# DEPARTMENT OF NATURAL RESOURCES FISHERIES LAKE MANAGEMENT PLAN

	<del></del>				1		
LAKE NAME (DOW):	REGION:	AREA:	COUNTY:	ACRES (surface   littoral):	CLASS:		
Shamineau	3	Little Falls	Morrison	1434/746	27		
Information Tier: B		Lake Priority Rank:	2 Ne	xt Plan Revision: 2037			
Revisions:  Initial Pl	an   🛛 Spec	ies   🛛 Goals/Object	ives   🛛 Stocking	🛛 Survey   🗖 Other:			
Primary Species (2 m	aximum; *ac	tive management):	Secondary Species	(4 maximum; *active managen	nent):		
Walleye, Muskellung	е		Northern Pike, Lar	gemouth Bass, Black Crappie, B	luegill		
Management Goals:	Maintain po	pulations of Walleye	and Northern Pike	that continue to provide mode	rate numbers		
of quality-sized pike a	of quality-sized pike and good numbers of Walleye of variable sizes for anglers. Maintain Muskellunge characterized						
by moderate densities, favorable growth and condition, and the continued presence of trophy size individuals.							
nonulations Maintai	ndance and	size structure charac	terizing the Largem	buth Bass, Black Crapple, and B	iuegiii		
size fich Maintain h	n current nu abitat condit	ions providing for fis	h based IBI scores in	ure to increase availability of n	arvestable		
Management Objecti				The Exceptional Tange.			
A Walleve gill r	ves.	at or above lake class n	nedian of 5 5/lift with	at least 50% of the sample in the 12	2-20" size		
range.					20 5120		
<ul> <li>Muskellunge ad spring Muskie</li> </ul>	dult (over 30 i evaluations.	nches) population of 20	00-300 fish with a least	15% of the females over 50 inches	based on		
<ul> <li>Maintain a Nor</li> </ul>	thern Pike cat	tch in spring Muskie tra	p netting with at least	30% of the sample exceeding 24 in	ches and 10%		
over 30 inches.	. Northern Pik	ce gill net catch rates sh	ould remain within the	e lake class Interquartile range of 2.	8-9.2/lift.		
Maintain a Blac	ck Crappie cat	ch in spring Muskie trap	o nets with at least 109	6 of the sample greater than 12 inc	hes in length.		
<ul> <li>Maintain a Blue length.</li> </ul>	egill catch in s	pring Muskie trap nets	characterized by at lea	st 30% of the sample exceeding 7 i	nches in		
<ul> <li>Maintain a spri</li> </ul>	ing daytime el	ectrofishing catch rate	of over 100 Largemout	h Bass per hour with a PSD of 40 or	r higher.		
<ul> <li>Maintain the p and fish-based</li> </ul>	resence of at IBI scores wit	least 8 "Intolerant" fish hin the "Exceptional" ra	species when conduct ange.	ing fish-based Index of Biotic Integ	rity sampling		
<b>Operational Plan Sun</b>	nmary:						
<ul> <li>Conduct gill ne</li> </ul>	t surveys ever	y 3 years commencing	in 2027 as part of rout	ine sampling and to provide data fo	or the ongoing		
Zebra Mussel/	Walleye recrui	itment study.					
<ul> <li>Spring daytime for 2027.</li> </ul>	electrofishing	g targeting Largemouth	Bass will be performe	d every 6 years with the next samp	ing scheduled		
<ul> <li>Evaluate Musk every fourth ye in trap nets.</li> </ul>	ellunge popula ear beginning	ation using large frame in 2025. Length freque	trap nets and spring e ncy data will be collect	lectrofishing to provide population red for all primary and secondary sp	estimates vecies caught		
<ul> <li>Perform juveni expected to pre</li> </ul>	le Walleye che ovide functior	ecks using fall electrofis Ial data to track expans	hing annually followin ion of the Smallmouth	g each scheduled fry stocking. This Bass population.	sampling is		
<ul> <li>Summer trap n for calculation necessary to fu</li> </ul>	etting and nea of a fish-base Ilfill IBI scoring	arshore sampling will be d Index of Biotic Integri g criteria.	e completed in conjun ty (IBI) score. Summer	ction with standard gill netting in 2 trap netting will only be conducted	)30 to provide d when		
<ul> <li>Video documer management p</li> </ul>	ntation of veg lan.	etation beds and riparia	an land use should be	performed prior to next revision of	the lake		
<ul> <li>Evaluate specia</li> <li>Current regulation</li> </ul>	al Northern Pil tions consist c	ke regulations enacted of a 24 to 36 inch protec	in 2003 using data from ted slot, 3 fish limit, o	n Muskie trap netting and routine g nly 1 over 36 inches allowed.	gill netting.		
<ul> <li>Provide technic County officials programs.</li> </ul>	cal assistance s regarding wa	and professional guidar ater quality and watersh	nce to lakeshore reside ned issues. Support co	ents, other resource agencies, and I ntinued water quality monitoring t	√lorrison hrough MPCA		
<ul> <li>Stock 1 million</li> </ul>	Walleve frv o	n an annual basis					

LAKE NAME (DOW): Shamineau	REGION: 3	AREA: Little Falls	COUNTY: Morrison	ACRES (surface   littoral): 1434/746	CLASS: 27		
<ul> <li>Stock Muskellunge (LLB) fingerlings biennially at a rate of 0.25 fish per surface acre (360 fish) during even numbered years. If larger, carryover fish (&gt;18") are used, no more than 72 Muskies will be stocked that year. All stocked Muskies will receive a PIT tag or fin clip to help assess the contribution of natural reproduction.</li> </ul>							
Additional Jurisdictio	ns and Triba	l Partners:					
			APPROVALS				
Area Fisheries Supervisor (e-signature):							
Regional Fisheries Manager (e-signature):							

