

Golden Lake Walleye Stocking Strategy: 2025 - 2031

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Regional Operations Division

Pembroke District and Southern Region

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Goal

Manage the Golden Lake Walleye Fishery as a put-grow-take (PGT) fishery focused on maintaining Walleye angling opportunities.

Strategy

The strategy is to stock Walleye at a size, rate, and frequency appropriate to current habitat conditions, food web dynamics, and fish culture capacity while incorporating effectiveness monitoring to evaluate outcomes. The objective of stocking is to maintain angling opportunities through a put-grow-take fishery in the absence of sufficient natural recruitment. Given the significant social, cultural, and economic value of the fishery, stocking is considered an appropriate management response with a high potential for benefit and low ecological risk.

Background and Context

Lake Description

Golden Lake (3,612.5 ha) is one of the larger Walleye lakes in Fisheries Management Zone (FMZ) 15 and supports a diverse fish community consisting of cold, cool, and warmwater species. Recreationally important species include Walleye, Smallmouth Bass, Largemouth Bass, Northern Pike, Lake Whitefish, and Yellow Perch. In addition to recreational angling, traditional Indigenous harvesting occurs on the lake, and the Algonquins of Pikwakanagan First Nation have longstanding cultural connections to the resource. Walleye has historically been an important species in both fisheries.

Historical Walleye Fishery

Prior to the introduction of Walleye in the 1920s, Golden Lake supported a Lake Trout fishery. Subsequent declines in water quality reduced the suitability of the lake for Lake Trout but created environmental conditions more favourable for Walleye. As a result, Golden Lake became well known for its productive Walleye fishery.

Over the past several decades, however, the Walleye population has declined substantially. Likely contributing factors include fishing pressure, shoreline development, spawning habitat degradation, changes in water quality, invasive species, and shifts in food web dynamics. Previous rehabilitation efforts in the early 2000s proved unsuccessful in re-establishing a self-sustaining fishery. The most recent rehabilitation

efforts consisted of a five-year fishing moratorium (2002-2006), stocking of approximately 130,000 summer and fall fingerlings (2003-2005), and implementation of a two-fish limit with a 50 cm minimum size limit in 2007.

Current Status

Today, the Walleye population remains impaired relative to other FMZ 15 lakes. Recruitment is poor, with low representation among year classes (appendix B), and abundance indices have continued to decline since Broadscale Monitoring (BsM) began in 2008. In the absence of management intervention, recruitment is expected to remain low and the fishery is expected to continue to decline.

Food web dynamics may also be contributing to the challenges facing Walleye recovery. Rainbow Smelt and Yellow Perch dominate the pelagic forage base and represent a substantial component of the small fish community observed across all three cycles of BsM. The abundance of Rainbow Smelt has raised concerns regarding predator-prey balance within the lake and the potential effects on Walleye recruitment and early life-stage survival.

Rationale for Stocking

Public concern regarding the scarcity of large fish, particularly Walleye, has resulted in requests for active control measures. Examples include targeted Rainbow Smelt removal initiatives promoted by the Golden Lake Property Owners Association, as well as renewed Walleye stocking to improve angling opportunities and support a more balanced fish community.

This strategy recognizes the social, cultural, and economic importance of the Golden Lake Walleye fishery and establishes a practical stocking program with measurable effectiveness indicators to evaluate whether stocked fish contribute to future angling opportunities.

Policy and Legislative Context

FMZ 15 Draft Fisheries Management Plan

The draft Fisheries Management Zone 15 Management Plan identifies species-specific management objectives, including objectives for Walleye. The proposed Walleye stocking objective for FMZ 15 supports put-grow-take (PGT) fisheries where stocking does not compromise management objectives for other species. This strategy is consistent with the draft FMZ 15 Management Plan, the *Guidelines for Stocking Fish in Inland Waters of Ontario* (MNR 2002), and Ontario's Provincial Fish Strategy.

Class Environmental Assessment (EA) Considerations

Under the Class EA for Resource Stewardship and Facility Development Projects (2024), Walleye stocking in Golden Lake is considered an ongoing activity. As such, the project is screened as a Category A undertaking and is exempt from further Environmental Assessment Act requirements.

