Carnegie Lake Phase I Diagnostic / Feasibility Study

Conducted as part of the
US Army Corp of Engineers, NY District's
Stony Brook – Millstone Watershed Flood Damage Reduction
And Ecosystem Restoration Feasibility Study

Goals of the presentation

- Identify the project objectives associated with the Phase I study.
- Describe the sampling methodology and monitored parameters.
- Present some of the in-lake and watershed data.
- Describe how the data will be used toward the development of the Restoration Plan.

pH

Project Objectives

- Generate a site specific and detailed seasonal database of the lake and its watershed.
- Quantify the hydrologic and pollutant loads of the watershed.
- Develop a Restoration Plan for the lake that addresses both short-term and long-term concerns.

pH

Associated field work and sampling

- Bathymetric survey of the lake.
- Collection of sediment samples for physical analyses.
- *In-situ* monitoring.
- Collection of discrete in-lake water samples.

pH

Associated field work and sampling

- Collection of discrete, baseflow samples from four of the main inlets.
- Collection of composite stormwater samples from the same four main inlets during a series of storm events.
- Collection of phytoplankton and zooplankton samples.

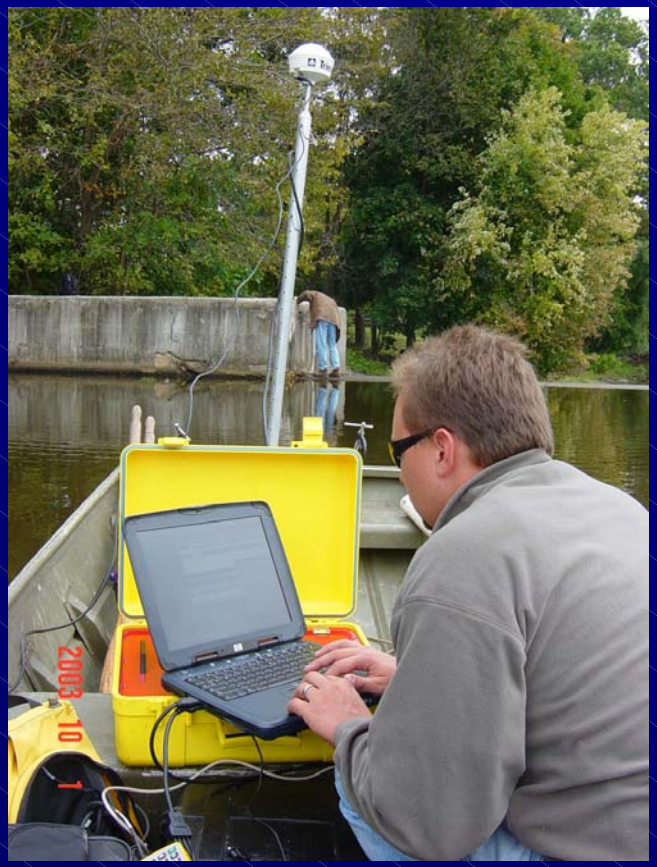
pH

Associated field work and sampling

- Mid-summer macrophyte (aquatic plant) survey
- Detailed fishery survey of Carnegie Lake

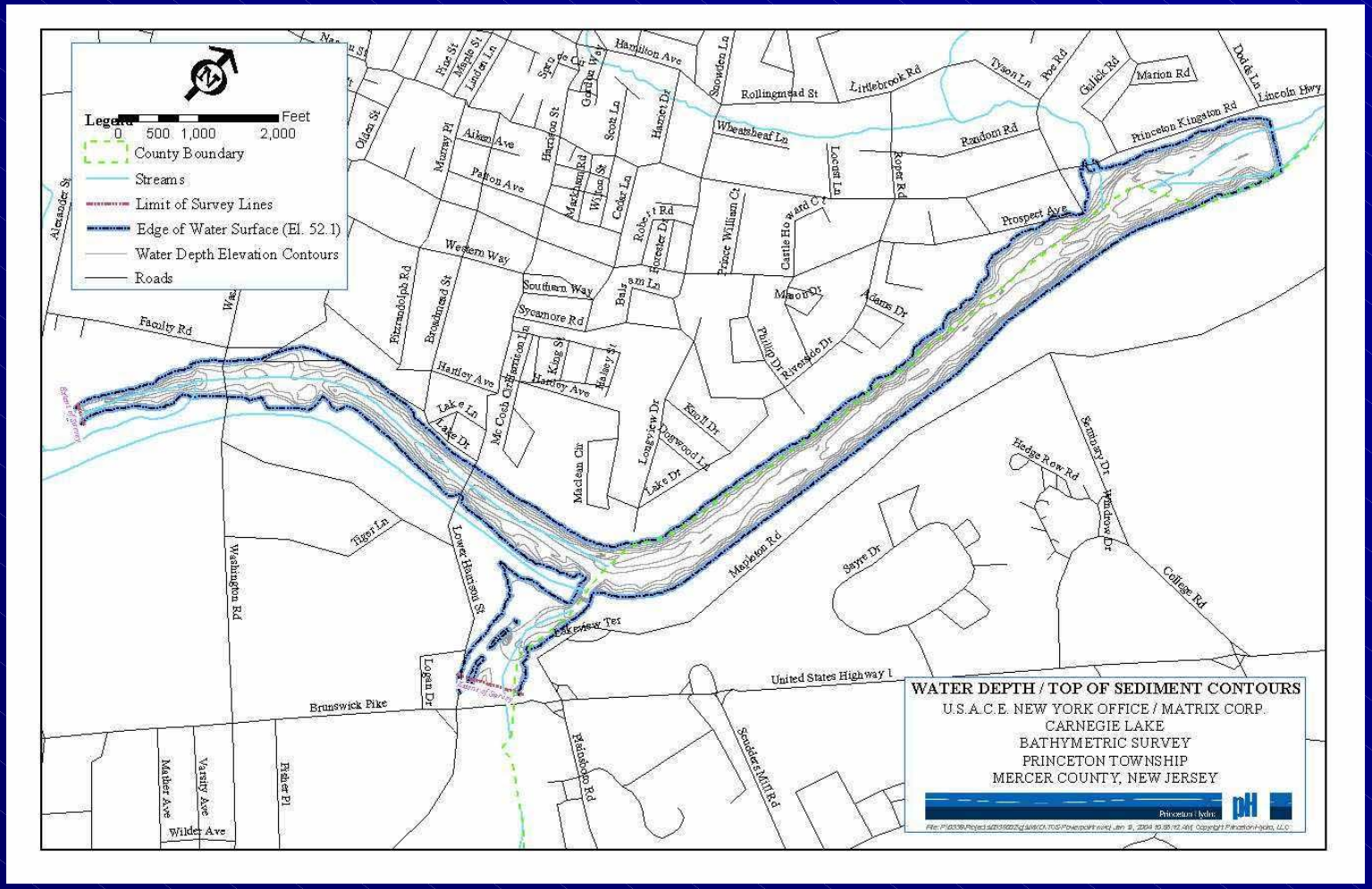
pH

Bathymetric Survey of Carnegie Lake



pH

Bathymetric Survey



pH

Bathymetric Survey

Parameter	Value
Lake Surface Area	259 acres (105 ha)
Mean Depth	3.4 ft (1.0 m)
Maximum Depth	7.1 ft (2.15 m)
Lake Volume	888 acre-ft (1.1 million cubic m)
Volume of Sediments	286,935 cubic yards
Mean Sed. Thickness	1.5 ft (0.45 m)
Max. Sed. Thickness	5.6 ft (1.7 m)

pH

In-situ Monitoring

- A calibrated Hydrolab Surveyor IV or Hydrolab Quanta was used to collect *in-situ* data.
- The *in-situ* data included measurements of temperature, dissolved oxygen, pH and conductivity from surface to bottom at the six stations.
- Water clarity was also measured with a Secchi disk.