# **Description of lake**

Shamineau Lake is a mesotrophic basin of 1434 surface acres with somewhat high residential development and a favorable diversity of aquatic habitats. Maximum depth is 52 feet. Shoal water substrates consist primarily of sand, although harder substrates such as gravel, rubble and boulder are found along much of the immediate shoreline in the shallowest water. Soft substrates such as muck and detritus are found in several bays and locations where marshy areas abut the lake. Shamineua has no natural outlet and lake level data indicate the lake has fluctuated more than 7.5 feet throughout its recorded history (since 1956). Water levels above the Ordinary High Water Level (OHW) have been characteristic over the last decade. Lake levels were at record high in the spring of 2020 but have receded about 2.5 feet based on the last reading in late October of 2024. The lake's overall Trophic State Index is 43 with Total Phosphorous and chlorophyll A levels within the expected range for the Northern Lakes and Forests Ecoregion. Summer water clarity averages 14 feet. Secchi disc data indicate no trends in water clarity since 1973. Land use within the lakeshed is roughly 65% forest/wetland and 18% agricultural suggesting farming practices are a minor threat to cause excessive eutrophication and habitat degradation. Shamineau continues to support a diverse submerged aquatic plant community with Northern Milfoil, Canada Waterweed, and Wild Celery the most commonly found species. Other primary components of the submerged plant community include Coontail, Illinois Pondweed, Flatstem Pondweed, and Bushy Pondweed. Water lilies and other floating-leaf species are well distributed in soft bottom areas. Maximum depth of aquatic vegetation growth is around 17 feet. Overhanging trees are found along a few shorelines. The lake continues to be characterized by extensive bulrush beds with some extending several hundred yards offshore. Cattail fringe is found along several areas of the immediate shoreline where soft substrates dominate.

## **Description of fish community**

Shamineau Lake has fish community characteristics typified by a large (>1400 acre) mesotrophic basin with diverse submerged vegetation and extensive emergent vegetation. Northern Pike, Walleye, Bowfin, Muskellunge and Largemouth Bass are the dominant predators. **Northern Pike** gill net catches have remained within the lake class interquartile range since 1994. (Figure 2.). **Walleye** gill net catches have also resided within the lake class interquartile range since 1985. (Figure 1.). The **Muskellunge** population has declined to its lowest level since the 1990s based on spring population estimates through 2021. (Table 1.) Muskies displayed relatively poor body condition when densities were higher and stocking was reduced. As body conditions have improved the stocking program has been refined to rebuild the population to the level of management objectives. **Largemouth Bass** daytime electrofishing catch rates are high and markedly above catch rates seen prior to 2010. (Table 4.). **Bluegill** densities are normal for the lake class and

may be trending lower. Crappie abundance is difficult to assess but spring trap nets indicate that healthy populations are typical along with a quality size structure. Yellow Perch catches in standard gill nets have been variable with catch rates below 4/lift in 1985, 1990, and 1994. Since 1998 perch catch rates have ranged from 7-23.9/gill net which were all within the lake class interquartile range. (Figure 3.). Smallmouth Bass were first documented in the lake in 2017 and these fish were 15-16 inch adults. They continue to be observed in several sampling gears, but in small numbers. The source of the Smallmouth Bass introduction is unknown as it was not DNR initiated. White Suckers have been consistently sampled and observed in multiple gears indicating a viable population exists. Data from historical gill netting and Muskellunge trap netting suggests a substantial decline in White Sucker abundance since the introduction of Muskellunge. (Figure 4.) (Table 5.) All three bullhead species have been observed with Yellow Bullheads being the most numerous. Yellow Bullhead numbers also appear to have declined significantly since Muskies were introduced. (Figure 5.) Rock Bass, Hybrid Sunfish, and Pumpkinseed are generally found in modest numbers and are not as abundant as Bluegills. Green Sunfish are usually found in low numbers with the exception of nearshore surveys. Three darter species have been documented including the Least Darter, Iowa Darter, and Johnny Darter. The cyprinid assemblage is quite diverse with the following species documented in sampling efforts: Golden Shiner, Blacknose Shiner, Blackchin Shiner, Common Shiner, Spottail Shiner, Western Blacknose Dace, Fathead Minnow, and Bluntnose Minnow. Banded Killifish, Central Mudminnow, and Tadpole Madtom are also resident. Hornyhead Chub and Brook Stickleback were last observed in 1957. A redhorse misidentified as a Golden Redhorse was sampled in 1985.

## **Management history**

## Stocking

Shamineau Lake has a history of fish stocking dating back to 1912. Sunfish and crappies were stocked prior to 1946 and Largemouth Bass have not been stocked since 1963. Walleye fingerlings and fry were stocked at irregular intervals from 1947 to 1968. Annual fingerling stocking of Walleye took place from 1972 to 1992 after which the schedule was changed to every even numbered year. Walleye fry were stocked in 2000, 2002 and 2004 with fingerlings as a contingency. Fry stocking also occurred in 2009 and 2013. Fingerlings were last stocked in 2016. Up until 2017 Walleye fingerling stocking proved to be the primary contributor to the population with fry stocking and natural reproduction making lesser contributions. Since 2017 fry stocking success has improved accounting for the bulk of Walleye now present with an observable but minor contribution from natural reproduction.

