

Cannon Lake Health

A healthy lake is one that is near its natural state. Water entering the lake has low levels of pollution. A healthy lake is protected by a natural shoreline and by investments in careful stewardship of the lake and its watershed (lakeshed).

About the Score

The Lake Health Score is an average of the Water Quality, Biology, and Hydrology Lake Health Component Scores and is on a 0 to 100 scale.

Lake Health Score (triangle): 25

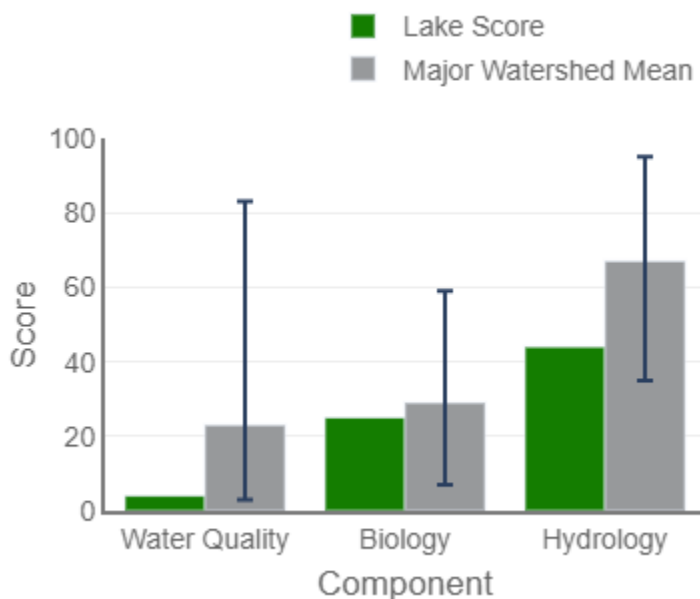
Lake Health Grade: D

Lake Health Score Major Watershed Mean (circle): 41

Lake Health Score Major Watershed Min/Max: 20/70



Lake Health Component Scores



Water Quality Score: 4

Water Quality Score Major Watershed Mean: 23; **Min/Max:** 3/83

Biology Score: 25

Biology Score Major Watershed Mean: 29; **Min/Max:** 7/59

Hydrology Score: 44

Hydrology Score Major Watershed Mean: 67; **Min/Max:** 35/95

Component Input Status

Each component score is created by combining data inputs. Some of these data inputs have a target value labeled a 'goal' or 'threshold'. If an input value is:

- **"Below (Goal or Threshold)"**, the condition for the lake has degraded to the point that it may not support one or more desired outcomes (e.g., water clarity quality, natural diversity of plants and animals).
- **"At or Above (Goal or Threshold)"**, the condition for the lake currently meets or exceeds the minimum criteria to support these desired outcomes.

Water Quality

Phosphorus: Below Goal

Water Clarity: Below Goal

Biology

Fish Community Quality: Not Evaluated

Lake Plant Community Quality: Below Threshold

About the Score

What is a healthy lake?

A healthy lake is one that is near its natural state. It has low levels of pollution and has a natural shoreline that protects the bank and filters runoff. It is surrounded by a landscape that delivers water and energy consistent with its self-sustaining plant and animal communities. A healthy lake can withstand changing conditions and seasonal fluctuations. Most importantly, it has a human community and society that values these resources and invests in the protection and restoration of the water, watershed, and interacting and dependent communities.

An unhealthy lake has received more disturbance than it can handle, forcing it to deviate from its natural state. The lake is out of balance with its water and nutrient input levels, impacting the health of fish and plant communities. A degraded lake is less resilient and may decline further under changing conditions.

Restoring a degraded lake back to a healthy condition is usually a lengthy, expensive, and complex challenge. In contrast, protecting a healthy lake and the surrounding land helps ensure that the ecological and economic benefits that it currently provides are likely to be sustained into the future.

How is lake health related to watershed health?

A lake's watershed (or lakeshed) is all land and surface water upstream of its outlet that contribute water to it. Lakes are influenced by the landscape characteristics and land uses within their respective lakeshed.

Lake health reflects the intensity of landscape alteration. Agriculture, forestry, transportation, industrial, and urban uses introduce contaminants that impact the health of our lakes.