Stocking Program

Stocking Strain

The *Guidelines for Stocking Fish in Inland Waters of Ontario* (MNR 2002) provide guidance on appropriate stocking strains, sizes, rates, and frequencies for Walleye (Table 2). Historically, Golden Lake Walleye were believed to be closely associated with Ottawa River populations due to the lake's connectivity to the Ottawa River. However, subsequent genetic analyses indicate the current population has mixed ancestry resulting from historical stocking activities, with Lake Ontario strain genetics representing a significant component of the existing population.

Stocking Rate and Frequency

The ecological conditions of Golden Lake are expected to support a put-grow-take stocking program. The abundant forage base, particularly Rainbow Smelt and Yellow Perch, is expected to provide favourable growing conditions for stocked Walleye, while minimizing competition and cannibalism among stocked year classes.

Previous stocking efforts also demonstrate that stocked Walleye can survive and contribute to the fishery. Between 2003 and 2005, approximately 130,000 summer and fall fingerlings were stocked as part of a rehabilitation program. Broad-scale Monitoring

conducted in 2008 found that 5 of 18 Walleye captured were marked fish originating from those stocking efforts. Because only advanced fall fingerlings were marked, the contribution of stocked fish may have been greater than observed. These results suggest that even modest stocking efforts can produce measurable benefits to the Golden Lake Walleye population.

The positive contribution of previous stocking efforts is particularly noteworthy given that the historical stocking densities were substantially lower than those proposed under this strategy.

Table 1: Walleye stocking History of Golden Lake

YEAR	NUMBER	LIFE STAGE	CLIP
2003	23,520	Fall fingerling	Left Ventral
2004	15,474	Fall fingerling	Right Pectoral
2005	64,492	Summer fingerling	n/a
2005	27,508	Summer fingerling	n/a
2014	1,972	Fall fingerling	
2018	260	Mature adults	Left Ventral

The Guidelines for Stocking Fish in Inland Waters of Ontario (MNR, 2002) generally recommend Walleye stocking on a 2-to-3-year cycle. However, annual stocking is recommended for Golden Lake due to the lake's abundant forage base, low Walleye abundance, and the low likelihood of competition or density-dependent effects among stocked year classes at the proposed stocking rate. Accordingly, annual stocking is not expected to negatively affect the survival, growth, or recruitment of fish stocked in previous years.

A recommended stocking schedule for Golden Lake is provided in Table 3. Stocking effectiveness should be reviewed periodically through Broadscale Monitoring assessments, including evaluation of the representation of stocked year classes in the population. Should additional Walleye stocking initiatives be implemented in Golden Lake by other proponents, the stocking strategy, rates, and frequency should be reviewed and adjusted as necessary to ensure management objectives continue to be met.

Stocking Schedule

Golden Lake supports a significant recreational fishery and remains an important destination for anglers, seasonal residents, and visitors. Given the social, cultural, and economic importance of the Walleye fishery, and following a review of regional stocking priorities and hatchery production capacity, the Ministry proposes stocking 15,000 clipped fall fingerling Walleye annually from 2025 to 2031 (Table 3). This represents a stocking density of approximately 4.2 fall fingerlings/ha. The proposed allocation reflects a strategic decision to concentrate available fish into stocking programs where measurable benefits are expected and is supported by Fish Culture Section production capacity and regional fisheries management objectives.

Table 2: Recommended Stocking Rate by Life stage as per Guidelines (2002) and Current Average Production Availability

Surface Area (ha)	Stocked Species / Life stage	Stocking Guideline Rate / Frequency	Stocking Guideline Recommended Number of Walleye to be Stocked	10-year Historical Annual Fall Fingerling Production from White Lake FCS	Recommended Target of Stocked Walleye Life stage and Stocking
3612.5	Walleye – Summer Fingerling	100 – 125 /ha Annually or alternating years	361,250 – 451,562	N/A	Do not recommend stocking summer fingerlings
	Walleye – Fall Fingerling	25 - 50 /ha Annually or alternating years	90,312 – 180,625	~ 30,000	15,000 annually

Table 3: Recommended Stocking Schedule and Stocking Numbers for Golden Lake

Year	2025	2026	2027	2028	2029	2030	2031
Fall Fingerling Stocking	15,000	15,000	15,000	15,000	15,000	15,000	15,000

Target Size at Stocking

Given the dominance of Rainbow Smelt and Yellow Perch within the Golden Lake food web, maximizing the survival of stocked Walleye is an important consideration in developing the stocking strategy. Stocking fish at a sufficient size to reduce predation risk during the first year following release is expected to improve survival and subsequent contribution to the fishery.

