Spring Valley Lake Fall 2015 Semi-Annual Mapping report

Prepared for
Spring Valley Lake Association

AquaTechnex, LLC
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Introduction

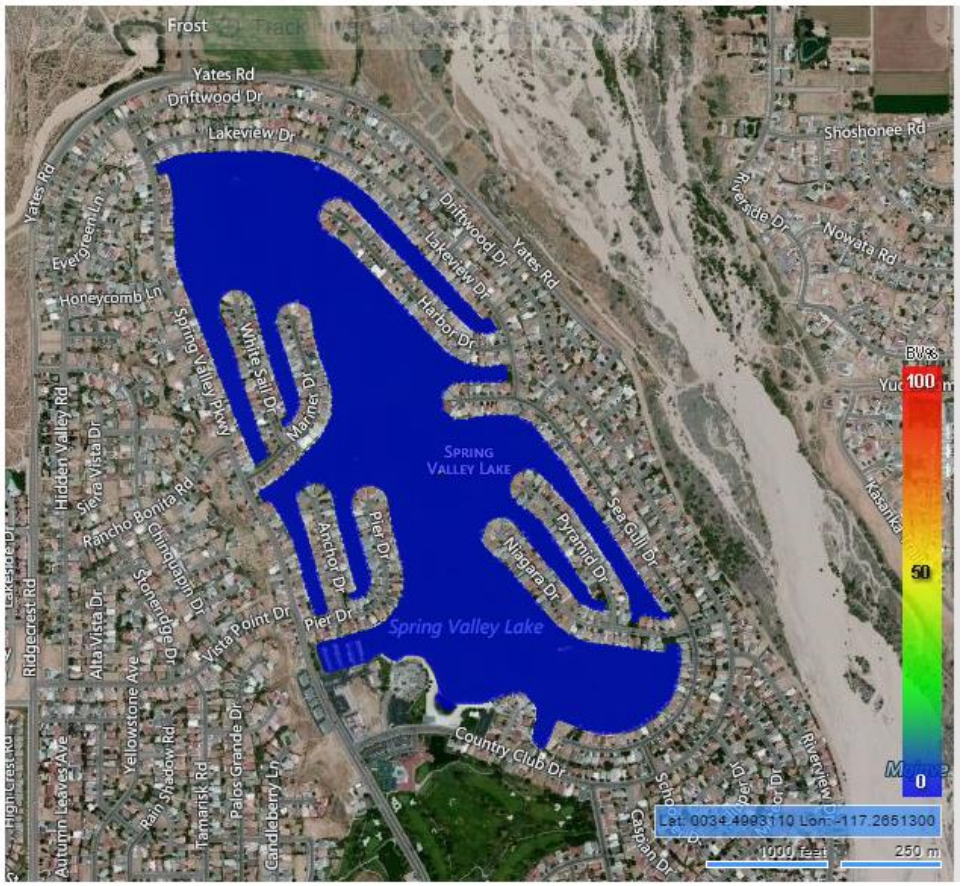
Spring Valley Lake Association is in the fifth year of working under a water clarity improvement program and has requested we perform a number of monitoring tasks to support this work. After baseline data was collected in May 2015, another subsequent data collection was performed in Oct 20, 2015. The objective was to map areas of aquatic plant coverage as well as collect water quality and algae samples on the north and south sections of lake. This report will summarize these findings.