Lake health is also affected by internal factors, such as lake area, depth, and diversity of nearshore habitat, and external factors, such as soils in the lakeshed, altered hydrology, lakeshed to lake size ratio, groundwater inflow, and the source and amount of surface water inflow.

It is the unique combination of these influences that determine the quality of the water and the aquatic community in a particular lake.

What do the lake health score and grade mean?

- The Lake Health Score is a starting point to investigate a lake's current health. The letter grade helps compare lakes across Minnesota.
- Lake Health Scores fall between a range of 0 to 100 and are graded as follows:

- 91 to 100 = A+
- 81 to 90 = A
- 71 to 80 = B+
- 61 to 70 = B
- 51 to 60 = C+
- 41 to 50 = C
- 31 to 40 = D+
- 21 to 30 = D
- 11 to 20 = F+
- 0 to 10 = F

- Each score compiles several inputs and is designed to encourage investigation into what might be influencing the lake ecosystem.
- Expectations for a shallow wetland lake are much different than a deep, cold northern lake. To provide context, Lake Health Scores are calculated based on the expectations for a lake of that type.
- The Lake Health Score reflects both measured conditions in the lake and the level of risk from land use activities in the lakeshed.
- The scores reflect inputs from each of the 5 Components that are used throughout the Watershed Health Assessment Framework (WHAF) for assessing system health (Water Quality, Biology, Hydrology, Geomorphology, and Connectivity). [Learn more about the WHAF \(opens in new tab\)](#).
- No matter what score/grade a lake currently receives, all Minnesota lakes require stewardship actions to keep them as healthy as possible, improve lake health when there are challenges, and address existing and future emerging risks.

Lakes Included

There is currently information presented on 2,939 lakes. These lakes were included based on the presence of water chemistry (total phosphorus) and morphological data. The number of lakes included in this dataset will likely increase in the future.

How is the lake health score calculated?

- The Lake Health Score uses existing measures that are regularly assessed and updated. The score represents a snapshot in time and is computed as the average of the three component scores including the *Water Quality Score*, the *Biology Score*, and the *Hydrology Score* (the *Hydrology Score* also includes facets of the Geomorphology and Connectivity components). When a component score is not available (NA), the Lake Health Score is calculated based on the remaining scored components.
- Each of these component scores are themselves an average of multiple index scores which reflect different indicators of health. Lake Health Scores are on a 0 to 100 scale with scores of 100 representing the best overall health according to available inputs.
- A table of scores, metrics used for scores, and other supporting data is included at the bottom of this page.

Component Input Status

- Some of the inputs used to derive component scores are evaluated relative to a target value called a 'goal' or a 'threshold'.
- Goals are used in deriving the index scores of *Phosphorus* and *Water Clarity* (inputs of the *Water Quality Score*). *Fish Community Quality* and *Lake Plant Community Quality* (inputs of the *Biology Score*) use established thresholds.
- For each of these inputs, if a value is:

- **"Below (Goal or Threshold)"**, the condition for the lake has degraded to the point that it may not support one or more desired outcomes (e.g., water clarity quality, natural diversity of plants and animals).
 - **"At or Above (Goal or Threshold)"**, the condition for the lake currently meets or exceeds the minimum criteria to support these desired outcomes.
- Statuses indicating a lake is above a goal or threshold do not imply that criteria will necessarily continue to be met in the future and it is important to consider the lakes proximity to this goal or threshold.

Cannon Lake Water Quality

The quality of the water within a lake basin has a critical impact on lake health. Excess nutrients can create explosive algae growth. Turbid water can reduce light penetration and stress fish communities. Other contaminants may accumulate in fish tissue or influence their hormonal balance. Improvements to lake health must address water quality challenges present in the lake system.

About the Score

The Water Quality Component Score is an average of the Phosphorus and Water Clarity Scores and is on a 0 to 100 scale.

Water Quality Score (triangle): 4

Major Watershed Water Quality Score Mean (circle): 23

Major Watershed Water Quality Score Min/Max: 3/83



Phosphorus

Phosphorus is required for plant and algae growth in lakes and most Minnesota lakes are especially sensitive to this nutrient. Any increase in phosphorus usually triggers an increase in abundance of plants and algae, while excessive levels can cause algae blooms, odor problems and low dissolved oxygen. Supported by data from Minnesota Pollution Control Agency, Minnesota Department of Natural Resources, and local water quality samplers and accredited laboratories.