Lawson and Carpenter (2014) developed a model relating Rainbow Smelt size structure to the minimum Walleye size required to avoid predation. Using Rainbow Smelt length data collected through three cycles of Broadscale Monitoring, the 95th percentile Rainbow Smelt total length in Golden Lake was estimated at 176.3 mm. Applying the model to this upper-end size distribution indicates that a Walleye total length of approximately 121 mm would largely avoid predation from Rainbow Smelt at the time of stocking. Detailed calculations are provided in Appendix C.

This target size can be achieved through fall fingerling production but would not be achievable through summer fingerling stocking. While smaller fish may reduce production costs and rearing time, they are expected to experience higher predation rates and lower first-year survival. Consequently, fall fingerlings are the preferred life stage for stocking in Golden Lake.

Fish Culture Section production records indicate that fall fingerling Walleye are routinely produced at sizes exceeding the 121 mm target. Analysis of 2026 White Lake Fish Culture Station production data indicated that a Walleye of 121 mm total length corresponds to an average weight of approximately 20 g (Appendix D). Accordingly, the objective of this strategy is to stock fall fingerlings at or above 121 mm total length, or approximately 20 g per fish, where operationally feasible. It is recognized that annual variation in rearing conditions may influence final fish size, and occasional departures from this target may occur.

Future reviews of stocking effectiveness should consider updated Rainbow Smelt size structure information from Broadscale Monitoring and other available assessment methods, including hydroacoustic surveys, to determine whether adjustments to stocking size or rates are warranted.

Stocking Effectiveness Monitoring

Monitoring Objectives

Monitoring the effectiveness of the stocking program is a key component of this strategy. The objective of put-grow-take (PGT) stocking in Golden Lake is to maintain Walleye angling opportunities in the absence of adequate natural recruitment. As such, the primary measure of success is whether stocked fish survive, grow to fishable sizes, and contribute to the population available to anglers.

Although improvements in angler catch rates may occur following implementation of the stocking program, catch rates are influenced by numerous factors beyond the control of the Ministry, including stocked fish survival, angler effort and behaviour, and food web dynamics. Consequently, population-based indicators derived from Broadscale Monitoring (BsM) surveys are considered the most reliable method for evaluating stocking effectiveness.

Indicators, Benchmarks and Targets

Establishing baseline conditions prior to substantial recruitment of stocked fish into the fishery is necessary to evaluate future performance of the stocking program. Table 4 identifies the primary indicators that will be tracked to assess stocking effectiveness in Golden Lake. These indicators focus on the abundance and contribution of stocked fish to the fishable population and are consistent with the objectives of a put-grow-take fishery. Methods used to estimate these indicators are provided in Appendix A.

Given the uncertainty associated with stocked fish survival and their eventual contribution to the fishery, quantitative performance thresholds cannot be established with confidence at this time. Instead, directional targets of "increase" have been adopted for the initial evaluation period. These targets recognize that stocked fish should become increasingly represented within the fishable population as successive year classes recruit to larger size classes.

The effectiveness indicators and associated targets should be reviewed following the 2031 BsM assessment. If measurable improvements are observed, future evaluations may transition from directional targets of "increase" to maintenance-based objectives that better reflect the long-term goal of sustaining Walleye angling opportunities in Golden Lake.

Table 4: Recommended Effectiveness Indicators, Benchmarks and Targets

Indicator	Primary / Secondary	What This Indicator Tells Us	Source	Current Benchmark (2026 BsM)	Target (2031 BsM assessments)
Clipped $\geq$ 500 mm TL Walleye CUEw (kg / net)	Primary	Relative abundance of stocked Walleye available to the fishery	BsM	To be established	Increase
Proportion of Clipped Walleye in the Fishable Population	Primary	Contribution of stocked Walleye to the fishery	BsM	To be established	Increase
Total Mortality	Secondary (if sample size is sufficient)	Is there evidence of fishing mortality beyond estimated natural mortality?	BsM (from catch survey)	To be established	No evidence of mortality exceeding expected natural mortality.

