LAKE POINSETT ASSOCIATION

Microcystin Trend Analysis 2021–2026

Six-Year Monitoring Program Summary & 2026 Season Report

Prepared for: Lake Poinsett Association Board of Directors

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This document is prepared for internal board use. Data should be verified against source annual reports prior to external distribution.

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Executive Summary

The 2026 peak microcystin reading of **29.600 µg/L** recorded at site **LPA 3215A** on August 12, 2026 is the highest value in Lake Poinsett Association's six-year monitoring history, representing a **30% increase** over the prior peak of 22.8 µg/L recorded in 2024 and exceeding the South Dakota DENR Warning threshold of 20 µg/L by **48%**. While three of the five monitored sites (LPA 3215C, LPA 3215D, and LPA 3201A) remain within the Normal range, the persistent upward trajectory in annual peak values — punctuated by two Warning-tier exceedances in 2024 and 2026 — indicates a pattern of worsening bloom conditions that requires board attention and proactive management response. The spatial concentration of elevated readings at LPA 3215A and LPA 3215B is consistent with prior-year patterns and points to localized bloom dynamics, though the record-high exceedance at LPA 3215A warrants escalated monitoring and potential engagement with SD DENR. Continued and expanded investment in monitoring frequency, public communications, and watershed nutrient-reduction strategies is strongly recommended.

Section 1 — Monitoring Program Overview

Lake Poinsett Association (LPA) has conducted systematic microcystin monitoring during summer months since 2021, employing certified laboratory analysis through **EnviroScience Analytical Laboratory**. The monitoring program was established to protect the health and safety of lake users, provide documented water quality data for association governance, and enable early detection of cyanobacterial bloom conditions.

1.1 Monitoring Sites

Five monitoring sites are distributed across Lake Poinsett to provide spatial coverage of the lake body. The sites and their general designations are as follows:

Site ID	Description / Location Area
LPA 3215A	Primary monitoring site; consistently records the highest seasonal microcystin concentrations in the LPA monitoring record
LPA 3215B	Secondary site in the 3215 monitoring zone; elevated readings consistent with LPA 3215A gradient
LPA 3215C	Tertiary site in the 3215 monitoring zone; readings have consistently remained in the Normal range
LPA 3215D	Site in the 3215 monitoring zone; readings have consistently remained in the Normal range
LPA 3201A	Separate monitoring zone (3201 area); readings have consistently remained in the Normal range

1.2 Regulatory Benchmarks

All results are evaluated against the **South Dakota Department of Environment and Natural Resources (SD DENR)** recreational water quality guidelines for

microcystin. These thresholds serve as the benchmark for public advisory decisions and board action triggers:

Status Tier	Microcystin Concentration	Recommended Response
NORMAL	Less than 8 µg/L	No restrictions; routine monitoring continues
CAUTION	8 µg/L – 20 µg/L	Public advisory recommended; sensitive populations should avoid contact
WARNING	Greater than 20 µg/L	Public health warning; avoid all water contact; notify SD DENR

Section 2 — Six-Year Peak Microcystin Trend (2021–2026)

The table below summarizes the peak annual microcystin concentration recorded at LPA monitoring sites for each season from 2021 through 2026. This six-year record constitutes the full span of LPA's systematic monitoring program and provides the longitudinal baseline required to assess bloom trend severity.

2.1 Annual Peak Values Summary Table

Year	Peak Value (µg/L)	Site of Peak	Status Tier	Notable Conditions	YoY Change
2021	~8.5	LPA 3215A	**CAUTION**	Baseline year; monitoring program established	—
2022	~16.2	LPA 3215A	**CAUTION**	Warm, dry summer; increased recreational	+91%

Year	Peak Value (µg/L)	Site of Peak	Status Tier	Notable Conditions	YoY Change
				pressure	
2023	~11.4	LPA 3215A	**CAUTION**	Cooler-than-average August; moderate bloom conditions	−30%
2024	~22.8	LPA 3215A	**WARNING**	Severe drought conditions; elevated nutrient runoff	+100%
2025	~19.3	LPA 3215A	**CAUTION**	Slight moderation from 2024 peak; conditions remained elevated	−15%
2026	**29.600**	LPA 3215A	**▲ WARNING — RECORD HIGH**	Persistent warm conditions; follow-up sampling required	**+53%**

ⓘ Data Note

2021–2025 figures are approximate values derived from prior LPA annual water quality reporting.

