

## **Hoister Lake**

Gladwin County, T20N R02W Secs. 8 & 9  
Cedar River Watershed, Last Surveyed 2021

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### **Environment**

Hoister Lake is a 23-acre impoundment located within the Gladwin Field Trial Area within Gladwin State Forest, a large tract of state land in northern Gladwin County, Michigan (T20N, R02W, Secs. 8 & 9; Figure 1). The lake lies within the Cedar River drainage. Hoister Lake and the adjacent Trout Lake each sit at the headwaters of separate unnamed tributaries to the North Branch Cedar River (Figure 2). The lake is surrounded by state land managed by the Michigan DNR as part of the approximately 5,040-acre Gladwin Field Trial Area, which encompasses approximately 6,000 acres of recreational land, three state forest campgrounds with 77 sites, 2.7 miles of hiking trails, and many miles of North Branch Cedar River frontage (Little Forks Conservancy 2011). The area is managed primarily for dog field trials — specifically grouse dog field trials that draw enthusiasts from across the United States — with hunting permitted during firearms deer season (Barlow 2018). Public access is provided via a boat launch at the south end of the lake and a beach swimming area at the north end. Nearby state forest campgrounds at House Lake and Trout Lake, combined with a network of hiking trails throughout the Gladwin Field Trial Area, provide additional recreational opportunities. Gas-powered motors are not permitted on Hoister Lake.

The North Branch Cedar River originates as a spring-fed flow from a hillside near Hoister Lake, making the lake and its associated groundwater system the hydrological headwaters of the North Branch (Little Forks Conservancy 2011). The North Branch and its tributaries are designated coldwater trout streams, classified as groundwater discharge areas underlain by permeable glacial moraines and dominated by Brook Trout with Brown Trout, sculpin, darter, and dace also present (Little Forks Conservancy 2011). Hoister Lake occupies a glacially formed kettle depression in a hilly landscape of sandy and sandy loam upland soils intermixed with lowland cedar swamps, typical of glacial moraines in north-central Lower Michigan (Figure 3). Elevations in the surrounding upland range from approximately 970 to 1,230 feet above sea level. The immediate shoreline is wooded with alder, tamarack, and spruce, transitioning to upland oak and aspen on higher ground. Trout Lake has a maximum depth of 18 feet and is characterized by steep drop-offs (Figure 4). The bottom substrate is a mixture of sand, marl, organic material, and fibrous peat, and numerous submerged trees provide fish habitat throughout the lake. The inlet originates from adjacent cedar swamps to the north; the outlet is a small creek at the southeast end draining to the North Branch Cedar River. The watershed is largely forested state land managed by Michigan with limited hunting also permitted (Barlow 2018). Wetland communities, including cedar swamps, are characteristic of the low-lying areas surrounding the lake and are integral to the local hydrology. Minimal agricultural or developed land use occurs within the watershed.

The shoreline is entirely undeveloped, with no docks, dwellings, or armored shorelines observed during the 2021 survey (Simmons 2022). A shoreline assessment documented 164 submerged trees across five surveyed segments; submerged wood provides valuable fish habitat and contributes to bank stabilization. The 2005 survey noted abundant aquatic vegetation including lily pads, cattails, *Chara* sp., and *Elodea* sp., with an organic bottom of numerous fallen logs and stumps around the entire lake perimeter. Lily pads remained visible in 2021, consistent with continued macrophyte coverage.

A limnological survey conducted August 9, 2021, documented the water quality characteristics shown in Table 1 (Simmons 2022). Maximum depth was 25 feet, down from 31 feet measured in 1938, a 6-foot reduction attributable to sediment accumulation. The thermal profile declined steadily from 74.5°F at the surface to 61°F at depth, with the thermocline between 17 and 18 feet (Figure 5). Dissolved oxygen was less than 2.0 ppm below approximately 18 feet, producing hypoxic conditions that effectively limit usable fish habitat to the upper water column during summer stratification. Surface pH was 9.47, declining to 8.15 at depth; specific conductivity ranged from 258 to 760  $\mu\text{S}/\text{cm}$ . Surface water temperatures during the June 2021 fish sampling ranged from 63 to 68°F. A previous limnological survey in 1987 recorded surface temperatures of 72°F declining to 62°F at depth, well-oxygenated conditions throughout, pH of 8.2 to 8.3, and alkalinity of 160 to 180 ppm — a notably different dissolved oxygen profile than observed in 2021. Although no formal trophic status analysis has been conducted for Hoister Lake, the water chemistry, thermal stratification pattern, and organic substrate are consistent with a mesotrophic classification, like the adjacent Trout Lake (Carlson and Simpson 1996).

## Fishery Resource

### History

#### *Pre-dam conditions*

Hoister Lake takes its name from a piece of industrial infrastructure from the northern Michigan logging era. In the late 1870s and 1880s, lumberman Thomas Nestor constructed a narrow-gauge logging railroad network through northern Gladwin County to harvest some of the last stands of virgin white pine in the Lower Peninsula. The lake at this location was then a natural spring-fed beaver-impounded pond of approximately 13 acres with a maximum depth of 31 feet and was used as a log holding pond. A large steam hoist installed to lift logs from the water onto rail cars for shipment to the Tittabawassee River mills gave the lake its name. Remnants of the logging era railroad trestles remain visible along the northern reaches of the North Branch Cedar River to this day (Little Forks Conservancy 2011; Gladwin County Record and Beaverton Clarion 2013). Cutover lands were abandoned and eventually reverted to state ownership through tax forfeiture in subsequent decades (Gladwin County Record and Beaverton Clarion 2013).

The Gladwin Field Trial Area was established in 1916 when tax-reverted lands in the northwest corner of Gladwin County were designated as a public grouse field trial area, encompassing approximately 5,040 acres within what would become the Au Sable State Forest. Hoister Lake and the surrounding landscape came under state stewardship at that time.

The earliest documented biological assessment of Hoister Lake was conducted in 1940 by the Michigan Department of Conservation Fisheries Division (Brown 1940). At that time the pre-impoundment beaver pond was approximately 13 acres with a maximum depth of 31 feet. From aerial photography and the 2017 drawdown, it is apparent that the natural lake portion of the pre-impoundment system occupied the southern half of the basin, fed by a tributary entering from the west as well as substantial groundwater inputs (Burroughs 2017). The lake was described as having a poor fishing reputation prior to active management, which began formally in 1938.

#### *Dam construction*

Planning and construction of the Hoister Lake Dam were undertaken by the Michigan Department of Conservation Fish Division in 1953–1955. The project was designed to increase the existing natural pond from approximately 13 acres to a planned 22-acre impoundment and to provide greater and more stable depth suitable for coldwater trout management. Original 1954 engineering plans were prepared and archived with the EGLE Dam Safety Program. Construction was completed in 1955.

The dam consists of a 115-foot earthen embankment with a structural height of 15 feet and a hydraulic height of 14.4 feet. Impoundment levels are controlled by a 6.5-foot by 6.5-foot reinforced concrete drop-inlet structure with a 6-foot-wide wooden stop log bay, outletting through a 30-inch corrugated metal pipe (CMP). Normal operating head is approximately 12 feet with 3 feet of freeboard. The drop-inlet design is a bottom-draw configuration (the outlet is located at the base of the riser rather than overtop), which was intended to discharge cooler hypolimnetic water to the downstream reach of the tributary to the North Branch Cedar River to benefit downstream coldwater fish habitat. The dam is regulated under Part 315 (Dam Safety) of NREPA (1994 PA 451) as a low-hazard dam. Because of the low-hazard classification, the structure is ineligible for most state or federal repair grants. The contributing drainage area is approximately 2.8 square miles.

The construction of Hoister Lake Dam must be understood within the management philosophy of its era. The mid-twentieth century was a period of intensive structural manipulation of aquatic habitats across Michigan and the broader United States, characterized by widespread dam construction, beaver removal, in-stream woody debris clearing, and heavy reliance on fish toxicants such as rotenone for population management (Latta 1973; Bednarek 2001). These practices reflected a prevailing belief that fish communities could be engineered to specification — that undesirable species could be eliminated, desirable species introduced, and habitat physically restructured to produce a target fishery. The management record of Hoister Lake is a textbook illustration of this approach and, as the subsequent fisheries history demonstrates, of its limitations.

The thermal benefit of the bottom-draw design in practice is uncertain and likely limited under current operating conditions. Temperature monitoring conducted by Michigan Trout Unlimited in 2016 recorded outlet temperatures at and below the dam of 76°F during July and August, temperatures characteristic of warm surface water rather than cool hypolimnetic discharge, suggesting the stop log configuration at that time was effectively functioning as a surface-draw rather than a true bottom-draw outlet (Burroughs 2017). By contrast, during the 2017 full drawdown when lake storage was eliminated and discharge consisted largely of groundwater-fed baseflow the outlet temperatures measured 58–61°F. The DNR Habitat Management Unit's 2017 review recommended arranging the stop log boards to create a true bottom-draw condition, noting that doing so might cause cooler groundwater-influenced water to discharge from the lower level of the outlet and reduce the dam's thermal impact on the North Branch Cedar River (Ertel 2017). Whether the current stop log configuration achieves this, and whether Hoister Lake's relatively shallow, groundwater-influenced basin can maintain a sufficient cold-water hypolimnion under summer stratification to make bottom-draw operation meaningful, has not been formally evaluated.

