Trout Lake

Gladwin County, T20N R02W Secs. 8 & 9
Cedar River Watershed, Last Surveyed 2015

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Environment

Trout Lake is a 27.5-acre glacial kettle lake located within the Gladwin Field Trial Area (formerly the Gladwin Game Refuge; Barlow 2018) 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. Trout Lake and the adjacent Hoister Lake each sit at the headwaters of separate unnamed tributaries to the North Branch Cedar River (Figure 2). The surrounding landscape is managed by the Michigan DNR Forestry Division primarily for dog field trials, with limited hunting also permitted (Barlow 2018). Public access is provided via a rustic state forest campground on the southwest shore, which includes toilets, a boat ramp, and roads; the campground generated $25,350 in revenue and 1,268 booked nights in 2024, with five-year annual revenues ranging from $18,800 to $25,350. Gas-powered motors are not permitted on the lake. No private development borders the lake.

The lake occupies a glacially formed kettle depression in a hilly landscape of sandy and sandy loam upland soils intermixed with lowland cedar swamps (Figure 3). The immediate shoreline is wooded with alder, tamarack, and spruce. 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. 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, with minimal agricultural or developed land use. Wetland communities, including cedar swamps, are characteristic of the low-lying areas surrounding the lake and are integral to the local hydrology (Figure 5).

A limnological survey conducted in August 2015 documented the following water quality characteristics (Table 1; Schrouder 2015): Secchi depth was 13 feet, pH ranged from 7.0 to 7.9, and alkalinity was 120 mg/L. The lake exhibited a gradual temperature gradient without a strong thermocline. Dissolved oxygen declined in deeper areas and was limiting (below 3 ppm) below 8 feet, effectively restricting coldwater fish habitat to surface waters during summer stratification (Figure 7). Trophic status was evaluated using Carlson's Trophic Status Index: Secchi disk depth (13 ft.), total phosphorus (0.00153 mg/L), and total chlorophyll-α (1.51 μg/L) yielded a composite TSI score of 39.4, indicating mesotrophic conditions (Carlson & Simpson 1996). Mesotrophic lakes are characterized by moderate biological productivity, good water quality, and some potential for hypolimnetic anoxia during summer stratification.

Fishery Resource

<u>History</u>
Pre-dam conditions

The earliest documented survey of Trout Lake was conducted on August 24, 1938, by R.C. Ball of the Institute for Fisheries Research, cooperating with the Michigan Department of Conservation (Ball 1938). At that time, the pre-impoundment lake was approximately 5.3 acres with a maximum depth of 15 feet, a marl and fibrous peat bottom, and abundant Chara vegetation. Water color was blue green.

pH ranged from 7.6 to 8.0 and dissolved oxygen measured 3.9 ppm above the thermocline and 9.0 to 9.9 ppm in the upper 15 feet. Fish species documented included Common Shiner and Bluntnose Minnow; no game fish were captured. The outlet at that time consisted of overflow from a beaver dam that drained through swamp and eventually reached the Cedar River. The lake was described as lightly fished with a local general reputation as a poor fishery.

A November 1960 reconnaissance survey of the future impoundment site recorded the natural lake at 1.4 acres with a maximum depth of 10 feet, average depth of 7 feet, marl bottom, and Chara vegetation — consistent with the 1938 survey (Dean 1960b). The variation in recorded lake area between 1938 (5.3 acres) and 1960 (1.4 acres) is consistent with documented beaver activity and fluctuating water levels at the site (Figure 6). Brook Trout were documented in the outlet stream at the time of the 1960 survey and had been stocked into the existing kettle lake from 1947 through 1952 (Table 2). The Michigan Department of Conservation Fish Division Management Record for Trout Lake recommended that stocking be discontinued, the water level stabilized, and a dam be constructed at the outlet to support an annual stocking of 1,500 fingerling Brook Trout in late fall for fishery enhancement.

Dam construction

Planning for the Trout Lake impoundment began in earnest in 1960. The proposed dam site at the southeast outlet had steep terrain on both sides, requiring approximately 100 linear feet of fill. A 15-foot head at the dam was estimated to create a 31-acre impoundment with an average depth of 9 feet and maximum depth of 19 feet, requiring clearing of 13 acres of cedar timber averaging 14 inches in diameter. An interdepartmental correspondence chain from October 1960 through August 1961 (Hammond, Dean, Fanselow, Tody, Wicklund, Bohland) documented the planning, cost estimation, materials procurement, and construction coordination. The dam was formally proposed in January 1961 (Fanselow to Engineering and Architecture) and constructed in fall 1961 under foreman supervision by the Lake and Stream Improvement Section (Wicklund 1961, Bohland 1961). The impoundment was constructed with Dingell-Johnson (DJ) federal Sport Fish Restoration funds (Peterson 1978).

The dam consists of a 6.5-foot-wide, 19-foot-high concrete riser structure, an earthen embankment, a 30-inch-wide corrugated steel pipe conduit approximately 90 feet long, and two wooden stoplog bays. The double-bay stoplog design was intended to function as a bottom draw, discharging cooler hypolimnetic water to the outlet stream — a feature with potential benefit for downstream coldwater habitat. In practice, the bottom draw has provided only intermittent benefit. The inlet is subject to recurring sedimentation that periodically blocks the lower draw, and the structure has functioned primarily as a surface-discharge impoundment throughout its management history. Even during periods when the bottom draw was operational following stoplog maintenance, the thermal benefit to the outlet stream was likely limited given the shallow depth of the impoundment and the restricted volume of coldwater habitat available during summer stratification. The dam is regulated under Part 315 Dam Safety as a low-hazard dam, meaning no loss of life is expected in the event of failure and economic and environmental damages would be limited. Because of the low-hazard classification, the structure is ineligible for most state or federal repair grants.

The construction of the Trout Lake dam in 1961 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 Trout Lake is a textbook illustration of this approach and of its limitations, as the subsequent fisheries management history would demonstrate across the U.S. landscape.

Inspection and maintenance responsibility for the dam has historically been assigned to the District Fisheries Biologist, with annual inspection required. The earliest inspection records (Peterson 1978) document a recommendation to replace boards in the dam, with boards replaced in July 1978. Subsequent inspections in 1980 established a twice-yearly spring and fall inspection schedule. By June 1982, the underspill was found non-functioning and boards were again replaced in September 1982 (LEM 1982). Formal dam safety inspections conducted by state engineers between 1976 and 2019 consistently rated the structure as good or satisfactory, with routine recommendations for vegetation management and monitoring of minor seepage at the downstream toe (Table 3). The 1988 inspection (Croskey 1988) documented ferrous oxide content in the toe seepage, indicating deep flow through the dam foundation findings that warranted annual monitoring and foreshadowed geotechnical concerns raised in 2024. The 2014 inspection (Pawloski 2014) formally recommended a camera-assisted inspection of the outlet pipe, citing recent corrosion failures at comparable DNR-owned corrugated metal pipe structures; that recommendation was not acted upon before the 2024 inspection cycle. This pattern of recurring stoplog maintenance, unaddressed pipe deterioration, and progressive structural wear over six decades is consistent with — and in hindsight predictive of — the poor condition documented by Michigan Department of Environment, Great Lakes, and Energy (EGLE) in 2024 (Table 3).

An August 2024 inspection by EGLE Dam Safety classified the dam's condition as "Poor." Notable deficiencies included severe deterioration of the wooden stoplogs (which had led to an uncontrolled 7-foot drawdown in 2024), advanced corrosion and suspected leakage in the outlet conduit, and structural deficiencies requiring immediate remedial action. The DNR Dam Management Committee recommended dam removal in October 2024, and the Resource Bureau endorsed removal in December 2024. Following an April 8, 2025, public meeting hosted by Gladwin County Commissioners with Fisheries Division and EGLE staff, and an April 9 inter-agency meeting, EGLE verbally approved an emergency drawdown permit. Drawdown was conducted April–July 2025 at a rate of 12 inches per week to reduce ecological and structural impacts, with weekly monitoring addressing fish and wildlife concerns. Drawdown was completed July 11, 2025, and the structure was inspected the same day. The inspection found that approximately 50% of the 30-inch corrugated steel pipe outlet showed advanced corrosion, visible holes, and ongoing leakage — requiring repair or replacement before any refill would be possible. The concrete riser structure showed no visible cracking and was in satisfactory condition. EGLE recommended a geotechnical survey of the embankment before investment in repairs; a comparable survey at Cornwall Dam (~$10,000) had identified seepage not visibly detectable, and a similar finding at Trout Lake would require a retrofit or full rehabilitation to retain the structure.