Muskellunge fingerlings were stocked in 1968 (190 fish), 1969 (375 fish) and 1977 (200 fish). These relatively small introductions did not produce an established Muskie fishery. A more concerted effort to provide a viable Muskie fishery began in 1988 with a stocking of 641 fingerlings. Muskie adults, yearlings and fingerlings were stocked in 1992, 1993, 1995-1999, and 2002. Muskie fingerlings were stocked every even numbered year from 2004 to 2014 and a reduced number of yearling Muskies were stocked in 2009. The stocking rate of Muskie was lowered in 2012 due to the poor condition observed in many adult Muskie captured during assessments. Muskie adults were stocked in 2016 and 2018, yearlings were stocked in 2020, and fingerlings were stocked in 2022 and 2024. The Muskie population remains below management objectives based on the 2021 population estimate, however the condition of the fish appears to be improved.

Northern Pike of varying sizes (fry to adult) were stocked regularly during the 1960's due to a perception that abundance was too low. Pike numbers increased dramatically by 1971 but have since stabilized. Yellow perch numbers exhibited a decrease in correspondence with the increase in pike numbers but have also stabilized within the normal range for the lake class. Pre-spawn Cisco were stocked in 2002 and 2003 in an effort to introduce this prey species and establish a self-sustaining population. This introduction appears to have failed since no Cisco have been reported in netting surveys or by anglers since the stocking.

Year	Species	Life Stage	Number	Pounds	Stocked By

## Special and Experimental Regulations

Special regulations for Northern Pike were enacted in 2003 consisting of a 24 to 36 inch protected slot with only one fish over 36 inches allowed. Muskie trap net data show an apparent improvement in Northern Pike size structure with an increased presence of pike over 30 inches and a higher proportion of fish over 24 inches. Recent gill net data corroborates these trends. (Table 6.) The evaluation period for the pike special regulations has expired and this regulation has attained a permanent status.

Species	Regulation	Start Year	End Year

## Surveys and Evaluations Completed

Lake Surveys: 1957, 1980, 1990, 1998, 2006(gillnets only), 2010, 2017, 2021

Population Assessments: 1971, 1985, 1994, 2002(gillnets only), 2014(gill nets only), 2024 (gill nets only)

Spring Electrofishing-Largemouth Bass: 1992

Muskie Assessments: 1995, 1997, 2006

Muskie Population Estimates: 2000, 2003, 2009, 2013, 2017, 2021

Ice-out Trap Netting: 1988, 1992, 1994

Fall Electrofishing-juvenile Walleye: 1996, 1998, 2000, 2002, 2011, 2017-present annually

Fish Based Index of Biotic Integrity: 2008(Eco), 2010 (DNR Fisheries), 2021 (Area), 2022 (State Crew)

Natural Reproduction Checks (seines): 1964, 1982, 1983, 1987

Creel Survey: 1998

Aerial Fish House Counts: 1981-1993, winters 1997-98, 2000-01

Emergent Vegetation Mapping: 2002, 2017 (FLEM)

Point-Intercept Plant Survey: 2005

Score the Shore Survey - 2017

Video of aquatic vegetation and riparian land use – 2014, 2015

Substrate Mapping - 2021

Fish Contaminant Monitoring: 2002-EPA Nationwide Study, 2010

Water Quality Monitoring: CLMP 1973-76, 1991-present (secchi), MPCA nutrient monitoring including chlorophyll A and TP 1980, 1986, 1990, 2004-present.

Lake Map: 1957, revised 1968

**Note\*** - Muskellunge population estimates which are completed every 4 years have proven to be a valuable tool for assessing several other managed species and prey species. Adult Walleye catches are usually in the 200-500 fish range, Northern Pike samples often range from 100 to 500 individuals. Black Crappie sample sizes have exceeded 600 fish in the last 3 efforts, and Bluegill counts consistently number in the thousands. All Walleye, Largemouth Bass, and Northern Pike are measured during Muskie trap net surveys along with large subsamples of Bluegill and Black Crappie. Due to the voluminous information provided by Muskie trap nets, this data has been utilized not only as the primary mode of evaluation for Northern Pike, Black Crappie, and Bluegill populations but also for development of management goals. In addition, Muskie trap net data provides ancillary information regarding adult Walleye and Largemouth Bass populations and size structures, and has proven useful in tracking trends in the White Sucker population.

Year	Survey Type	Components Used	Species Targeted

## Managed Fish Species – Status and Trends

**Walleye** gill net catches have ranged from 3.6 to 8 per lift since 1985 remaining within the lake class interquartile range. (Figure 1.) The 2024 gill net catch rate was 4.6/lift. The record low of 3.6 /lift occurred in 2017. Of historical interest is the fact that the gill net catch in 1957 was 23/lift being comprised primarily of naturally reproduced fish. This density has not been approached since that time despite a major expansion of stocking activities. A population estimate for Walleye was conducted in 2021 by DNR Fisheries Research which calculated a total of 2,009 Walleye residing in the lake, the corresponding 2021 standard gill net catch rate was 5.07/lift. Aging data derived from otoliths in 2024 indicated that Age 2 and Age 3 fish comprised roughly 2/3 of the catch and 13 year classes were represented. By mid-summer Age 2 fish averaged 11.8 inches and Age 3 fish averaged 13.6 inches displaying normal growth rates for the area. Due to the Covid-19 pandemic no stocking occurred in 2020, however a moderate year class was produced naturally with 7 fish represented in the 2024 catch. While low numbers of naturally reproduced Walleye have been evident in the past, the 2020 year class has shown the potential for natural fish to add meaningfully to the population.