Assessment Timelines

Understanding when stocked fish are expected to recruit to Broadscale Monitoring (BsM) gear and the recreational fishery is important for both managing angler expectations and determining appropriate timelines for evaluating stocking effectiveness. To support these timelines, a length-at-age relationship was developed for Golden Lake Walleye using the *VonGrow* function within the BSMT R package (Pearce 2026) and available BsM age and length data (Figure 1). For comparison, the FMZ 15 regional growth model was also plotted.

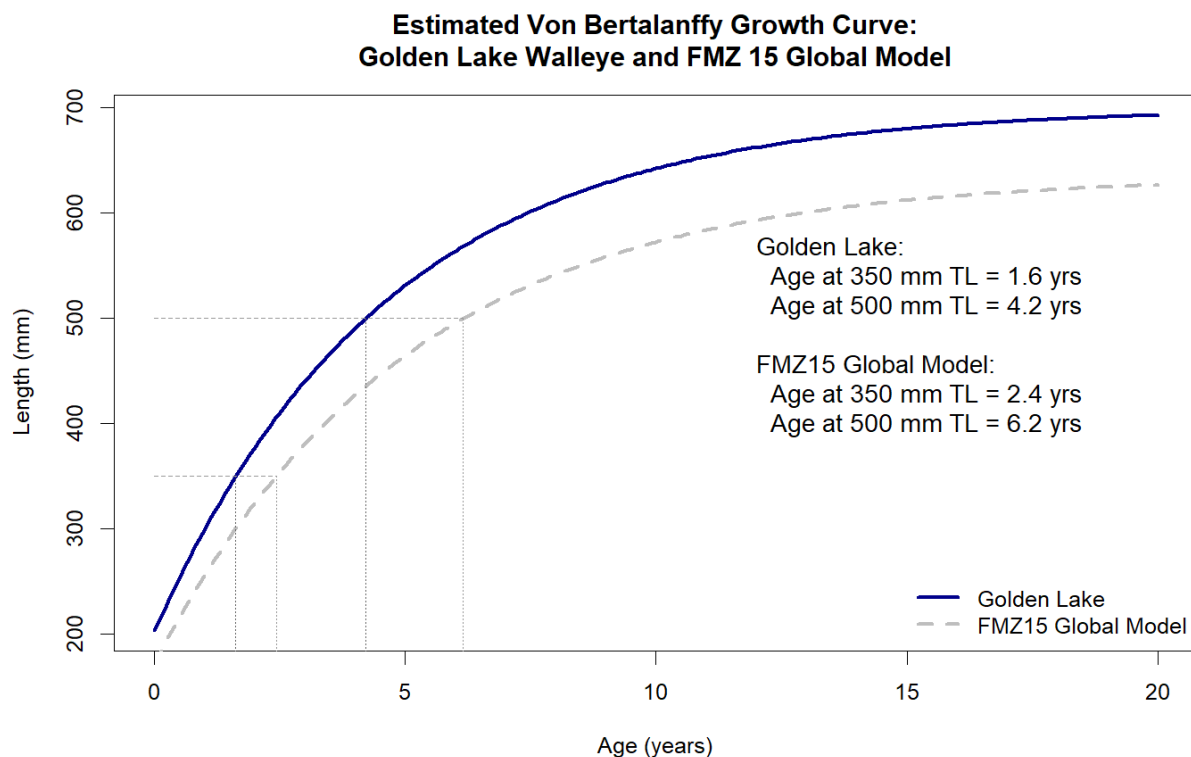
Based on the available data, Golden Lake Walleye are estimated to reach 350 mm total length, the approximate size at which they become fully recruited to BsM gear, at 1.6 years of age. Walleye are estimated to reach 500 mm total length, corresponding to the current minimum size limit in the recreational fishery, at approximately 4.2 years of age. These estimates are based on limited data and may not fully reflect realized growth rates of stocked fish.

For comparison, the average FMZ 15 Walleye population is estimated to reach 350 mm at 2.4 years of age and 500 mm at 6.2 years of age. The faster growth rates observed in Golden Lake are consistent with expectations for low-density Walleye populations occupying systems with abundant forage resources. Given the substantial Rainbow Smelt and Yellow Perch prey base currently present in Golden Lake, significant density-

dependent reductions in growth are not anticipated under the proposed stocking program.

