Minnesota Valley National Wildlife Refuge

A PLACE TO DISCOVER, A PLACE TO EXPLORE

ROUND LAKE CONCEPTUAL MANAGEMENT PLAN

Round Lake Unit (Arden Hills, Minnesota)

Updated (Draft) August 6, 2013

U.S. Fish and Wildlife Service
Minnesota Valley National Wildlife Refuge
Bloomington, Minnesota

Tim Bodeen, Refuge Manager

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February 28, 2012
(DRAFT)
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EXECUTIVE SUMMARY

The purpose of the Round Lake Conceptual Management Plan is to provide a framework for future management of the Round Lake Unit (Unit) of the Minnesota Valley National Wildlife Refuge (Refuge). It will remain a draft plan until a remedy is selected to address the heavy metal and PCB contamination in the sediments of the wetland basin known as Round Lake. These contaminants are attributed to the previous ownership and management of the area by the Department of the Army as part of the Twin Cities Army Ammunition Plant (TCAAP). The U.S. Fish and Wildlife Service (Service) remains actively engaged with the regulatory agencies responsible for the clean-up of the TCAAP contamination on Round Lake Unit with the goal of returning the Unit to its intended functions. Based upon the remedy selected, elements of this draft plan may be modified to best meet the Refuge's responsibilities while considering the remediated ecological health of the Round Lake Unit. As new information becomes available, the Service will update this management plan.

The vision of the U.S. Fish and Wildlife Service for the Round Lake Unit is to have a fully functioning unit of the National Wildlife Refuge System. This means providing quality habitat for focal species to promote their conservation and management and providing *priority public use*[1] opportunities where appropriate and compatible. This plan echoes similar proposed actions identified in earlier Unit management documents to accomplish Service objectives for the Round Lake Unit.

Active management of the aquatic resources (e.g., water levels) on the Unit ceased in mid-1980s based on a Service decision to use high water levels to separate wildlife and the public as much as possible from contaminants found in the lake's sediments. At this time the public use was restricted to non-consumptive uses on the upland areas of the Unit. The Service continues to allow use of a hiking trail constructed and maintain within a City of Arden Hills right-of-way on Service property along the west side of the Unit away from the water's edge. Some limited wildlife observation and photography likely occurs along this trail. Prior to use restrictions, the Unit was open to fishing, wildlife observation, and photography.

The Service's vision for the Round Lake Unit consists of managing the natural resources primarily as migratory habitat for diving ducks, other migratory waterfowl, and water dependent birds.. This requires maintaining water clarity and requires water depths that follow a cycle of fluctuating water levels. During the summer, resource management activities would focus on providing habitat for nesting by some dabbling duck, marsh bird, and riparian nesting species. Management actions to accomplish this includes active water level management, biological monitoring to measure the success of management actions, invasive species management and upland vegetation manipulation. Water manipulation cycles generally would occur every 3 to 5 years. Timing of manipulations would be determined by using growing season vegetation surveys to track plant and invertebrate community health. Due to the capability of water control structure that is currently in place, water levels would be actively manipulated to fluctuate 2 to 3

[1] National Wildlife Refuge System Improvement Act of 1997 defines "priority public uses" as: hunting, fishing, wildlife observation, wildlife photography, environmental education and interpretation. Further, it directs FWS to facilitate these uses.

feet or less. Natural drought cycles may (and historically have been documented to) bring water levels below that which can be attained by the water control structure.

In addition to resource management, the Service would provide public use opportunities to include wildlife observation and photography, fishing, structured and self-led interpretive programs. Environmental Education opportunities would include pond studies (including dip netting), water quality, fishing and fish ecology, wetland/upland plant and tree identification, habitat ecology, wildlife management. . Management actions to facilitate these public uses include expanding the existing trail, and constructing a fishing pier and a platform that could be used for wildlife viewing as well as environmental education. We expect to continue our partnership with City of Arden Hills and support the City's efforts to expand the use of their parklands at south end of lake. Potential exists to link the park property to Refuge property and provide access to Service facilities on the shores of Round Lake (e.g., fishing pier, environmental education/wildlife observation platform) for visitors to the City Park. Due to the urban character of this Unit, the Service is not considering offering hunting opportunities at this time.

The future value of the Round Lake Unit of the Minnesota Valley National Wildlife Refuge for wildlife conservation and public use for wildlife-dependent recreation depends upon the level of clean-up attained via the Superfund remediation project. The Service presumes that the current ecological risk posed to the Round Lake ecosystem will be mitigated via the actions of the Superfund remediation project in a manner that enables this vision to be fulfilled.

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PURPOSE OF THIS PLAN

The purpose of this draft plan is to serve as a framework for future management of the Round Lake Unit (Unit) of the Minnesota Valley National Wildlife Refuge (Refuge). It also provides background for use in discussions regarding the resolution of contaminant issues at the Round Lake Unit. It will remain a draft plan until a remedy is selected to address onsite contamination. The final disposition of the contaminants in the Round Lake basin, and therefore the status of the ecological health of the Round Lake Unit, has the potential to change the ability of the U.S. Fish and Wildlife Service (Service) to fully implement this plan. Based upon the remedy selected, elements of this draft plan may be modified to best meet the Refuge's responsibilities while considering the constraints posed by the remediated ecological health of the Round Lake Unit.

MINNESOTA VALLEY NATIONAL WILDLIFE REFUGE PURPOSE

The National Wildlife Refuge System Improvement Act of 1997 (P.L. 105-57) established several important mandates aimed at making the management of lands within the National Wildlife Refuge System (System) more cohesive. The preparation of a Comprehensive Conservation Plan (CCP) for each national wildlife refuge and wetland management district within the System is one of those mandates. Minnesota Valley National Wildlife Refuge is one of more than 550 National Wildlife Refuges and 37 Wetland Management Districts in the National Wildlife Refuge System. The mission of the National Wildlife Refuge System is to "administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

The CCP outlines the overall management direction for a refuge or district based on the mission of the System and the purposes for which a refuge or district was established. Minnesota Valley National Wildlife Refuge was established by Congress in 1976 through the Minnesota Valley National Wildlife Refuge Act (Public Law 94-466; October 8, 1976). In general, its purposes are to (1) provide habitat for a large number of migratory waterfowl, fish, and other wildlife species; (2) to provide environmental education, wildlife recreational opportunities, and interpretive programs for hundreds of thousands of Twin Cities residents; (3) to protect important natural resource areas from degradation; and to (4) protect the Minnesota River valley's unique social, educational, and environmental assets.