The deteriorating condition of the Trout 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 Trout Lake dam, at 65 years old, exceeds its engineered lifespan by 15 years. Nationally, the average age of dams is 64 years and more than 70% have surpassed the 50-year threshold. In Michigan, the average dam age is 74 years. 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 Trout Lake structure. The ASCE's 2025 Infrastructure

Report Card assigned the nation's dams a grade of D+, estimating that over $165 billion is needed to rehabilitate non-federal dams (ASCE, 2025). For small, state-owned structures like Trout Lake, 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 (Association of State Dam Officials [ASDSO], 2025).

Fisheries history

Following dam construction and impoundment in 1961–1962, the lake was chemically treated with rotenone and stocked with Brook Trout and Brown Trout. The lake was drawn down and treated again in September 1963. Despite repeated chemical treatments and stocking of multiple trout species through the late 1960s and into the 1970s, trout populations never established successfully, and stocking was discontinued following the 1972 season due to consistently poor returns (Table 2). The failure of trout to persist was not surprising in retrospect: the headwater cedar swamp environment impounded by the dam is characterized by warm surface temperatures, limited dissolved oxygen at depth, organic sediment accumulation, and highly variable water levels — conditions incompatible with self-sustaining coldwater fish populations (Zaidel et al., 2021; Kashiwagi & Miranda, 2009).

Management shifted to warmwater species in 1976, when the lake was drawn down, chemically treated, and restocked with Bluegill and Largemouth Bass. Brown Trout stockings resumed intermittently from 1973 to 1986, with a final stocking of 1,500 yearling Brown Trout in 1986. A 1986 fisheries survey documented an out-of-balance predator-prey relationship and the lake's designation as a "trout lake" was formally removed. Management continued as a warmwater lake thereafter.

The dam was drawn down in 1999 to repair and replace stoplogs. Rainbow Trout were stocked from 2001 to 2003 as an interim fishery during population recovery following the drawdown. No fish were stocked after 2003. Stoplogs were replaced in approximately 2014 without requiring a full drawdown. A 2015 fisheries survey documented a fish community dominated by overabundant and stunted sunfish with an out-of-balance predator-prey ratio.

Historical fish community surveys

Two previous post-impoundment fisheries surveys provide context for interpreting the 2015 fish community. A gill net survey conducted July 27–30, 1981 (Lake and Kalling; analyzed by Jaffery) captured 569 fish totaling 74.6 pounds across 18 gill net sets at depths of 1–12 feet. Brown Bullhead dominated the catch at 424 fish (74.5% by number, 49.2 lb.), followed by Bluegill at 90 fish (15.8%, 6.3 lb.), Yellow Perch at 39 fish (6.9%, 10.5 lb.), Largemouth Bass at 15 fish (2.6%, 7.5 lb.), and one White Sucker (0.8 lb.). No trout were captured, and one fisherman reported no trout had been caught in several years despite active Brown Trout stocking during 1973–1977. Growth analysis documented above-average growth for all species evaluated: Bluegill (ages II–IV, mean growth index +0.3), Largemouth Bass (ages I–II, mean growth index +0.3), and Yellow Perch (ages I–III, mean growth index +3.0). Cover was described as abundant stumps, weed beds, downed trees, and brush. The survey biologist recommended either total chemical treatment followed by restocking with yearling Brown Trout or managing the lake for bass and Bluegill with special regulations.

A boomshocker (electrofishing) survey conducted September 8, 1986 (Shepherd and Hamilton; analyzed by Shepherd and Mrozinski) captured 179 fish in 0.41 hours of shocking at 2–5 feet depth. Largemouth Bass dominated the catch at 136 fish (76.0%), with Bluegill at 35 (19.6%), Brown Trout at 7 (3.9%), and one Common Sucker. Mean lengths were 7.7 inches for Largemouth Bass, 5.3 inches for Bluegill, and 8.4 inches for Brown Trout. Crayfish were noted as an abundant food source. The survey biologist described the Brown Trout as "very thin" and recommended removing the lake from the designated trout list and discontinuing trout stocking, while noting an "excellent population of Largemouth Bass coming on." This survey led to the formal removal of Trout Lake's trout lake designation.

Comparison of the 1981, 1986, and 2015 surveys reveals a consistent trajectory of declining fishery quality (Table 4). In 1981, the warmwater community was relatively balanced despite bullhead dominance, with above-average growth across all game fish species. By 1986, Largemouth Bass had increased substantially following the 1976 chemical treatment and restocking and appeared to be establishing a functional predator guild. However, by 2015 the community had shifted to extreme panfish dominance with severely stunted growth and virtually no bullheads. The loss of predator-prey balance likely resulted from a combination of declining bass recruitment, insufficient predator biomass to control panfish reproduction, and progressive habitat degradation from organic sediment accumulation in the aging impoundment.

<u>Current status of the fish community</u>

Methods

The fish community of Trout Lake was sampled May 25–29, 2015, as part of the Michigan DNR Fisheries Division's Status and Trends Monitoring Program. Sampling methods followed standardized Status and Trends protocols (Wehrly et al., in revision). A total of two experimental gill nets were set for one night each (2 total net nights), nine large-mesh fyke nets were set for one night each (9 total net nights), and four small-mesh fyke nets were set for one night each (4 total net nights). One seine haul was also conducted. 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, Rock Bass, Yellow Perch, and Largemouth Bass. Weights for all fish species were calculated using length-weight regression equations compiled by Schneider et al. (2000), developed from statewide survey data. Limnological sampling was conducted on August 12, 2015, during the warmest part of the year when the lake was fully stratified and dissolved oxygen concentrations at depth are most limiting. Temperature, dissolved oxygen, and pH were recorded at one-foot depth intervals at the deepest location in the lake (18 feet).

The relative abundance for each fish species was assessed using catch per unit effort (CPUE) calculated as the number of fish caught per net night (gill and fyke nets) or per seine haul. The CPUE data from this survey were compared to summary CPUE data from lakes surveyed in the Status and Trends program during 2001–2015 on both a statewide level and a regional level for the Southern Lake Huron Management Unit (SLHMU). A growth index was calculated for each species and age class by subtracting the statewide average mean length-at-age from that of the 2015 Trout Lake survey. Growth indices for age classes represented by a minimum of five fish were averaged to provide a mean index of growth for each species (Schneider et al., 2000). Mean growth index scores ranging from 1.0 to −1.0 are considered similar to the statewide average (except for Bluegill, where −0.5 to 0.5 is considered average), whereas scores less than −1.0 and greater than 1.0 (less than −0.5 and greater than 0.5 for Bluegill) are considered below and above the statewide average, respectively. Bluegill size structure was also rated using a combined index based on mean length, proportions of fish greater than 6.0 inches, 7.0 inches, and 8.0 inches collected using specific gear types, and mean growth index score (Schneider, 1990; Schneider, 2000).

Results

A total of 2,048 fish representing 9 species were captured in the 2015 survey (Table 4). Bluegill dominated the catch, contributing 85% (1,733 fish) of the total by number. Rock Bass were the second most abundant species at 9.4% of the total catch. All remaining species individually comprised less than 3% of the total catch. Predators — Largemouth Bass, Northern Pike, and one Northern Muskellunge — collectively represented less than 1% of the catch by number but contributed a greater proportion by weight. No minnow species were collected.

Bluegill catch rates were 123.4 fish per net night in large-mesh fyke nets and 155.2 fish per net night in small-mesh fyke nets. Bluegill ranged from 1 to 7 inches and averaged 4.3 inches (Figure 8). Only 2% of Bluegill were of angler-acceptable size (≥ 6 inches). Age classes I through VIII were documented, indicating the population has good longevity, but growth was severely below average, with a mean growth index of −1.0. The Schneider size structure index score for Bluegill was 1.0, which is rated "very poor" and is worse than most lakes surveyed in the region (Table 5). Size structure, growth rates, and age distribution collectively indicate a population limited by intraspecific competition for food resources rather than by mortality or poor recruitment.