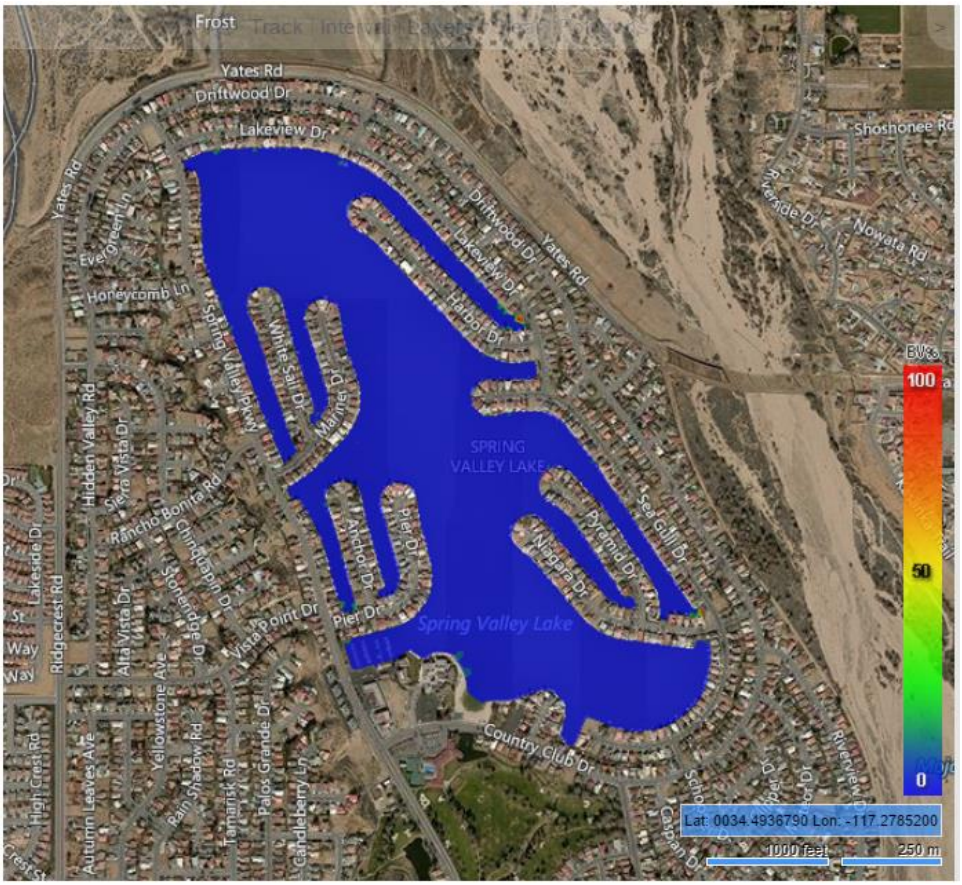
Hydro-Acoustic Mapping

AquaTechnex mobilized a hydro-acoustic mapping vessel to the lake on October to collect data on the potential presence and distribution of aquatic plant growth in the lake. The mapping vessel traveled survey transects across the lake at regular intervals providing near-complete coverage of the water body. The sensing equipment collects a GPS point linked to hydro-acoustic soundings and this data is processed using algorithms to map bathymetry, aquatic plant bio-volume and sediment hardness. The resulting maps are produced below, with this previous result for side by side comparison.

Water Quality Sampling

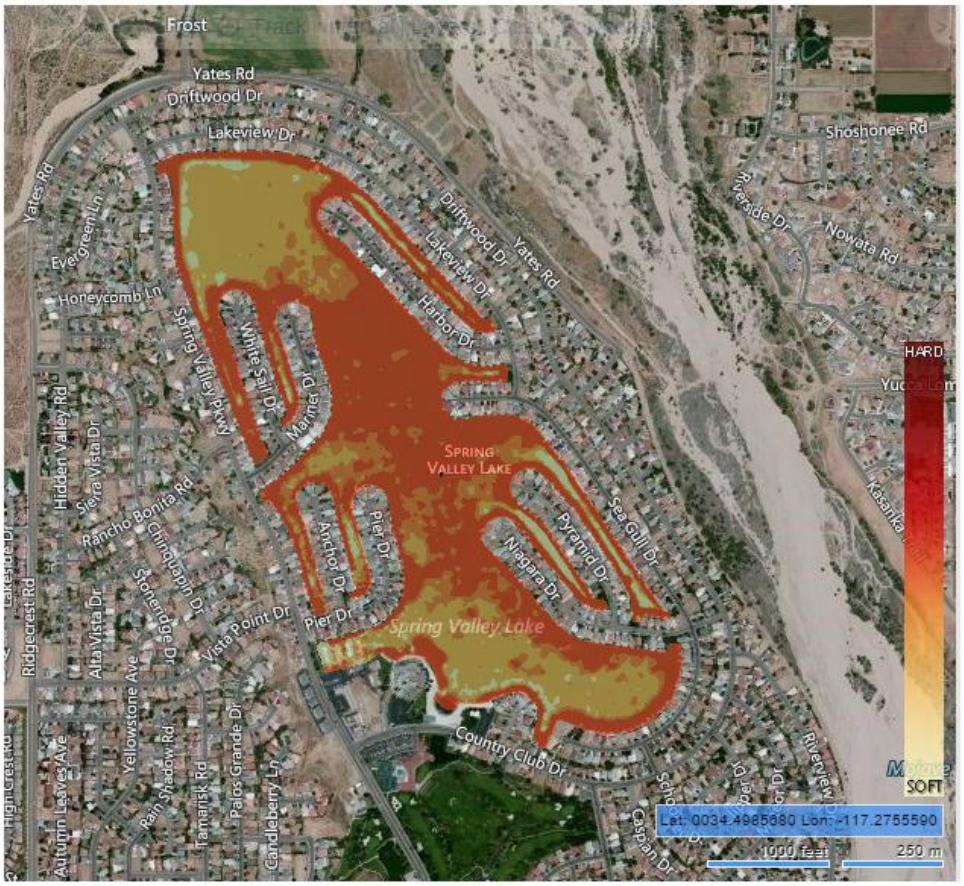
A water quality and algae bundle was taken on Oct 20, 2015 as part of the survey. A sample was taken from the North and South Sections in the main part of the lake. The results show that the lake has a moderate density of algae. The algae sample also shows a diverse assemblage of mostly good types of algae. The water quality parameters are within acceptable ranges, although with moderately high levels of phosphorous (total and free reactive), there is a chance of an algae bloom occurring in the future or perhaps leading to diminished transparency. Based on the results of the latest water quality testing, Spring Valley Lake is considered eutrophic. For a more detailed description on each water quality parameter, please see the Water Quality Analysis Explanation on the last page.