The CCP for the Refuge was completed in 2004 (USFWS 2004) and outlines the management direction for the Refuge, including objectives for 15 years of implementation (i.e., 2004 – 2019). This Conceptual Management Plan for the Round Lake Unit refines the management objectives and the potential strategies listed in the CCP to meet the objectives for the Unit into a more specific proposal.

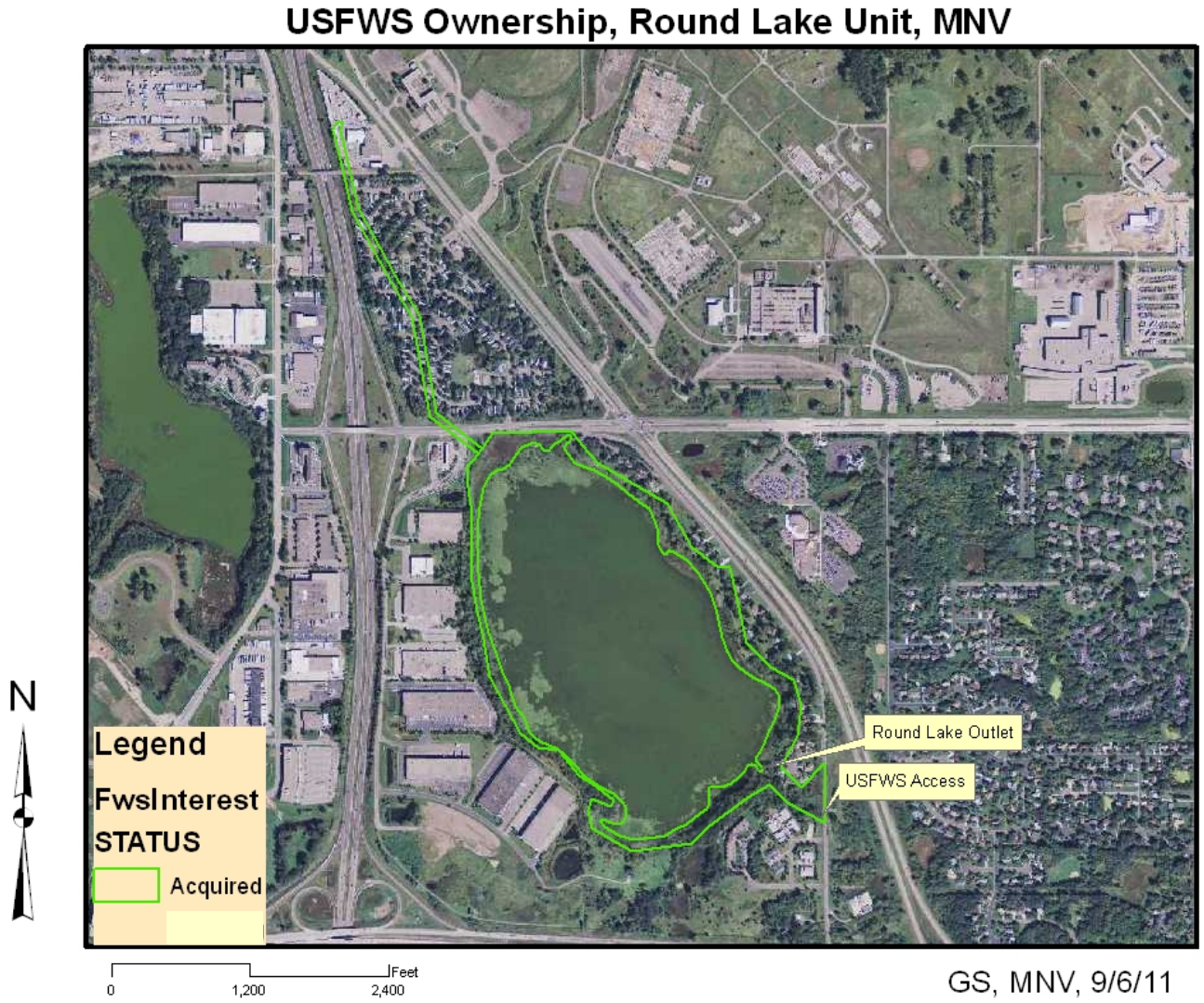
ROUND LAKE UNIT DESCRIPTION AND BACKGROUND

The Round Lake Unit of the Minnesota Valley National Wildlife Refuge is located in the community of Arden Hills in Ramsey County, Minnesota. Ecologically, it lies within an area of Minnesota known as the Anoka Sand Plain, which was historically characterized by oak savanna and sand prairie. Anoka Sand Plain topography is highly variable and its upland soils support a heterogeneous mixture of grassland, trees and shrubs.

The Unit is comprised of about 154 acres of land held in fee title and managed as habitat for wildlife. About 125 of these acres are occupied by a permanently flooded basin named Round Lake (Figure 1). Round Lake is located at the top of the watershed and is dominated by hydric soils, with open water and a fringe of emergent vegetation. The remainder of the Unit is comprised of 29 acres of upland. This upland habitat occupies a relatively narrow zone, typically about 200 feet wide, around the lake. Most of this area supports Oak Savanna or Oak-Maple Woodland communities. An additional 7+/- acres are held as a permanent easement that contains a 48-inch diameter pipeline that was used as a sewer line under previous ownership and was transferred with the property to the Service in 1974.

The Unit is bounded on the west by light industrial development and on the south and east by private homes. This Unit is northeast of St. Paul and about 22 miles from the Refuge Headquarters in Bloomington, Minnesota. Prior to Service ownership, the Round Lake Unit was under the ownership and management of the Department of the Army (Army) as part of the Twin Cities Army Ammunition Plant (TCAAP). The area, designated by the Army as TCAAP Area H, was operated as part of TCAAP's stormwater and wastewater systems. Area H was declared excess by Army in 1973 and made available for transfer to another federal agency. In 1974, the General Services Administration transferred the area to the Department of the Interior (Interior) for the purpose of wildlife conservation under the authority of the Migratory Bird Treaty Act. Interior assigned the area to Sherburne National Wildlife Refuge to be managed as the Ramsey County Waterfowl Production Area (WPA). In 1979, the Service transferred the management of Ramsey County WPA to Minnesota Valley National Wildlife Refuge and it became designated as the Round Lake Unit of this Refuge. Contaminants were identified in the groundwater immediately adjacent to the Unit in 1981. These contaminants are attributed to discharges from the TCAAP (MPCA 1981). Part of the Unit was declared a Superfund site by the US Environmental Protection Agency (USEPA) in 1983 under the provisions of the Comprehensive Environmental Response, Compensation and Liability Act. Subsequent testing by Army found PCBs and heavy metals in Round Lake sediments near sanitary/industrial gravity flow sewer line outfalls (USFWS 1988). Further sediment testing found this contamination to be more widespread than originally thought (Wenck 2010, 2011). As part of the ongoing clean-up of the larger TCAAP site, the drainage of wastewater from TCAAP into Round Lake was halted in 1991. However, Round Lake continues to receive stormwater inputs from the watershed, including overland flow from the TCAAP site.