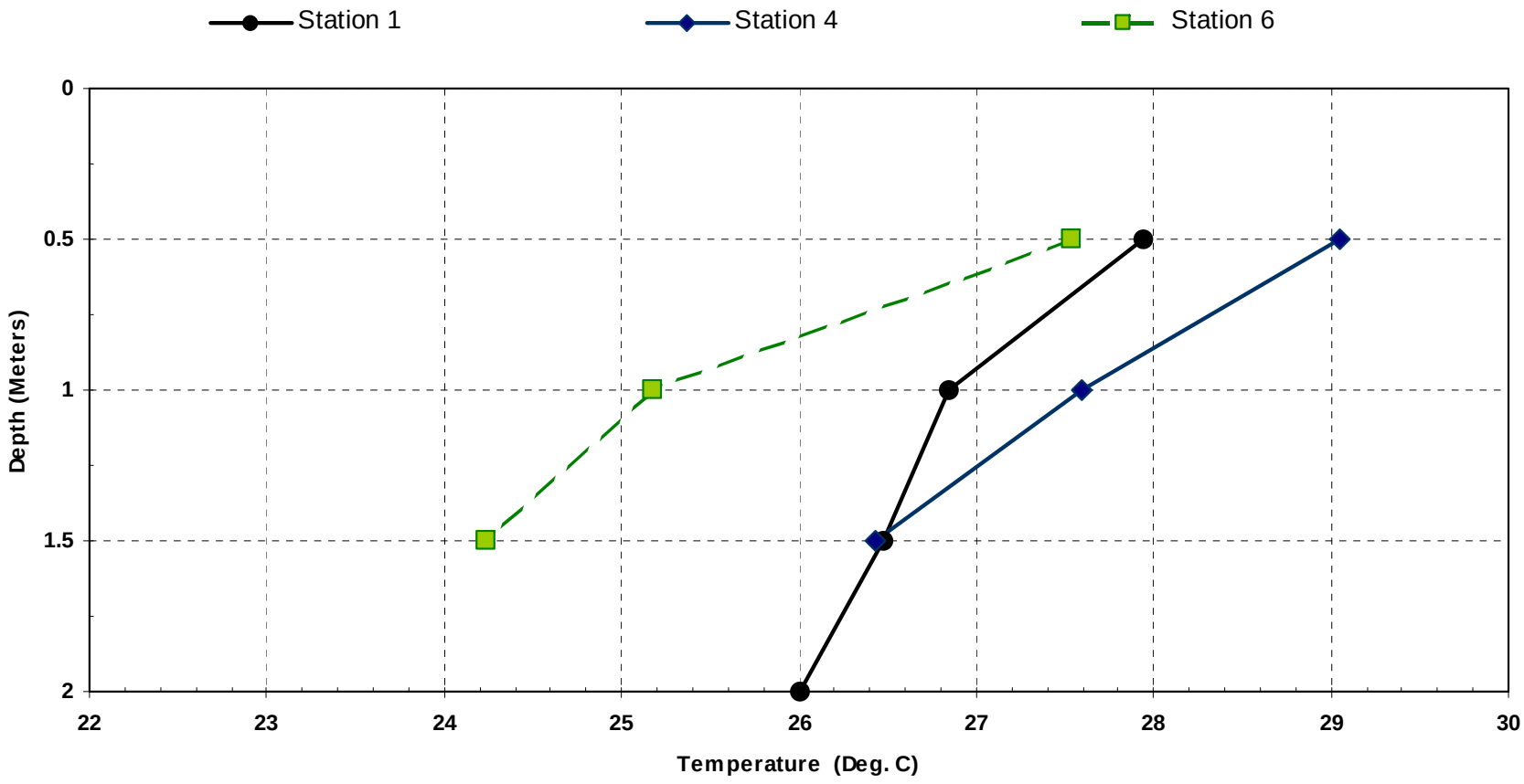
pH

In-lake Sampling Stations

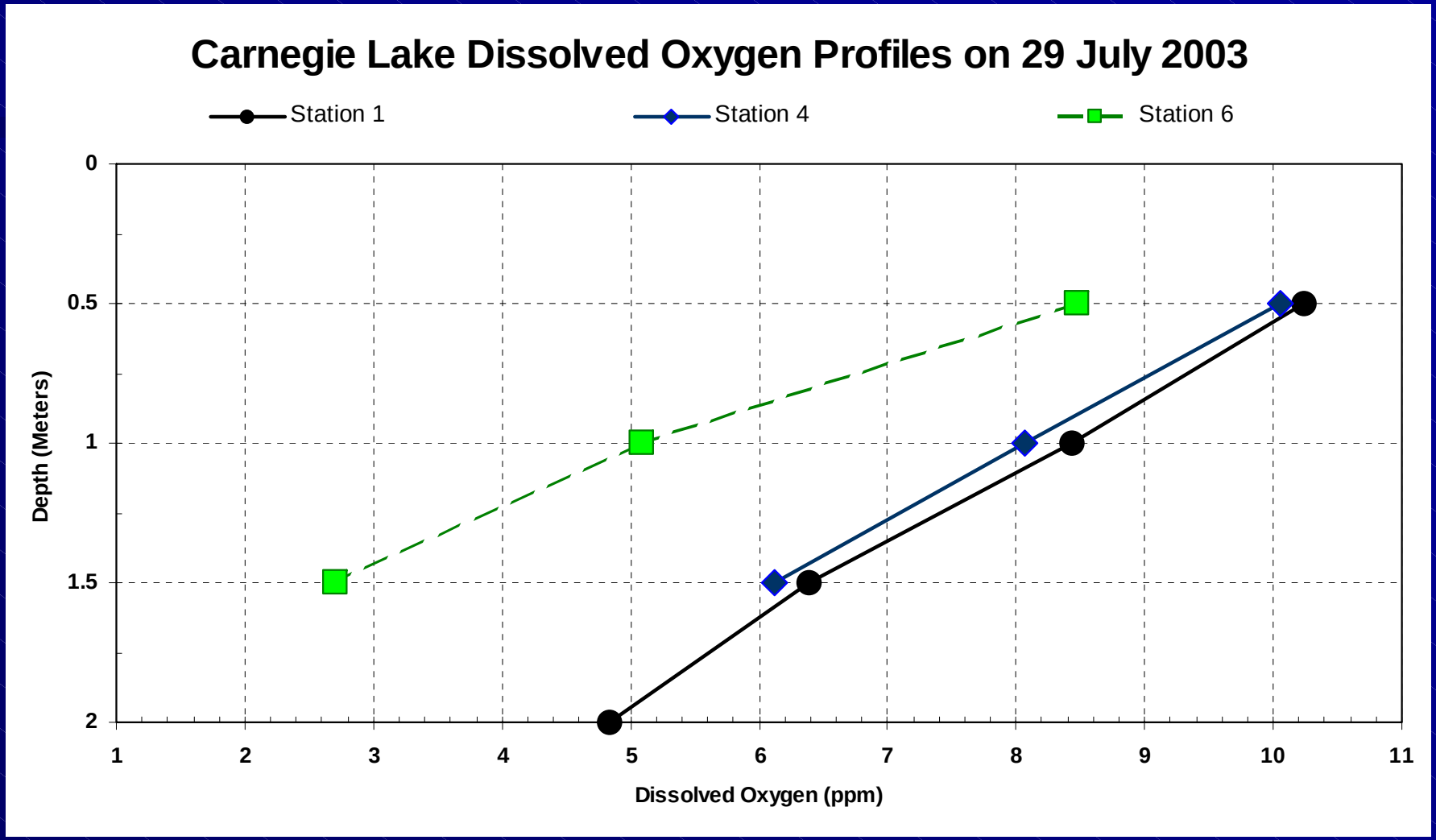
- Station 1 – Northern most station, adjacent to the dam.
- Station 2 – Just south of the public boat launch.
- Station 3 – Approximately half way between the dam and the Millstone inlet.
- Station 4 – Just north of the Millstone inlet.
- Station 5 – Just west of the Millstone inlet.
- Station 6 – Southern most station, adjacent to the crew team's facility.