As stocked fish begin to appear more frequently in BsM catches, updated age and growth information should be incorporated into future assessments to improve estimates of recruitment timing and stocking effectiveness.

Figure 1. Estimated Von Bertalanffy growth curve for Golden Lake Walleye derived from Broadscale Monitoring (BsM) age and length data, compared to the FMZ 15 regional growth model.



Based on the modelled growth curve, Golden Lake Walleye are expected to reach approximately 350 mm total length, the size at which fish become fully recruited to BsM NA1 gear, at 1.6 years of age. Walleye are estimated to reach 500 mm total length, corresponding to the current minimum harvest size, at approximately 4.2 years of age. Although these estimates are based on the best available data, actual growth rates of stocked fish may vary.

The model suggests that Walleye in Golden Lake currently grow faster than the average FMZ 15 population, reflecting the low density of Walleye and abundant forage resources available within the lake. As a result, stocked fish are expected to recruit to both monitoring gear and the recreational fishery quickly.

Golden Lake is scheduled for Broadscale Monitoring in 2026. By that time, the initial 2025 stocked year class is expected to be only partially recruited to BsM gear and will not yet have reached harvestable size. Consequently, the 2026 survey will provide a suitable benchmark of population conditions prior to meaningful recruitment of stocked fish into the fishery. While some stocked fish may be detected during the 2026 survey, the assessment will not fully reflect survival or contribution of the 2025-year class.

Under the current five-year BsM cycle, Golden Lake will be assessed again in 2031. By that time, the 2025 and 2026 stocked year classes, along with a substantial portion of the 2027-year class, are expected to have reached harvestable size (Table 5). The 2031 assessment should therefore provide the first meaningful evaluation of stocking effectiveness relative to the benchmarks and targets shown in Table 4.

Table 5: Stocked year class stocking rates and estimated timelines for recruitment to BsM gear and the fishery

Stocked Year Class	2025	2026	2027	2028	2029	2030	2031
# of Fall Fingerlings Planned to be Stocked	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Year 50% Recruited to NA1 BsM Nets (350 mm / 1.6 years of age)	2026	2027	2028	2029	2030	2031	2032
Year 50% Recruited to Recreational Fishery (500 mm / 4.2 years of age)	2029	2030	2031	2032	2033	2034	2035
BsM Scheduled		Yes					Yes

Adaptive Management and Future Considerations

Regulatory Changes

The proposed FMZ 15 zone-wide Walleye regulation includes a harvestable slot size of 40 to 50 cm and catch limits of four fish for a Sport licence and two fish for a Conservation licence. Given the low density of Walleye currently observed in Golden Lake and other nearby Walleye fisheries, this regulation is recommended for adoption in Golden Lake if implemented across FMZ 15. Upon implementation, the primary abundance indicator in Table 4 should be revised from Walleye ≥ 500 mm total length to Walleye between 400 and 500 mm total length to reflect the protected slot and harvestable size range.

Harvest Monitoring

If future concerns arise regarding low or declining angler catch rates, additional assessment of the age and size structure of the Walleye population may help determine whether stocked fish are successfully recruiting to the fishery and whether harvest pressure may be affecting the population. Indicators such as the truncation of older age classes or larger size classes could provide evidence that harvest is influencing population structure and may be compared with similar Walleye populations elsewhere in FMZ 15.

Future Stocking Reviews

Future reviews of the stocking program may also consider updated information on Rainbow Smelt abundance and size structure derived from Broadscale Monitoring and hydroacoustic surveys. These data may help inform adjustments to stocking rates, stocking frequency, or target stocking size to ensure the program continues to meet its objectives.

References

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Appendix A – Methods for calculating effectiveness indicators.

Indicators using BsM as the data source were derived from Golden Lake's Cycle 3 (2021) survey. CUEw (≥ 500 mm TL; kg/net) was derived from the BSMT R package and is selectivity corrected and area-weighted based on methods prescribed in Pearce et al. (in press). Proportion of clipped Walleye is # of clipped Walleye / # of unclipped Walleye. Total mortality is not yet estimated given the low numbers of Walleye caught at the benchmark of 2026 but can be estimated using the 'BSMT' package 'reapGrim' function.

Length and age distributions for cycles 1-3 are provided as reference only from the Lake Synopsis.