Figure 1. USFWS Ownership at Round Lake Unit.



The Service stopped active management of the aquatic resources and public uses on the Unit in the mid-1980s based on a management decision to use high water levels to separate wildlife and the public as much as possible from contaminants in the lake's sediments (USFWS 1981, 1994). The Unit has remained in "caretaker status" with minimal active management since then. The Service became a partner in working with the regulatory agencies and responsible party to resolve contaminant concerns on the Round Lake Unit in 1981. The Service remains actively engaged with the regulatory agencies responsible for the clean-up of TCAAP-source contamination on the Round Lake Unit with the goal of returning the Unit to its intended functions (USFWS 2004).

FUTURE MANAGEMENT OF THE ROUND LAKE UNIT

Vision

The future value of the Round Lake Unit of the Minnesota Valley National Wildlife Refuge for wildlife and its use by humans depends upon the level of clean-up attained via the Superfund remediation project. Prior to the discovery of contamination, Round Lake was considered to be valuable area for migrating waterfowl and other water birds. It was selected to become a part of the National Wildlife Refuge System because of its known migratory bird use, the quality of the lake and surrounding habitat, and the recognized threat from development to it and similar areas on the edge of an expanding metropolitan area.

The vision of the Service since it acquired the Round Lake Unit has been to have a fully functioning unit of the National Wildlife Refuge System. This means providing quality habitat to support the natural resources entrusted to the Service by the American people. It also means facilitating priority public use opportunities where those public uses would be appropriate and compatible with the mission of the National Wildlife Refuge System and the purposes of the Refuge. Priority public uses are defined as environmental education and interpretation, wildlife observation and photography, fishing, and hunting (Public Law 105-57).

On August 24, 1999, a public open house was held at Bethel College and Seminary, Arden Hills, Minnesota as part of the planning process for the development of Minnesota Valley National Wildlife Refuge's Comprehensive Conservation Plan. The primary purpose of this event was to obtain public input into the future management of the Round Lake Unit. The objective and potential strategies to meet management goals for the Round Lake Unit, as identified in the CCP, reflect the results of that workshop. The CCP also notes the limitations on Unit management resulting from continued contamination. This plan further refines the CCP objectives and strategies specific to this Unit of the Refuge.

A summary of comments given to the Service by the open house attendees are as follows:

- Recommend caution with trail locations (relative to residential development adjacent to the Refuge on east side of the Unit).
- Provide more wildlife viewing opportunities.
- Maximize wildlife habitat.
- Develop environmental education and interpretation partnerships with Bethel College and local schools.

- Maintain the water quality of Round Lake.
- There would be support of some water level manipulation if it improves habitat.
- More public access would increase public support for the Round Lake Unit as a community asset rather than it being viewed as simply a stormwater sewer.

Resource Management. Round Lake will be managed primarily as habitat for migrating waterfowl. It is well suited to providing migratory habitat for diving ducks given its basin configuration, submergent plant community, and low levels of human disturbance. Round Lake will also support some dabbling duck, marsh bird, and riparian nesting species reproduction. Management actions to support the primary wildlife use will focus on establishing and maintaining a productive submergent plant community as a food source for migratory birds on portions of the lake basin. This will be accomplished by maintaining water quality and clarity and by having water depths manipulated to follow an annual cycle of fluctuating water levels typical for wetlands and shallow lake basins in this part of Minnesota. Management for nesting marsh birds and dabbling ducks will also benefit from water level management that will maintain and enhance the emergent vegetation within the basin. Management for riparian wildlife species will consist of restoring and maintaining a healthy upland plant community adjacent to the wetland basin.

As we do on other Refuge Units, we will implement active resource management on the Round Lake Unit for the benefit of wildlife. These management activities include biological monitoring, water level adjustments, and vegetation management. Biological monitoring activities will be conducted by Refuge staff and volunteers. Examples of monitoring activities are water level observations, marsh bird surveys, migratory bird counts, bald eagle productivity surveys, fish population surveys, and lake vegetation surveys. Adjusting water levels is a tool used throughout the Refuge to stimulate food and plant cover conditions that provide quality habitat for migratory and resident wildlife. Vegetation management projects to remove or control undesirable or invasive species such as purple loosestrife or European buckthorn will be conducted.

Public Use Management. Public use will be expanded on a small portion of the Unit from the existing wildlife observation to include environmental education and interpretation, as well as public fishing. Presently, most public use is along a trail developed and maintained by the City of Arden Hills that follows the western shore of Round Lake (Figure 2). The Service granted an easement to the City of Arden Hills to enable the construction of this public use facility. Environmental education and interpretation activities will be focused on an outdoor classroom and natural area along a small portion of the Lake's south shore (Figure 3). We envision hosting formal programs for school groups and the general public as well as providing less formal opportunities for independent environmental studies. Formal programs would include activities that give participants hands-on experiences with nature, as is done on other Refuge Units. Less formal activities will range from birding to outdoor photography to simply watching flocks of waterfowl come into the lake.

We intend to provide fishing opportunities on this Unit, as we do on other Refuge Units. Several Refuge lakes, ponds, and marshes are included in the Fishing in the Neighborhood (FIN) program managed by the Minnesota Department of Natural Resources (MNDNR). We

anticipate hosting fishing opportunities on Round Lake similar to these areas and propose to partner with MNDNR to bring FIN program activities to Round Lake. Fishing in the Neighborhood seeks to increase angling opportunities, public awareness and environmental stewardship within the metro region. Fishing will be allowed from the shore and a designated fishing platform. No boats will be allowed on the lake in order to minimize disturbance to wildlife using other parts of Round Lake.

Some improvements to Service infrastructure are central to providing these public uses (Figure 2, Figure 3). We propose a spur trail that would extend from the existing trail on the west side of the Unit to a new fishing platform on the southwest side of Round Lake. Another trail will be placed on Refuge property adjacent to the Round Lake outlet. This trail will start at Old Highway 10 and follow the lake outlet channel to the southern lakeshore. From there the trail will follow the lakeshore to the west and link up with either the existing trail on the west side of the lake or the City's park property midway along the southern shore. Prior to the Round Lake Unit being placed in caretaker status in the early 1980s, the City of Arden Hills was actively discussing linking the city park with the Unit. We envision that will finally occur.