Vegetation

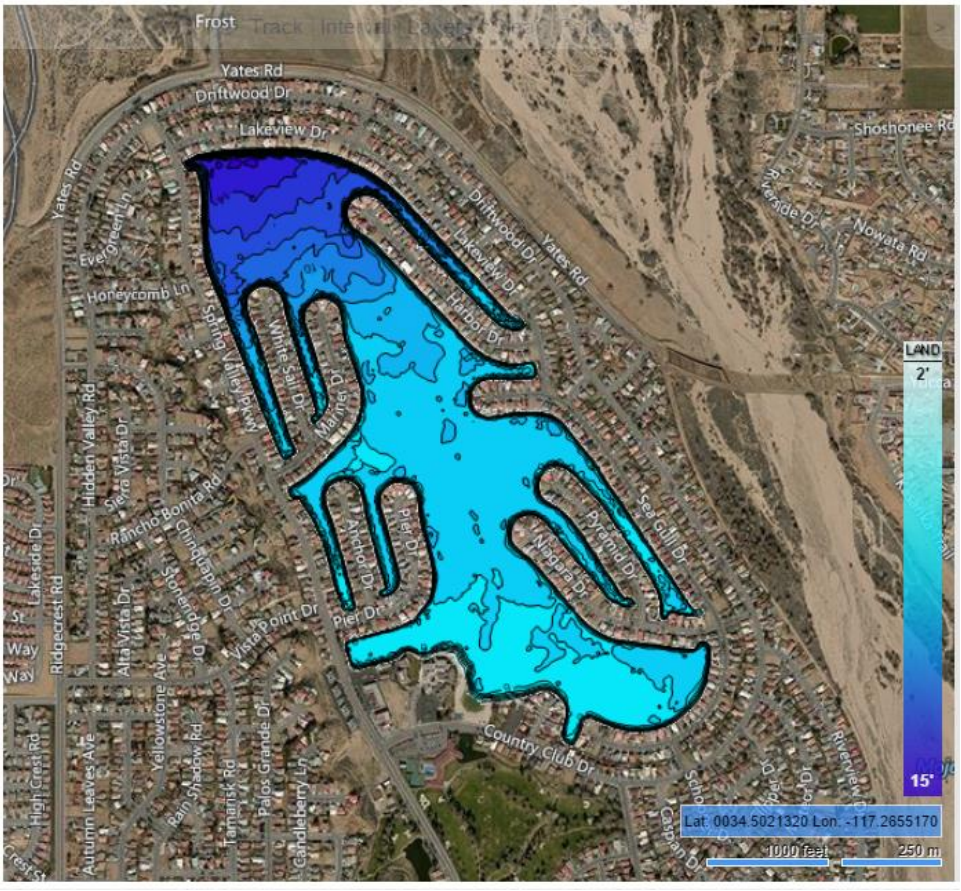
At the time of this mapping event, aquatic weeds were found concentrated in the NE and SE fingers. In addition, some low density of weeds were found in the Northern shore and on the north end of the beach. Another small cluster was found in the SW finger north of the marina.



Hardness

This map shows the current bottom sediment hardness present in the lake. The legend bar on the right shows the graduated scale.

Generally speaking, the lake retains the same bottom hardness profile and no major changes have been observed.