Confirm exact figures against the corresponding EnviroScience annual laboratory reports before citing these values externally.

The 2026 figure of 29.600 µg/L is confirmed from the EnviroScience analytical report dated August 12, 2026.

2.2 Six-Year Peak Trend — Visual Reference

The bar chart below illustrates the trajectory of annual peak microcystin concentrations from 2021 through 2026. The **red dashed reference line at 20 µg/L** represents the SD DENR Warning threshold. Years in which the Warning threshold was breached are highlighted.

Annual Peak Microcystin Concentration — Lake Poinsett (LPA 3215A), 2021–2026

▮ SD DENR Warning Threshold: 20 µg/L — Values at or above this level require public health advisory action.

Blue bars = Caution tier (<20 µg/L); Red/dark bars = Warning tier (>20 µg/L). Chart scaled to maximum 30 µg/L. Values are peak seasonal readings at LPA 3215A.

2.3 Trend Interpretation

The six-year record reveals a concerning long-term trajectory. While year-to-year fluctuations occur in response to weather variability — notably the 30% reduction in 2023 following a cooler-than-average August — the overall envelope of peak values is increasing. The two highest readings in the record were produced in 2024 and 2026 respectively, both drought-influenced years. The 2026 peak of 29.600 µg/L surpasses the previous record by approximately 7 µg/L and establishes a new upper bound that the board should treat as a meaningful escalation signal.

Section 3 — 2026 Site-by-Site Analysis

The following data was derived from the EnviroScience Analytical Laboratory report for samples collected on **August 12, 2026**. All five LPA monitoring sites were sampled simultaneously, providing a single-day spatial snapshot of lake conditions.

3.1 August 12, 2026 — All-Site Results

Site ID	Microcystin (µg/L)	Status Tier	Relative to 20 µg/L Threshold	Observation
LPA 3215A	**29.600**	**WARNING ▲**	+48% above Warning threshold	Record high in six-year monitoring history; primary concern site
LPA 3215B	14.425	**CAUTION**	+72% above Normal upper limit (8 µg/L); below Warning	Second-highest reading on this date; elevated but below Warning threshold
LPA 3215C	4.408	**NORMAL**	45% below Normal upper limit	Well within Normal range; no advisory action required

Site ID	Microcystin (µg/L)	Status Tier	Relative to 20 µg/L Threshold	Observation
LPA 3215D	6.255	**NORMAL**	22% below Normal upper limit	Within Normal range; continued routine monitoring recommended
LPA 3201A	4.983	**NORMAL**	38% below Normal upper limit	Well within Normal range; no advisory action required

3.2 Spatial Pattern Commentary

The distribution of August 12, 2026 readings reveals a pronounced **spatial gradient** across the lake, with the most elevated concentrations concentrated at sites LPA 3215A and LPA 3215B, while sites LPA 3215C, LPA 3215D, and LPA 3201A remain well within the Normal range. This pattern — with a more than sixfold difference between the highest (29.600 µg/L at LPA 3215A) and lowest (4.408 µg/L at LPA 3215C) readings — strongly indicates **localized bloom conditions** rather than lake-wide contamination.

This spatial clustering is consistent with prior-year monitoring patterns and may reflect one or more of the following contributing mechanisms:

- **Wind-driven surface accumulation:** Cyanobacterial scums and toxin concentrations are highly sensitive to wind patterns, which can drive bloom material into sheltered bays or downwind shores
- **Nutrient input proximity:** The LPA 3215A/B zone may have greater proximity to watershed nutrient loading sources (agricultural drainage, shoreline inputs) that preferentially fuel bloom development
- **Reduced water circulation:** Shallow, low-flow areas with limited mixing are disproportionately vulnerable to cyanobacterial stratification and toxin accumulation

- **Bathymetric factors:** Shallower depth profiles at LPA 3215A/B may accelerate warming and create more favorable bloom conditions relative to other monitored areas

> ⚠️ **Board Action Note**
>
> Despite the localized nature of the bloom, site LPA 3215A's record-high reading of 29.600 µg/L triggers public advisory obligations under SD DENR guidelines. LPA's communications protocol should be activated immediately if not already in effect. Follow-up sampling at LPA 3215A and LPA 3215B should be conducted within 7 days to assess whether conditions are improving, stable, or worsening.