Appendix B – Broadscale Monitoring Lake Synopsis for Golden Lake

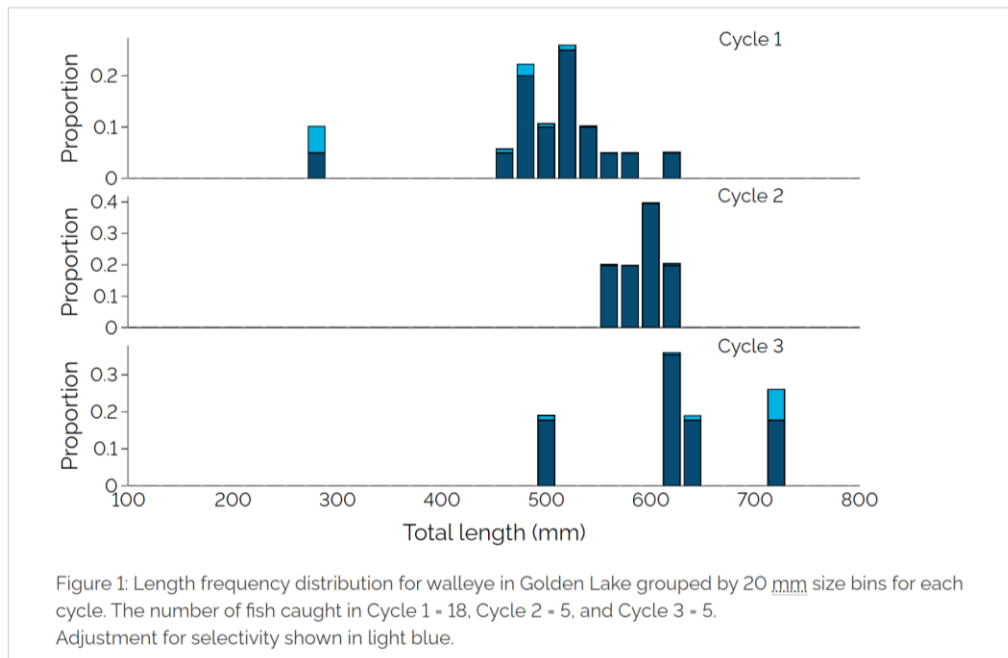
General lake and species information

Golden Lake facts:

- waterbody code: 18-3186-50482
- zone: 15
- location (latitude/longitude): 45.57388 °North, -77.33611 °West
- surface area: 3,612.5 hectares
- mean depth: 8.6 metres
- maximum depth: 24.4 metres
- water clarity: 4 metres

Length

Figure 1 and table 2 show total length distribution of walleye caught in large mesh nets for each cycle. The y-axis shows the proportion of fish in each 20 mm size bin. The y-axis scale may differ by cycle. The light blue portion of the bars show the selectivity adjustment.



Age

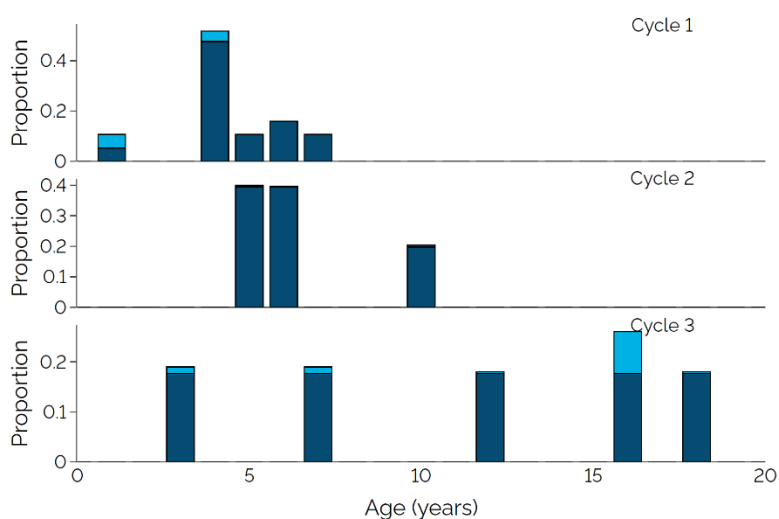


Figure 3: The age frequency distribution of walleye in Golden Lake by cycle where data are available. Fish with missing ages were assigned an estimated age using a 50 mm length-age key. A grey distribution indicates that all ages in the cycle were estimated and a note of caution should be made in the use. The upper portion (light blue or light grey) of the bar shows values after correcting for selectivity. Number of age samples observed (number of ages estimated) is Cycle 1 = 17(0), Cycle 2 = 5(0), and Cycle 3 = 5(0).