Contour

Between the two mapping events, we can see the bottom profile has had some minor shifts. These are quite normal and small changes are bound to occur in a lake with moderate activity.

October 2015 Vegetative Map

SRTC SePRO Research & Technology Campus AquaTechnex

SeSCRIPT Analysis Report:
Spring Valley Lake 1

Company: AquaTechnex, LLC

Address: P.O. Box 30824, Bellingham, WA 98228

Contact Person: Cody Appling; Ben Chen

Phone: 760-272-5842

Email: Cody@aquatechnex.com; Ben@aquatechnex.com

Project Name: Spring Valley Lake 1: N

Surface Area: 200 acres

Average depth: 8.5 feet

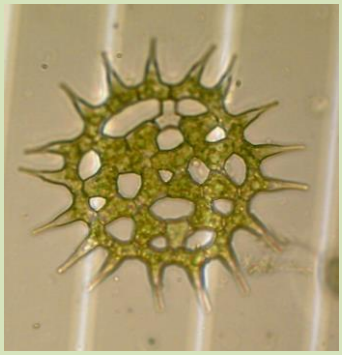
Date Sample Received: 10/23/15

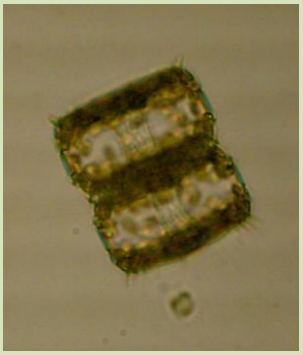
SeSCRIPT Analysis Performed: Algae analysis

Algae ID Results
Spring Valley Lake 1

Identification	Classification	Description	Density (cells/mL)
Pediastrum sp. (some present)	Chlorophyta-Green algae	Colonial, planktonic	480
Scenedesmus sp. (some present)	Chlorophyta-Green algae	Colonial, planktonic	160
Stephanodiscus sp. (little present)	Bacillariophyta-Diatoms	Colonial/single-celled, planktonic	< 40

Other algae in the sample, at lower densities, include: *Ankistrodesmus, Pseudstaurastrum, Tetraedron, Tetraselmis, Cosmarium, Coelastrum* (Chlorophyta); *Euglena* (Euglenophyta); *Aulacoseira, Navicula, Cyclotella, Surirella* (Bacillariophyta); *Cryptomonas* (Cryptophyta); *Pseudanabaena* (Cyanophyta); Dead particulate organic matter observed





SRTC SePRO Research & Technology Campus AquaTechnex

SeSCRIPT Analysis Report:
Spring Valley Lake 2

Company: AquaTechnex, LLC

Address: P.O. Box 30824, Bellingham, WA 98228

Contact Person: Cody Appling; Ben Chen

Phone: 760-272-5842

Email: Cody@aquatechnex.com; Ben@aquatechnex.com

Project Name: Spring Valley Lake 2: S

Surface Area: 200 acres

Average depth: 8.5 feet

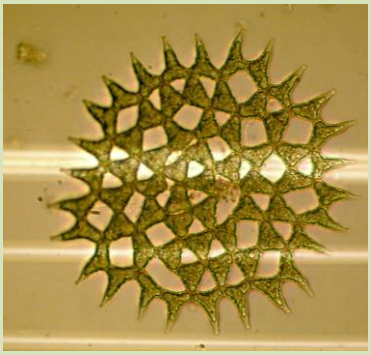
Date Sample Received: 10/23/15

SeSCRIPT Analysis Performed: Algae analysis

Algae ID Results
Spring Valley Lake 2

Identification	Classification	Description	Density (cells/mL)
Pediastrum sp. (some present)	Chlorophyta-Green algae	Colonial, planktonic	320
Scenedesmus sp. (some present)	Chlorophyta-Green algae	Colonial, planktonic	160
Tetraedron sp. (some present)	Chlorophyta-Green algae	Single-celled, planktonic	140

Other algae in the sample, at lower densities, include: *Staurastrum, Pseudstaurastrum, Monorpahidium, Tetraselmis, Sphaerocystis* (Chlorophyta); *Peridinium* (Dinophyta); *Aulacoseira, Amphipleura, Stephanodiscus* (Bacillariophyta); *Cryptomonas* (Cryptophyta); *Pseudanabaena* (Cyanophyta); Dead particulate organic matter observed



SePRO Research & Technology Campus
16013 Watson Seed Farm Road, Whitakers, NC 27891