pH

Carnegie Lake Temperature Profiles on 29 July 2003

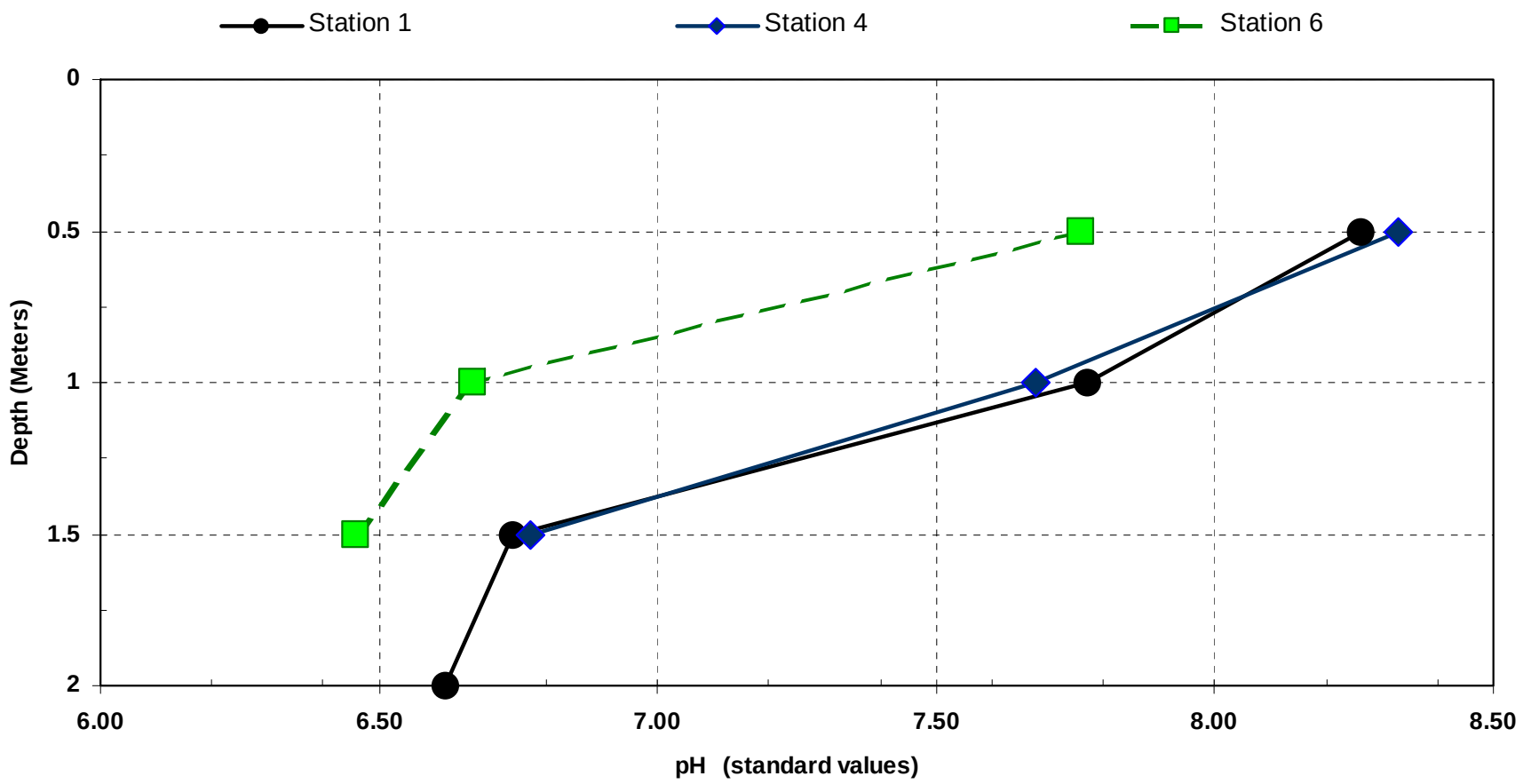


pH


Carnegie Lake Dissolved Oxygen Profiles on 29 July 2003
Station 1
Station 4
Station 6
Depth (Meters)
0
0.5
1
1.5
2
1
2
3
4
5
6
7
8
9
10
11
Dissolved Oxygen (ppm)