A new observation platform specifically designed for environmental education and interpretive programming will be constructed on the Service lakeshore either near the outlet channel or adjacent to the city park. This platform would be designed to provide both a good view of the entire lake surface as well as easy access to the wetland habitat along the shore.

Similar proposed actions to accomplish Service objectives for the Round Lake Unit were identified in earlier Unit management documents in 1979, 1982, and 1998 (USFWS 1979, 1982, 1998). The Service's planned management actions were modified to manage ecological risk upon discovery of significant contamination of the Round Lake ecosystem in the early 1980s (USFWS 1981). The Service presumes that the current ecological risk posed to the Round Lake ecosystem will be mitigated via the actions of the Superfund remediation project in such a manner that enable this vision to be fulfilled.

Resource Management Concepts

Water Management. The dominating feature of the Round Lake Unit is Round Lake itself. The lake is about 125 acres at a surface elevation of 890 msl (Table 1). At this elevation, the lake has a maximum depth of nearly 22 feet. Since about the mid-1980s the lake elevation has been managed to try and maintain a level of 891 msl in order to reduce the exposure of wildlife and people to the contaminated sediments. A 1978 survey of the lake showed substrate consisting of 20% sand and rocks, 20% muck, and 60% detritus (Joarnt and Kenow, 1978). More recent sampling in 2011 showed 6% sand, 1% silt, 43% muck, and 50% peat in the upper 0.5 ft. of the substrate; and showed 10% sand, 2% silt, 22% muck, and 66% peat in the 0.5 ft. to 1.0 ft. layer

Figure 2. Round Lake Management Public Use Overview.

Figure 3. Round Lake Management Public Use South Shore.

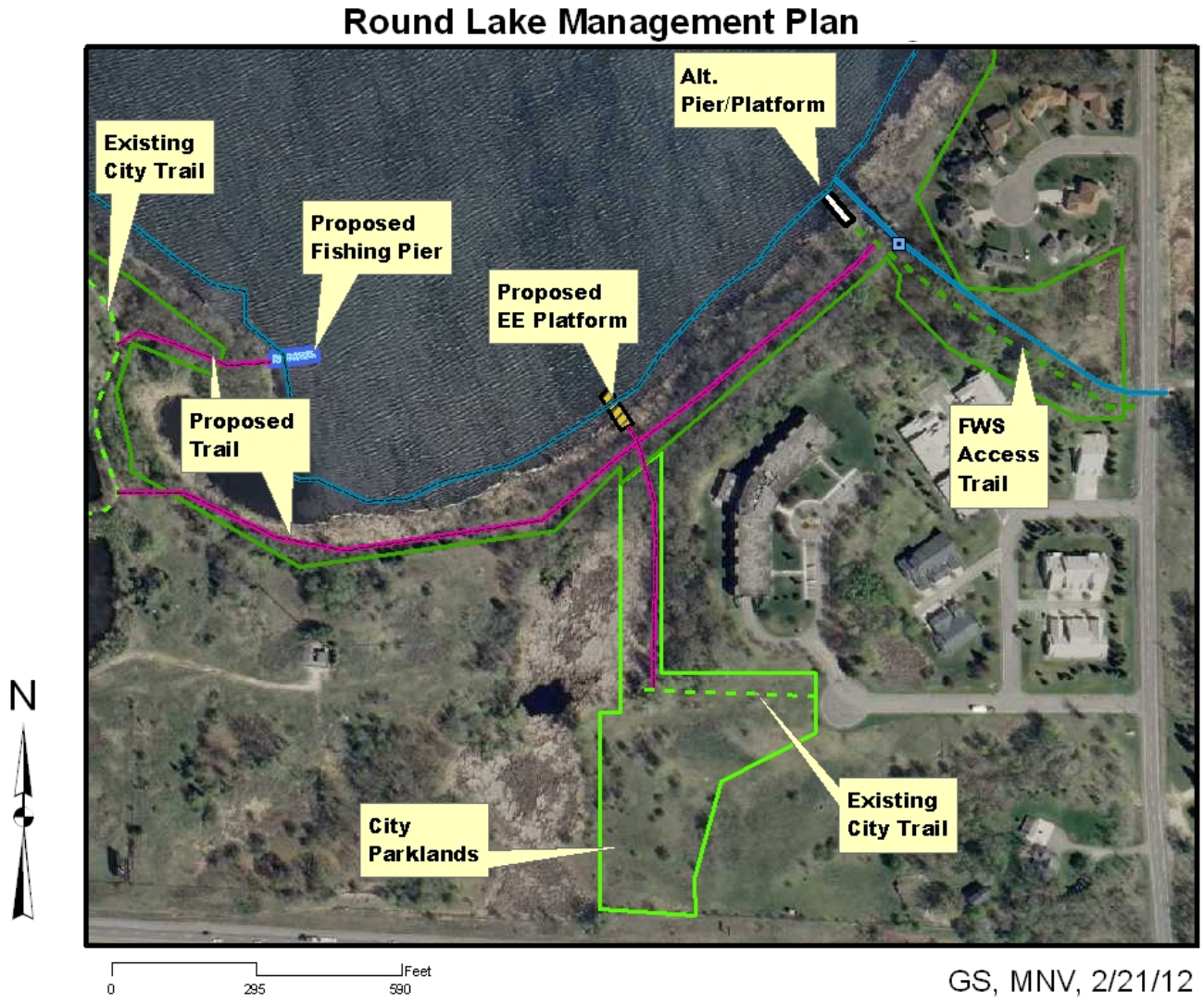


Table 1. Round Lake Acreage based on Bathymetry Data [1]

Elevation	Maximum Depth[2]	Wetted Area	% of Basin Wetted[2]	Volume[2]	Cumulative Volume	Comments[2]
(ft. msl)	(ft.)	(acres)	(percent)	(ac. ft.)	(ac. ft.)	
890.0	24.6	126	100	222	832	Water elevation at time of purchase; approx. upper range of active water management.
889.0	23.6	120	95	117	610	
888.0	22.6	114	90	110	493	
887.0	20.6	107	85	103	383	Existing water control structure sill
886.0	20.6	99	79	91	280	
885.0	19.6	83	66	68	189	Minimum observed & documented during droughts
884.0	18.6	53	42	40	121	
883.0	17.6	26	20	19	81	Light penetration with water elev. @887.0
882.0	16.6	14	11	12	62	
881.0	15.6	11	9	10	50	
880.0	14.6	9.2	7	9	40	
879.0	13.6	7.6	6	12	31	
877.0	11.6	5.2	4	9	19	
875.0	9.6	3.3	3	5.1	10	
873.0	7.6	2.0	2	3.2	4.9	
871.0	5.6	1.1	<1	1.4	1.7	
869.0	3.6	0.3	<1	0.3	0.3	
865.4	0	0.0	0	0	0.0	

[1]Source: Analysis by Wenck Associates, Inc. (2012) of contour map identified as Figure 4 in this report.
[2] Added by USFWS

of the substrate (Wenck 2011). Samples from deeper in the substrate show less muck and more silt and sand. This buildup of muck and peat is consistent with what would be expected with prolonged stable water levels that do not go through a low water or drought cycle which enables dead vegetation to consolidate or oxidize when dried out.