PJLA Testing
Accreditation #: 777497

SeSCRIPT*

Chain of Custody: 2015-52032-00

LABORATORY REPORT

Customer Company

Company Name: Aquatechnex LLC-Main
Address: PO Box 4193
Palm Desert, CA 92261

Customer Contact

Contact Person: Cody Appling
E-Mail Address: cody@aquatechnex.com
Phone: (760) 636-8267
Fax:

Waterbody Information

Waterbody: Spring Valley Lake - CA Waterbody Size (acres): 200 Depth Average: 8.5

Sample Information

Lab ID	Sample Location	Test Method	Results	Sampling Date	Sampling Time	Temp at Receipt (C)
42593	SOUTH			10/20/2015		19.9
		Total Kjeldahl Nitrogen (mg/L) EPA 351.2	**1.319**			
		Total Nitrate & Nitrite (mg/L) Campbell et al 2004	**0.0426**			
		Nitrite (mg/L) EPA 354.1	**< 0.02**			
		Total Nitrogen (mg/L) Calculated	**1.36**			
		Nitrate (mg/L) Calculated	**0.033**			
		Alkalinity (mg/L as CaCO3) EPA 310.2	**101**			
		Chlorophyll a (µg/L) SMEWW 10200 H.	**43.3**			
		Conductivity (µS/cm) SMEWW 2510	**294**			
		Dissolved Oxygen (mg/L) SMEWW 4500-O	**5.68**			
		Free Reactive Phosphorus(µg/L) EPA 365.3	**34.4**			
		Total Hardness (mg/L as CaCO3) EPA 130.1	**84.677**			
		pH (SU) SMEWW 4500-H+	**8.3**			
		Total Phosphorus (µg/L) EPA 365.3	**142**			
		Turbidity (NTU) SMEWW 2130	**12.06**			
		Algae ID and enumeration	**Complete**			

Original

SePRO Research & Technology Campus

Chain of Custody: **2015-52032-00**

Waterbody Information

Waterbody: Spring Valley Lake - CA Waterbody Size (acres): 200 Depth Average: 8.5

Sample Information

Lab ID	Sample Location	Test Method	Results	Sampling Date	Sampling Time	Temp at Receipt (C)
Sample temperature at arrival was not within recommended levels.						
42594	NORTH			10/20/2015		19.9
		Total Kjeldahl Nitrogen (mg/L) EPA 351.2	**1.6**			
		Total Nitrate & Nitrite (mg/L) Campbell et al 2004	**0.0449**			
		Nitrite (mg/L) EPA 354.1	**< 0.02**			
		Total Nitrogen (mg/L) Calculated	**1.70**			
		Nitrate (mg/L) Calculated	**< 0.02**			
		Alkalinity (mg/L as CaCO3) EPA 310.2	**107**			
		Chlorophyll a (µg/L) SMEWW 10200 H.	**45.9**			
		Conductivity (µS/cm) SMEWW 2510	**275**			
		Dissolved Oxygen (mg/L) SMEWW 4500-O	**5.3**			
		Free Reactive Phosphorus(µg/L) EPA 365.3	**43.3**			
		Total Hardness (mg/L as CaCO3) EPA 130.1	**116.54**			
		pH (SU) SMEWW 4500-H+	**8.3**			
		Total Phosphorus (µg/L) EPA 365.3	**150.9**			
		Turbidity (NTU) SMEWW 2130	**9.88**			
		Algae ID and enumeration	**Complete**			
Sample temperature at arrival was not within recommended levels.						

Original

SePRO Research & Technology Campus

Chain of Custody: **2015-52032-00**

Waterbody Information

Waterbody: Spring Valley Lake - CA Waterbody Size (acres): 200 Depth Average: 8.5

Sample Information

Lab ID	Sample Location	Test Method	**Results**	Sampling Date	Sampling Time	Temp at Receipt (C)

ANALYSIS STATEMENTS:
SAMPLE RECEIPT /HOLDING TIMES: All samples arrived in an acceptable condition and were analyzed within prescribed holding times in accordance with the SRTC Laboratory Sample Receipt Policy unless otherwise noted in the report.
PRESERVATION: Samples requiring preservation were verified prior to sample analysis and any qualifiers will be noted in the report.
QA/QC CRITERIA: All analyses met method criteria, except as noted in the report with data qualifiers.
ACCREDITED METHODS: This laboratory is not accredited for the tests marked "‡"
COMMENTS: No significant observations were made unless noted in the report.
MEASUREMENT UNCERTAINTY: Uncertainty of measurement has been accounted for with regards to determination of compliance of instruments used for analysis; uncertainty measurements are available upon request.