Rock Bass were the second most abundant species, with a catch rate of 6.0 fish per net night in large-mesh fyke nets and 34.8 fish per net night in small-mesh fyke nets. Rock Bass ranged from 1 to 10 inches and averaged 4.5 inches. Eight age classes (ages I–IX) were represented in the sample. Growth was well below the statewide average, with a mean growth index of −1.7. The high catch rates, broad age structure, and severely stunted growth are consistent with an overcrowded population experiencing strong intraspecific competition.

Pumpkinseed (n = 49) were collected exclusively in large-mesh fyke nets and small-mesh fyke nets, ranged 2 to 3 inches, and averaged 2.6 inches. Only young age classes (ages I–III) were represented. Longear Sunfish (n = 33) and Green Sunfish (n = 3) were also captured in small numbers; all were small (2–3 inches) with no legal-size individuals observed. Collectively, sunfish of all species dominated the catch by number, and all exhibited size structures consistent with an overcrowded panfish assemblage.

Yellow Perch (n = 22) were present in low numbers but were the only species in the 2015 survey exhibiting above-average growth, with a mean growth index of +0.4. Yellow Perch ranged from 6 to 9 inches and 55% of individuals were at or above the angler-desirable size of 7 inches (Table 5). Age classes III through VI were represented in the sample, and the catch rate in experimental gill nets was 1.5 fish per net night. Yellow Perch appear to benefit from reduced intraspecific competition relative to the overcrowded sunfish assemblage.

Predator abundance was critically low. Only 8 Largemouth Bass were captured, with a large mesh fyke net catch rate of 0.8 fish per net night. Largemouth Bass ranged from 2 to 14 inches, with the majority below legal harvest size (15 inches). It should be noted that no night electrofishing was conducted during this survey; Largemouth Bass are well known to be net-shy and are most effectively sampled by electrofishing. Largemouth Bass abundance was likely underrepresented in the 2015 survey data. Six Northern Pike were captured, primarily in large mesh fyke nets and gill nets, ranging 20 to 31 inches. Predators comprised approximately 11% of total catch by weight, below the 20–50% range considered indicative of a balanced predator-prey community (Schneider, 2000).

The capture of a single Northern Muskellunge (36 inches, 13.3 lb.) was entirely unexpected. Trout Lake has no documented connectivity with waters supporting Muskellunge populations, and the species has not been stocked in the lake or adjacent watershed. The origin of this individual cannot be explained by natural dispersal or management activity; an unauthorized augmented transfer is the most probable explanation (Schrouder, 2015).

During limnological sampling on August 12, 2015, Secchi depth was 13 feet (Table 1). Dissolved oxygen declined with depth and fell below 3.0 ppm at depths greater than 8 feet, effectively eliminating coldwater and coolwater habitat in the lower portion of the water column during summer stratification (Figure 7). pH ranged from 7.0 to 7.9. The composite Carlson Trophic Status Index score of 39.4 indicated mesotrophic conditions.

During the May 2015 survey, 6 Snapping Turtles (12–16 inches) and 20 Painted Turtles (3–6 inches) were also observed.

Analysis and Discussion

The 2015 fish community survey documented a severely imbalanced community dominated by stunted panfish and critically deficient of predators. Bluegill were the most abundant species by a wide margin, comprising 85% of the total catch, and the population ranked "very poor" on the Schneider size structure index (Table 5). The mean growth index of −1.0 and near-complete absence of fish at or above angler-acceptable size indicate a population constrained by intense intraspecific competition for food resources rather than by harvest pressure or poor recruitment. Rock Bass exhibited even more severe growth depression (mean growth index −1.7) despite a broad age structure spanning eight year classes, further supporting an overcrowded condition lake-wide. The total absence of minnow species from the catch is consistent with competitive exclusion or depletion of forage resources by the dense panfish assemblage.

Yellow Perch were the sole exception to the pattern of poor growth, with a mean growth index of +0.4 and most individuals at or above angler-desirable size. This likely reflects lower competitive pressure on Yellow Perch relative to the sunfish guild, and suggests the lake retains some capacity for individual fish quality even within an imbalanced community.

Predator abundance was insufficient to regulate panfish populations. Largemouth Bass catch rates were below expected values for SLHMU lakes, and the absence of night electrofishing likely resulted in further underrepresentation of this species. Even accounting for gear bias, the evidence collectively indicates a critically low predator-to-prey ratio. Northern Pike were present in low numbers, and the single Muskellunge, while notable, does not constitute a functional predator population. The absence of sufficient predator biomass allows panfish populations to persist at densities that preclude individual growth throughout the community.

Collectively, the three post-impoundment surveys spanning 1981, 1986, and 2015 document a fishery that has never achieved the management objectives for which the impoundment was created and has followed a consistent trajectory of decline despite repeated intervention. In 1981, the warmwater community showed above-average growth across all game fish species. By 1986, Largemouth Bass appeared to be establishing a functional predator guild. By 2015, both of those positive signals had disappeared entirely. The 65-year record — four chemical treatments, repeated stocking of multiple species, periodic drawdowns, and ongoing structural maintenance — documents intensive management effort with consistently poor long-term outcomes.

Management Considerations

Recreational value

The Trout Lake impoundment 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, and the rustic state forest campground attracts visitors who value solitude and direct access to nature. The campground generated $25,350 in revenue and 1,268 booked nights in 2024, with five-year revenues ranging from $18,800 to $25,350 annually. At the April 8, 2025, public meeting hosted by Gladwin County Commissioners, stakeholders emphasized the recreational importance of the lake — including swimming, paddling, and wildlife viewing — alongside its role as an economic draw for a region with limited recreational infrastructure. Loons have been documented nesting on the lake, and the quiet water paddling and wildlife observation opportunities it provides are legitimate public benefits that exist independent of fishery condition.

The fishery itself, while poor by objective metrics, still offers recreational opportunity. Anglers willing to target Bluegill and Rock Bass in quantity rather than quality can find willing fish. Individual Yellow Perch of above-average size and legal Largemouth Bass are present in the community, and Northern Pike add an element of surprise. The lake provides an accessible and scenic angling experience in an undeveloped setting — a value not captured by growth indices or predator-prey ratios. These recreational benefits would persist in some form if the dam were removed, though the character of the experience would change substantially: the impounded lake would give way to a restored wetland and headwater stream system, trading still-water paddling and bank fishing for stream corridor recreation and wildlife habitat.

Ecological context and management feasibility

The 65-year management record of Trout Lake makes a clear case that the impoundment was constructed in an environment unsuited to sustaining the kind of fishery it was intended to produce. The headwater cedar swamp environment is characterized by warm surface temperatures, limited dissolved oxygen at depth, organic sediment accumulation, and nutrient dynamics that favor panfish over both coldwater and balanced warmwater communities — all conditions well documented at Trout Lake and consistent with the broader scientific literature on small headwater impoundments (Zaidel et al. 2021; Kashiwagi & Miranda, 2009; Brown et al. 2024). The trout fishery failed repeatedly over two decades of intensive stocking and chemical treatment. The warmwater community that replaced it achieved a brief period of balance before reverting to the stunted panfish-dominated state documented in 2015 — and is likely to remain in that state without sustained management intervention.

Restoring a quality fishery in Trout Lake under current conditions would require the kind of intensive management more commonly applied to private impoundments: periodic drawdowns for fish community restructuring, systematic predator stocking, harvest incentive programs, and likely repeated chemical treatments to reset panfish populations. This level of intervention is not commensurate with the Department's mission and exceeds its management capacity and resources for a 27.5-acre headwater impoundment on public land in a state with over 6,000 lakes of 10 acres or larger. Contemporary fisheries management emphasizes working within the ecological capacity of existing habitats rather than attempting to engineer systems beyond their natural potential (Bellmore et al., 2019; Dietrich et al., 2025). Small headwater dams are now widely recognized as disproportionately harmful to aquatic ecosystems relative to their size — through thermal alteration of downstream reaches, disruption of native fish assemblage connectivity, and risk of significant sediment loading in the event of failure (Kashiwagi & Miranda, 2009; Brown et al., 2024).