The dam's relationship to sediment dynamics in the downstream system also warrants consideration. Under normal full-pool operation, the impoundment traps sediment entering from the western tributary and from groundwater-fed inputs; the outlet channel carries relatively clear water to the North Branch Cedar under these conditions. However, a road stream crossing immediately downstream of the dam outlet is undersized and has been identified as the primary ongoing source of sand entering the outlet channel during normal operation (Burroughs 2017). During the 2017 drawdown, significant quantities of fine sediment and organic material were mobilized from the lake bed into the outlet channel and transported toward the North Branch Cedar. A beaver dam located approximately 100 yards downstream of the confluence with the North Branch temporarily contained much of this material, but the broader reach of the North Branch Cedar in this vicinity was already characterized by wide, shallow, sand-impacted conditions attributable to a combination of the undersized Trestle Junction road crossing, beaver dam activity, and historical disturbance (Burroughs 2017; Ertel 2017). Any future drawdown or possible removal should be coordinated with an assessment of downstream

sediment conditions and, where feasible, stream restoration measures in the outlet channel and the affected North Branch Cedar reach.

Formal dam safety inspections have been conducted on multiple occasions (Table 2). The inspection record extends back to 1976 and documents a consistent pattern of recurring concrete deterioration on the spillway riser, persistent seepage at the embankment toe and wingwalls, repeated failure to implement prior repair recommendations, and the continued absence of a written O&M plan across nearly five decades of inspection cycles. The outlet structure was rehabilitated in 2017: spalling and broken concrete on the riser were patched, stop logs were replaced, and a video inspection of the 30-inch CMP culvert was completed, identifying corrosion but no significant deficiencies at that time. The 2014 inspection (Pawloski 2014) rated the dam satisfactory; the 2019 inspection (DeVaun 2019) confirmed the 2017 repairs had addressed prior concrete concerns while recommending continued quarterly seepage monitoring and preparation of an O&M Plan.

The most recent formal inspection, conducted August 7, 2024 (Stone and Trumble 2024), rated the dam's overall condition as fair, a decline from the satisfactory ratings of the two prior inspections. Specific deficiencies included: debris on the principal spillway riser requiring immediate maintenance; deteriorating concrete on the riser requiring high-strength concrete patching to a minimum 3-inch thickness by December 31, 2025; a depression on the downstream embankment slope requiring regrading, stabilization, and revegetation by December 31, 2025; seepage sinkholes on the downstream embankment slope adjacent to concrete wingwalls; and preparation of a written Operation and Maintenance Plan. The dam's low hazard potential classification remained appropriate. The 2024 inspection confirms a pattern of recurring concrete deterioration, persistent seepage, and absence of an O&M Plan across three inspection cycles.

The deteriorating condition of Hoister Lake Dam is consistent with national trends in aging dam infrastructure. The American Society of Civil Engineers (ASCE 2025) reports that the average design lifespan of a dam is 50 years, after which structures enter a critical period of accelerated risk. The Hoister Lake Dam, at 70 years old, exceeds its engineered lifespan by two decades. Common modes of deterioration in aging dams include concrete degradation, corrosion of steel components, seepage and internal erosion, and loss of capacity to safely pass flood flows, concerns documented at the Hoister Lake structure across multiple inspection cycles. For small, state-owned structures like Hoister Lake Dam, the cost of major rehabilitation frequently exceeds the cost of removal, a calculus that increasingly favors decommissioning when the impoundment no longer serves its original purpose (ASDSO 2025).

### ***Fisheries history***

Fisheries management of Hoister Lake began in 1938 under the Michigan Department of Conservation Fisheries Division. In 1940, the lake was lethally treated with fish toxicants (i.e., rotenone) for the first time to clear the existing fish community (primarily Bluegill, Yellow Perch, and other warmwater species considered incompatible with the intended coldwater fishery), and Brook Trout stocking was initiated. Brook Trout were stocked annually through approximately 1952, when stocking was discontinued due to fluctuating water levels that the existing uncontrolled outlet could not regulate — a problem that motivated construction of the permanent dam and control structure completed in 1955.

Following dam construction, the lake was lethally treated with rotenone a second time in 1957 and restocked with both Brook Trout and Rainbow Trout. The mechanism of warmwater species recolonization between treatment events is not documented; an incomplete kill, natural immigration via the inlet tributary, or unauthorized introduction are all plausible explanations. All trout life stages were stocked to encourage establishment of a self-sustaining trout fishery. Brook Trout were stocked

through approximately 1965; Rainbow Trout stocking continued through 1975. The lake was treated with rotenone a third time in 1971 and restocked with Rainbow Trout. Despite sustained stocking effort over nearly two decades under improved water level stability, a fully self-sustaining trout population did not establish itself. The failure of trout to persist was not surprising in retrospect: the warm surface temperatures, dissolved oxygen at depth, and organic sediment accumulation characteristic of the Hoister Lake basin created conditions incompatible with a robust coldwater fishery, and the dam's intended thermal benefit to the impoundment appears to have been limited by the basin's relatively shallow, well-mixed character.

Management shifted to warmwater species in 1975. Due to an imbalance in the panfish population, a special regulation was established for Largemouth Bass with a 15-inch minimum size limit. A 1988 fisheries survey documented improved size structure for both Largemouth Bass and Bluegill under this regulation, with an excellent population of bass 12–14 inches, evidence of catchable Bluegill, and remnant populations of native Brook Trout. These positive indicators prompted another management shift back toward trout, and a new Brown Trout stocking program was initiated in 1989. Yearling Brown Trout were stocked annually from 1989 to 1994 without prior lethal treatment (Table 3). A total of 2,907 Brown Trout were stocked over six years, and a 1993 management evaluation survey confirmed that stocking events were creating Brown Trout angling opportunity and documented an excellent overall fish population. The stocking prescription was not renewed after 1994, and no DNR Fish Stocking Database records exist for Hoister Lake between 1995 and 2017. The reason for discontinuing the stocking prescription is not documented in available records; given the 1993 survey's positive findings, the decision may reflect budgetary or logistical factors rather than management concerns about population performance. Management through 2017 was for warmwater species with no special regulations.

In fall 2016, the original wooden stop log boards in the control structure began failing, prompting the Michigan DNR Fisheries Division to initiate planning for a controlled drawdown to enable culvert inspection and structural repairs. Trout Unlimited was consulted regarding downstream sediment management on the North Branch Cedar River. The drawdown was initiated in June 2017, and the lake was reduced to a stream channel with a deeper remnant pool, remaining drawn down for approximately one year. The drawdown led to a significant decrease in fish abundance and mobilized substantial fine sediment and organic material into the downstream system. Following completion of the 2017 structural repairs (concrete riser repaired, new stop log boards, camera outlet pipe inspection; ~\$2,200 in direct supply and inspection costs; total project cost including staff time and travel would be substantially higher) in early May 2018 and the impoundment refilled within approximately two weeks. In response to the fish population decline caused by the drawdown, a prescription of Rainbow Trout stocking was initiated for three years, with warmwater fish also transferred from Sanford Lake following pathogen screening (Table 3). Rainbow Trout were stocked in 2018, 2019, and 2020 (1,850 total fish). No fish have been stocked since 2020. Rainbow Trout were stocked following the drawdown, likely for their availability and ability to provide short-term angling opportunity; no documented stocking rationale or management objectives have been identified to support this prescription, and the decision appears to have been made on an ad hoc basis rather than as part of a formal management plan.

### ***Historical fish community surveys***

Fish community data from Hoister Lake predate the current impoundment. Gill net surveys conducted by the Institute for Fisheries Research between 1938 and 1952 documented Brook Trout, Bluegill, Largemouth Bass, and associated forage species in the pre-dam natural lake, with Brook Trout present in every survey of that period. Following dam construction, surveys in 1960 and 1962 confirmed

Brook Trout persistence, with the 1962 survey capturing 29 individuals across four stations. A 1973 gill net survey documented Rainbow Trout, Bluegill, Largemouth Bass, Yellow Perch, and Northern Pike following the 1971 rotenone treatment and restocking; Brook Trout were again present by 1974, three years post-treatment. A 1981 gill net survey by DNR staff captured three Brook Trout averaging 15.5 inches with growth indices well above the state average, and the survey report explicitly attributed their presence to natural reproduction in the inlet stream. A 1988 electrofishing survey documented an excellent Largemouth Bass population to 12–14 inches, catchable Bluegill, and noted remnant Brook Trout. These pre-1993 records are summarized in the Management Record and are not directly comparable to the standardized Status and Trends surveys that follow; they are discussed in detail in the Brook Trout section of the Analysis.

Three post-construction fisheries surveys provide context for interpreting the current fish community. The earliest systematic catch data available were collected in 1993, when a fyke net survey (12 net-nights) captured 512 fish representing 9 species (Table 4). Bluegill dominated the catch at 41.6% by number (213 fish), followed by Yellow Perch at 27.7% (142 fish) and Green Sunfish at 13.1% (67 fish). Rock Bass contributed 9.4% (48 fish) and Largemouth Bass 6.1% (31 fish). Brown Trout (6 fish, 7–13 inches), White Sucker (2 fish), Hybrid Sunfish (2 fish), and Mudminnow (1 fish) were also collected. No fish with established length limits were legal size. This survey confirmed that the 1989–1994 Brown Trout stocking program had produced catchable trout while maintaining an active and diverse warmwater community.

The 2005 Status and Trends survey (Parson 2005) collected 643 fish representing 6 species using trap nets, fyke nets, experimental gillnets, and seining. Bluegill dominated the catch at 80.9% by number, with 400 fish averaging 6.4 inches and ranging from 4 to 9 inches, ages 3 to 9 (Table 4). Sixty-one percent of Bluegill met or exceeded the 6-inch acceptable harvest size. The Schneider Index score was 4.5, rating the population satisfactory to good. Largemouth Bass were the second most abundant species at 14.3% of the catch (93 fish), ranging 6 to 19 inches and averaging 11 inches, growing 2.0 inches below the state average, with only 4 fish at or above the 14-inch legal size. All other species — White Sucker, Green Sunfish, Rock Bass, and Yellow Perch — were present only in low numbers. The survey biologist recommended no management changes, noting that the lake was providing excellent Bluegill angling opportunity with no angler complaints received since 2000.