Laboratory Information

Date Received: 10/23/2015
Time Received: 10:15
Date Results Sent: 10/30/2015
Date Analysis Performed: 10/30/2015

Disclaimer: The results listed within this Laboratory Report relate only to the samples tested in the laboratory. The analyses contained in this report were performed in accordance with the applicable certifications as noted. All soil samples are reported on a dry weight basis unless otherwise noted in the report. This Laboratory Report is confidential and is intended for the exclusive use of SRTC Laboratory and its client. This report shall not be reproduced, except in full, without written permission from SRTC Laboratory. The Chain of Custody is included and is an essential component of this report.
This entire report was reviewed and approved for release.

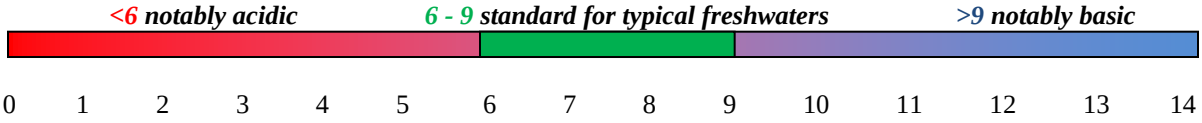
Reviewed By: Quality Control Analyst

Original

Water Quality Analysis Explanation

These water quality parameters are essential to document the condition of a water body and design custom treatment prescriptions to achieve desired management objectives.

pH: Measure of how acidic or basic the water is (pH 7 is considered neutral).



Hardness: Measure of the concentration of divalent cations, primarily consisting of calcium and magnesium in typical freshwaters. *0-60 mg/L as $CaCO_3$ soft; 61-120 moderately hard; 121-180 hard; > 181 very hard*

Alkalinity- Measure of the buffering capacity of water, primarily consisting of carbonate, bicarbonate and hydroxide in typical freshwaters. Waters with lower levels are more susceptible to pH shifts.
≤ 50 mg/L as $CaCO_3$ low buffered; 51-100 moderately buffered; 101-200 buffered; > 200 high buffered

Conductivity- Measure of the waters ability to transfer an electrical current, increases with more dissolved ions.
< 50 uS/cm relatively low concentration may not provide sufficient dissolved ions for ecosystem health; 50-1500 typical freshwaters; > 1500 may be stressful to some freshwater organisms, though not uncommon in many areas

Dissolved Oxygen- amount of diatomic oxygen dissolved in the water.
< 2 mg/L likely toxicity with sufficient exposure duration; < 5 stressful to many aquatic organisms; ≥ 5 able to support most fish and invertebrates

Phosphorus: Essential nutrient often correlating to growth of algae in freshwaters.

Total Phosphorus (TP) is the measure of all phosphorus in a sample as measured by persulfate strong digestion and includes: inorganic, oxidizable organic and polyphosphates. This includes what is readily available, potential to become available and stable forms.
<12 µg/L oligotrophic; 12-24 µg/L mesotrophic; 25-96 µg/L eutrophic; > 96 µg/L hypereutrophic

Free Reactive Phosphorus (FRP) is the measure of inorganic dissolved reactive phosphorus (PO_4^{-3}, HPO_4^{-2}, etc). This form is readily available in the water column for algae growth.

Nitrogen: Essential nutrient that can enhance growth of algae.

Total N is all nitrogen in the sample (organic N^+ and Ammonia) determined by the sum of the measurements for Total Kjeldhal Nitrogen (TKN) and ionic forms.

Nitrites and Nitrates are the sum of total oxidized nitrogen, often readily free for algae uptake.
< 1 mg/L typical freshwater; 1-10 potentially harmful; >10 possible toxicity, above many regulated guidelines

Chlorophyll *a*: primary light-harvesting pigment found in algae and a measure of the algal productivity and water quality in a system.
0-2.6µg/L oligotrophic; 2.7-20 µg/L mesotrophic; 21-56 µg/L eutrophic; > 56 µg/L hypereutrophic

Turbidity- Measurement of water clarity. Suspended particulates (algae, clay, silt, dead organic matter) are the common constituents impacting turbidity.
< 10 NTU drinking water standards and typical trout waters; 10-50 NTU moderate; > 50 NTU potential impact to aquatic life.