Dam removal would restore longitudinal connectivity to the North Branch Cedar River headwaters, re-establish natural thermal and hydrologic regimes, and allow recovery of the wetland and riparian communities inundated during impoundment. Brook Trout were documented in the outlet stream prior to impoundment (Dean, 1960b), and the pre-impoundment lake was a coldwater system with Chara vegetation, marl substrate, and spring-fed inputs — all indicators of habitat capable of supporting native salmonid populations. The broader Cedar River system is designated trout water, and a Status and Trends backpack electrofishing survey conducted July 24, 2024, approximately one mile downstream of the Trout Lake outlet documented 85 fish representing 5 taxa over a 700-foot reach, with Brook Trout dominating at 75.3% of the catch (n = 64, 2–8 inches) and Brown Trout also present (n = 4, to 11 inches). The presence of a robust coldwater community this close to the outlet confirms that the receiving stream has the ecological capacity to support native salmonid populations and that restoration of headwater connectivity would provide immediate and meaningful benefit. Research on dam removal outcomes consistently demonstrates that headwater stream ecosystems recover relatively rapidly — often within three to five years — with recovery 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 maintenance and rehabilitation costs are high, ecological benefits of impoundment are limited, and restoration potential is strong — removal is increasingly the long-term management direction most consistent with both fiscal responsibility and ecological outcomes.

Management Direction

Current

Trout Lake is currently managed under standard statewide fishing regulations with no special regulations in effect. Given the current fish community condition — dominated by overcrowded, slow-growing panfish with critically low predator abundance — no regulatory changes are recommended at this time. Special regulations would be unlikely to meaningfully improve fish community balance in the absence of structural changes to the impoundment or active population management, and the impending dam removal or repair decision renders near-term regulatory action premature.

Trout Lake began a managed drawdown in April 2025 under emergency authority following deterioration of the dam's stoplog system and identification of significant structural concerns with the 64-year-old outlet pipe conduit. EGLE rated the dam's condition as "Poor" in August 2024. The DNR Dam Management Committee recommended dam removal in October 2024, and the DNR Resource Bureau endorsed removal in December 2024. A public press release recommending removal was issued January 27, 2025. An emergency drawdown was initiated in April, 2025 at 12 inches per week to alleviate pressure on the deteriorating structure and was completed July 11, 2025. The July 2025 inspection confirmed advanced corrosion with visible holes and ongoing leakage in the outlet conduit, requiring repair or replacement before any refill. A final drawdown permit application was submitted to EGLE in February 2026 and is out for public comment. No active fisheries management has been implemented since 2003 (last fish stocking).

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/

Association of State Dam Safety Officials. (2025). Roadmap to reducing dam safety risks. https://damsafety.org/Roadmap

Ball, R. C. (1938). Lake summary: Trout Lake, Gladwin County. Institute for Fisheries Research, cooperating with Michigan Department of Conservation, Division of Fisheries, University of Michigan.

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.

Bohland, R. (1961). Memorandum to Norman Brown, Land Use Specialist: Materials for Trout Lake Dam, Gladwin County, T20N, R2W, Sec. 29. Michigan Department of Conservation, Fisheries Division.

Brown, R. L., Charles, D., Horwitz, R. J., Pizzuto, J. E., Skalak, K., Velinsky, D. J., & Hart, D. D. (2024). Size-dependent effects of dams on river ecosystems and implications for dam removal outcomes. Ecological Applications, 34(6), e3016.

Carlson, R. E., & Simpson, J. (1996). A coordinator's guide to volunteer lake monitoring methods. North American Lake Management Society.

Croskey, G. F. (1988). Dam safety inspection report: Trout Lake Dam, Gladwin County (Dam ID No. 330). Michigan Department of Natural Resources, Land and Water Management Division, Dam Safety and Lake Engineering Unit.

Dean, B. (1960a). Memorandum to Roger Wicklund, Technical Supervisor: Reconnaissance impoundment surveys. Michigan Department of Conservation.

Dean, B. (1960b). Memorandum to Jack Hammond, District Fisheries Supervisor: Trout Lake impoundment. Michigan Department of Conservation.

DeVaun, D. L. (2019). Dam safety inspection report: Trout Lake Dam, Dam ID No. 330, unnamed tributary to North Branch Cedar River, Gladwin County, Section 9, T20N, R02W.

Michigan Department of Environment, Great Lakes, and Energy, Water Resources Division, Hydrologic Studies and Dam Safety Unit.

Dietrich, J. P., Rickard, A., Sethi, S., Cuppett, S., & Sullivan, P. (2025). Dam removal restores aquatic ecosystem within three years. Ecosphere, 16(7), e70345.

Fuller, L. M., & Minnerick, R. J. (2008). State and regional water-quality characteristics and trophic conditions of Michigan's inland lakes, 2001–2005 (Scientific Investigations Report 2008-5188). U.S. Geological Survey.

Kashiwagi, M. T., & Miranda, L. E. (2009). Influence of small impoundments on habitat and fish communities in headwater streams. Southeastern Naturalist, 8(1), 23–36.

Kirk, M. A., & Rahel, F. J. (2022). Forested watersheds mitigate the thermal degradation of headwater fish assemblages under future climate change. Ecology of Freshwater Fish, 31(2), 339–353.

Lake, & Kalling. (1981). Fish collection: Trout Lake, Gladwin County, T20N, R2W, Sec. 8, 9 (R8058 4/81). Michigan Department of Natural Resources, Fisheries Division.

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.

Michigan Department of Conservation. (1960). Management record: Trout Lake, Gladwin County, T20N, R2W, Secs. 8 & 9 (Cons. 8076, 8/60). Fish Division.

Michigan Department of Natural Resources. (1973–1986). Record of fish planted: Trout Lake, Gladwin County, T20N, R2W, Sec. 9 (R 8075, 4/73). Fisheries Division.

Pawloski, J. T. (2009). Dam safety inspection report: Trout Lake Dam, Dam ID 330, unnamed tributary to North Branch Cedar River, Gladwin County, Section 9, T20N, R02W. Michigan Department of Environmental Quality, Land and Water Management Division, Dam Safety Program.

Pawloski, J. T. (2014). Dam safety inspection report: Trout Lake Dam, Dam ID 330, unnamed tributary to North Branch Cedar River, Gladwin County, Section 9, T20N, R02W. Michigan Department of Environmental Quality, Water Resources Division, Dam Safety Program.

Peterson, D. R. (1978). Facilities inventory: Trout Lake Dam, Facility No. F-Glad-ID-2, T20N R2W Sec. 9, N. Branch Cedar River, Gladwin County. Michigan Department of Natural Resources, Fisheries Division, District 8.

Peterson, D. R. (1978–1982). Facilities inspection record: Trout Lake Dam, Facility No. F-Glad-ID-2, Gladwin County (R8062 9/78). Michigan Department of Natural Resources, Fisheries Division.

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.

Schrouder, K. S. (2015). Trout Lake Michigan inland lakes status and trends survey 2015. Michigan Department of Natural Resources.

Shepherd, R. E., & Hamilton. (1986). Fish collection: Trout Lake, Gladwin County, T20N, R02W, Sec. 09 (R8058 Rev. 3/82). Michigan Department of Natural Resources, Fisheries Division.

Wicklund, R. (1961). Memorandum to Art Feldhauser, Construction Supervisor, L.S.I.: Plans for Trout Lake Dam, Gladwin County. Michigan Department of Conservation.

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, August 2015 (selected depths). Ppm = parts per million.

Depth (ft.)	Temperature (°F)	Dissolved oxygen (ppm)	pH
0	73.12	8.46	7.93
1	73.11	8.84	7.93
2	73.02	8.86	7.93
3	72.93	8.84	7.82
4	72.82	8.87	7.92
5	72.74	8.92	7.91
6	72.06	8.24	7.77
7	71.18	6.36	7.53
8	70.21	4.03	7.41
9	69.52	2.71	7.33
10	68.95	2.57	7.29
11	68.43	2.59	7.27
12	67.55	2.66	7.23
13	67.17	2.63	7.23
14	66.66	2.18	7.20
15	66.16	1.80	7.19
16	65.83	1.57	7.19
17	65.18	1.58	7.08
18	65.03	1.48	7.13

Table 2. Fish stocking history for Trout Lake, Gladwin County, Michigan, 1947–2003.