Comparison of the 1993 and 2005 surveys documents a notable shift in community composition. The 1993 catch was more diverse and balanced, with multiple species contributing meaningfully to the total. By 2005, Bluegill had come to heavily dominate the catch and Largemouth Bass growth had declined well below the state average — conditions that would persist in the 2021 survey.

Current status of the fish community

#### *Methods*

The fish community of Hoister Lake was sampled June 1–4, 2021, as part of the Michigan DNR Fisheries Division’s Status and Trends Monitoring Program. The survey was selected both randomly as part of the statewide program and as the management evaluation prescribed following the 2017 drawdown and dam repair. Sampling methods followed standardized Status and Trends protocols (Wehrly et al., in revision). Gear deployed included one seine haul, one trap net (one night), two experimental gillnets (one night each; 2 total net-nights), two small-mesh fyke nets (one night each; 2 total net-nights), and three large-mesh fyke nets (one night each; 3 total net-nights), for a total of 20 net-nights across gear types. Night electrofishing was not conducted during this survey.

All fish were identified to species, counted, and measured for total length. Aging structures (scales or spines) were collected from fish in each one-inch length class for Bluegill, Largemouth Bass, Yellow

Perch, and Rock Bass. Weights for all species were calculated using length-weight regression equations compiled by Schneider et al. (2000). Relative abundance was assessed using catch per unit effort (CPUE) calculated as number of fish per net-night. A growth index was calculated for each species and age class by subtracting the statewide average mean length-at-age from that observed in the 2021 Hoister Lake survey (Schneider et al. 2000). Mean growth index scores ranging from -1.0 to +1.0 are considered like the statewide average (except for Bluegill, where -0.5 to +0.5 is considered average). Bluegill size structure was also evaluated using the Schneider combined index incorporating mean length, proportion of fish exceeding 6, 7, and 8 inches, and mean growth index score (Schneider 1990; Schneider 2000). A limnological survey was conducted at the deepest point in the lake (25 feet) on August 9, 2021, during peak summer stratification.

Proportional size distribution (PSD) indices were calculated for Bluegill and Largemouth Bass from the aged subsample using the length categorization framework of Gabelhouse (1984), following the procedures described by Anderson and Neumann (1996). PSD expresses the percentage of stock-length fish that meet or exceed quality length; PSD-P, PSD-M, and PSD-T express the percentage meeting or exceeding preferred, memorable, and trophy lengths, respectively.

### Results

A total of 423 fish representing 11 species were captured in the 2021 survey (Table 4). The fish community was dominated by Bluegill at 37.4% of the catch by number (158 fish), followed by Yellow Perch at 21.7% (92 fish), Largemouth Bass at 18.2% (77 fish), and Bluntnose Minnow at 13.9% (59 fish). All remaining species individually comprised 5% or less of the total catch. The sport fish community — Rainbow Trout, Brook Trout, Largemouth Bass, and Rock Bass — constituted approximately 23.6% of the total catch by number but 45% by weight. Forage species — Bluntnose Minnow, Brook Stickleback, and Central Mudminnow — made up 14.6% of the total catch and all ranged from 1 to 2 inches.

Bluegill were the most abundant species collected, with 158 individuals ranging from 6 to 9 inches and averaging 8.2 inches (Figure 6). Bluegill were most efficiently captured in trap nets, which accounted for 65% of the total Bluegill catch; 102 individuals were captured in the trap net alone. All Bluegill collected were of acceptable angling size ( $\geq 6$  inches), representing a marked improvement over the 2005 survey in which only 61% met that threshold. Age and growth analysis documented ages 3–10 with a mean growth index of +0.6, indicating growth above the statewide average. The Schneider Index score was 6.4, placing this population in the excellent to superior category (Schneider 1990) — a substantial improvement from the satisfactory to good rating (4.5) recorded in 2005. PSD indices confirmed strong size structure: PSD = 100 and PSD-P = 54, both above the target ranges for a balanced Bluegill population (PSD 20–60; PSD-P 10–40), indicating an abundance of quality and preferred-size fish. Multiple year classes were present, suggesting acceptable recruitment to the harvestable fishery.

Largemouth Bass totaled 77 fish ranging from 7 to 15 inches and averaging 11.6 inches (Figure 7). Trap netting accounted for 66% of the Largemouth Bass catch, followed by large mesh fyke nets (27%). Only 1% of bass captured were of acceptable angling size. Age and growth analysis documented ages 3–9 with a mean growth index of -2.1, indicating growth well below the statewide average. This is essentially identical to the growth index recorded in 2005 (-2.0) and is consistent with a persistent pattern of poor size structure for this species in Hoister Lake. PSD indices reflected the truncated size structure: PSD = 45 and PSD-P = 2, with the PSD-P critically below the target range of 10–45, confirming near-complete failure to produce preferred-size fish. Multiple year classes were present, suggesting acceptable recruitment to the harvestable fishery. At a minimum catch of 77 Largemouth Bass across 23 acres, a catchable density of at least 3.3 bass per acre is suggested — likely

an underestimate given gear selectivity — indicating a relatively abundant bass population despite the poor size structure.

Yellow Perch totaled 92 fish ranging from 5 to 10 inches and averaging 7.6 inches (Figure 8). The experimental gillnet accounted for 73% of the Yellow Perch catch and large mesh fyke nets accounted for 26%. Forty-seven percent of Yellow Perch were of acceptable angling size. Age and growth analysis documented ages 3–7 with a mean growth index of +0.1, indicating growth like the statewide average. Multiple year classes were present, suggesting acceptable recruitment. Yellow Perch were notably more abundant in 2021 than in either the 1993 or 2005 surveys.

Rock Bass totaled 20 fish ranging from 5 to 8 inches and averaging 6.9 inches. White Sucker totaled 9 fish ranging from 10 to 15 inches and averaging 14.7 inches. Two Brook Trout were collected at 9 and 14 inches, aged 3 and 5 years respectively. Brook Trout are not stocked in Hoister Lake; these individuals are the product of natural reproduction within the lake or its tributaries. Their presence is ecologically significant, as discussed below. One Rainbow Trout measuring 17 inches and aged 3 years was collected, consistent with the 2018 post-drawdown stocking event (590 fish stocked May 30, 2018), confirming survival and growth of stocked fish to a desirable size. Green Sunfish (2 fish, 3–6 inches), Brook Stickleback (2 fish, 1 inch), Bluntnose Minnow (59 fish, 1–2 inches, mean 1.6 inches), and Central Mudminnow (1 fish, 1 inch) were also captured.

### **Analysis and Discussion**

The 2021 survey documented a fish community in generally stable and improved condition relative to 2005, with the notable exception of Largemouth Bass size structure, which has remained consistently poor across all three survey periods.

The Bluegill population has improved markedly since 2005. The Schneider Index score of 6.4 in 2021 compared to 4.5 in 2005 represents a genuine improvement in population quality, driven by above-average growth (+0.6 mean growth index), a higher proportion of fish at angling size (100% vs. 61%  $\geq$  6 inches), and a larger mean length (8.2 vs. 6.4 inches; Table 5). The presence of ages 3 through 10 suggests a stable, multi-cohort population with adequate recruitment and good retention of older individuals. By the Schneider classification, this is now an excellent to superior Bluegill fishery — among the stronger outcomes that can be expected for a small warmwater impoundment in the SLHMU region. The PSD of 100 and PSD-P of 54, both above the upper bounds of target ranges, indicate a population skewed heavily toward larger size classes — a pattern consistent with reduced predation pressure from the stunted Largemouth Bass population.

The Largemouth Bass population presents a persistent management challenge. The mean growth index of -2.1 in 2021 is essentially identical to the -2.0 recorded in 2005, and the PSD-P of 2 confirms that the growth deficit translates directly into a near-total failure to produce fish at preferred size or above (Table 5). The consistency of this pattern across two surveys separated by 16 years, spanning a major management intervention in the 2017 drawdown, points to an intrinsic constraint of this basin rather than a transient condition. The combination of a within-range PSD (45) and a collapsed PSD-P suggests a bass population that is reproducing adequately and reaching quality size but is unable to grow through to preferred length, a signature consistent with overcrowding and intraspecific competition for forage. The predator-prey balance index further supports this interpretation: with Bluegill PSD at 100 and Largemouth Bass PSD at 45, the ratio is well outside the balanced range, suggesting that despite adequate bass abundance, size structure constraints may be limiting their effectiveness as a predator on larger Bluegill size classes, and that Bluegill competition for invertebrate prey may in turn be suppressing bass growth (Anderson and Neumann 1996). The conventional management response to overcrowded bass populations is increased harvest, but bass angling pressure

at Hoister Lake is light and most fish are released, a behavioral pattern that, while understandable given the absence of legal-size fish, perpetuates the overcrowding dynamic. Anglers willing to harvest sub-legal bass would provide a modest but meaningful population-level benefit, though a dramatic improvement in size structure should not be expected without a fundamental change in the lake's carrying capacity for this species.

Yellow Perch showed notably higher abundance in 2021 than in either prior survey and exhibited near-average growth (+0.1; Table 5). The 2017 drawdown and post-drawdown fish transfers from Sanford Lake may have contributed to the Yellow Perch population's current status. The presence of multiple year classes (ages 3–7) and 47% of fish at acceptable angling size indicates that Yellow Perch now represent a genuine and underappreciated angling opportunity at Hoister Lake.

