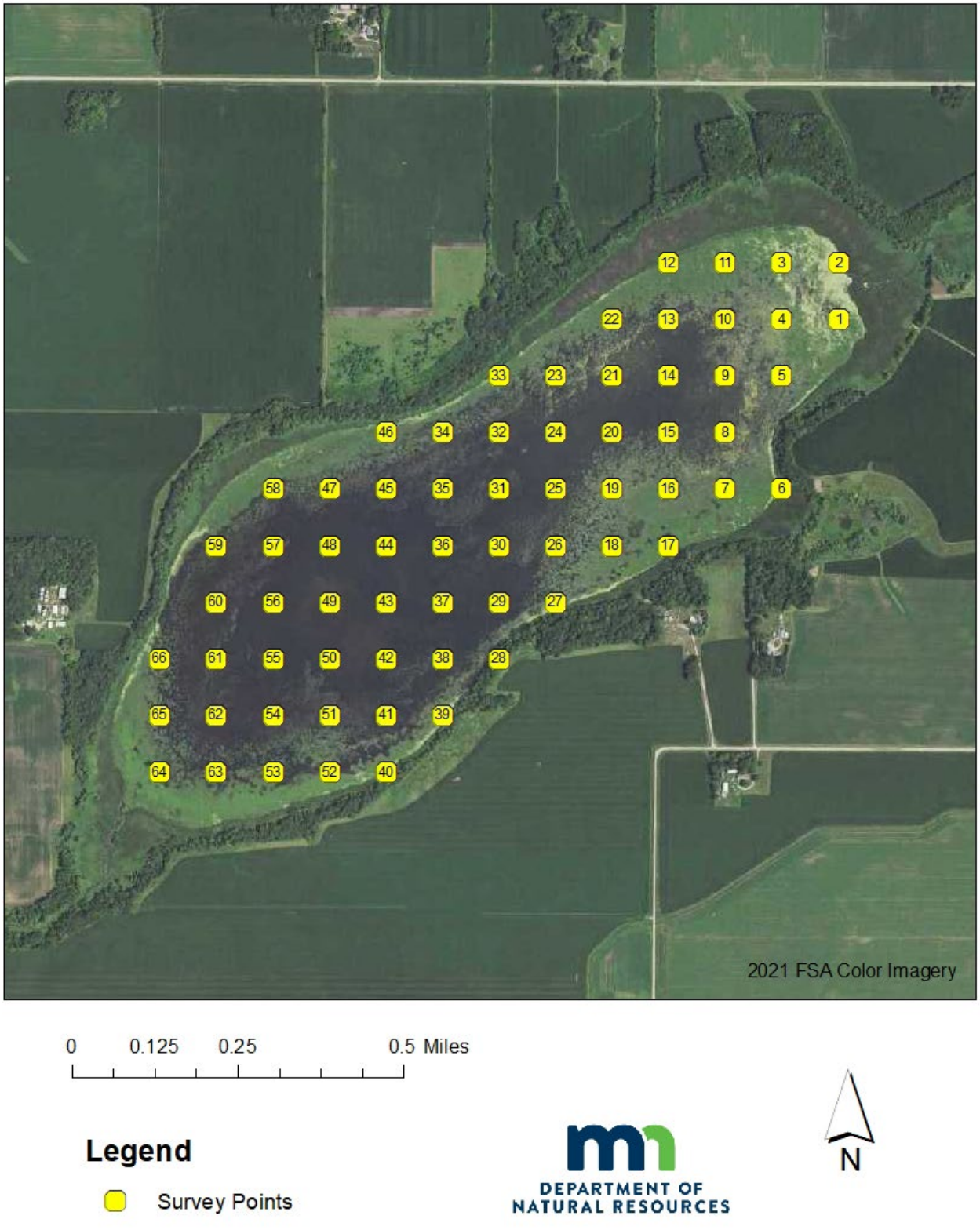

Figure 6. Silver Lake standard survey plots for wildlife habitat surveys.