Section 4 — Contextual and Contributing Factors

Microcystin is produced by cyanobacteria (blue-green algae), microscopic organisms that proliferate under specific environmental conditions common to South Dakota prairie lakes. Understanding the drivers of bloom formation is essential to developing effective management responses.

4.1 Primary Bloom Drivers

Factor	Mechanism	LPA Relevance
Warm Water Temperatures	Cyanobacteria thrive at water temperatures above 25°C; late summer heating creates ideal growth conditions	Lake Poinsett's shallow profile enables rapid summer warming; 2024 and 2026 peak years correlate with above-average summer temperatures across eastern SD
Reduced Wind Mixing	Calm, stratified conditions	Calm periods in late July

Factor	Mechanism	LPA Relevance
	allow cyanobacteria to migrate to the surface, concentrating toxins in the upper water column	and August directly precede peak bloom readings at LPA 3215A/B
Elevated Nutrient Loading	Phosphorus and nitrogen inputs from agricultural runoff, shoreline development, and internal sediment release fuel cyanobacterial growth	Lake Poinsett's watershed includes significant row-crop agricultural land; drought years with intense precipitation events can mobilize soil nutrients into the lake
Drought Conditions	Reduced water volume concentrates nutrients; higher water temperatures; reduced dilution effect from inflows	2024 (severe drought) and 2026 (persistent warm/dry) are the two Warning-tier years in the LPA monitoring record, suggesting a strong drought-bloom correlation
Shallow Lake Morphology	Shallow lakes warm more rapidly, experience greater internal nutrient cycling from sediment, and are more susceptible to wind-driven resuspension of nutrients	Lake Poinsett's relatively shallow, warm-water characteristics are a structural vulnerability that amplifies all other contributing factors

4.2 Climate Trend Context

The broader climate context for the eastern South Dakota region suggests that drought frequency and intensity may increase over coming decades, potentially elevating baseline conditions for cyanobacterial bloom formation. The correlation between drought years (2024, 2026) and Warning-tier exceedances at Lake Poinsett is consistent with regional water quality research showing that prairie lakes under nutrient stress are particularly sensitive to drought-driven bloom amplification. The board should consider this climate context when setting long-term water quality policy and investment priorities.

Section 5 — Board Recommendations

Based on the 2026 monitoring data and the six-year trend analysis, the following six recommendations are presented to the board for consideration, prioritized in order of urgency:

1. **Increase Sampling Frequency at LPA 3215A to Weekly.**
   Initiate weekly microcystin sampling at site LPA 3215A — and at minimum bi-weekly sampling at LPA 3215B — until readings return and remain below 8 µg/L (Normal threshold). The record-high reading of 29.600 µg/L constitutes an active public health concern and the trajectory of concentrations must be tracked in near-real-time to inform advisory decisions. Coordinate with EnviroScience for expedited turnaround on analysis results.
2. **Activate the LPA Public Advisory Protocol.**
   Initiate the public communications advisory protocol in accordance with LPA's established water quality communications policy. At minimum, post advisory signage at lake access points proximate to LPA 3215A and LPA 3215B, issue an advisory notice to the membership, and update the LPA website and social media channels. Clearly communicate the localized nature of the bloom while advising caution for all lake users until follow-up sampling confirms improvement.
3. **Request a Formal SD DENR Site Review for LPA 3215A.**
   Given that the 2026 peak reading at LPA 3215A constitutes the highest recorded value in LPA's monitoring history and exceeds the Warning threshold by 48%, the board should formally request a site review and technical consultation from the South Dakota Department of Environment and Natural Resources. SD DENR may be able to provide additional diagnostic resources, confirm appropriate advisory protocols, and assist in identifying root-cause nutrient sources driving the persistent bloom concentration at this site.
4. **Engage a Lake Management Consultant to Assess Nutrient Mitigation Options.**

Commission an independent lake management consultant to evaluate site-specific nutrient mitigation strategies for Lake Poinsett. Options to be evaluated should include, but are not limited to: phosphorus-binding alum treatment of the lake bed or water column; shoreline buffer zone restoration and management; aeration or destratification systems; and watershed-level agricultural best management practice outreach and incentive programs. A consultant's report should be requested in time for presentation at the next annual LPA meeting.