Year	Species	Number	Life stage	Notes
1947	Brook Trout	2,500	Spring fingerling	
1948	Brook Trout	2,500	Spring fingerling	
1949	Brook Trout	1,500	Spring fingerling	
1950	Brook Trout	1,500	Spring fingerling	
1951	Brook Trout	1,700	Fall fingerling	
1952	Brook Trout	~1,500	Fingerling	Program discontinued; poor results
1962	Brook Trout	1,000	Legal	October; first stocking after impoundment
1962	Brown Trout	1,000	Legal	May
1964	Brown Trout	4,000	Fingerling	
1964	Rainbow Trout	1,000	Legal	May, Jun, Jul, Nov; total or per event unclear — verify against original records
1964	Brown Trout	1,000	Legal	May, Jun, Jul, Nov; total or per event unclear — verify against original records
1964	Brook Trout	1,000	Legal	May, Jun, Jul, Nov; total or per event unclear — verify against original records
1964	Largemouth Bass	300	Fingerling	
1965	Rainbow Trout	1,000	Legal	
1966	Rainbow Trout	2,860	Fall fingerling	
1967	Rainbow Trout	8,500	Fingerling	
1970	Rainbow Trout	1,300	Fall fingerling	
1970	Brown Trout	1,500	Yearling	
1970	Brown Trout	1,300	Spring fingerling	Post-drawdown/rotenone; fall stocking
1971	Brown Trout	2,000	Yearling	
1972	Brown Trout	2,000	Yearling	Stocking discontinued; poor returns
1973–1977	Brown Trout	3,000–4,000	Yearling	Annual stocking; discontinued after 1977
1983	Brown Trout	2,000	Yearling	
1984	Brown Trout	3,010	Yearling	
1985	Brown Trout	1,530	Yearling	
1986	Brown Trout	1,500	Yearling	Final stocking; trout lake designation removed after 1986 survey

2001	Rainbow Trout	Unknown	Unknown	Interim fishery post-1999 drawdown
2002	Rainbow Trout	Unknown	Unknown	Interim fishery post-1999 drawdown
2003	Rainbow Trout	Unknown	Unknown	Last stocking on record

Table 3. Dam safety inspection history for Trout Lake Dam (ID No. 330), Gladwin County, Michigan, 1976–2025.

Date	Rating	Key recommendations / actions
1976, May	Good	No repairs needed. Minor seepage at toe, not serious. Stoplogs not closely inspected; appeared satisfactory.
1978, Jul	—	First formal facilities inventory. Stoplogs replaced July 1978. Twice-yearly inspection schedule established 1980.
1979, Sep	Good	All components rated good. No deficiencies; no recommendations made.
1982, Sep	—	Underspill found non-functioning. Stoplogs replaced.
1988, Aug	Good	Ferrous oxide in toe seepage; annual monitoring recommended. Walkway bridge to riser removed. Safety concern: unguarded spillway adjacent to swim beach; warning signs recommended.
1999	—	Drawdown for stoplog repair and replacement.
2009, Jul	Good	Outlet pipe rated fair; vegetation obstructing outlet. Brush removal and O&M plan recommended.
2014, May	Satisfactory	Outlet pipe rated fair. Camera-assisted pipe inspection recommended, citing failures at comparable DNR structures. Not acted upon.
~2014	—	Stoplogs replaced without full drawdown.
2019, Jul	Satisfactory	Outlet pipe rated fair; minor corrosion near outlet. Camera inspection again recommended prior to 2024 inspection. Third consecutive inspection to flag pipe; recommendation not acted upon.
2024, Aug	*Poor*	Stoplogs severely deteriorated; ~2-ft uncontrolled drawdown. Pipe camera inspection unsuccessful. Removal recommended by DNR Dam Management Committee (Oct 2024) and Resource Bureau (Dec 2024).
2025, Jul	*Poor (pipe)*	Post-drawdown inspection. ~50% of outlet pipe showing advanced corrosion, visible holes, ongoing leakage. Geotechnical survey of embankment recommended before repair investment.

Table 4. Fish species captured and relative abundance in the 2015 Status and Trends survey of Trout Lake, Gladwin County, Michigan.

Species	**Number**	**Total weight (lbs)**	**Average length (in)**	**Length range (in)**
Bluegill	1733	94.7	4.3	1–7
Green Sunfish	3	0.1	3.5	3–3
Largemouth Bass	8	1.3	7.3	2–14
Longear Sunfish	33	0.6	2.9	2–3
Northern Muskellunge	1	13.3	36.5	36–36
Northern Pike	6	21.4	23.3	18–31
Pumpkinseed	49	0.7	2.6	2–3
Rock Bass	193	18	4.5	1–10
Yellow Perch	22	3.8	7.6	6–9
Total	**2048**	**154.1**		

** Length range and average length in total inches.*

*** Percent legal size based on Michigan minimum size limits.*

Table 5. Mean length at age and growth index score for five species that age structures were collected for during the 2015 fish survey on Trout Lake, Gladwin County, Michigan.

Age	Bluegill	Largemouth Bass	Pumpkinseed	Rock Bass	Yellow Perch
Growth index	*-1*	—	—	*-1.7*	*0.4*
Age 1	1.9 (18)	—	2.4 (11)	—	—
Age 2	—	6.4 (3)	3.1 (3)	3.1 (1)	—
Age 3	3.3 (6)	7.9 (3)	3.2 (7)	3.6 (4)	6.7 (11)
Age 4	4.4 (19)	—	—	4.4 (9)	8.1 (6)
Age 5	5.7 (11)	—	—	5.2 (8)	8.9 (3)
Age 6	6.3 (3)	—	—	6.1 (5)	7.9 (1)
Age 7	6.3 (2)	—	—	6.9 (6)	—
Age 8	6.2 (2)	—	—	8.1 (4)	—
Age 9	—	—	—	9.8 (2)	—

Values are mean length (inches) 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. This image contains a complex map. Call 517-284-5830 for assistance with reading or interpreting.