The detection of naturally reproducing Brook Trout, two individuals, ages 3 and 5, in 2021, is ecologically significant and warrants emphasis in the context of long-term management planning. Brook Trout have not been stocked in Hoister Lake since at least the mid-1960s, yet individuals consistent with natural reproduction have been documented in surveys spanning multiple decades, including the 1988 and 2021 assessments. Their persistence through the 1975 management shift to warmwater species, the 1989–1994 Brown Trout stocking program, and the 2017 drawdown and post-drawdown warmwater restocking indicates that the lake or its tributaries retain sufficient thermal and habitat conditions to support at least low-level Brook Trout reproduction. During the 2017 full drawdown, groundwater-fed discharge from the system measured 58–61°F which is genuinely cold water consistent with Brook Trout thermal requirements and suggesting that the groundwater-fed southern basin and its associated tributaries represent a persistent coldwater refugium within an otherwise warm impoundment (Burroughs 2017). This population fragment represents a potential conservation resource and a preview of the coldwater fish community that natural recovery could support if the impoundment were removed and the headwater stream system restored.

Collectively, the trajectory from 1993 to 2005 to 2021 documents a warmwater impoundment that has undergone significant compositional change. Species richness increased from 6 species in 2005 to 11 in 2021. Bluegill quality improved substantially. Yellow Perch abundance increased. The Largemouth Bass size structure constraint present in 2005 persists unchanged. The impoundment provides a functional, if unremarkable, warmwater fishery — but it has never achieved the coldwater management objectives for which it was constructed, and the evidence accumulated across eight decades of management suggests it is unlikely to do so under current conditions.

## **Management Considerations**

### ***Recreational value***

Hoister Lake provides genuine recreational value to the public independent of its fishery quality. The surrounding Gladwin Field Trial Area offers an extensive trail network through varied upland and lowland habitats. The state forest campground on the north shore provides public access to a clean, entirely undeveloped lake in a scenic forested setting. Paddling, swimming, wildlife observation, and family-oriented angling for Bluegill and Yellow Perch are legitimate and durable recreational benefits. Loons have been documented on the lake.

Importantly, the pre-impoundment natural lake in the southern basin (approximately 13 ac) of the current impoundment persisted through the 2017 full drawdown and would remain as a water body in the event of dam removal (Burroughs 2017). The exposed reservoir bottom at the southern access point during drawdown suggested potential for an improved beach-like recreation area — larger and more gently sloping than the current north end beach — with some augmentation (Burroughs 2017). These observations are relevant to any future dam management planning: the recreational loss associated with

dam removal at Hoister Lake would be substantially less than at a site where no natural water body would persist.

***Ecological context and dam management feasibility***

The 2024 dam safety inspection rating of fair, down from satisfactory in 2014 and 2019 and reflects a structure that has operated for 70 years and carries an accumulating maintenance burden that is likely to intensify. At 70 years of age, the Hoister Lake Dam has exceeded its engineered design lifespan of approximately 50 years by two decades (ASCE 2025). The deficiencies identified across three inspection cycles; recurring concrete deterioration on the spillway riser, persistent seepage at the embankment toe, emerging sinkholes adjacent to wingwalls, a depression on the downstream slope, and the continued absence of a written O&M Plan describe a structure on a trajectory of progressive deterioration consistent with aging dam infrastructure nationally. Required actions from the 2024 inspection carry deadlines of December 31, 2025. Required maintenance activities, including debris removal from the spillway riser and regrading of the downstream embankment depression, were completed by the December 31, 2025, deadline; concrete patching on the spillway riser, remediation of seepage sinkholes adjacent to the wingwalls, and preparation of a written O&M Plan remain outstanding.

Unlike the adjacent Trout Lake Dam, which was rated poor by EGLE in 2024 and for which the DNR Dam Management Committee has recommended removal, the Hoister Lake Dam has not yet reached a condition requiring immediate action beyond the 2024 maintenance items. However, the structural trajectory, the dam's low-hazard classification that precludes most repair grant funding, and the ecological costs of the impoundment to the downstream system collectively suggest that dam removal and headwater stream restoration represent the management direction most consistent with both long-term fiscal responsibility and ecological outcomes as the structure continues to age.

The ecological cost of the Hoister Lake Dam to the North Branch Cedar River system is real, if incompletely characterized. Under normal full-pool operation, summer outlet temperatures have been measured at approximately 76°F — well above the thermal requirements of coldwater fish and potentially harmful to the Brook Trout and Brown Trout community documented in the North Branch Cedar downstream (Burroughs 2017). The bottom-draw design of the outlet was intended to mitigate this warming, but available temperature data suggest it has not functioned as intended under current stop log operation (Burroughs 2017; Ertel 2017). The dam also traps sediment from the upper watershed, and any future drawdown carries the risk of mobilizing accumulated fine sediment and organic material into the outlet channel and downstream system, as occurred in 2017. The thermal impairment mechanism documented at Hoister Lake has a regional parallel. The Cedar River Watershed Management Plan identified Chappel Dam — a top-discharge structure on the mainstem Cedar River — as the dividing line between the coldwater and warmwater fisheries in the watershed, and recommended retrofitting it as a bottom-discharge structure to extend the coldwater fishery's range in alignment with the natural soil and groundwater conditions of the northern watershed (Little Forks Conservancy 2011). The Hoister Lake Dam, also a nominally bottom-draw structure, has been documented operating with outlet temperatures characteristic of surface discharge rather than the cooler hypolimnetic temperatures the design intended (Burroughs 2017). This thermal signature reflects the current stop log configuration rather than physical blockage of the outlet; whether reconfiguring the stop logs could achieve true bottom-draw operation, and whether the basin maintains a sufficiently cold hypolimnion under summer stratification to make that meaningful, has not been formally evaluated (Ertel 2017).

The natural lake basin in the southern portion of the current impoundment is spring-fed and groundwater-influenced, with discharge temperatures of 58–61°F documented during the 2017 full

drawdown (Burroughs 2017). This thermal signature is consistent with coldwater fish habitat requirements and suggests that the groundwater-fed southern basin represents a genuine coldwater refugium capable of supporting Brook Trout and potentially other coldwater species. Dam removal would restore longitudinal connectivity between this headwater refugium and the North Branch Cedar River, re-establish natural thermal and hydrologic regimes in the outlet reach, and open approximately 0.15 miles of stream corridor to recolonization by coldwater fish from the downstream population. The North Branch Cedar River downstream of the Hoister Lake outlet supports coldwater fish communities consistent with the river's designated trout water status. Brook Trout documented in the lake itself — naturally reproducing without stocking for at least six decades — confirm that the Hoister headwater system retains the ecological capacity to support native salmonids. Research on dam removal outcomes consistently demonstrates that headwater stream ecosystems recover relatively rapidly, often within three to five years, with restoration of natural channel morphology, macroinvertebrate communities, and native fish assemblages (Bellmore et al. 2019; Dietrich et al. 2025).

Dam removal has become an increasingly common and well-supported restoration tool nationally, with over 2,100 dams removed in the United States since 1912, the majority since 2000 (American Rivers 2024). For small, aging, state-owned structures on headwater streams — where rehabilitation costs are high, the ecological benefits of impoundment are limited, and restoration potential is strong — removal is increasingly the management direction most consistent with both fiscal responsibility and ecological outcomes.

### ***Fish community management***

The 2021 survey supports continued management for the warmwater species present with no special regulations in the near term. The Bluegill population is excellent and requires no active intervention. Yellow Perch abundance and size structure are adequate for angling opportunity. The chronic Largemouth Bass growth deficit warrants ongoing monitoring but does not indicate a condition likely to be corrected by available management interventions.

The naturally reproducing Brook Trout population merits targeted attention. Documenting the distribution and reproductive status of Brook Trout in Hoister Lake and its tributary streams — through targeted upstream tributary sampling — would help characterize whether a self-sustaining population is present, whether it has genetic significance relative to the broader North Branch Cedar River Brook Trout population, and what habitat conditions are supporting its persistence. This information would directly inform the ecological case for dam removal and headwater restoration and should be a priority for the next management cycle.

### **Management Direction**

Hoister Lake is currently managed as a warmwater lake with no special regulations. No fisheries management actions are recommended currently beyond continued monitoring. The Bluegill fishery is excellent and stable. Yellow Perch represent a developing secondary angling opportunity. Largemouth Bass growth will continue to be tracked through future surveys.

Near-term dam management priorities are to address the deficiencies identified in the 2024 EGLE Dam Safety inspection — concrete repairs to the spillway riser, remediation of seepage sinkholes and the embankment depression, and development of a formal O&M Plan, with required actions due December 31, 2025 — and to maintain quarterly monitoring of embankment toe seepage as recommended across multiple inspection cycles.

Looking ahead, the Fisheries Division recognizes that Hoister Lake Dam is aging beyond its design lifespan and that the ecological costs of the impoundment — primarily the thermal impairment of the

North Branch Cedar River system under full-pool operation and the sediment mobilization risk during any future drawdown — are likely to outweigh its benefits as the structure continues to deteriorate. The impoundment has not achieved the coldwater management objectives for which it was constructed. The naturally reproducing Brook Trout population documented in the lake and its tributaries, the groundwater-fed thermal refugium in the southern basin, and the coldwater fish community of the North Branch Cedar River collectively define a restoration opportunity that dam removal would realize. Restoration of a coldwater headwater stream at this latitude would also contribute to the resilience of Brook Trout populations under projected climate warming scenarios. Tributary survey work to characterize the Brook Trout population and temperature profiling of the lake under full-pool conditions are recommended as near-term data collection priorities to inform future dam management planning.