During a lake survey in 1978, Joarnt and Kenow noted that emergent (10 – 20% of locations) or submergent (70 – 80% of locations) plant species were observed at 90% of their sampling locations. They found submergent plants in water over 6 ft. deep (correlating to a bottom

elevation of 883 msl). They identified 15 plant species: 8 rooted submergent species; 4 emergent species; and, 3 floating species. Nine of the species they observed rank as excellent to good waterfowl foods (e.g., slender and softstem bulrush, chara). The Service did not conduct quantitative vegetation surveys for nearly 30 years after contaminants were discovered in the early 1980s. Recent observations by Refuge staff found 10 species of submergent plants and 14 species of emergent plants. Coontail was the dominant submergent species and cattail was the dominat emergent species. Noteably, cattail was present in less than 20% of the basin sampling locations. (USFWS 13). White water lilly was found in about 35% of the sampling locations.

Waterfowl migration surveys conducted on Round Lake from 1975 through 1978 routinely recorded large flocks of waterfowl numbering between 1,000 and 9,000 individuals. The most abundant species were diving ducks (e.g., ring-necked duck, scaup, merganser, bufflehead, coot) with slightly fewer dabbling ducks (e.g., American widgeon, mallard) (Sherburne National Wildlife Refuge field reports). Round Lake waterfowl observations during 2010, 2011, and 2012 fall migration showed that use of the lake is variable across the migration period. Numbers of waterfowl observed on the lake at any one time ranged from a few hundred to a few thousand (USFWS 2010, 2011, 2012). Diving ducks were more abundant than dabbling ducks. In 2012, Round Lake had disproportionately high duck use (more than 10 times) compared to nearby waterbodies. Diving ducks used Round Lake in higher proportions than nearby waterbodies.

Following the remediation of contaminants in the Round Lake basin, water management activities on the Round Lake Unit will focus on maintaining healthy emergent and submergent plant communities as well as maintaining water quality. Attaining these habitat goals will provide a plant and animal food base and suitable cover to support not only habitat requirements for waterbirds in migration but also the annual lifecycle needs of several migratory and resident wildlife species. This will require active water management.

There are some key elevations and concepts related to water level management.

- At an elevation of 892.0 msl water starts to cause damage to adjacent properties. This could be characterized as a “maximum” water elevation, although it is possible that runoff from significant rainfall events may cause this elevation to be exceeded.
- An elevation of 890.0 msl is the historical “normal” water level for the lake (Anon. 1947). This elevation is a likely target for water elevations to maximize use of emergent vegetation by dabbling ducks during fall migration. At this elevation we would expect about 6 – 7% of the lake to have emergent vegetation.
- The sill of the existing water control structure is 887.0 msl. This would be a likely maximum “draw down” elevation because water levels cannot be moved lower than this without special techniques, such as pumping or siphoning. Historical Round Lake observations have recorded water levels as low as 885 – 886 msl due to evaporation during natural “droughts.” Prior to the Service’s decision to hold water levels in Round Lake high due to the contaminated sediments, water levels were regularly targeted to this 887.0 level for management purposes. Based on recent bathymetry information shown in Table 1 (Wenck 2010), at an elevation of 887.0 msl, 90 % of the basin would still be covered with water.

- The elevation of 883 msl represents the likely limiting depth for light penetration and therefore presence of rooted submergent vegetation. Secchi disc readings taken on Round Lake through 1992 found water clarity to an average depth of around 4.5 feet below the water surface (MPCA 2011). With water levels at 887.0 msl and Round Lake water clarity following historical trends, sunlight will penetrate to at least this depth and stimulate submergent plant growth. Sunlight penetration to this depth would promote submergent vegetation over about 75% of the lake bottom. Joarnt and Kenow (1978) observed rooted submergent vegetation to this depth coincident with the time period when Service staff observed the highest waterfowl use on Round Lake. Recent sampling found water clarity to 5.5 feet (USFWS 2013).

The Round Lake basin configuration is shown in Figure 4 (Wenck 2011). This configuration is based on 2011 basin mapping. Figure 5 shows how the key elevations identified above are distributed throughout the basin.

A general concept for water level management on Round Lake would be similar to what we do on other wetland basins of this type on the Refuge and is described below:

- Remove stoplogs to bring the water levels down as soon as possible in early spring to facilitate light penetration to the maximum depth. This facilitates the germination of emergent and submergent vegetation and also exposes flats for migrating shorebirds, and consolidates muck and detritus.
- Hold the water at this level through mid-summer to allow successful nesting of water dependent birds. After the over water nesting species fledge, gradually bring water levels up to a level that will promote maximum submergent plant growth without drowning out or uprooting the emergent plant growth that has begun in the more shallow areas of the basin.
- Hold the water at this level until fall when the seed, which provides a food source for migrating waterfowl, matures on annual emergent plant species and migration approaches.
- Raise water levels up to the optimum depth for fall waterfowl migration. This targeted optimum water depth is where the majority of the seeds produced through the summer are at a depth above or below the water's surface that can be accessed by the waterfowl. Water levels often are increased in small increments through the fall migration season as food resources are eaten out. Increasing water levels makes new areas accessible and provides a continuous food resource.

Under typical water management scenarios, water levels can fluctuate anywhere from 2 to 5 feet depending on the basin configuration. Due to the capability of the water control structure that is currently in place on Round Lake, we expect that water levels would be actively managed to fluctuate 2 to 3 feet, or less. Rapid changes in water levels would be counterproductive to establishing and maintaining vegetation and, therefore, wildlife management success. In addition, water levels are generally not manipulated every year. Typical water management employs the manipulation model outlined above every 3 to 5 years.

Figure 4. Round Lake Basin Configuration (Wenck 2011).