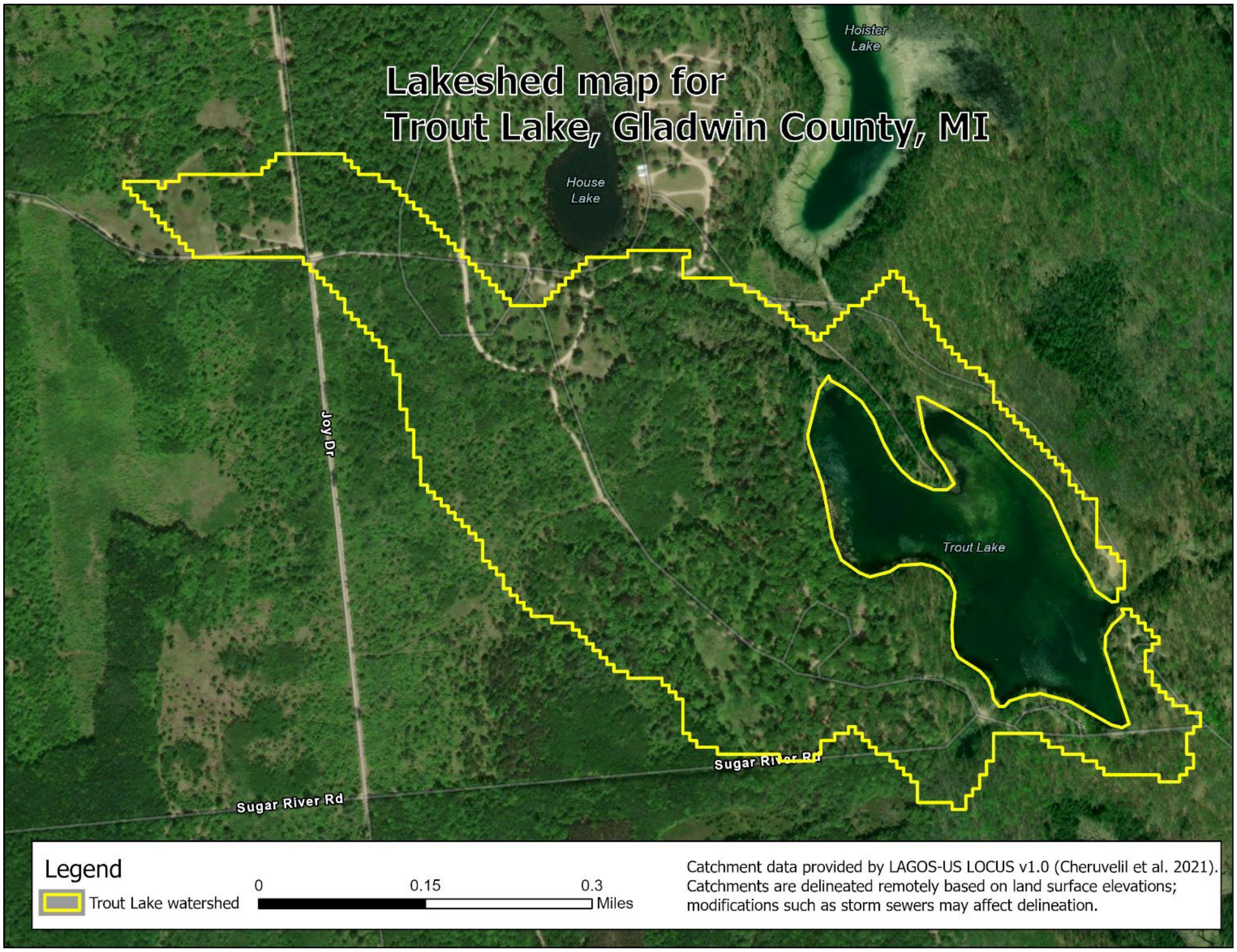

Figure 2. Lakeshed of Trout Lake in Gladwin County, Michigan. This image contains a complex map. Call 517-284-5830 for assistance with reading or interpreting.

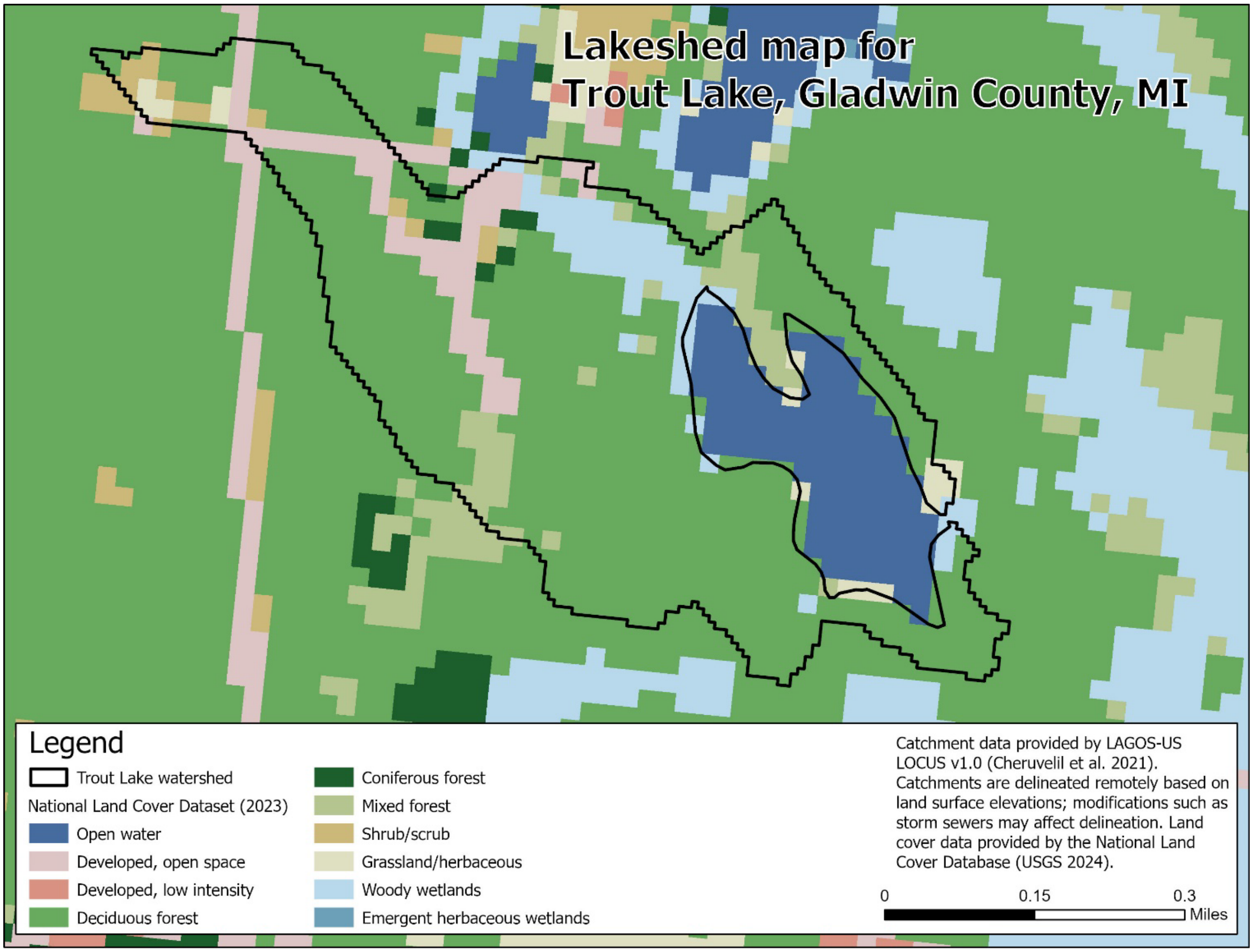

Figure 3. Land use in the Trout Lake watershed. Lakeshed map and land cover type from 2023 imagery (United States Geological Survey [USGS] 2024) for Trout Lake. This image contains a complex map. Call 517-284-5830 for assistance with reading or interpreting.