The Fisheries Division's preferred management direction for the Hoister Lake Dam, as the structure continues to age and maintenance costs escalate, is dam removal and restoration of the coldwater headwater stream system. This direction is consistent with the Division's management of the adjacent Trout Lake Dam, where removal has been formally recommended, and with the broader national trajectory away from aging small headwater impoundments that impose ecological costs disproportionate to their recreational or fishery benefits. Formal planning for removal should be initiated proactively — in coordination with EGLE Dam Safety, the DNR Habitat Management Unit, and Michigan Trout Unlimited — rather than reactively in response to a structural failure or emergency condition.

## References

- American Rivers. 2024. American Rivers dam removal database. <https://www.americanrivers.org/threats-solutions/restoring-damaged-rivers/dam-removal-map/>
- American Society of Civil Engineers. 2025. 2025 infrastructure report card: Dams. <https://infrastructurereportcard.org/cat-item/dams-infrastructure/>
- Anderson, R.O., and Neumann, R.M. 1996. Length, weight, and associated structural indices. Pages 447–482 in B.R. Murphy and D.W. Willis, editors. *Fisheries Techniques*, 2nd edition. American Fisheries Society, Bethesda, Maryland.
- Association of State Dam Safety Officials. 2025. Roadmap to reducing dam safety risks. <https://damsafety.org/Roadmap>
- Barlow, B. 2018. Gladwin Field Trial Area master plan. Michigan Department of Natural Resources, Wildlife Division.
- Bednarek, A.T. 2001. Undamming rivers: A review of the ecological impacts of dam removal. *Environmental Management*, 27(6), 803–814.
- Bellmore, J.R., Pess, G.R., Duda, J.J., O'Connor, J.E., East, A.E., Foley, M.M., Wilcox, A.C., Major, J.J., Shafroth, P.B., Morley, S.A., Magirl, C.S., Anderson, C.W., Evans, J.E., Torgersen, C.E., & Craig, L.S. 2019. Conceptualizing ecological responses to dam removal: If you remove it, what's to come? *BioScience*, 69(1), 26–39.
- Brown, C.J.D. 1940. Fisheries survey of House, Hoister, and Trout lakes, Gladwin County, Michigan. Michigan Department of Conservation, Fisheries Division, Fisheries Research Report 613.
- Burroughs, B. 2017. Hoister Lake Dam and the North Branch Cedar River, Gladwin State Field Trial Area. Michigan Trout Unlimited, July 19, 2017.
- DeVaun, D.L. 2019. Dam safety inspection report: Hoister Lake Dam, Dam ID No. 329, unnamed tributary to North Branch Cedar River, Gladwin County, Section 8, T20N, R02W. Michigan Department of Environmental Quality, Hydrologic Studies and Dam Safety Unit, Water Resources Division.
- Dietrich, J.P., Rickard, A., Sethi, S., Cuppett, S., & Sullivan, P. 2025. Dam removal restores aquatic ecosystem within three years. *Ecosphere*, 16(7), e70345.
- Ertel, P. 2017. Review of Hoister Lake Dam drawdown, impacts to North Branch Cedar River, and recommendations for future action. Interoffice memorandum, Michigan Department of Natural Resources Fisheries Division Habitat Management Unit, July 27, 2017.
- Gabelhouse, D.W. 1984. A length-categorization system to assess fish stocks. *North American Journal of Fisheries Management*, 4(3), 273–285.
- Gladwin County Record and Beaverton Clarion. 2013, November 8. Railroads of northwestern Gladwin County. [gladwinmi.com](http://gladwinmi.com).

- Latta, W.C. 1973. Rotenone as a toxicant for fisheries management in Michigan (Fisheries Research Report No. 1803). Michigan Department of Natural Resources, Fisheries Division.
- Little Forks Conservancy. 2011. Cedar River Watershed Management Plan (updated). University of Michigan-Flint, University Outreach. Prepared for Little Forks Conservancy, Midland, Michigan, through MDNRE grant tracking number 2009-0036. Original plan created August 2001 by Michael D. Turner, Gladwin Conservation District.
- Michigan DNR Fish Stocking Database. Hoister Lake (20N 02W 08), Gladwin County. Records since 1979.
- Parson, R.L. 2005. Hoister Lake fisheries survey report. Michigan DNR Fisheries Division. Last updated by Jeffrey Jolley, DNR. On file with Michigan DNR Fisheries Division, Southern Lake Huron Management Unit, Bay City, Michigan.
- Pawloski, J.T. 2014. Dam safety inspection report: Hoister Lake Dam, Dam ID No. 329, unnamed tributary to North Branch Cedar River, Gladwin County, Section 8, T20N, R02W. Michigan Department of Environmental Quality, Water Resources Division, Dam Safety Program.
- Schneider, J.C. 1990. Classifying bluegill populations from lake survey data (Fisheries Technical Report No. 90-10). Michigan Department of Natural Resources, Fisheries Division.
- Schneider, J.C., & Merna, J.W. 2000. Survey reports. In J.C. Schneider (Ed.), Manual of fisheries survey methods II: With periodic updates (Fisheries Special Report 25). Michigan Department of Natural Resources.
- Simmons, A. 2022. Hoister Lake 2021 Status and Trends lake report. Michigan DNR Fisheries Division, Southern Lake Huron Management Unit, Bay City Customer Service Center, Bay City, Michigan.
- Stone, J., & Trumble, L.A. 2024. Dam safety inspection report: Hoister Lake Dam, Dam ID No. 329, tributary to N Br Cedar River, Gladwin County, NE ¼ Section 8, T20N, R02W. Michigan Department of Environment, Great Lakes, and Energy, Dam Safety Unit, Water Resources Division, Lansing, Michigan.
- Wehrly, K., et al. (in revision). Status and trends monitoring protocols. Michigan DNR Fisheries Division.
- Zaidel, P.A., Roy, A.H., Houle, K.M., Lambert, B., Letcher, B.H., Nislow, K.H., & Smith, C. 2021. Impacts of small dams on stream temperature. *Ecological Indicators*, 120, 106878.

**Tables and Figures**

Table 1. Oxygen, temperature, and pH profiles from Trout Lake, Gladwin County, June 2021 (selected depths).

<b>Depth (ft)</b>	<b>Temperature (°F)</b>	<b>Dissolved Oxygen (ppm)</b>	<b>pH</b>	<b>Specific conductance (mS/cm)</b>
0	74.50	10.98	9.47	.2580
1	74.30	11.28	9.43	.2580
2	73.50	11.34	9.35	.2660
3	72.20	10.89	9.25	.2830
4	70.40	9.70	9.08	.3020
5	69.60	9.59	9.06	.2980
6	69.20	9.23	9.02	.3010
7	68.40	9.62	9.03	.2920
9	67.50	10.11	9.04	.2890
10	66.80	10.11	9.03	.2910
11	66.60	10.01	9.07	.2910
12	66.20	10.06	9.04	.2910
13	66.00	10.01	9.02	.2900
14	65.60	9.68	8.98	.2920
15	65.40	8.60	8.89	.2980
16	65.30	8.61	8.86	.2980
17	65.20	7.85	8.81	.3040
18	64.90	5.42	8.68	.3200
19	64.70	3.61	8.58	.3390
20	64.30	0.86	8.42	.3670
21	63.80	0.46	8.36	.7600
22	62.80	0.31	8.30	.3930
23	61.80	0.31	8.27	.4040
24	61.30	0.26	8.19	.4120
25	61.00	0.24	8.15	.4170

Table 2. Dam safety inspection history for Hoister Lake Dam (ID No. 329), Gladwin County, Michigan, 1976–2025.

<b>Date</b>	<b>Rating</b>	<b>Key recommendations / actions</b>
1976	Not rated	Minor seepage at embankment toe; concrete spalling on control structure top; water entering structure through stoplog opening (underspill) rather than overtop; check stoplogs recommended
1977	N/A (repair)	Stop logs replaced (presumed from historical records)
1979	Good	Embankment very good condition; downstream seepage attributed to adjacent springs; concrete spalling at water line between stoplog slots; repair recommended
1984	N/A (repair)	Stop logs replaced
1988	Good	Concrete spalling on drop inlet box; 9 feet of stoplogs in upstream slots creating underspill; seepage with ferrous oxide content at right wingwall indicating deep embankment flow; settlement depression ~10 ft wide, ~6 in deep in dam crest over outlet tube; erosion at left abutment; repair cost estimated <\$1,000; no O&M plan
1991	Good	1988 concrete repairs not implemented; spillway riser concrete spalling ongoing; seepage on right downstream slope adjacent to outlet pipe; repair cost estimated \$1,000-\$2,000; trees and brush on embankment slopes; no O&M plan
1999	Fair	Moderate to severe concrete deterioration and spalling on riser with exposed steel reinforcement at right upstream corner; debris blocking downstream access road culvert; seepage at embankment toe both sides of outlet; CMP corrosion noted; concrete repairs required by June 1, 2000; no O&M plan
2009	Good	Continued concrete deterioration on riser at water line; trash rack rusted, not cleaned despite 2 prior recommendations; seepage at embankment toe both sides of outlet; CMP corrosion; CMP replacement recommended within 10-15 years (timeline now elapsed); no O&M plan
2014	Satisfactory	Concrete deterioration on spillway riser (priority); camera inspection of outlet pipe recommended; O&M plan required
2017	N/A (repair)	Outlet structure rehabilitated: riser concrete patched, stop logs replaced, CMP video inspection completed (corrosion noted, no holes or pipe separation); cost estimated \$2,200
2019	Satisfactory	2017 repairs confirmed adequate; quarterly toe seepage monitoring recommended; O&M plan required
2024	Fair	Remove debris from spillway riser (immediate); patch concrete on spillway riser to minimum 3-inch thickness by December 31, 2025; regrade, stabilize, and revegetate downstream embankment depression by December 31, 2025; remediate seepage sinkholes adjacent to concrete wingwalls; O&M plan required

Table 3. Fish stocking history for Hoister Lake, Gladwin County, Michigan, 1940-2020.