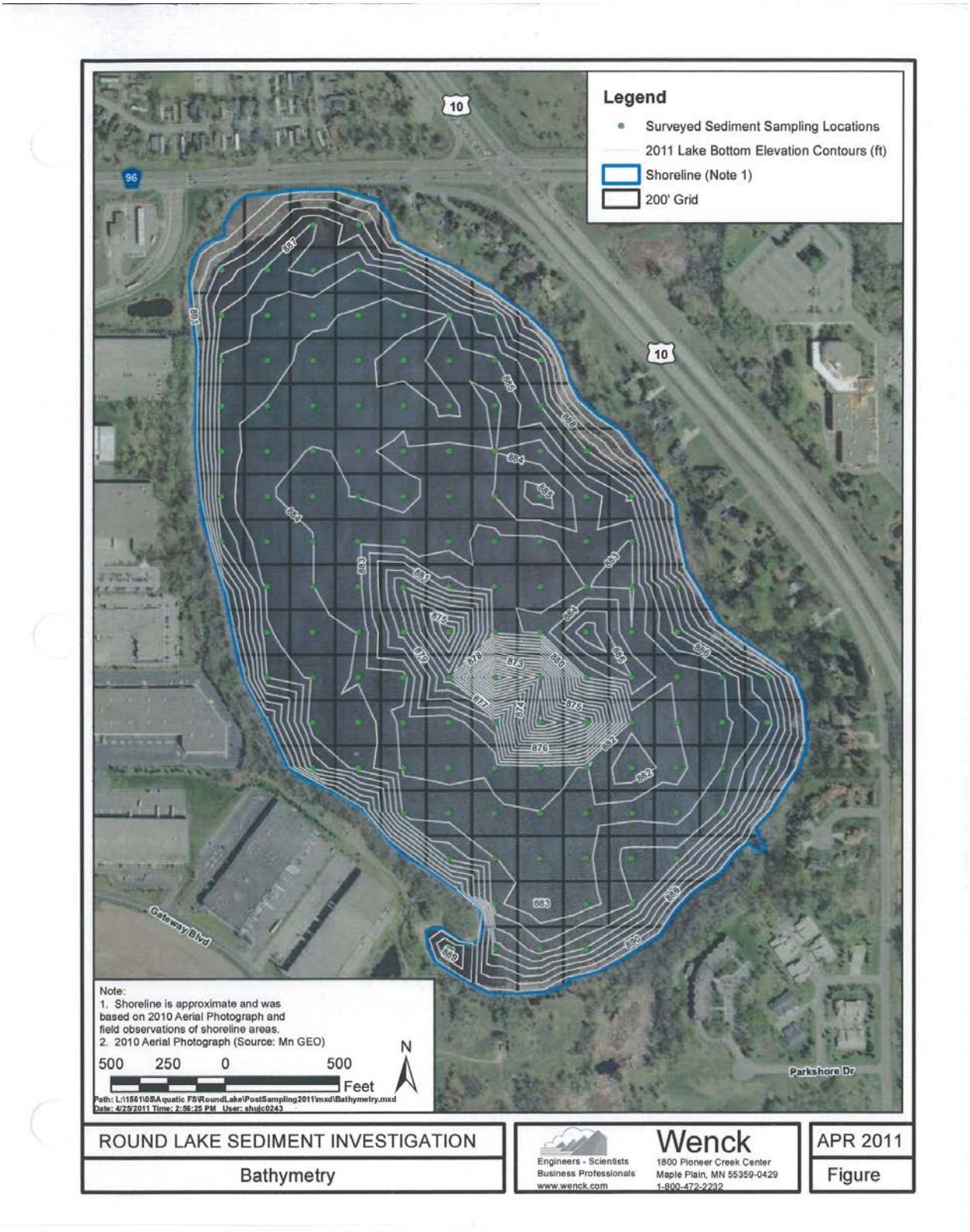
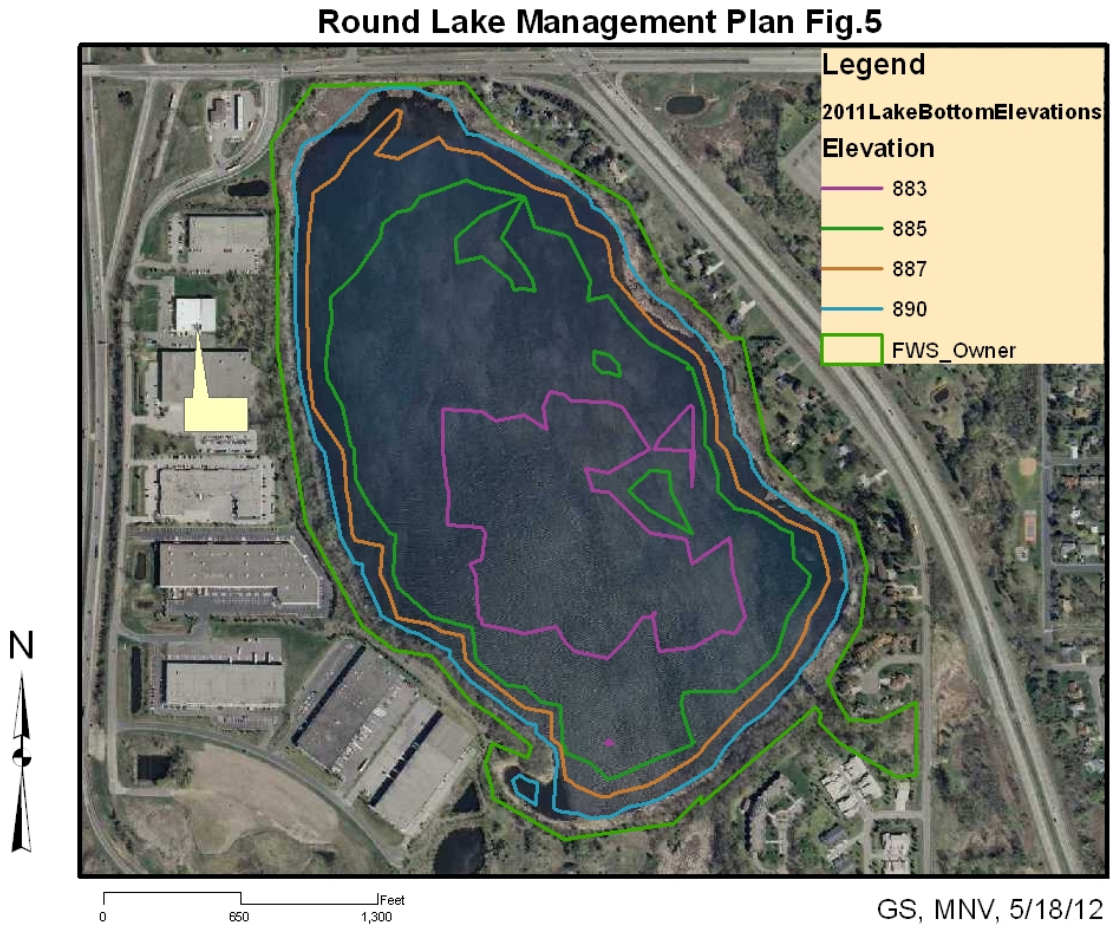


Figure 4. Round Lake Basin Key Elevations.