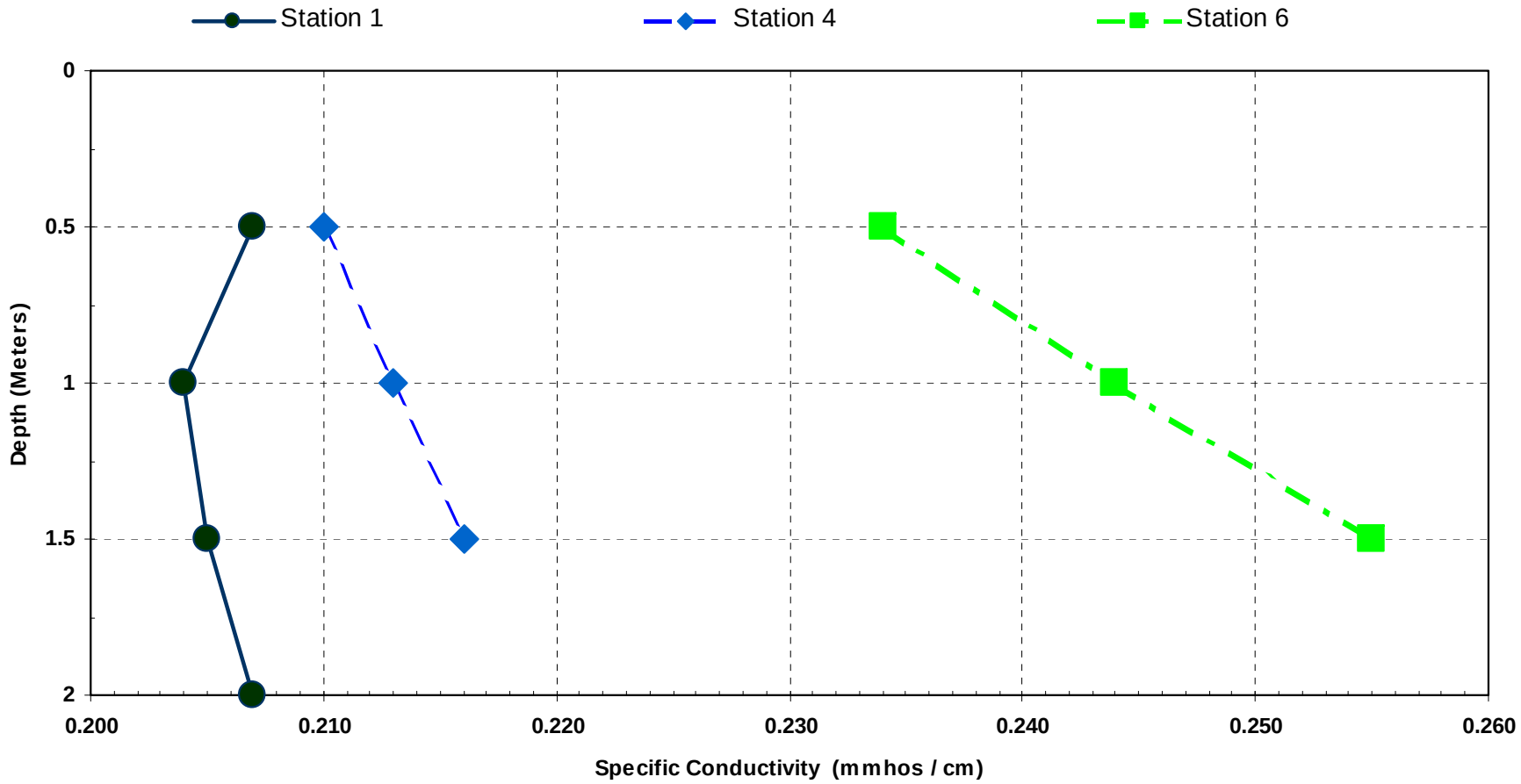
pH

Carnegie Lake pH Profiles on 29 July 2003



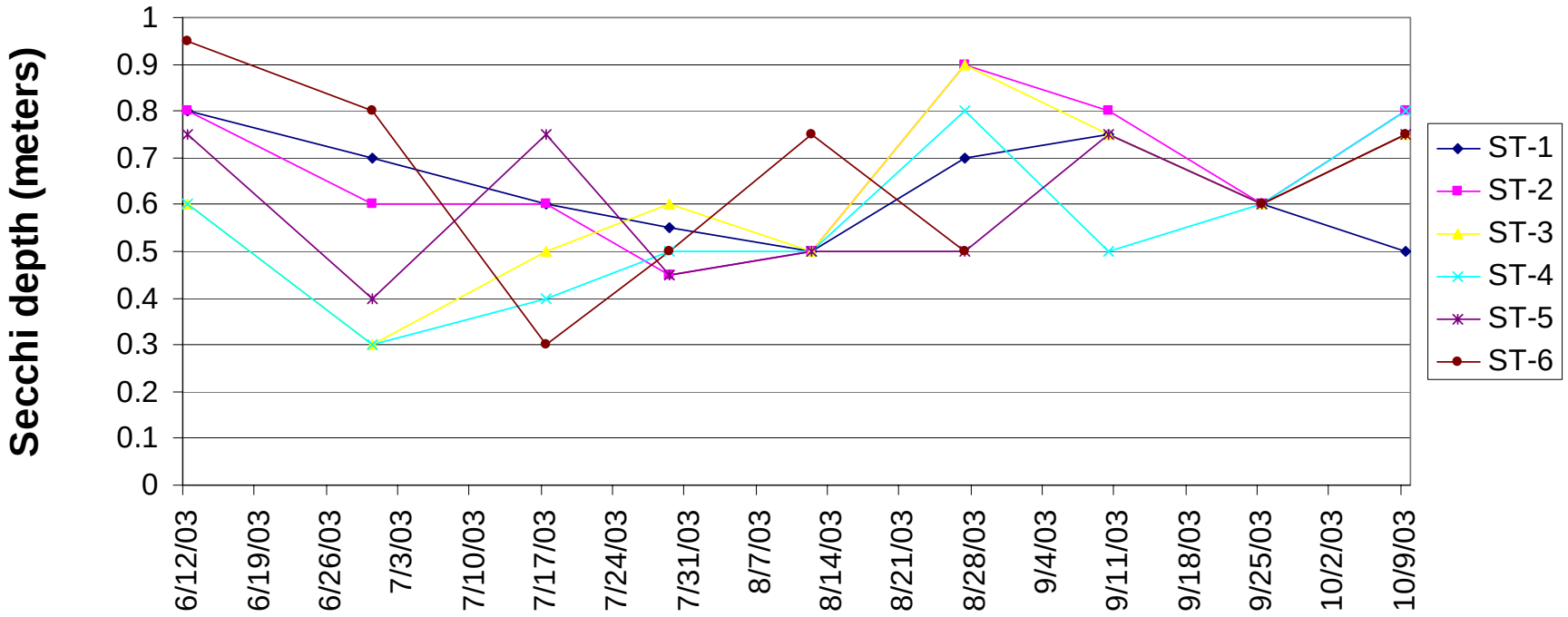
pH

Carnegie Lake Conductivity Profiles on 29 July 2003