Year	Species	Number	Strain	Mean total length (in.)
1940	Brook Trout	Unknown	—	—
1941	Brook Trout	6700	—	—
1942	Brook Trout	6700	—	—
1943	Brook Trout	10000	—	—
1946	Brook Trout	6700	—	—
1947	Brook Trout	6700	—	—
1948	Brook Trout	6700	—	—
1949	Brook Trout	4500	—	—
1950	Brook Trout	6700	—	—
1951	Brook Trout	1000	—	—
1956	Brook Trout	367	—	—
1957	Brook Trout / Rainbow Trout	600	—	—
1958	Brook Trout	600	—	—
1959–1964	Brook Trout	600/yr	—	—
1962	Brook Trout	3600	—	—
1965–1974	Rainbow Trout	2300/yr	—	—
1975–1988	None	—	—	—
1989	Brown Trout	500	Plymouth Rock	6.22
1990	Brown Trout	497	Soda Lake	5.00
1991	Brown Trout	440	Plymouth Rock	6.54
1992	Brown Trout	480	Wild Rose	6.73
1993	Brown Trout	490	Wild Rose	7.40
1994	Brown Trout	500	Wild Rose	6.61
1995–2017	None	—	—	—
2018	Rainbow Trout	590	Eagle Lake	6.15
2019	Rainbow Trout	630	Eagle Lake	7.52
2020	Rainbow Trout	630	Eagle Lake	7.80

Table 4. Fish species captured and relative abundance during the 1993, 2005, and 2021 Status and Trends surveys of Hoister Lake, Gladwin County, Michigan.

<b>Species</b>	<b>Number captured</b>	<b>Percent by number</b>	<b>Weight (lb.)</b>	<b>Percent by weight</b>	<b>Length range (in.)</b>	<b>Mean total length (in.)</b>
Bluegill	158	37.4	56.5	37.6	6–9	8.2
Bluntnose Minnow	59	13.9	0.1	0.1	1–2	1.6
Brook Stickleback	2	0.5	0.0	0.0	1	1.5
Brook Trout	2	0.5	1.5	1.0	9–14	11.5
Central Mudminnow	1	0.2	0.0	0.0	1	1.5
Green Sunfish	2	0.5	0.2	0.2	3–6	—
Largemouth Bass	77	18.2	59.1	39.4	7–15	11.6
Rainbow Trout	1	0.2	1.9	1.3	17	17.2
Rock Bass	20	4.7	4.9	3.3	5–8	6.9
White Sucker	9	2.1	10.6	7.0	10–15	14.7
Yellow Perch	92	21.7	15.4	10.3	5–10	7.6
All species	423	100.0	150.3	100.0	—	—

Table 5. Mean length at age, number of fish ages in parenthesis, and growth index score for five species collected during the June 2021 Status and Trends survey of Hoister Lake, Gladwin County, Michigan.

Age	Bluegill	Brook Trout	Largemouth Bass	Rainbow Trout	Yellow Perch
Growth index*	0.6	—	-2.1	—	0.1
Age 3	6.53 (4)	9.50 (1)	10.32 (6)	17.20 (1)	6.87 (32)
Age 4	7.53 (3)	—	10.50 (10)	—	8.88 (3)
Age 5	7.87 (7)	14.30 (1)	11.94 (7)	—	9.12 (2)
Age 6	7.87 (3)	—	12.38 (10)	—	10.25 (2)
Age 7	8.44 (5)	—	12.58 (8)	—	10.05 (2)
Age 8	8.81 (5)	—	13.90 (1)	—	—
Age 9	8.40 (2)	—	15.80 (1)	—	—
Age 10	9.10 (1)	—	—	—	—

\*Mean growth index = mean length at age minus state average length at age (Schneider et al. 2000). Values within  $\pm 1.0$  in. of zero considered similar to state average (Bluegill:  $\pm 0.5$  in.). -- indicates insufficient sample size to calculate index. Values are mean total length (in.) with number of fish aged in parentheses.



Figure 1. General location of Trout Lake in Gladwin County, Michigan. The black star indicates location of Trout Lake.

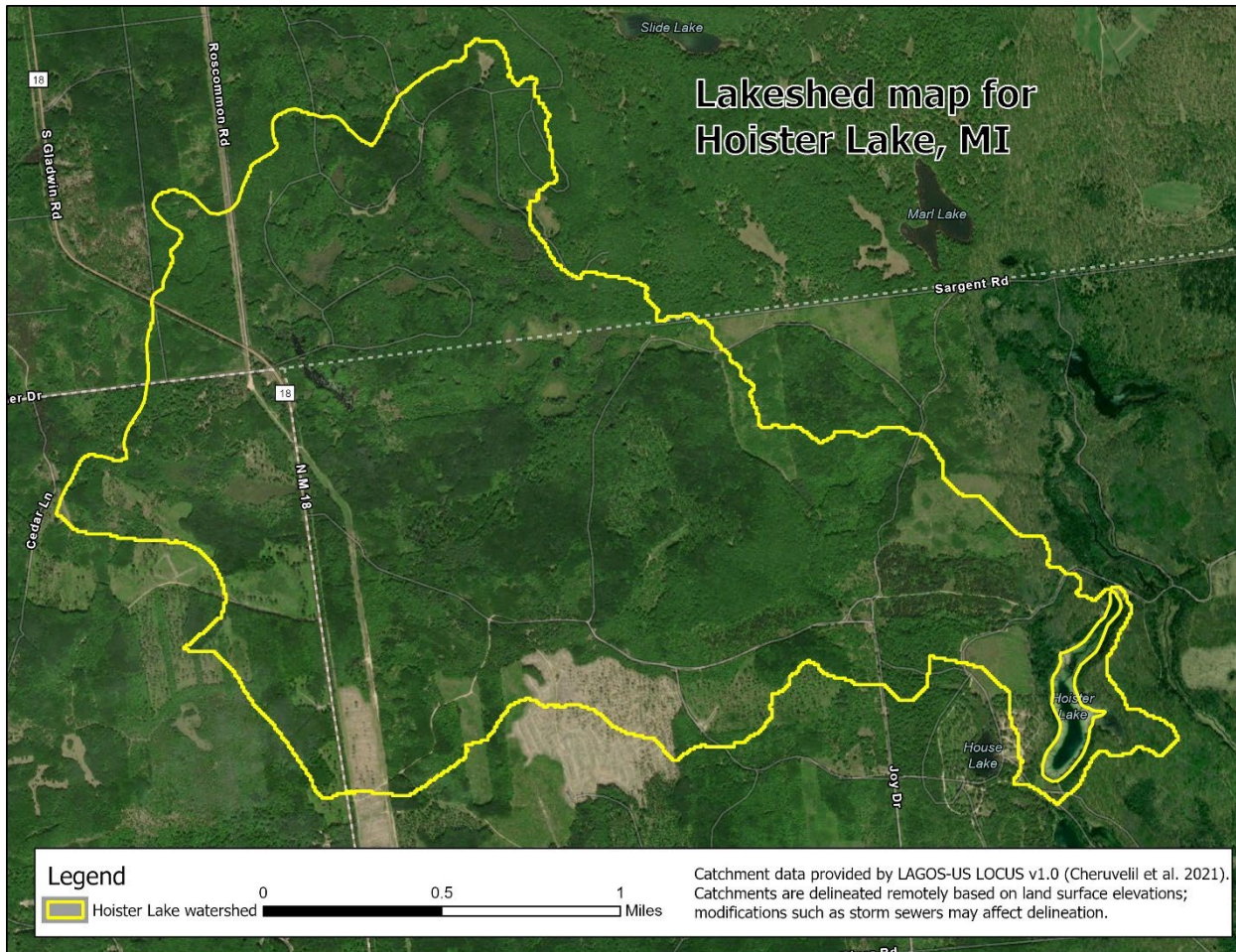


Figure 2. Lakeshed of Hoister Lake in Gladwin County, Michigan.