The frequency of water level drawdowns would be determined by using growing season vegetation surveys to track plant and invertebrate community health. Key factors in developing alternative water level depths, duration, and frequency would be the need to account for species' annual cycles, wildlife use, and vegetation disturbance activities. Annual monitoring results would be incorporated into annual water management plans, including planning to not adjust water levels, based upon Adaptive Management principles.

Water Quality. In addition to water levels, water quality is a key component of wildlife habitat. Water quality affects the character and composition of invertebrate communities at the base of the food chain. Of the constituents normally monitored in surface waters, nutrients, sediment and chlorides are of particular interest in Round Lake. Nutrients and sediments have the potential to affect water clarity and oxygen levels. Water clarity is key to light penetration and growth of submergent plants, which in turn provide habitat for invertebrate and food for waterfowl. Chlorides and oxygen levels can dramatically alter invertebrate communities. As with other Refuge Units, we will monitor water quality parameters, including results of sampling conducted by other agencies such as MPCA. We would continue to actively work with regulatory agencies and units of local government to identify non-TCAAP sources of water quality degradation, such as road improvement projects, that adversely affect the water quality in Round Lake and prevent its degradation.

The sediments of the Round Lake basin have elevated concentrations of heavy metals and PCBs (MPCA 1981). The origin of these contaminants was the former Twin Cities Army Ammunition Plant, which during World War II allowed industrial pollutants to enter area surface waters and consequently, some of these contaminants found their way into Round Lake. Ongoing investigations by the U.S. Army in cooperation with Service staff and several other agencies have determined that these contaminants threaten the biological communities of this area. This aspect of Round Lake is an overriding factor currently reducing the biological integrity and limiting the public use of the Round Lake Unit. We will continue to work with Army, the US Environmental Protection Agency, and Minnesota Pollution Control Agency to remedy this threat to the biotic community of Round Lake and public use of the Round Lake Unit of Minnesota Valley National Wildlife Refuge. We also will partner with these agencies to monitor the Lake's recovery and suitability for public use.

Upland Habitats. The majority of the upland on the Unit is contained within a relatively narrow zone of vegetation that rings the wetland area. These uplands support a mixture of trees and shrubs. Although upland habitats occupy only about 29 acres of the 154 acre Round Lake Unit, they are important to the Unit in several ways. Ecologically, they provide an area that buffers the runoff from surrounding residential and light industrial development before it reaches Round Lake. These habitats also provide nesting habitat for migratory songbirds, raptors, and cavity nesting birds, including some waterfowl such as wood ducks and hooded mergansers. There is a documented bald eagle nest currently on the Unit.

The focus for management activities in these upland habitats will be to restore and maintain quality native habitats. Some of the natural upland habitat has been removed by adjacent property owners. There are opportunities to restore native habitat in these areas using existing Service programs such as Partners for Fish and Wildlife. The reduction of non-native species, such as European or glossy buckthorn, also will be a focus. There also may be opportunities to showcase native plantings for interpretive and environmental education purposes.

Public Use Concepts.

Historical Context. Under Department of Army management, Area H (i.e., the Round Lake Unit) was "closed" to the public with access control consisting of 3-strand barbed wire fence and signage that, at times, was in disrepair to the extent that neighboring landowners asked Army to clean and repair it (Thorne 1956). Service records of Unit inspections shortly after assuming management responsibility identified past trespass, encroachment, dumping, and other unauthorized use of the newly acquired area (USFWS 1975b). When the Service acquired Area H and it became the Ramsey County Waterfowl Production Area, it also became open to public use and recreational activities, such as hunting, fishing and wildlife observation, that did not conflict with its primary purpose of waterfowl production.

In 1975, shortly after acquiring the Ramsey County WPA, the Service supported the Ramsey County Open Space Proposal that would incorporate some portions of the WPA in the County's plan as public use areas (USFWS 1975a). Public uses of the Round Lake area proposed in the Open Space Proposal included: bicycle and walking trails; nature oriented education, interpretation, and recreation; snowshoeing and cross-country skiing. In its first formal management plan for the WPA (USFWS 1979), the Service evaluated expanding public use of the area. Subsequent Unit Management Plans (USFWS 1982, 1998) also proposed to increase recreational use, environmental education, and nature observation activities that would be appropriate and compatible with the wildlife management goals for the Unit. With the discovery of contamination and the subsequent declaration of the Unit as part of the New Brighton-Arden Hills Superfund site, the 1982 Management Plan for the Round Lake Unit was completed and approved but not implemented (USFWS 1981, 1994). At that time, due to human health concerns, the Service made a management decision to suspend public use on the Unit and withhold the development of public use facilities and programs pending the clean-up of the contamination at the Round Lake Unit (USFWS 1981).

In October, 1999, the Service granted a right-of-way to the City of Arden Hills to enable the construction of a public hiking trail on the upland portions of Service property along the west side of Round Lake. This was implemented after an August, 1999 open house was held at Bethel College and Seminary, Arden Hills, Minnesota as part of the planning process for the development of Minnesota Valley National Wildlife Refuge's Comprehensive Conservation Plan. At this open house the Service heard renewed public support for more wildlife viewing opportunities and development of environmental education and interpretation opportunities and partnerships on the Round Lake Unit.