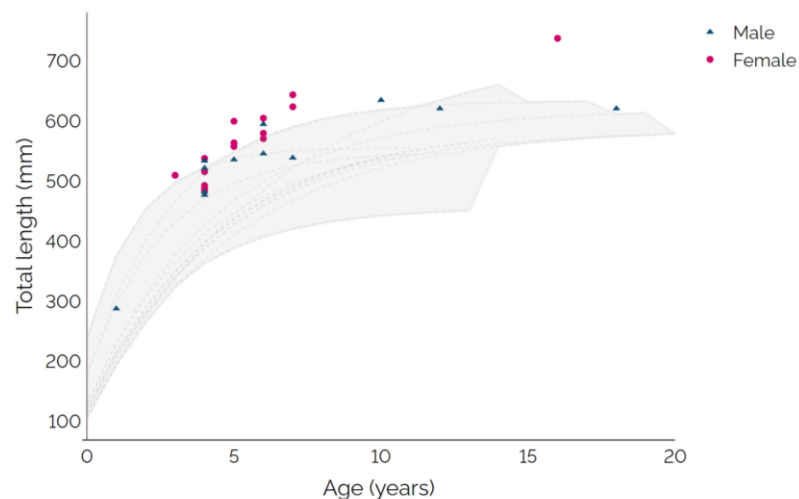


Figure 10: Relationship between length and age for walleye in Golden Lake. If sufficient data exists, the black line represents growth of all fish combined and the grey area shows the range of growth in the zone. The pink points and blue triangles and corresponding coloured lines represent the relationship for females and males, respectively. Green squares are fish of unknown sex.

Appendix C – Derivation of the Target Walleye Stocking Size

To support the selection of a suitable stocking size for Golden Lake, the relationship between Rainbow Smelt size and potential predation on stocked Walleye was evaluated using the model developed by Lawson and Carpenter (2014). The model estimates the minimum Walleye total length required to avoid predation based on Rainbow Smelt total length:

- $TL_{Walleye} = 0.819(TL_{Rainbow\ Smelt}) - 23.838$

where:

- $TL_{Walleye}$ = target Walleye total length (mm)
- $TL_{Rainbow\ Smelt}$ = Rainbow Smelt total length (mm)

To account for uncertainty in Rainbow Smelt size structure and to provide a precautionary estimate, the 95th percentile Rainbow Smelt length observed across three cycles of Broadscale Monitoring (BsM) was used. The 95th percentile Rainbow Smelt total length was 176.3 mm. Applying the model:

- $TL_{Walleye} = 0.819(176.3) - 23.838$
- $TL_{Walleye} = 144.4 - 23.838$
- $TL_{Walleye} = 120.6\text{ mm}$

Rounded to the nearest millimetre:

- $TL_{Walleye} \approx 121\text{ mm}$

A target stocking size of approximately 121 mm total length is expected to avoid predation from Rainbow Smelt up to the 95th percentile of the observed size distribution.

For comparison, alternative predation avoidance thresholds were also evaluated:

Predation Avoidance Level	Target Walleye Length (mm)
50%	87.5
75%	94.9
95%	121.0

While smaller target sizes may reduce rearing requirements, they are expected to increase vulnerability to predation and reduce first-year survival. Consequently, the stocking strategy adopts a target size of 121 mm total length, which is routinely achieved through fall fingerling production and provides the greatest degree of predation avoidance.

Appendix D – White Lake Fish Culture Station Length-Weight Relationship for Fall Fingerling Walleye

Purpose

Length-weight data collected from 150 fall fingerling Walleye produced at White Lake Fish Culture Station in 2026 were analyzed to provide a practical conversion between fish length and weight. This information was used to estimate the hatchery production weight corresponding to the 121 mm stocking target identified in Appendix C.