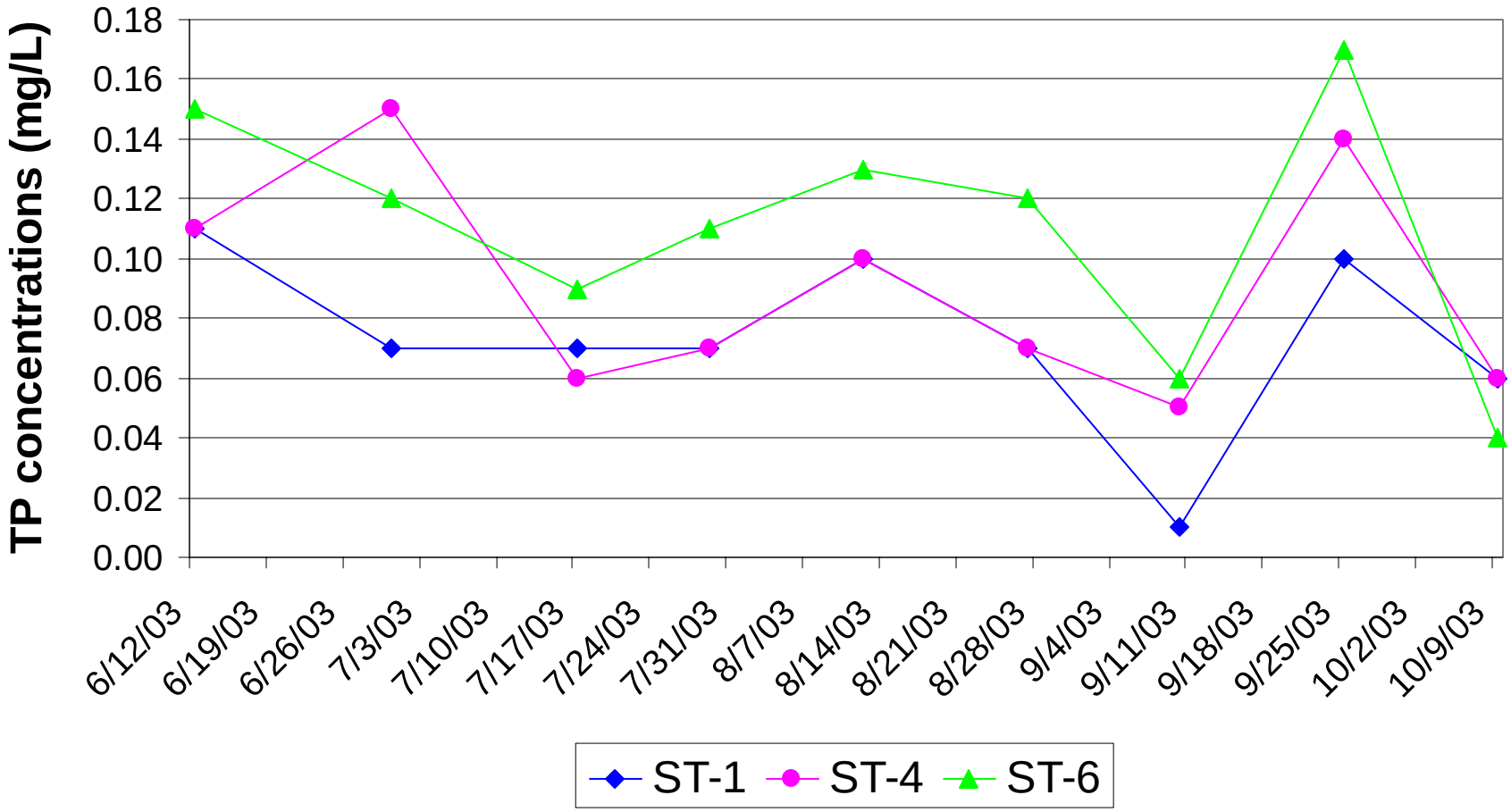


pH

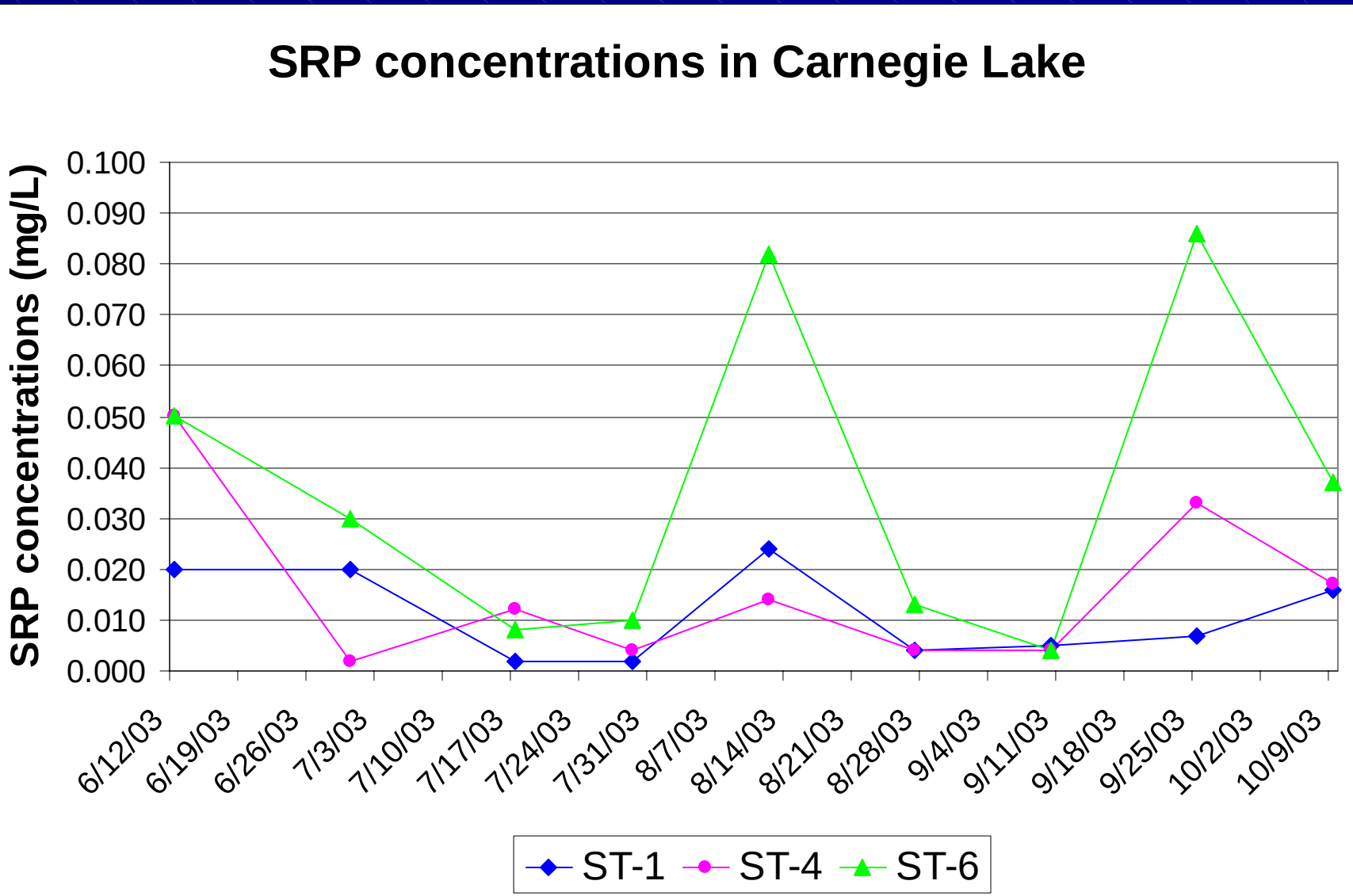
Secchi depth values in Carnegie Lake during the 2003 growing season