**Muskellunge** population estimates indicate a steady decline in abundance after 2009. (Table 1.) The most recent estimate from 2021 was 135 adult Muskies (>30"). Population estimates from 2000 through 2009 ranged from 403 to 499 fish. By 2013 the estimate dropped to 204. It was unlikely the high densities observed during the early 2000s could be sustained as the fish showed poor condition and reduced weights by the 2010s. While Muskie numbers are presently below management goals their body condition has improved. Stocking rates and frequencies currently being applied have taken into account the lake's limited ability to sustain densities higher than management goals.

**Northern Pike** densities have shown remarkable stability since 2002 while size structure has improved since the implementation of special regulations in 2003. (Figure 2.) (Table 6.) Maintaining the present abundance and size structure is desired. A population estimate for Northern Pike was conducted in 2021 by DNR Fisheries Research which calculated a total of 3,647 pike residing in the lake, the corresponding 2021 standard gill net catch rate was 3.4/lift.

**Largemouth Bass** populations have been assessed using electrofishing since 1992. Largemouth Bass have been evaluated incorporating daytime instead of nighttime electrofishing since 2010. Largemouth Bass electrofishing catch rates are above the area average and appear to suggest densities have remained higher since 2010. (Table 4.). PSDs of Largemouth Bass have shown stability ranging from 35 to 55 except for one occasion. A population estimate conducted in 2021 calculated a population of 5,121 bass 8 inches or longer. Largemouth Bass aged using otoliths collected in 2016 showed fast growth, good body condition, and reliable recruitment were the norms.

**Bluegill** abundance has not been tracked closely with summer trap nets as this gear type has been used sporadically since 1998. Gill net catches of Bluegill have been substantial throughout much of the lake's history and appear to indicate abundance has moved lower since 2014. Bluegill densities seem to be within the range of expectations for a lake with Shamineau's mesotrophic state and habitat components. The size structure in the 2021 Muskie trap nets reflected a modest representation of fish over 7 inches (38%), 10% of the fish exceeded 8 inches and none were over 9 inches. Maximum size was 8.8 inches. The proportion of Bluegills over 7 inches and 8 inches has shown sustained improvement since 2013. (Table 2.) Bluegill over 9 inches have rarely been observed. Growth of Bluegill has been assessed using otoliths collected in 2021. Bluegill growth rates are slow compared to Area averages with Age 5 fish averaging 5 inches. The 2021 sample was dominated by older fish as Bluegill 6 years and older constituted over 80% of the catch. Maximum Bluegill age was 10.

**Black Crappie** - None of the sampling performed by DNR has been deemed practical for tracking changes in crappie abundance. Large numbers of crappie have been observed during spring trap netting assessments targeting Muskie. (Table 3.) Otoliths were extracted from crappies sampled in spring trap nets in 2021. Crappie recruitment seems fairly stable with all ages from 2 to 11 documented. Age 4 fish comprised the highest proportion of the catch at 30%. Crappie growth is fast with Age 6 fish averaging over 11 inches long. The lake has shown potential to produce large individuals as crappie exceeding 14 inches have been recorded in DNR sampling efforts. Crappie 12 inches and longer have always been well represented in Muskie trap nets.

#### **Other Species**

**Yellow Perch** have sustained densities within the Lake Class interquartile range since 1998. The 2024 gill net catch rate was 11.4/lift and the lowest since 2010. (Figure 3.)

## Research Projects and Relevant Findings

1) A diet study was performed on several predatory fish species in Shamineau Lake inn2021 by a Bemidji State University student (Kameron Glade). Important findings include: the two major components of Muskie diets were bullheads and esocids, Walleye and Northern Pike diets had significant overlap with both consuming primarily sunfish and perch, Largemouth Bass ate mainly crayfish and perch, predation by Muskie on Walleye was minimal and much lower than predation on Muskie by Muskie (cannibalism). Muskie diets overlapped very little with the diets of other predators.

2) Population estimates were determined by DNR Research (Ahrenstorff) for several predatory fish species in 2021 including Muskellunge, Northern Pike, Walleye, and Largemouth Bass. These estimates were used in conjunction with the concurrent diet study to determine the overall impacts of predation by each species. Muskies consumed about 10% of the total biomass consumed by predators while Northern Pike consumed 35% and Walleye over 20%. Largemouth Bass consumed over 30% but this was mainly invertebrates.

3) DNR Fisheries Research staff (Herwig) also conducted a study in 2021 using stable isotope analysis to determine the relative trophic levels and niches of each predator species. This study confirmed the position of Muskellunge as the top predator. Walleye were also positioned as a high-level predator while Northern Pike and Largemouth Bass occupied a slightly lower trophic position and were more generalists with larger niches. Top predators were deemed to be a stabilizing influence on food webs.

4) The University of Minnesota performed a study in 2021 to determine the impacts of Zebra Mussel infestations on mercury levels in fish tissue. Results indicated that lakes with Zebra Mussels show substantially higher concentrations of mercury in the flesh of Walleye and Yellow Perch than non-infested waters. Shamineau Lake was used in this study as a non-infested water.

5) DNR Fisheries is conducting an ongoing statewide study to determine the impacts of Zebra Mussels on Walleye recruitment and population dynamics. Shamineau is included in this study as a non-infested water.

## **Other Projects**

Insert text or delete section if N/A.