Results

Analysis demonstrated a strong positive relationship between fish length and weight (Figure D-1). The relationship was described by the equation:

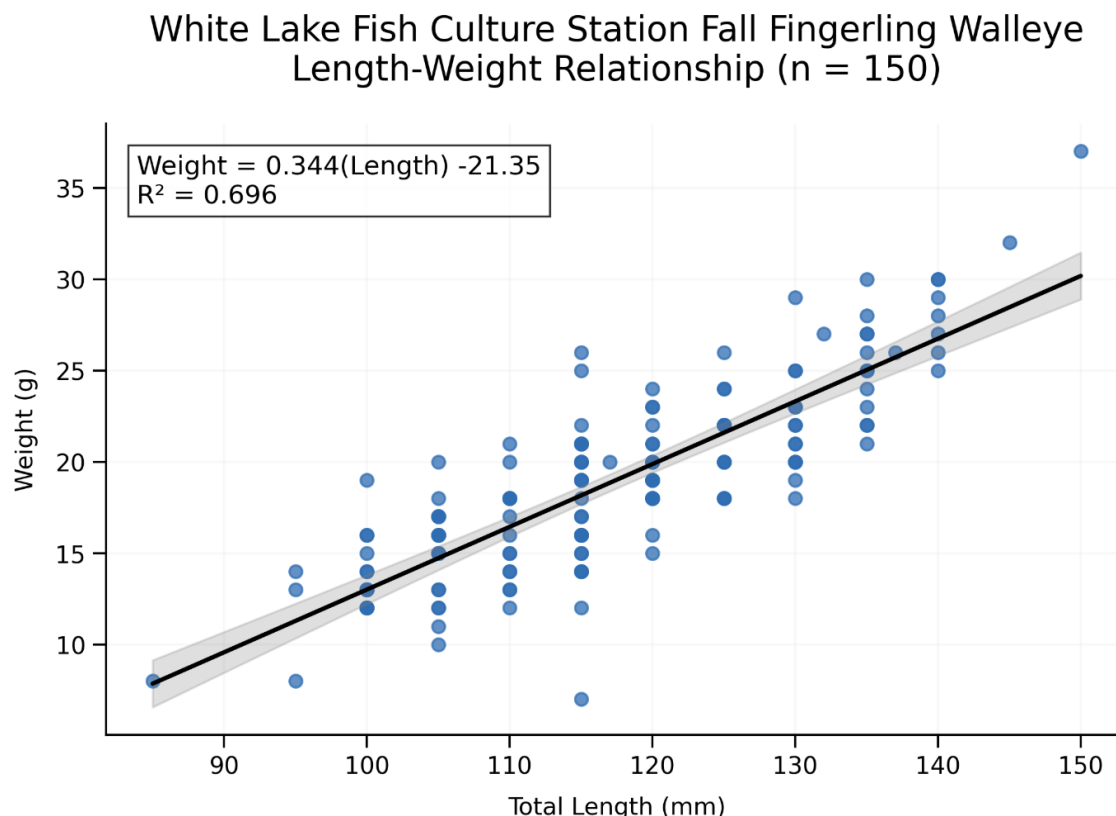
$$\text{Weight (g)} = 0.344 \times \text{Length (mm)} - 21.35$$

The model explained approximately 70% of the variation in fish weight ($R^2 = 0.696$). Based on this relationship, a Walleye of 121 mm total length corresponds to an average weight of approximately 20 g.

Table D-1. Approximate length-weight conversions for fall fingerling Walleye produced at White Lake Fish Culture Station.

Total Length (mm)	Average Weight (g)
117	18.9
119	19.6
121	20.2
123	20.9
125	21.6
127	22.3
130	23.4

Figure D-1. Relationship between total length (mm) and weight (g) for fall fingerling Walleye produced at White Lake Fish Culture Station in mid-September 2026 (n = 150) immediately prior to stocking. The solid line represents the fitted regression, and the shaded area represents the 95% confidence interval around the mean predicted weight.



Management Application

The target stocking size adopted for Golden Lake is intended to minimize predation risk from Rainbow Smelt while remaining achievable through routine fall fingerling production. Based on White Lake Fish Culture Station production data, a Walleye of 121 mm total length corresponds to an average weight of approximately 20 g (Table D-1). Fish ranging from 117 mm to 130 mm are expected to weigh approximately 19 g to 23 g and would meet or exceed the target size range identified for stocking. Accordingly, the predation avoidance target of 121 mm total length can be operationally interpreted as a hatchery production target of approximately 20 g per fish.