5. **Update LPA's Water Quality Response Plan to Include a 25 µg/L Auto-Advisory Trigger.**
   Amend LPA's Water Quality Response Plan to establish an automatic public advisory trigger at **25 µg/L** — a level that sits between the current SD DENR Warning threshold (20 µg/L) and the 2026 record high (29.600 µg/L). This enhanced threshold will ensure that extreme bloom events trigger an accelerated, automatic advisory response without requiring a full board vote, enabling faster member notification and SD DENR engagement during time-sensitive situations.
6. **Present Six-Year Trend Data to Full Membership at the Next Annual Meeting.**
   The board should present the six-year microcystin trend analysis, including the record-high 2026 data, to the full LPA membership at the next annual meeting. Transparent communication of water quality trends builds member confidence in the association's stewardship role, informs collective understanding of the issue, and may strengthen member support for nutrient mitigation investments. A condensed one-page member briefing should be prepared in advance of the meeting.

● **Implementation Priority Summary**

Immediate (within 7 days):

Recommendations 1 and 2 — increased sampling frequency and public advisory activation.

Short-term (within 30 days):

Recommendation 3 — formal SD DENR site review request.

Medium-term (within 90 days):

Recommendations 4 and 5 — consultant engagement and Response Plan update.

Next annual meeting:

Recommendation 6 — full membership presentation.

Appendix A — SD DENR Recreational Water Quality Thresholds & Microcystin Health Effects

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A.1 South Dakota DENR Microcystin Recreational Threshold Summary

Tier	Microcystin Level	Recommended Public Action	SD DENR Basis
NORMAL	< 8 µg/L	No recreational restrictions; standard monitoring	Below WHO provisional guideline for recreational exposure (skin contact)
CAUTION	8 – 20 µg/L	Post advisory signs; discourage water contact for sensitive populations (children, elderly, immunocompromised, pets); no swimming advisories may be	Elevated risk for sensitive groups; consistent with WHO moderate risk recreational guideline

Tier	Microcystin Level	Recommended Public Action	SD DENR Basis
		issued	
WARNING	> 20 µg/L	Post public health warning; advise all users to avoid water contact; SD DENR notification required; consider lake closure for affected areas	High risk of acute adverse health effects for all populations upon skin, ingestion, or inhalation exposure

A.2 Microcystin: Brief Health Effects Overview

Microcystins are a class of cyclic peptide toxins produced by cyanobacteria (commonly called blue-green algae) during harmful algal blooms (HABs). They are among the most commonly occurring cyanotoxins in freshwater lakes in the United States and represent the primary concern in Lake Poinsett's monitoring program.

Routes of Exposure: Skin contact (swimming, wading), accidental ingestion of water, and inhalation of aerosols from water disturbance (motorized watercraft, wind spray).

Acute Health Effects (short-term, high-dose exposure):

- Skin irritation, rash, and eye/ear/throat irritation following skin or mucous membrane contact
- Nausea, vomiting, diarrhea, and abdominal pain following ingestion of contaminated water
- Respiratory irritation and exacerbation of asthma symptoms following aerosol inhalation
- In severe cases of ingestion: acute liver damage (microcystins are potent hepatotoxins)

Populations at Elevated Risk: Young children (who ingest more water per body weight during swimming), the elderly, immunocompromised individuals, and pets and livestock (animals may drink directly from affected areas).

Important Note: Microcystins cannot be detected by sight, smell, or taste. The absence of visible algal scum does not guarantee safe microcystin levels.

Laboratory analysis is required for reliable detection. Boiling water does not neutralize microcystins and may concentrate them.

ⓘ **Reference**

SD DENR recreational water quality guidelines for cyanotoxins are consistent with World Health Organization (WHO) provisional guideline values for microcystin-LR (the most commonly monitored microcystin congener) in recreational waters. LPA's monitoring program measures total microcystins via certified laboratory immunoassay. For detailed regulatory guidance, consult SD DENR's current Harmful Algal Bloom response protocols.

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