Once remediation of the contamination of Round Lake is complete, we intend to continue and enhance our partnership with City and County as we work together to provide for additional public use on the Round Lake Unit by expanding the existing trail, as appropriate. We also support the City's efforts to expand the use of their parklands at south end of lake. We believe that there is an opportunity to link the existing trail, and the City parklands, to the Service access area near the Round Lake outlet. Such a trail link would facilitate wildlife observation and photography, as well as self-directed wildlife interpretation opportunities

Environmental Education and Interpretation. Significant opportunities to expand the environmental education programming and interpretation opportunities on the Round Lake Unit exist with relatively small investment in infrastructure on Service and City lands at the south end of Round Lake. The development of a trail, boardwalk, and teaching platform adjacent to the City's parkland would expand the potential for programs and activities hosted jointly by the Service and other organizations. With this development, the area would be suited to outdoor classroom or interpretive activities in a natural habitat and provide a contrast to the highly developed areas that surround it. It would serve Arden Hills and nearby communities as a location for these types of programs. Education and interpretive components would be formal or self-led in partnership with Refuge staff and volunteers. The site would be available for use by educators who participate in the Refuge's Partner Teacher program. This program offers a teacher-led environmental education program that emphasizes teacher training, field trip planning support and multi-disciplinary, standard based curriculum. The Refuge Partner Teacher Program is open to any teacher interested in using the Refuge as an outdoor classroom to give students hands-on, real life experiences with plants and wildlife. Examples of programming already developed for other units of the Refuge that would be applicable to this Unit are pond studies (including dip netting), fishing and fish ecology, wildlife management, upland and wetland plant identification, water quality, and habitat ecology. The Round Lake Unit also would be a site to support local scouting and other community youth development or service programs. It would support environmental studies programming for Bethel College and other institutions of higher learning.

Fishing. Historically, Round Lake supported a fishery that included sunfish, crappie, bass, and other game fish. Pending the clean-up of TCAAP-sourced contaminants, Round Lake would again be opened to public fishing. Access would be limited to bank fishing only to reduce disturbance to the larger expanse of open water in the basin. The trails along the south and west sides are likely access points. There is the potential for a designated fishing pier off the southeast shore. We would seek a partnership with the Minnesota Department of Natural Resources (MNDNR) to include a rehabilitated Round Lake in the "Fishing in the Neighborhood" program. With this program, the MNDNR would list the lake on its website and build the fishery via stocking.

Disallowed Activities. Some public use activities would not be allowed on the Round Lake Unit. The Unit is designated as closed to general public hunting programs in our recent Refuge Visitor Services Plan. We have no intention of opening the Unit to public hunting due to the size and urban character of the Unit. All public boating activities, regardless of method of propulsion, currently are prohibited on the Unit to reduce wildlife disturbance. This prohibition would remain in place in the future. Activities that are not priority public uses and therefore not

wildlife dependent public uses are generally prohibited on refuges across the nation. Examples of activities that would be prohibited on the Round Lake Unit are all types of motorized vehicle use, including snowmobiles and ORVs, swimming, wading, camping, and cutting or destroying vegetation.

Resource Management Activities

Resource management activities will continue into the future. These can be grouped in to 2 general categories: Infrastructure maintenance and improvement, and natural resource monitoring.

Infrastructure. The Round Lake outlet and water control structure are critical infrastructure components on the Unit. Since TCAAP-source contaminants were identified in Round Lake in the early 1980s, the Service has kept water levels high to minimize exposure of wildlife and humans to contaminated sediments. The strategy of maintaining water levels at higher elevations has been balanced with the goal of not causing damage to public infrastructure and private property. At times, beaver-caused obstructions have been removed from the outlet channel to prevent flooding of the CASH 96 embankment. The water control structure itself was constructed by Army in 1942. The Service has no pending plans to modify the structure. The concrete portions appear to still be adequate for the present; however, the wooden stoplogs currently used to adjust water levels will need to be replaced periodically. Boundary signs will be replaced as they weather, as will signs providing information to public users. Additional regulatory and interpretive signs will be added as the Unit becomes open to public use once again after contaminant remediation.

The Service will continue to monitor and take corrective actions related to trespass, encroachment by neighboring property owners, and vandalism. Unauthorized activities of this nature typically increase wildlife disturbance and adversely affect habitat conditions as well as water quality. We also monitor nearby off-refuge activities in the watershed, such as road construction and commercial development, to evaluate the likelihood that proposed projects will adversely affect the habitat and wildlife populations on the Round Lake Unit. We will continue to review these types of projects and will recommend modifications that would maintain the quality of the Unit and nearby natural areas. We are particularly interested in stormwater and activities that relate to where, when, and how much stormwater is delivered to Round Lake because of the potential for runoff to be detrimental to the lake ecosystem.

As the Service continues to develop infrastructure, such as trails, environmental education and wildlife observation platforms, and fishing piers on the Unit, we will have additional infrastructure related activities.

Resource Monitoring. We will continue, and expand as needed, natural resource monitoring activities. Water level monitoring on a frequency that ranges from weekly to monthly will continue, depending on the time of year and the status of water management activities. We anticipate that water quality monitoring activities will continue for the typical constituents such as nutrients, fecal coliform, oxygen, chlorides, and water clarity. Some water quality monitoring for constituents (e.g., total phosphorus, chlorophyll-a, fecal coliform) will be conducted by other entities, such as MPCA (MPCA 2011), in coordination and cooperation with the Service. As

noted earlier in this document, aquatic vegetation, invertebrate and water quality monitoring (e.g., dissolved oxygen, clarity, salinity) will be conducted by Refuge staff and volunteers. Monitoring not only provides critical information regarding the health of Round Lake, it provides information regarding the condition and abundance of waterfowl foods. Information obtained by sampling aquatic vegetation and invertebrates will be used to track the results of water level management activities. We expect to conduct vegetation surveys at intervals ranging from 1 – 5 years, depending on water level management activities or natural climatic events, such as droughts. Regular monitoring and sampling of aquatic invertebrates, including those residing in the substrate, also is necessary because they provide an additional source of waterfowl foods. Habitat monitoring in the uplands also is important. The ability of a habitat to support wildlife is dependent on the species composition and structure of the habitat. Surveys to identify these components, as well as the presence of invasive species, will be performed. The monitoring results will enable refuge staff to identify what management actions are necessary and appropriate.

Wildlife monitoring will include surveys relating to eagle nest success, bird migration, invasive species, amphibians, and reptiles. Surveys specifically targeted for listed state or federal species, such as Blanding's turtles, as well as general wildlife use will be conducted as needed. As with other Refuge waterbodies, fish surveys will be conducted on a 3 – 5 year cycle. Fish surveys provide information regarding habitat management and also support the Refuge fishing program, and potentially, the MNDNR FIN program.

Following the remediation of TCAAP-source contamination in Round Lake, we expect that there will be additional monitoring of natural resources in the larger environment within which the Round Lake Unit is located. While we do not anticipate being the lead agency for such landscape level natural resource monitoring, we will be actively involved as a natural resource partner in that monitoring as well.

Epilogue

The future value of the Round Lake Unit of the Minnesota Valley National Wildlife Refuge for wildlife conservation and its use by others for wildlife-dependent recreation depends upon the level of clean-up attained via the Superfund remediation project. The Service presumes that the current ecological risk posed to the Round Lake ecosystem will be mitigated via the actions of the Superfund remediation project in such a manner that enable this vision to be fulfilled.

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