The Phosphorus Score is based on the distance of the lake's Total Phosphorus measurement from the aquatic recreation goal and is on a 0 to 100 scale.

Phosphorus Score Water Quality Score Input #1 (triangle): 0

Major Watershed Phosphorus Score Mean (circle): 27

Major Watershed Phosphorus Score Min/Max: 0/75



Metrics Used for Scoring

Total Phosphorus ($\mu\text{g/l}$): 346

Total Phosphorus Regional Goal ($\mu\text{g/l}$): 40

Total Phosphorus % Deviation from Goal: -59%

Total Phosphorus Goal Status: Below Goal

Additional Data

Phosphorus Sensitivity is the predicted loss in lake clarity with additional phosphorus loading into the lake. The lake's phosphorus sensitivity significance class is used to prioritize lakes for protection. Classes relate to the state's priority of focusing on "*high-quality, unimpaired lakes at greatest risk of becoming impaired.*"

Total Phosphorus Sensitivity Index: 0 inches lost in water clarity with an increase in 100 pounds of phosphorus loading)

Total Phosphorus Sensitivity Significance Priority Class: Impaired

Water Clarity

Water clarity measures how far light can penetrate into a lake's water. It affects how well plants can grow, and high water clarity may allow growth of beneficial aquatic plants. Water clarity also refers to how 'clear' the water appears. This indicator is important for human perception of lake health, particularly for recreational uses. Supported by data from University of Minnesota LakeBrowser.

The Water Clarity Score is based on the distance of the lake's Water Clarity measurement from the aquatic recreation goal and is on a 0-100 scale.

Water Clarity Score Water Quality Score Input #2 (triangle): 9

Major Watershed Water Clarity Score Mean (circle): 20

Major Watershed Water Clarity Score Min/Max: 1/90



Metrics Used for Scoring

Water Clarity (meters): 1

Water Clarity Regional Goal (meters): 1

Water Clarity % Deviation from Goal: -35%

Water Clarity Status: Below Goal

Additional Data

Water clarity data derived from satellite imagery is also available spanning several decades. This longer time series can be used to understand trends in water clarity alongside other known changes affecting the lake.

Water Quality Impairments

A water quality impairment is present when a lake has been assessed and failed to meet a federal water quality standard. A number of pollutants or stressors can lead to a lake's impairment designation, including mercury, sediment, and bacteria, among others. Supported by data from Minnesota Pollution Control Agency.

Impairments:

- Mercury in fish
- Nutrients

Cannon Lake Biology

Thriving animal and aquatic plant communities provide functions that are essential for the overall health of a lake. Monitoring the composition of these communities can determine whether a lake supports the expected range of aquatic life. The status of aquatic communities can help indicate the overall impact and response to lakeshed conditions.

The Biology Component Score is an average of the Fish Community Quality and Lake Plant Community Quality Scores and is on a 0 to 100 scale.

Biology Score (triangle): 25

Major Watershed Biology Score Mean (circle): 29

Major Watershed Biology Score Min/Max: 7/59



Fish Community

The health of the fish community is an important indicator of overall lake health. Data is collected on the number of different species, the abundance of those species, and whether the right species are present to fill the necessary ecological roles for a healthy lake. Supported by data from Minnesota Department of Natural Resources.

The Fish Community Quality Score is based on the distance of the lake's Fish IBI Score from the aquatic life threshold and is on a 0 to 100 scale.

Fish Community Quality Score *Biology Score Input #1* (): Not Evaluated

Major Watershed Fish Community Quality Score Mean (): 30

Major Watershed Fish Community Quality Score Min/Max: 6/63

Metrics Used for Scoring

Fish IBI : Not Evaluated

Fish IBI Threshold: Not Evaluated

Fish IBI % Deviation From Threshold: Not Evaluated

Fish IBI Status: Not Evaluated

Additional Data

Fish sampling data are used to determine whether a lake is meeting standards to support aquatic life during the MPCA watershed assessment. The aquatic life use judgement has information about how the most recent fish survey data and corresponding IBI scores relate to current impairment determinations.