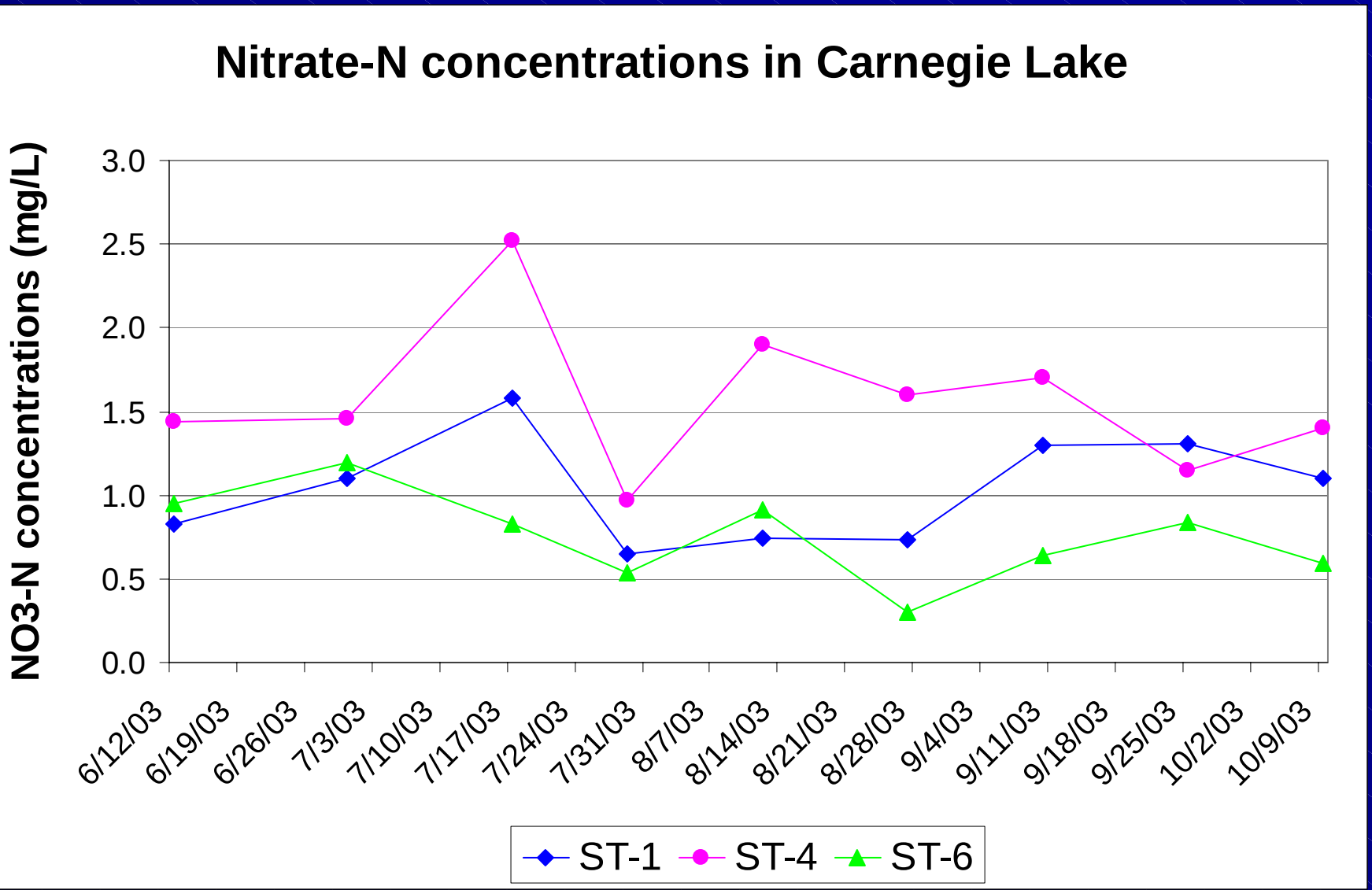
pH


TP concentrations in Carnegie Lake
TP concentrations (mg/L)
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
6/12/03
6/19/03
6/26/03
7/3/03
7/10/03
7/17/03
7/24/03
7/31/03
8/7/03
8/14/03
8/21/03
8/28/03
9/4/03
9/11/03
9/18/03
9/25/03
10/2/03
10/9/03
ST-1
ST-4
ST-6