# **Social Aspects**

## General Information

The lake's shoreline has experienced a high level of alteration as evidenced by a "Score-the-Shore" value of 65.4 determined in 2017. This score is in the low range indicating that overall human impacts to shoreline habitat are quite significant. Most of the lake's shoreline has been developed with the exception of a large portion of the north shore. This undeveloped area is characterized by steep banks and is owned by Camp Shamineau Bible Camp. Minimizing impacts to all remaining undeveloped shoreline areas is vital to fish management. The 2010 survey reported the presence of 292 cabins/homes on the lake compared to 265 in 1998. No house/cabin counts have been made since 2010. Two resorts remain in operation. A golf course was constructed in 1993 immediately west of the lake and opened for business in 1994. Second tier development appears to be increasing.

Shamineau's overall lake health score is considered normal as determined by the DNR Lake Health Assessment Framework. An overall score of 65 was produced coming in above the Long Prairie River watershed mean of 61. Biological (fish and plants) and hydrology scores were also above watershed means, while the water quality score was at the watershed mean. Under this framework the lake had a Watershed Health Index of 90 compared to a Long Prairie River major watershed mean of 76. A majority (65%) of the lake's watershed is in forest/wetland land uses (2015 NLCD) which constitute a minimal threat to water quality. The watershed area to lake area ratio is low at 9.4:1. Minimizing future impacts of development and land use practices will be important in maintaining a healthy aquatic community.

A stated owned access is located on the west end of the lake. This access site provides a concrete ramp, dock, restroom, and gravel parking area which can accommodate up to 10 trucks/trailers. A smaller, township owned access is found on the east end and has a concrete ramp, dock, and gravel parking area suitable for up to 8 vehicles/trailers.

A lake association was formed in the early 2000s and has shown an eagerness to work with DNR regarding lake management. The association has a large membership and well-defined structure. The association was supportive of implementing Northern Pike regulations. Eurasian Milfoil (EWM) was discovered in the lake in 2012 and has drawn attention from the association which has chemically treated some small areas of the lake (up to 1 acre). Divers have also been hired by the association to hand pull EWM. Shamineau Lake has no outlet and is subject to long term water fluctuations of as much as 7.5 feet. Several landowners along the eastern arm employed sandbagging in 2014 to protect their property from high lake levels. Record lake levels were observed in the spring of 2020 flooding multiple properties and structures. Water levels receded by more than 2.5 feet by the fall of 2024. Severe erosion has occurred along the

several shorelines during high water periods. The use of rip-rap along eroding shorelines has increased in response to these erosion problems. To mitigate fluctuating water levels, the Shamineau Lake Improvement District (LSLID) undertook a project to establish a pumped outlet for Lake Shamineau. The intent is to pump water out of Lake Shamineau and eventually discharging to Fish Trap Creek in Todd County. A MN DNR permit was issued in 2021 authorizing the construction of this system which would reduce, and then maintain, water surface elevations at or near OHW elevation. The system started construction in 2023 and in spring 2024 a portion of the system was damaged due to hydrostatic pressure. As of early 2025 the pumping and conveyance system has not been completed/repaired. Once construction is completed the LSLID will begin operation following the approved Operation and Maintenance Plan on file. The pumping project was funded 50% by local taxation through the LSLID and 50% from the MNDNR Flood Hazard Mitigation Grant program, some of the grant money was legislatively mandated.

## Fishing Pressure and Other Recreational Use

Shamineau Lake experiences a moderately high level of recreational activity from pleasure boaters and swimmers. Clear water and large size make the lake attractive to recreational users. The considerable level of residential lakeshore development and presence of two resorts and a bible camp contribute significantly to overall recreational use.

Fishing accounts for a large portion of the lake's recreational use. Fishing pressure appears to be in the moderate range with pulses of pressure evident during some winters and open water periods. Walleye are a primary target as are Muskellunge. The lake has been noted for good Walleve fishing in the past and in recent years, especially during low light periods. Spring and early winter appear to be the best seasons to pursue Walleye. Muskie fishing success seems to have declined in response to the lower population. Complaints about the Muskie program on Shamineau have been forwarded but in relatively low numbers. Some constituents have stated that they would like to see Muskie stocking curtailed or discontinued because of suspected impacts to panfish and Walleye populations. Northern Pike and Largemouth Bass provide good fishing opportunity and are pursued by a modest number of anglers. Pike were the most targeted species by anglers during the 1998 creel survey, however pike densities were higher at that time. Pike in excess of 36 inches continue to be present in the population. It is possible that the bass population which seems to be sustaining higher abundances may draw more bass anglers, especially as bass fishing in general seems to be becoming more popular. Any expansion of the Smallmouth Bass population may also make the lake more attractive to bass anglers. Panfishing is popular on Shamineau because of the lake's clear water and the favorable palatability of the fish. The 1998 creel survey noted that over 20% of overall angler effort was directed at sunfish. Crappie fishing continues to be productive throughout the summer with dawn and dusk periods providing the best fishing. The early spring and winter periods can also be productive for crappies.

#### Public Input

Intenet solicitation.sert text.

## **Limiting Factors**

#### Habitat

Multiple indicators such as fish-based IBI sampling, plant surveys, and Lake Health Assessment data suggest habitat conditions on the lake are desirable and capable of supporting a diverse and healthy fish assemblage. The relatively high degree of residential development has impacted habitat within the riparian zone as evidenced by the "low" Score the Shore reading. The lake currently supports extensive beds of emergent vegetation that need to be protected. Shoreline

erosion problems and ice heaves have occurred during high water years. The failure of the Cisco introductions likely points to limited habitat suitability for the species.