Lake Plant Community

The health of the lake plant community has a strong influence on overall lake health. Data is collected on the composition of plant species in the community. The highest value is given to diverse plant communities, especially when they include species that are not tolerant of human stressors. Supported by data from Minnesota Department of Natural Resources.

The Lake Plant Community Quality Score is based on the distance of the lake's Plant Floristic Quality Index (FQI) Score from the aquatic life threshold and is on a 0 to 100 scale.

Lake Plant Community Quality Score Biology Score Input #2 (triangle): 25

Major Watershed Lake Plant Community Quality Score Mean (circle): 28

Major Watershed Lake Plant Community Quality Score Min/Max: 7/69



Metrics Used for Scoring

Plant FQI: 16

Plant FQI Threshold: 19 (for lakes within ecoregion 2B)

Plant FQI % Deviation From Threshold: -16%

Plant FQI Status: Below Threshold

Hydrology

When the supply of water is consistent with the geomorphology of the lakeshed, the lake receives an appropriate range of water, energy, nutrients, and sediment. The presence of intact, connected natural communities in the lakeshed help provide this consistency, as well as the resilience needed to handle disturbance and return to a healthy state.

The Hydrology Component Score is an average of the Lake Watershed Health Index and Score the Shore survey Scores and is on a 0 to 100 scale.

Hydrology Score (triangle): 44

Major Watershed Hydrology Score Mean (circle): 67

Major Watershed Hydrology Score Min/Max: 35/95



Lake-Watershed Interactions

The water that flows into a lake comes from land directly adjacent to the lake and from land areas further away that also drain to that lake. The relative influence of land uses across the lakeshed, as well as the dominance of groundwater versus surface water inflow, are important interactions to consider. Supported by data from Minnesota Department of Natural Resources and Multi-Resolution Land Characteristics Consortium.

The Lake Watershed Health Index is calculated by multiplying the percent of disturbed land in the lakeshed and the Lake Watershed Transport Capacity Class and is on a 0 to 100 scale.

Lake Watershed Health Index Score Hydrology Score Input #1 (triangle): 44

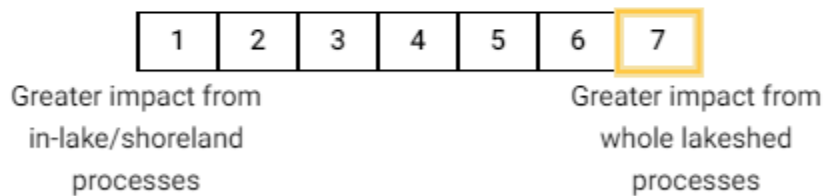
Major Watershed Lake Watershed Health Index Score Mean (circle): 68

Major Watershed Lake Watershed Health Index Score Min/Max: 35/95



Metrics Used for Scoring

Lake Watershed Transport Capacity Class: 7



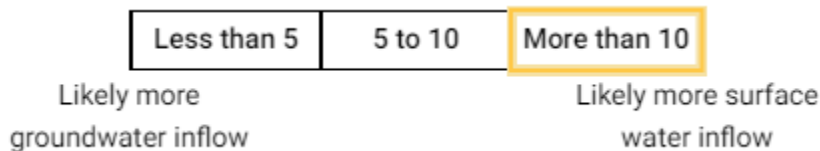
Percent Disturbed Landcover in Lakeshed: 63%

Additional Data

The watershed to lake area ratio can also be used to assess whether a lake is groundwater dominated.

Watershed to Lake Area Ratio: 118.3

Watershed to Lake Area Class: More than 10, likely more surface water inflow



Lakeshed Land Use and Cover

The percent of natural and disturbed land cover types indicate the intensity of human activity and the potential for lakeshed conditions to impact a lake's water and habitat quality. Expanding perennial vegetation, protecting wetlands, and using native plant species are stewardship actions that help protect lake health. Supported by data from Minnesota Department of Natural Resources and Multi-Resolution Land Characteristics Consortium.

Forested: 9%



Grass and Shrub: 1%



Wetland: 7%



Pasture and Hay: 13%



Disturbed: 63%