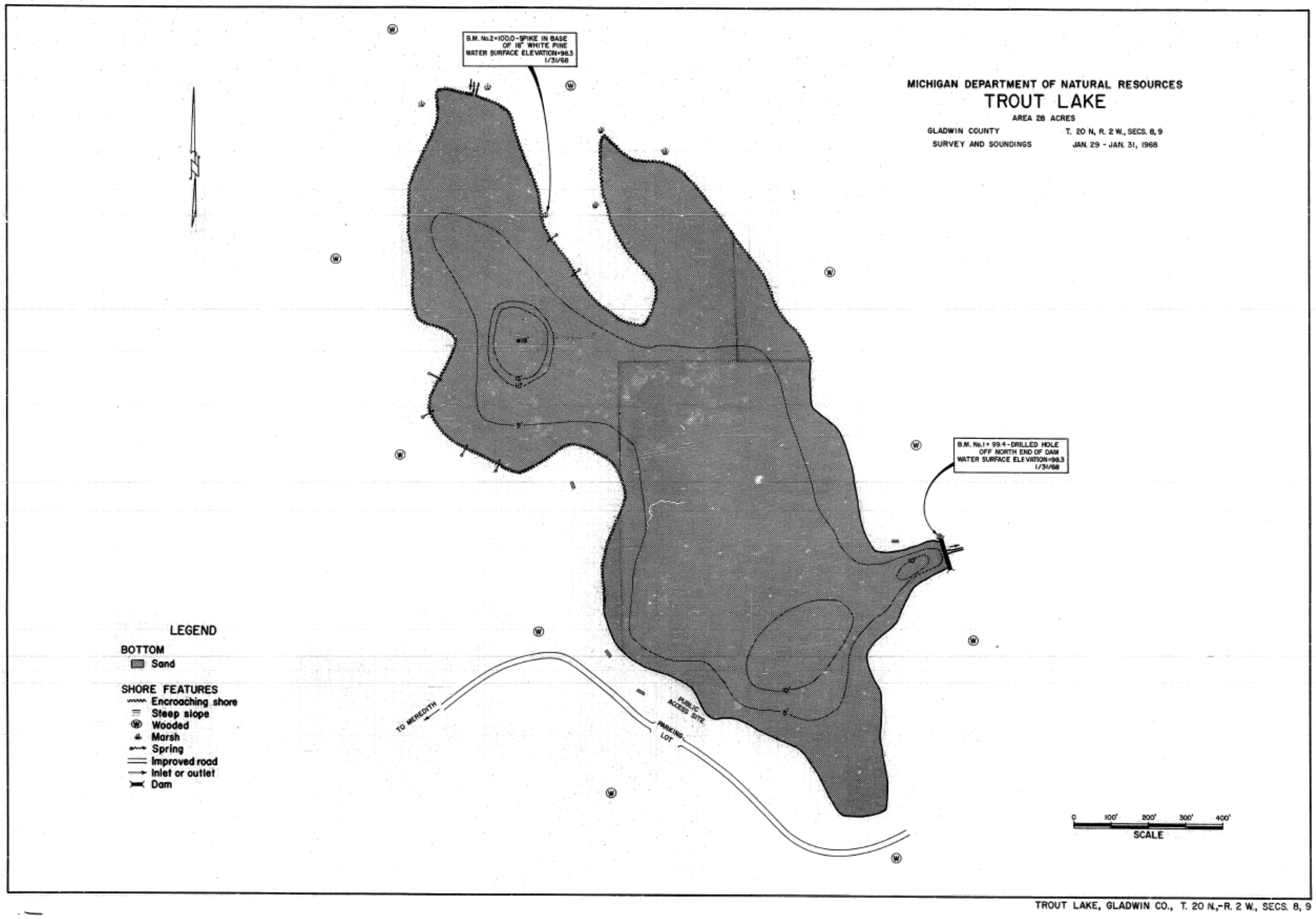

Figure 4. Bathymetric map for Trout Lake in Gladwin County, Michigan. Contour lines represent depth in feet. This image contains a complex map. Call 517-284-5830 for assistance with reading or interpreting.

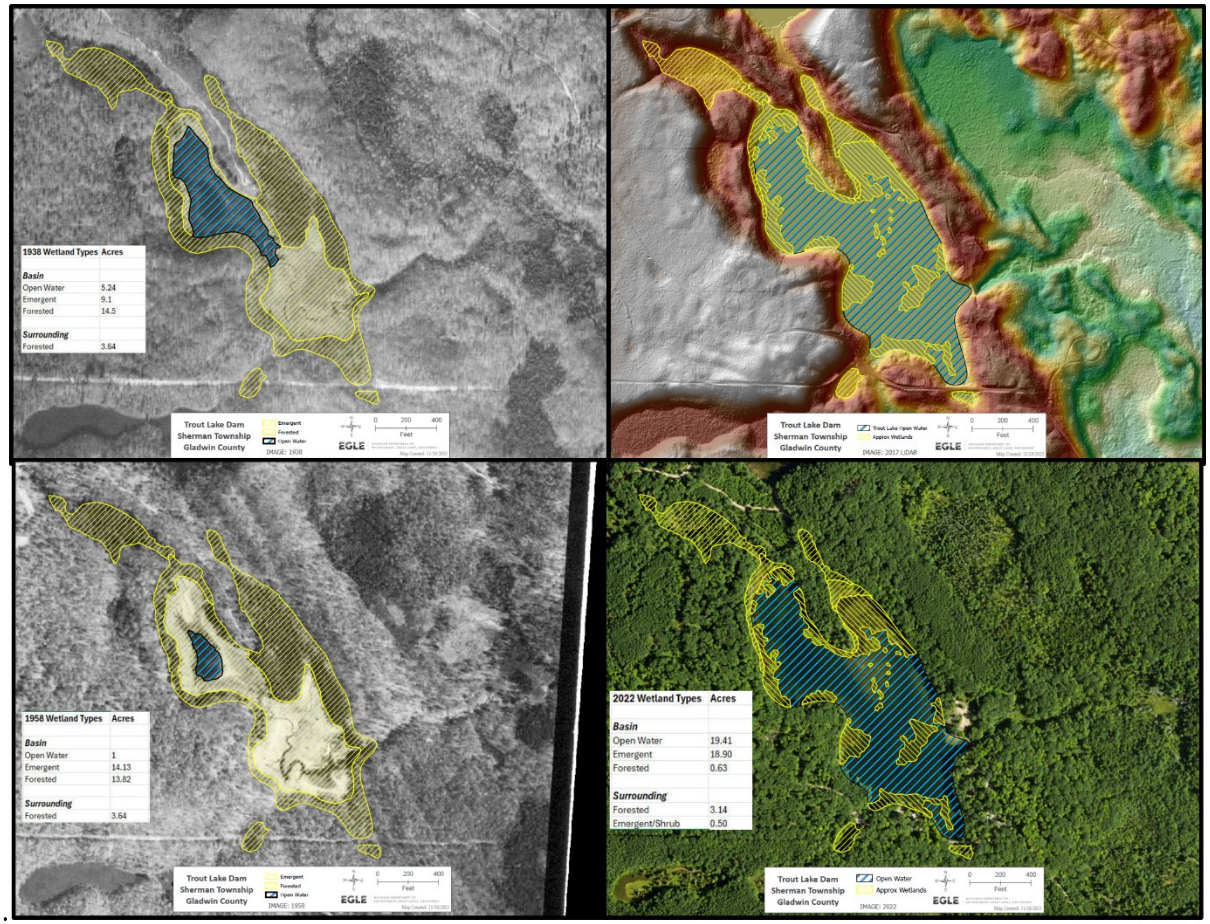

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Figure 5. Wetland coverage of Trout Lake in Gladwin County, Michigan before (1938 and 1958) and after (2017 and 2022) the construction of Trout Lake Dam. This image contains a complex map. Call 517-284-5830 for assistance with reading or interpreting.

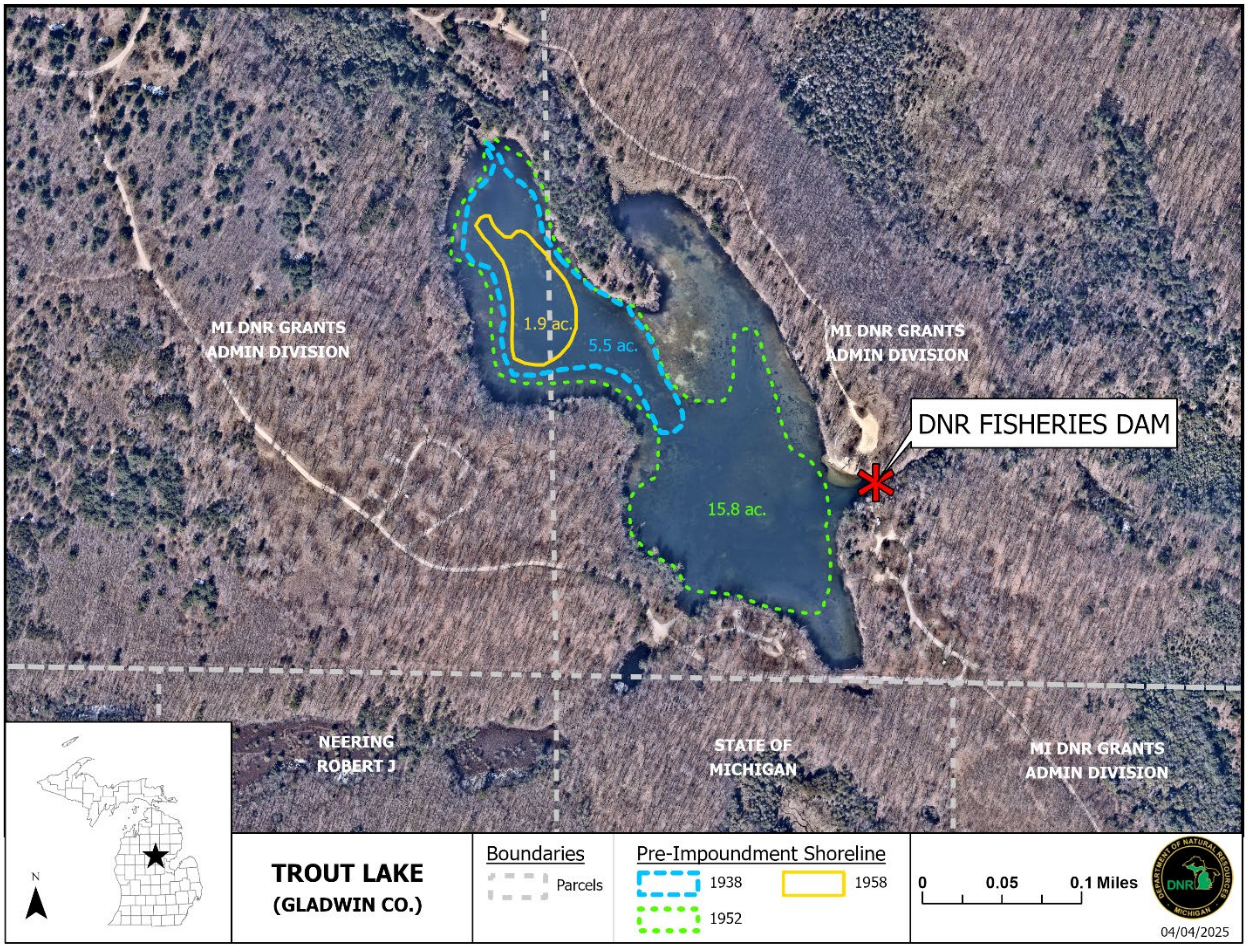

Figure 6. Open-water extent of Trout Lake, Gladwin County, in 1938, 1952, and 1958, prior to impoundment. This image contains a complex map. Call 517-284-5830 for assistance with reading or interpreting.