## Water Quality

Shamineau's water quality is not a limiting factor in its relationship to fish management. The lake's overall Trophic State Index is 43 with total phosphorous and chlorophyll A levels near the lower end of the expected range for the Northern Lakes and Forests Ecoregion. Summer water clarity averages 14 feet no trends observed in water clarity since 1973. Land use within the lakeshed is roughly 65% forest/wetland and 18% agricultural suggesting farming practices are a minor threat to increase the rate of eutrophication.

## Fish Community

While Northern Pike abundance has remained within the normal range for the lake class for over 20 years, Northern Pike condition and growth rates show high variability within the population with some individuals displaying slow growth and/or poor condition. Muskie assessments have indicated a noticeable decline in the numbers of adult Muskie. Poor condition (low relative weight) of Muskies was noted as the decline commenced and fish condition improved as the population continued its drop. It is apparent that prey availability was limiting growth and condition of large esocids, especially Muskies. It is hoped that maintaining a Muskie population of 200-300 adults will strike a balance that can provide improved fishing opportunities without stressing the prey base and reducing Muskie health. Natural reproduction of Muskie has been evidenced but at a low level. The contribution of natural Muskies to the population is being monitored through stocking gaps and fin clipping/PIT tagging of stocked fish. Northern Cisco were introduced in 2002 to provide alternative prey for large predators, however this stocking effort failed to establish a population.

Natural reproduction of Walleye has been documented with a few natural fish noted from the 2020 stocking gap. It is believed that a strong majority of the Walleye residing in Shamineau originated from our fry stocking efforts. Yellow Perch are a key component of the lake's prey base and maintaining adequate densities of adult perch, preferably above the Lake Class Median (18/gill net), is important for sustaining healthy populations of large predators such as Walleye, Northern Pike, and Muskellunge. Maintaining Northern Pike numbers within management objectives should prove vital in preserving the lake's prey base and enhancing survival of stocked and naturally reproduced Walleye. Largemouth Bass may also benefit if pike abundance remains stable. Growth rates of Bluegill are slower than Area averages while Black Crappie growth rates are fast.

## **Invasive Species**

Invasive plant species have the potential to impact the abundance and distribution of more preferred native plant species. Eurasian Milfoil (EWM) was discovered in the lake in 2012 and drew attention from the lake association which has chemically treated some small areas of the lake (up to 1 acre). Divers were also hired by the association to hand pull EWM. Bases on more recent observations, Eurasian WaterMilfoil has not become a dominant plant in the lake in terms of density or distribution. Curly-leaf Pondweed is an invasive plant species that has been residing in the lake for numerous decades. Purple Loosestrife is also present along the shoreline but is uncommon and has not been expanding its distribution.

## Climate Change

Climate change is expected to increase both air and water temperatures with the largest increases likely to occur during the winter. While annual precipitation is also expected to increase most will occur during spring and winter. Short term summer droughts may become more frequent and when combined with longer open water seasons and increased evaporation the result will be lower lake levels in the summer. The impact of lower lake levels and warmer surface waters may be to further limit dissolved oxygen levels and fish habitat availability below certain depths. However, if **<Insert approval date>** 

summer droughts occur there may be reduced nutrient input from runoff resulting in improved summer water clarity and dissolved oxygen levels. Northern Pike are the species most likely to be negatively impacted by warming conditions as their preferred temperature range is the coolest and rapid spring warming can limit egg viability and recruitment. While pike numbers across central Minnesota do not appear to be declining at this time, a sustained reduction in pike abundance may improve survival of Walleye. If summer water clarity increases submerged plant growth is also likely to expand to greater area and depths. Vegetation dwelling predators such as bass and pike may benefit from these conditions. Clearer water is also preferred by pike which are sight feeding predators in contrast to Walleye whose available habitat can decrease as water gets clearer. Largemouth Bass have a higher preferred temperature range than pike and Walleye and may benefit from expected climate changes.

## Fishing Mortality

It is not known to what extent fishing mortality impacts gamefish and panfish populations in Shamineau Lake. Age and size structures currently characterizing bass, Walleye, Muskie, and Northern Pike populations do not indicate an excessive degree of fishing mortality. The noted decline in Muskie abundance is primarily attributed to natural mortality and the poor body conditions observed at higher densities. Catch and release mortality of Muskies is possibly a secondary consideration. The Largemouth Bass total mortality rate has been estimated at 33% using catch curve analysis. Black Crappie grow well in Shamineau and fishing pressure does not appear to severely limit the recruitment of fish to older age groups and larger sizes. Crappies exceeding 13.5 inches and 10 years of age have remained present in DNR sampling. The impacts of fishing on the Bluegill size structure are also unknown, however some improvement in size structure has been apparent indicating limited impacts from fishing harvest. Additionally, a major proportion of the Bluegills aged in 2021 were 9-10 years old further indicating that angling impacts are minor.

Other

Insert text or delete if N/A.

# **Rationale for Management Species Selection, Goals, and Objectives**

## Information Tier and Lake Priority Rank Comments

**Tier – B, Priority Rank – 2.** Shamineau Lake receives a considerable level of fish management attention. Regular gill netting, spring electrofishing, Muskellunge population estimates, and nearshore IBI sampling will occur to monitor Primary and Secondary species and the overall fish assemblage. The lake has an extensive history of Walleye and Muskie stocking that will be continued and warrants evaluation. Fall electrofishing targeting juvenile Walleye will occur at least every year when fry stocking occurs. The lake has been known to receive significant fishing pressure for Walleye, Muskellunge, Northern Pike, bass and panfish.