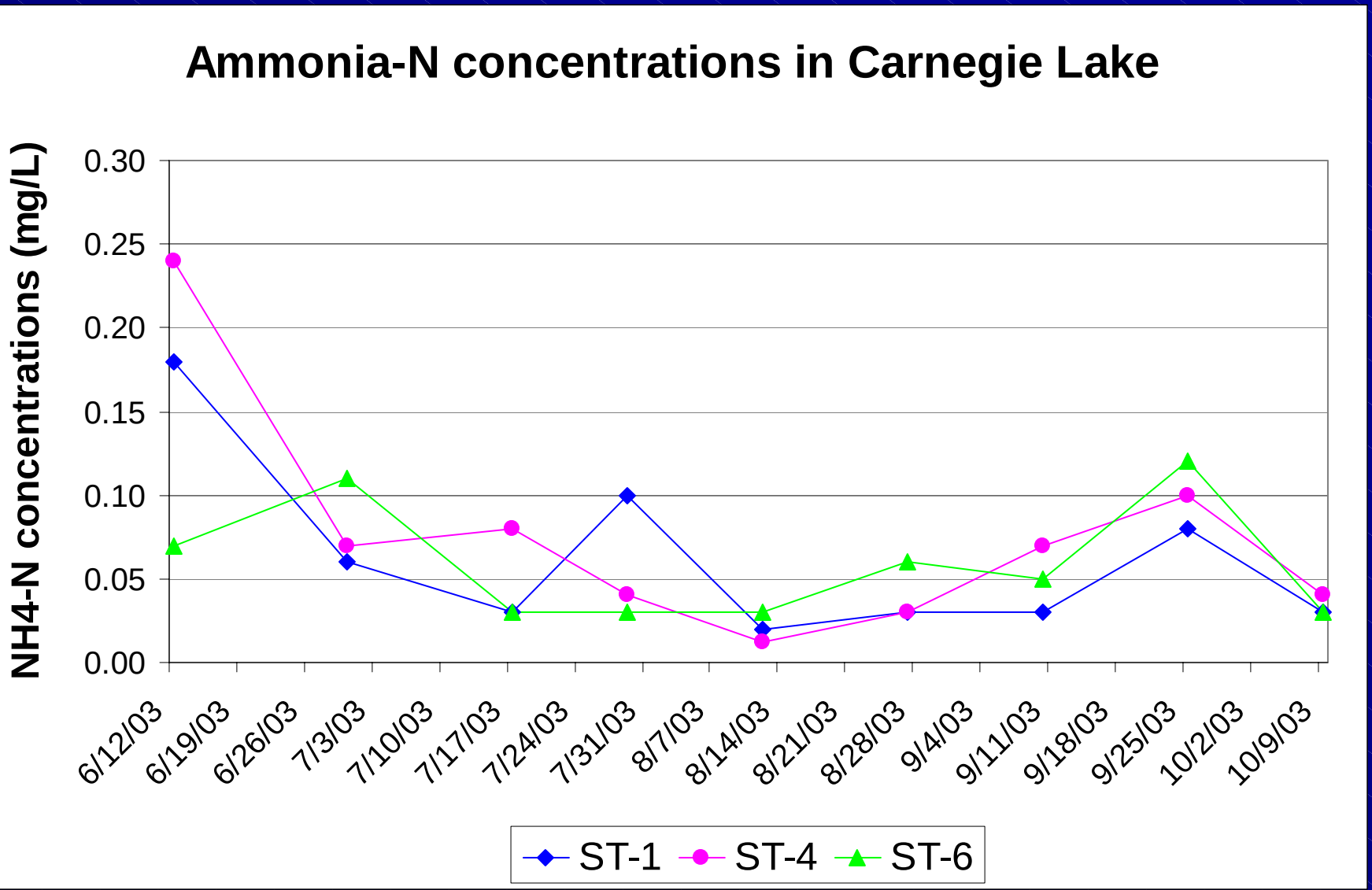
pH


SRP concentrations in Carnegie Lake
SRP concentrations (mg/L)
0.100
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
6/12/03
6/19/03
6/26/03
7/3/03
7/10/03
7/17/03
7/24/03
7/31/03
8/7/03
8/14/03
8/21/03
8/28/03
9/4/03
9/11/03
9/18/03
9/25/03
10/2/03
10/9/03
ST-1
ST-4
ST-6

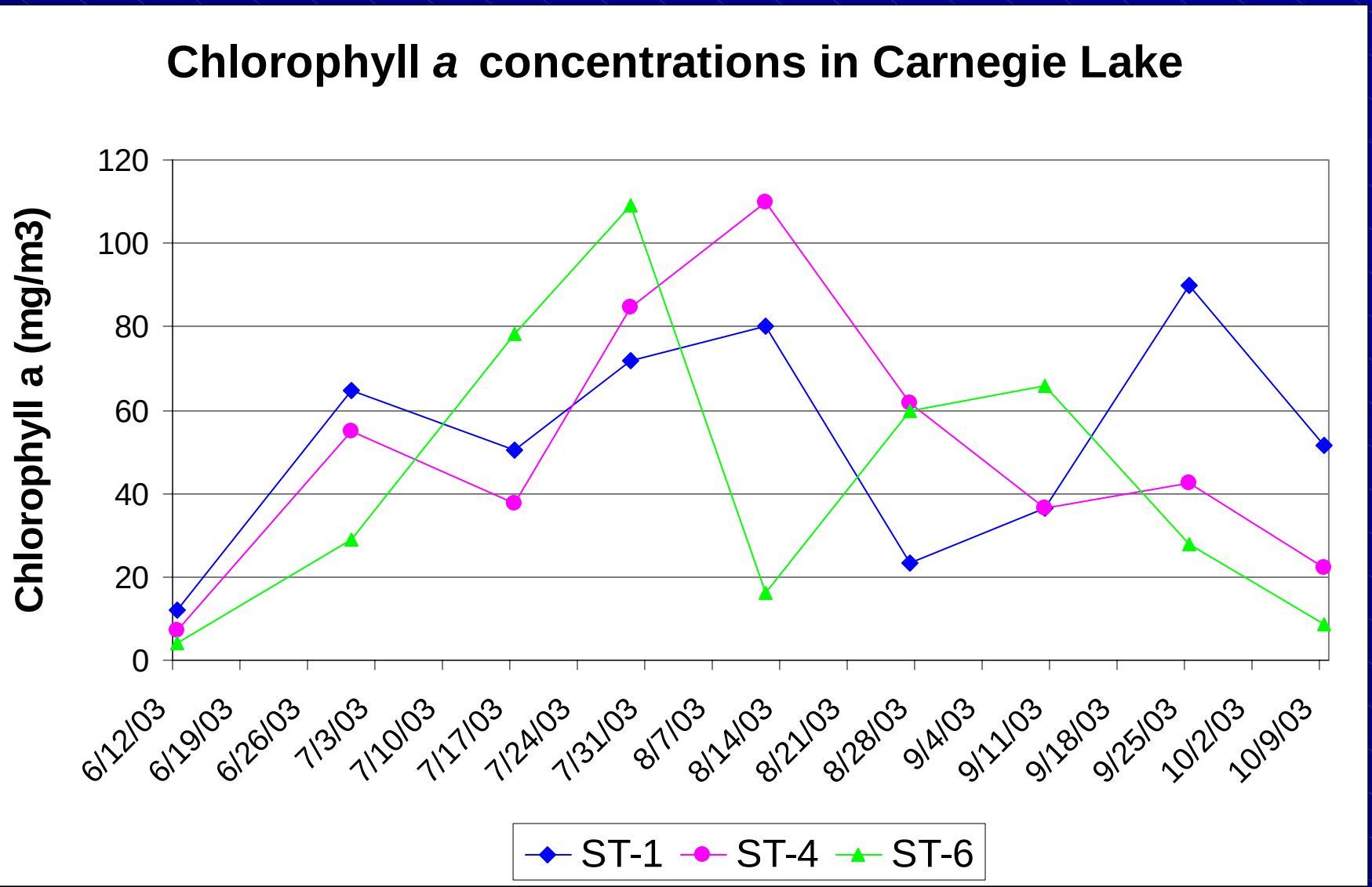
pH


Nitrate-N concentrations in Carnegie Lake
NO3-N concentrations (mg/L)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
6/12/03
6/19/03
6/26/03
7/3/03
7/10/03
7/17/03
7/24/03
7/31/03
8/7/03
8/14/03
8/21/03
8/28/03
9/4/03
9/11/03
9/18/03
9/25/03
10/2/03
10/9/03
ST-1
ST-4
ST-6