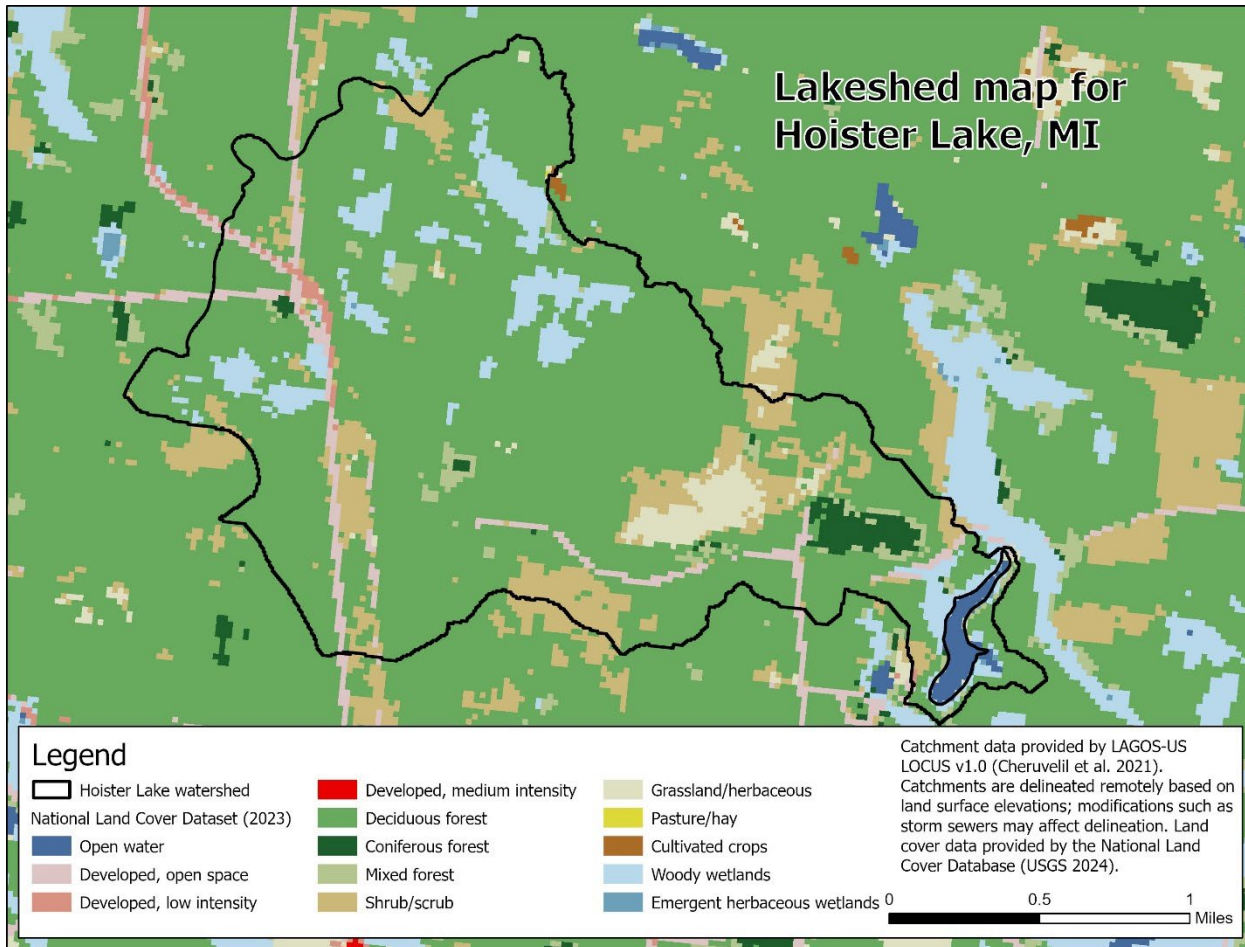


Figure 3. Land use in the Hoister Lake watershed. Lakeshed map and land cover type from 2023 imagery (USGS 2024) for Trout Lake.

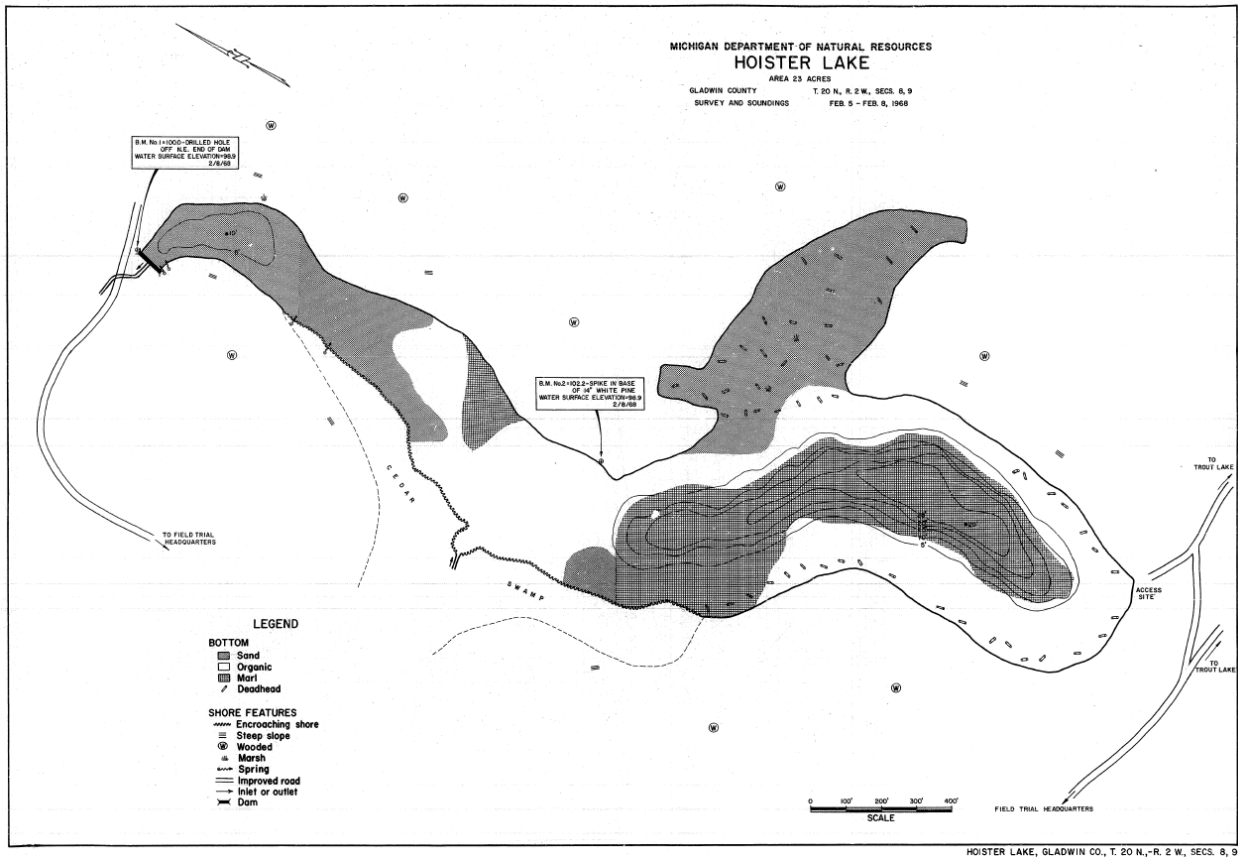


Figure 4. Bathymetric map for Hoister Lake in Gladwin County, Michigan. Contour lines represent depth in feet.

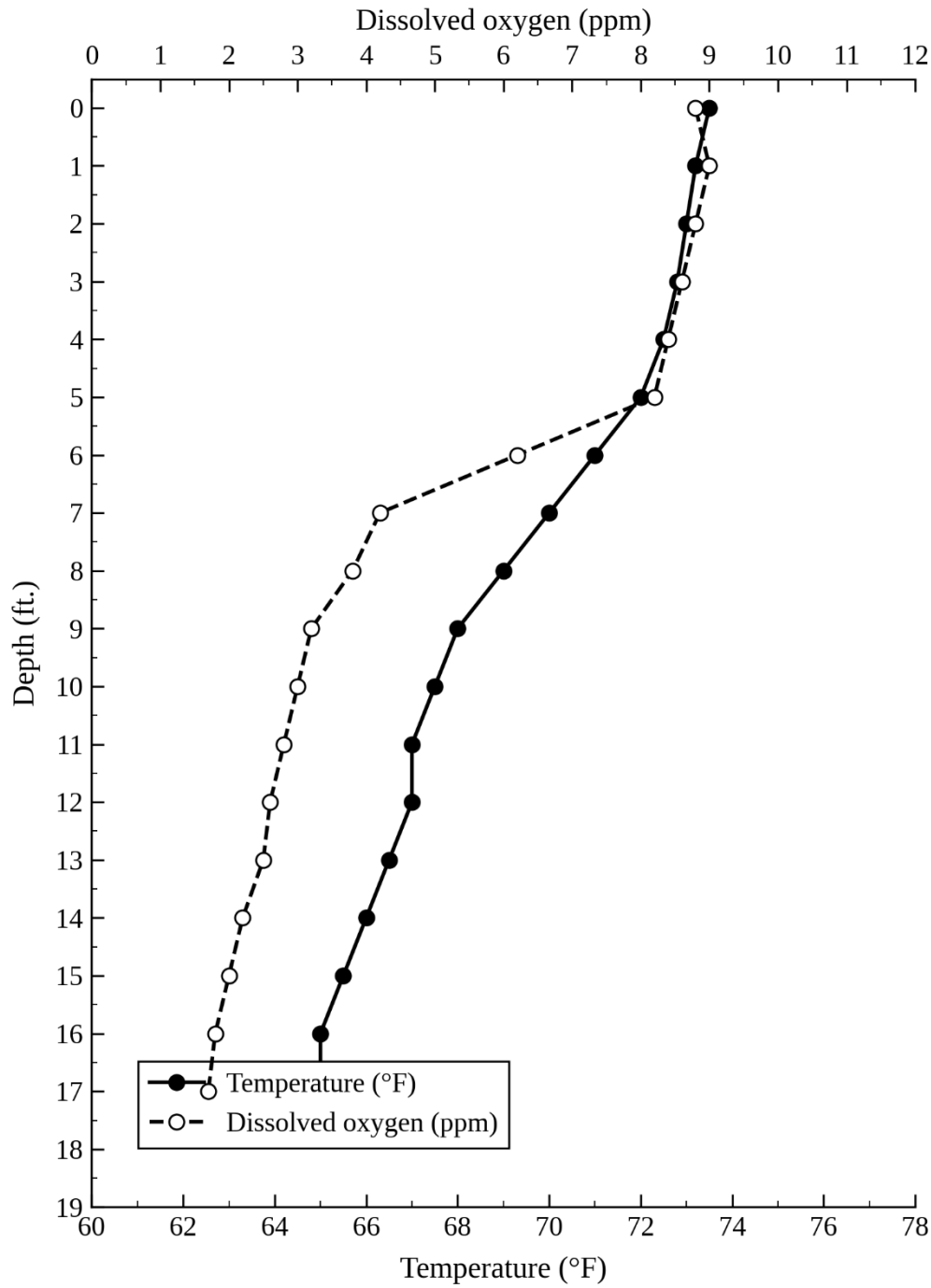


Figure 5. Temperature and dissolved oxygen profiles, Hoister Lake, Gladwin County, Michigan, August 2021.