## Primary and Secondary Management Species

Walleye will be considered a Primary Species due to the lake's history of supporting desirable densities and the objective of maintaining abundances at historical levels via the stocking program. Muskellunge have been elevated to Primary Species status due to the stocking program, consistent population estimate efforts, and popularity with anglers. Bluegill and Black Crappie receive Secondary Species designation due to their angler popularity and size structures often conducive to harvest. Largemouth Bass are given Secondary Species designation due to the lake's habitat features and current population densities which are favorable. Northern Pike warrant Secondary Species designation due to their

moderate densities, favorable size structure attributes and targeting by anglers. The potential for large pike is present as fish greater than 36 inches continue to be regularly observed in DNR sampling.

## Goals and Objectives

The objectives chosen for Walleye aim to improve current population levels (gill net catches) to within the range expected when considering the lake's history and lake class. The objectives selected for Muskellunge propose to increase abundance levels, sustain the desired availability of trophy class fish, and maintain suitable body condition. Bluegill and Black Crappie objectives are derived from spring trap net data and seek to preserve the present the size structures. Largemouth Bass electrofishing objectives also seek to maintain existing density and size structure attributes. Objectives determined for Northern Pike seek to maintain current densities while preserving quality size structure components. Objectives developed for Intolerant species and fish assemblage (IBI) are aimed at sustaining the habitat and water quality conditions that currently exist.

# **Operational Plan Detail**

#### Stocking

One million Walleye fry will be stocked on an annual basis. Muskellunge (LLB) fingerlings will be stocked biennially at a rate of 0.25 fish per surface acre (360 fish) during even numbered years. If larger, carryover fish (>18") are used, no more than 72 Muskies will be stocked that year. All stocked Muskies will receive a PIT tag or fin clip to help assess the contribution of natural reproduction. Muskie stocking rates and frequencies may be adjusted based on determination of densities above or below management goals and/or changes in body condition.

#### Regulations

Special regulations for Northern Pike were enacted in 2003 consisting of a 24 to 36 inch protected slot with only one fish over 36 inches allowed. The evaluation period for these special regulations has expired and they have attained a permanent status. Muskie trap net assessments will be used for ongoing evaluation of these regulations. Muskie trap net data show an apparent improvement in Northern Pike size structure with an increased presence of pike over 30 inches and a higher proportion of fish over 24 inches. (Table 6.) Recent gill net data corroborates these trends.

#### Habitat Development and Protection

Critical review of A.P.M. and D.O.W. permits will continue along with support of the local water plan. Video documentation of vegetation beds and riparian land use will be performed to monitor habitat changes. Future "Score the Shore" and GPS/GIS mapping assessments maybe scheduled to assess riparian land use and habitat changes. Substrate mapping completed in 2021 provided valuable fish habitat information. Use of BMP's (Best Management Practices) by lakeshore residents and landowners should be encouraged to protect water quality and shoreline habitat. Potential exists to improve fish and wildlife habitat within the riparian zone along much of the shoreline. Protection of the terrestrial and aquatic plant communities along shoreline areas should provide many benefits to the lake including fish and wildlife habitat, nutrient tie-up, erosion abatement and lake soil stability. Educational efforts and project funding should be directed at maintaining and/or improving developed shorelines. Index of Biotic Integrity (IBI) assessments provide useful information on habitat conditions. A fished based IBI score of was most recently calculated from sampling completed in 2022. This score (68) was in the "Exceptional" range and was indicative of excellent lake habitat conditions. The "Intolerant" species sampled in the lake are the Iowa Darter, Least Darter, Banded Killifish,

Smallmouth Bass, Rock Bass, Blacknose Shiner, Blackchin Shiner, and Muskellunge. "Tolerants" include Green Sunfish, Black Bullhead, and Fathead Minnow.

#### Acquisition

#### None planned.

## Fish Removal (commercial, state, or bait harvest)

Sucker removal efforts were made in 1985 and 1987 in an attempt to restructure the population. A total of 6100 pounds of White Sucker were removed with no apparent change in the size structure. Bullheads were harvested by commercial fishermen ("B" permit) in 1981, 1982 and each year from 1986 to 1991. The bullhead populations presently found suggest limited commercial viability. In 1992 a total of 1078 Northern Pike under 24 inches in length were removed and used for stocking lakes in other areas.

#### Outreach

Providing information and education to all types of lake users will aid in achieving proper lake management.

#### Surveys and Evaluation

- Gill net surveys will be completed every 3 years commencing in 2027 as part of routine sampling and to provide data for the statewide and ongoing Zebra Mussel/Walleye recruitment study.
- Spring daytime electrofishing will be performed every 6 years with the next sampling scheduled for 2027. This sampling will primarily target Largemouth Bass.
- The Muskellunge population will be evaluated every 4 years beginning in 2025 using large frame trap nets and spring electrofishing to provide population estimates. Length frequency data will be collected for all primary and secondary species caught in trap nets.
- Juvenile Walleye checks using fall electrofishing will be conducted annually following each scheduled fry stocking. This sampling is expected to provide functional data to track expansion of the Smallmouth Bass population.
- Summer trap netting and nearshore sampling will be completed in conjunction with standard gill netting in 2030 to provide for calculation of a fish-based Index of Biotic Integrity (IBI) score. Summer trap netting will only be conducted when necessary to fulfill IBI scoring criteria.
- Video documentation of vegetation beds and riparian land use should be performed prior to next revision of the lake management plan.
- The special Northern Pike regulations enacted in 2003 will be monitored using data from Muskie trap netting and routine gill netting. These regulations consist of a 24 to 36 inch protected slot, 3 fish limit, only 1 over 36 inches allowed.