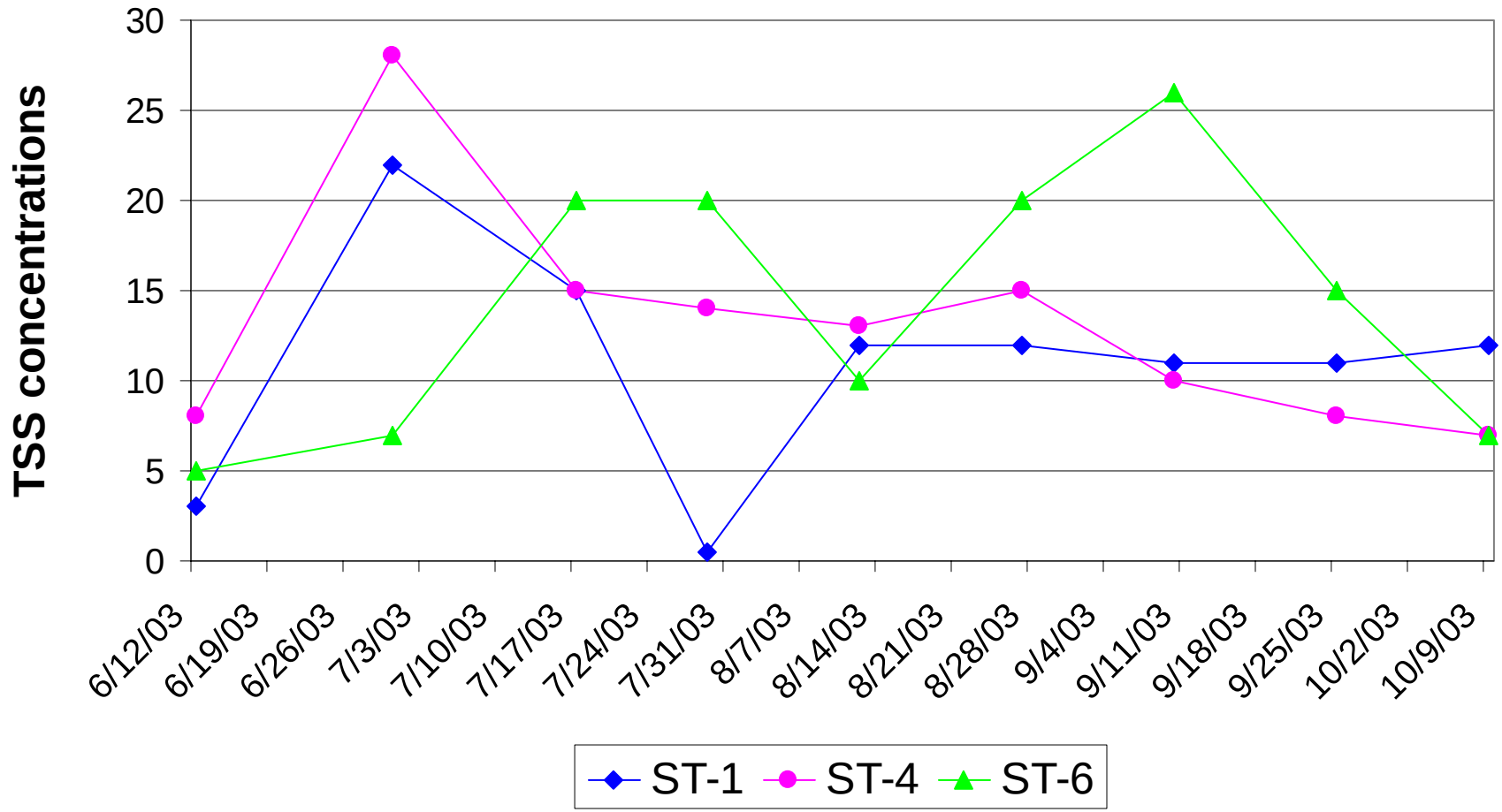
pH


Ammonia-N concentrations in Carnegie Lake
NH4-N concentrations (mg/L)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
6/12/03
6/19/03
6/26/03
7/3/03
7/10/03
7/17/03
7/24/03
7/31/03
8/7/03
8/14/03
8/21/03
8/28/03
9/4/03
9/11/03
9/18/03
9/25/03
10/2/03
10/9/03
ST-1
ST-4
ST-6

pH


Chlorophyll a concentrations in Carnegie Lake
Chlorophyll a (mg/m3)
120
100
80
60
40
20
0
6/12/03
6/19/03
6/26/03
7/3/03
7/10/03
7/17/03
7/24/03
7/31/03
8/7/03
8/14/03
8/21/03
8/28/03
9/4/03
9/11/03
9/18/03
9/25/03
10/2/03
10/9/03
ST-1
ST-4
ST-6

pH


TSS concentrations in Carnegie Lake
TSS concentrations
30
25
20
15
10
5
0
6/12/03
6/19/03
6/26/03
7/3/03
7/10/03
7/17/03
7/24/03
7/31/03
8/7/03
8/14/03
8/21/03
8/28/03
9/4/03
9/11/03
9/18/03
9/25/03
10/2/03
10/9/03
ST-1
ST-4
ST-6

pH

Inlet and Stormwater Sampling

- Inlet (baseline or non-storm event) samples were collected six times during the 2003 monitoring season for TN, TP, TSS and fecal coliform.
- Composite stormwater samples were collected three times during the 2003 monitoring season for TN, TP and TSS. Fecal coliform grab samples were collected.

pH

Baseline and Stormwater Sampling Stations

- Station 1 – Small tributary that enters the lake from the northwest, just south of the dam.
- Station 2 – Small tributary that receives a lot of stormwater from the University.
- Station 3 – The Stony Brook River.
- Station 4 – The Millstone River.

pH

ISCO Automated Sampling Unit

pH

Baseline Concentrations (mg/L)

Station	TN	TP	TSS
Station 1	1.22	0.06	3
Station 2	2.53	0.06	12
Station 3	1.06	0.10	6
Station 4	2.82	0.10	8

pH

Stormwater Concentrations (mg/L)

Station	TN	TP	TSS
Station 1	1.13	0.10	24
Station 2	2.06	0.15	55
Station 3	0.90	0.11	10
Station 4	3.35	0.08	11

pH

Fecal Coliform Samples

- Moderate to excessive in-lake fecal coliform counts. Particularly high at Station 6.
- Inlet baseline fecal coliform counts were generally higher than in-lake counts.
- Stormwater fecal coliform counts were excessive, with counts >2,400 counts per 100 mLs.

pH

Plankton Communities

- In the process of completing the samples.
- Generally high diversity of phytoplankton. Green algae, diatoms, chryosphytes, blue-green algae and other groups.
- Rotifers were the dominant zooplankton in Carnegie. A few moderately sized herbivores identified.

pH

Fishery Survey

- Utilized a variety of sampling techniques to conduct the fishery survey (electroshocking, shoreline seining, gill nets, and trap nets).
- Over 15 species were identified in Carnegie Lake.
- Species of panfish and gizzard shad were the dominant species.

pH

Fishery Survey

pH

Fishery Survey

pH

The Next Step……

- Complete analyzing the 2003 Carnegie Lake database.
- Quantify the hydrologic budget for the lake.
- Quantify the pollutant (TN, TP and TSS) budget for the lake.
- Utilize all of the information to develop a Restoration Plan for Carnegie Lake.

pH

Some possible in-lake strategies

- Selective dredging of specific areas of the lake. Some potential locations include the southern most end of the lake and adjacent to the public boat launch.
- Some pro-active fishery management.
- The possible application of biomanipulation.
- Potential installation of circulators.

pH

Some possible watershed-based strategies

- Possible use of agricultural BMPs such as structural diversions, grassed waterways, water and sediment control basins, water quality terraces and other runoff control techniques.
- The emphasis of agricultural BMPs will be based on the findings of the pollutant budget analysis.

pH

Some possible watershed-based strategies

- The implementation of structural BMPs to reduce existing and future pollutant loads related to residential / commercial runoff.
- Such potential structural BMPs include grassed swales, retention ponds, infiltration basins, porous pavement, nutrient / sedimentation chambers.

pH

Some possible watershed-based strategies

- In addition to structural BMPs, the use of retrofits into existing stormwater infrastructure may be a cost effective approach toward dealing with land that has already been developed.
- Such retrofits include SNOUTS, infiltration inlets, upgraded catch basins and basin sleeves.

pH

Some possible watershed-based strategies

- Streambank stabilization will be another important means of protecting Carnegie Lake, especially relative to TSS loading.
- Public education needs to be addressed as well.
- All of the possible strategies will also address the new Stormwater Rules and satisfy a community's MS4 requirements.

pH

Thank You

For More Information Please Contact

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