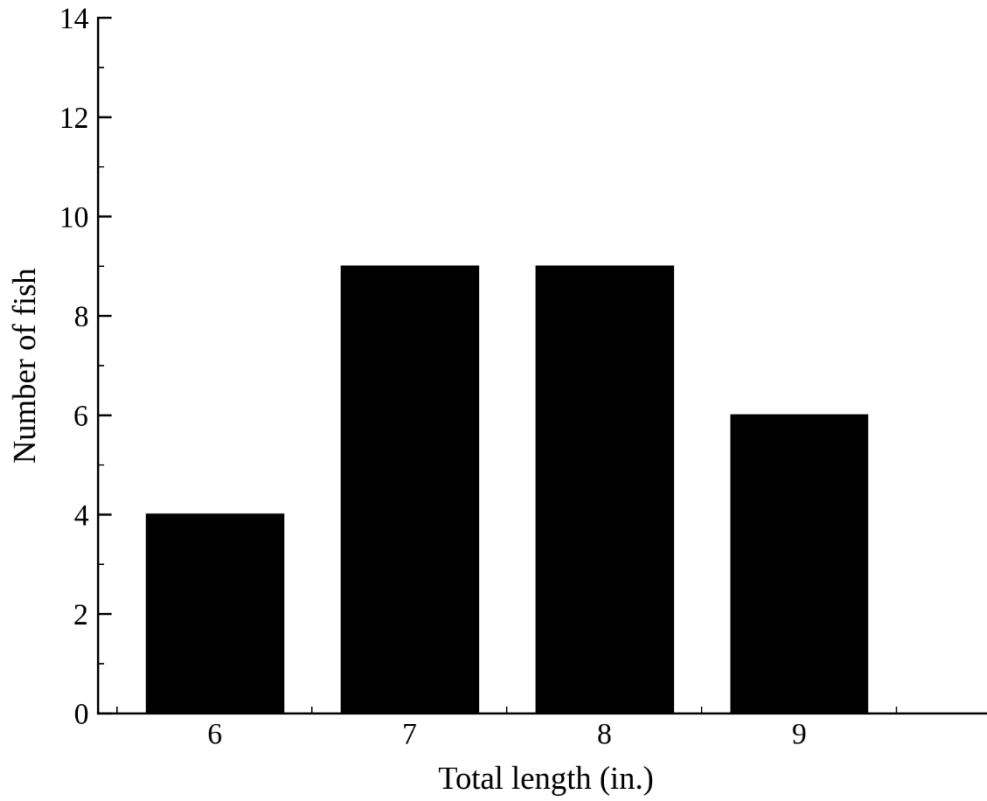


Figure 6. Length-frequency of Bluegill collected during the 2021 survey of Hoister Lake, Gladwin County, Michigan.

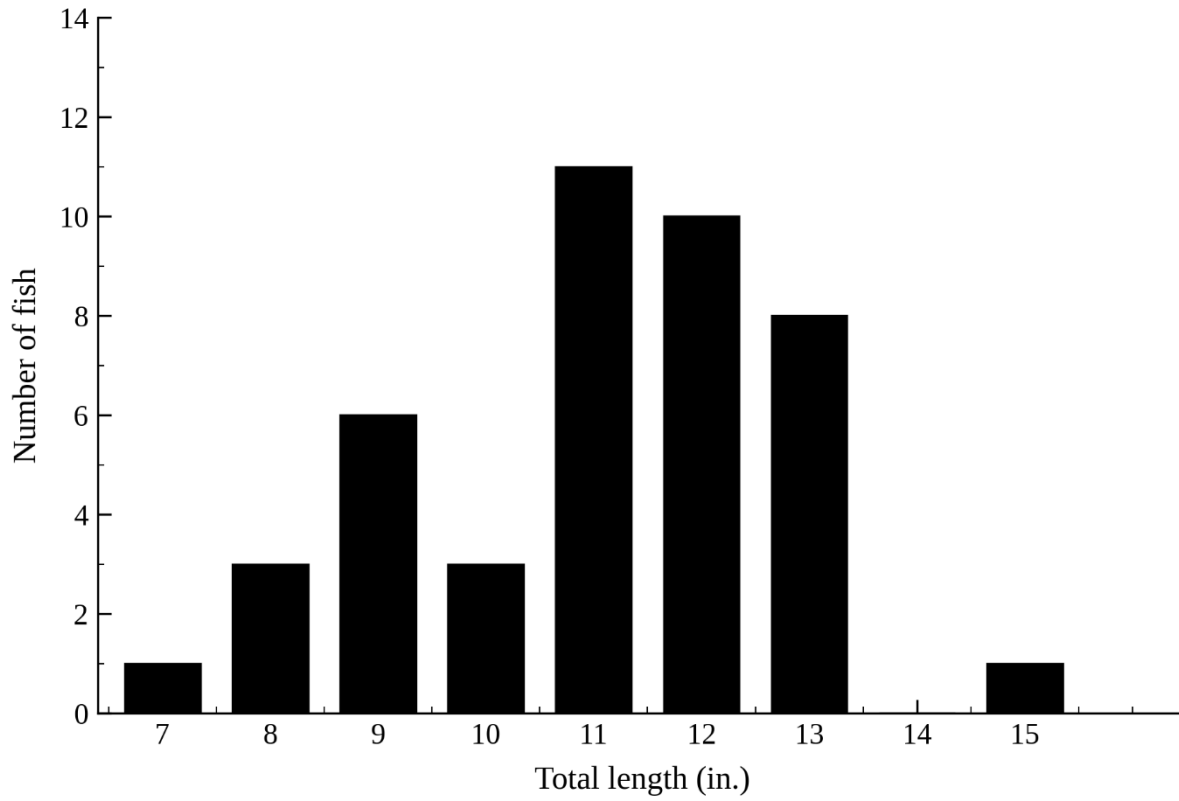


Figure 7. Length-frequency of Largemouth Bass collected during the 2021 survey of Hoister Lake, Gladwin County, Michigan.

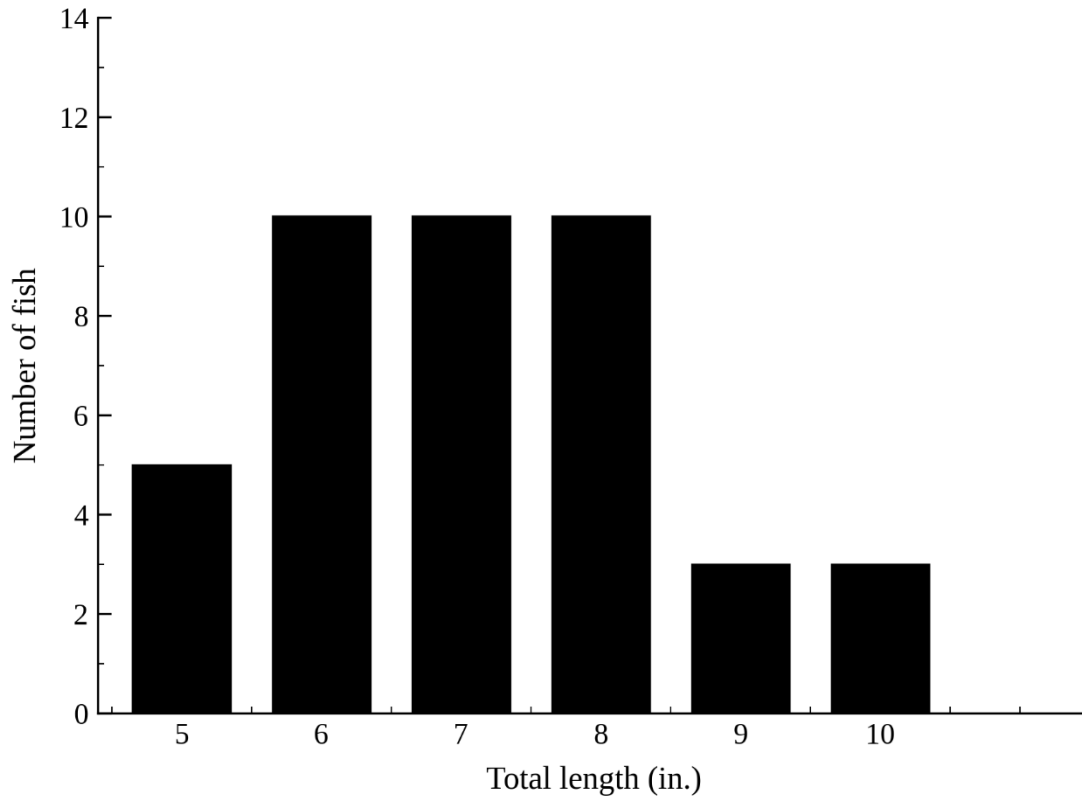


Figure 8. Length-frequency of Yellow Perch collected during the 2021 survey of Hoister Lake, Gladwin County, Michigan.

**Literature Path**

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