Future GPS/GIS vegetation mapping and "Score the Shore" surveys would be useful in assessing trends in the lake's riparian conditions. Continued monitoring of water clarity and quality is warranted in order to assess improvements/degradation to fish habitat.

## References

Insert references using AFS citation standards.

## **Supporting Tables, Figures, and Appendices**

Green line on graphs signifies Lake Class Median





Table 1. Muskie Population Estimate history

# Shamineau Lake - Summary Statistics For MUE Assessments

Date	<u>%Fem 50"+</u>	<u>N over 50"</u>	Pop. Estimate
			(adults >30")
1995	0	0	n/a
1997	0	0	n/a
2000	0	0	499 (.35/acre)
2003	0	0	403 (.28/acre)
2006	3.4	2	n/a
2009	15.4	4	447 (.31/acre)
2013	17.1	6	204 (.14/acre)
2017	10.3	4	169 (.12/acre)
2021*	9.1	1	135 (0.09/acre)





Figure 3. Yellow Perch Gill Net History



Table 2. Bluegill – Historical Trap Net Catches – Muskie Trap Nets

<u>Year</u>	<u>No. Caught</u>	No. Meas.	<u>%&gt;7"</u>	<u>%&gt;8"</u>	<u>%&gt;9"</u>
1995	2281	182	30.2	1.6	1.1
1997	1727	223	13.5	0.9	0
2000	3180	668	9.4	0.7	0
2003	2346	193	13.1	0	0
2009	2772	514	11.9	0	0
2013	1783	695	33	1.7	0
2017	7276	301	49.9	14	0
2021	1864	511	37.7	9.8	0

## Table 3. Black Crappie - Historical Trap Net Catches – Muskie Trap Nets

<u>Year</u>	<u>No. Caught</u>	<u>No. Meas.</u>	Largest (in)	<u>%&gt;10"</u>	<u>%&gt;12"</u>
1995	375	261	14.2	39.1	7.7
1997	1168	313	13.9	68.4	9.3
2000	865	489	13.9	68.2	11.4
2003	359	290	13.7	85.5	16.5
2006	92	91	13.5	63.7	16.5
2009	130	126	13.3	55.5	7.8
2013	654	453	14.1	45.4	5.5
2017	778	302	13.2	25.5	2.7
2021	957	460	13.7	32.3	7.7

# Table 4. Largemouth Bass – Electrofishing History

Population Estimate 2021 = 5,121 fish >8 inches, 95%CL = 4,397-6,129

Year	PSD	CPUE fish/hr.	Day/Night	Coffelt/Sm-Root
1992	55	35	Night	Coffelt
1994	40	25.4	Night	Coffelt
1998	44	41	Night	Coffelt
2002	42.1	56.2	Night	Coffelt
2006	75	37.6	Night	Coffelt
2010	44.8	112	Day	Sm-Root
2014	35.3	274.7	Day	Sm-Root
2016	52.7	114.6	Day	Sm-Root





Table 5. White Sucker Trap Net History – Muskie Trap Nets

# White Sucker Data

<u>Date</u>	WTS CPUE5x6TN	<u>Total Num Caught</u>
1995	10.1	566
1997	8.8	786
2000	0.66	135
2003	0.24	15
2006	0.31	21
2009	0.86	98
2013	1.5	123
2017	0.77	151
2021	0.33	141



Figure 5. Yellow Bullhead Gill Net History

## Table 6. Northern Pike Historical Size Structures

		Mean				
Date	Number	Length"	Max. Length"	%>24"	%>30"	Survey Type
		not				
1992	1101	calculated	34	2.1	0.3	NOP IO
1995	114	20.1	35.6	17.5	2.6	MUE Assess.
1997	348	19.6	36.1	12.1	1.1	MUE Assess.
2000	288	21	35.9	17	2.1	MUE Assess.
2003	60	22.2	33.9	31.7	11.7	MUE Assess.
2006	152	23.2	32.7	46.7	10.5	MUE Assess.
2009	112	22.7	35	41.1	8	MUE Assess.
2013	134	20.9	38.5	21.6	6.7	MUE Assess.
2017	301	20.9	37.5	18.3	8.3	MUE Assess.
2021	520	21.7	35.7	27.5	9.2	MUE Assess.

		not				
1971	40	calculated	27	10	0	Gill Nets
		not				
1980	54	calculated	27	11.1	0	Gill Nets
		not				
1985	85	calculated	27	5.9	0	Gill Nets
		not				
1990	125	calculated	36	4	1.6	Gill Nets
1994	85	18.8	29.5	3.5	1.2	Gill Nets
1998	132	18	35.1	6.8	2.3	Gill Nets
2002	99	18.5	33.1	5	1	Gill Nets
2006	46	20.4	33.1	30.4	4.3	Gill Nets
2010	87	18.4	31.8	10.3	2.3	Gill Nets
2014	104	18.2	32.6	10.7	1	Gill Nets
2017	47	22.4	37.5	25.5	14.9	Gill Nets
2021	51	22.2	34.4	37.3	9.8	Gill Nets
2024	68	20.4	31.9	23.5	7.4	Gill Nets

nclude supporting material and reference in body of LMP.

Tables accessibility – avoid unnecessary merged cells, check for reader compatibility using by tabbing through table.

Figures accessibility – use informative figure captions, insert figure as image and include alt text.