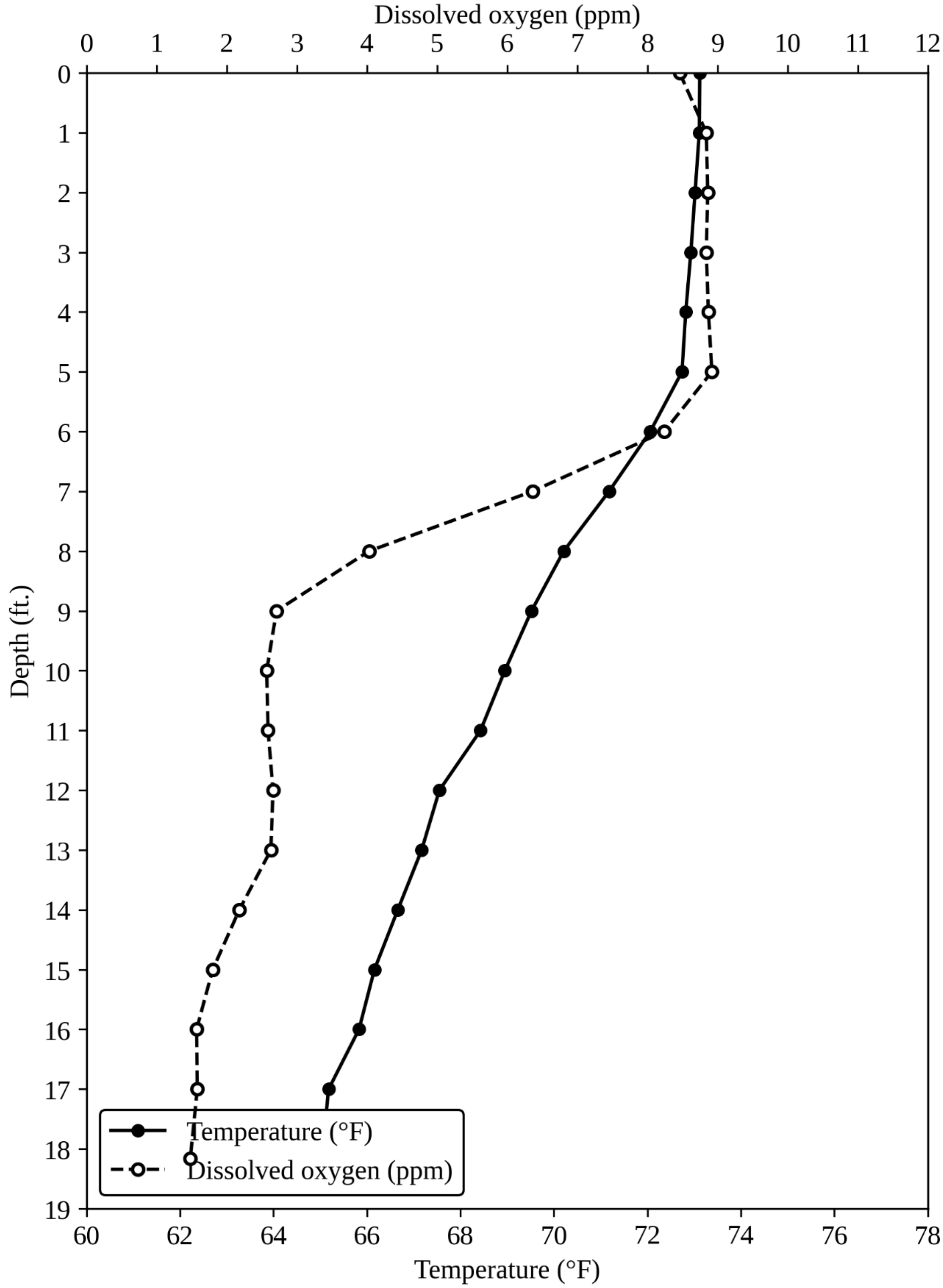

Figure 7. Temperature and dissolved oxygen profiles, Trout Lake, Gladwin County, Michigan, August 2015. Ppm = parts per million.

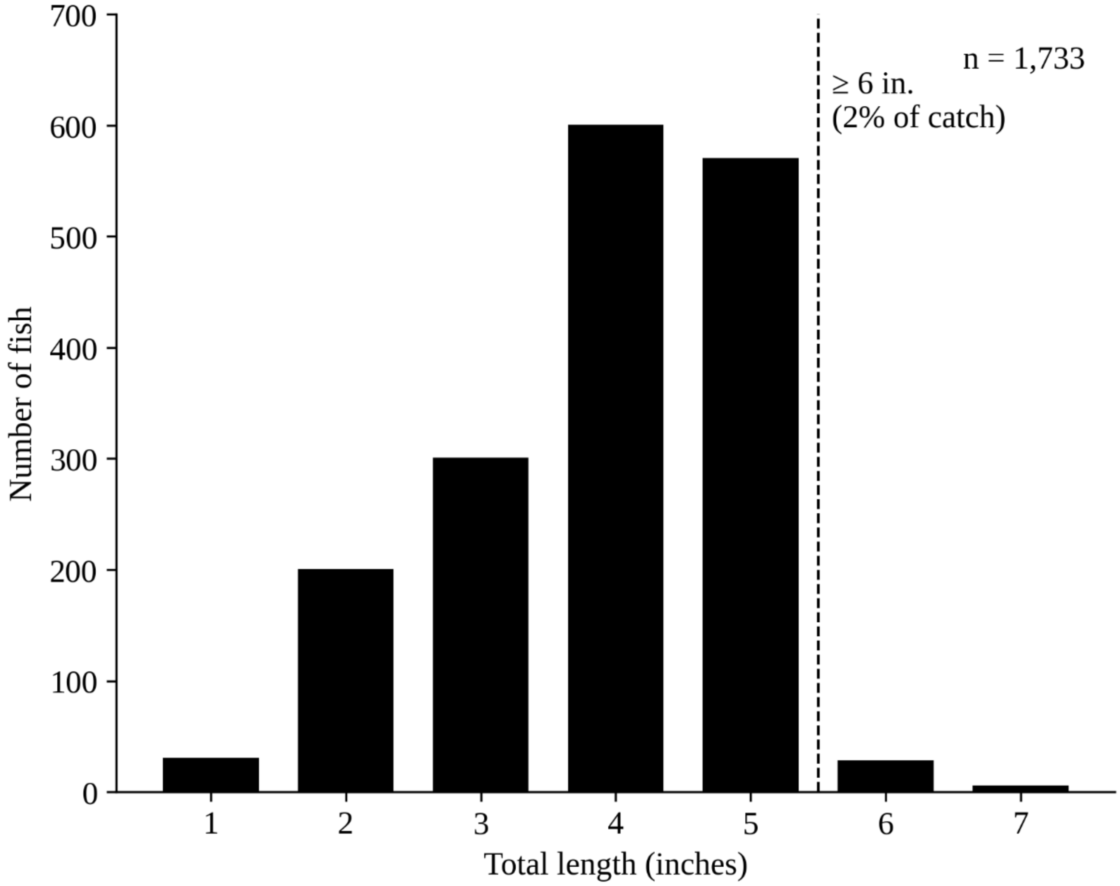

Figure 8. Length-frequency of Bluegill collected during the 2015 survey of Trout Lake, Gladwin County, Michigan.

Literature Path

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