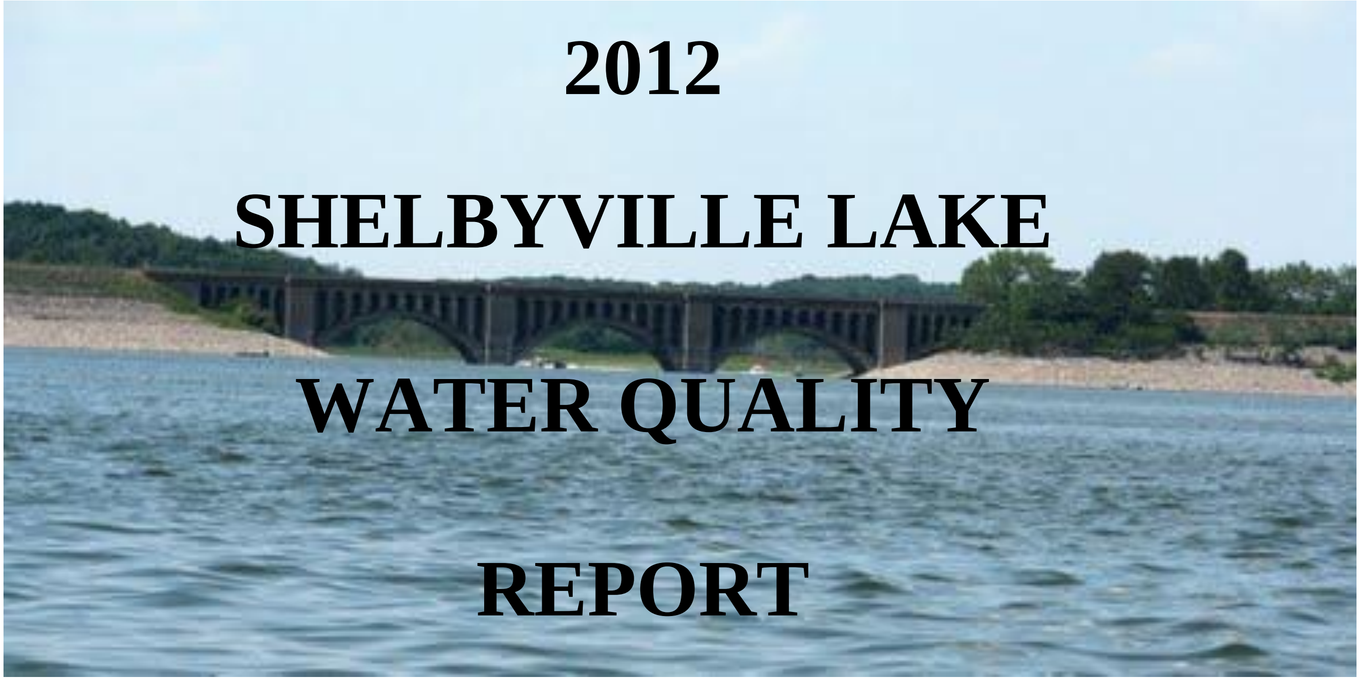

2012

SHELBYVILLE LAKE

WATER QUALITY

REPORT

U.S. ARMY CORPS OF ENGINEERS, ST. LOUIS DISTRICT
ENVIRONMENTAL ENGINEERING SECTION – WATER QUALITY

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Executive Summary

The purpose of this report is to provide an annual analysis of the water quality in the lake for the past year. Shelbyville Lake is a multi-purpose reservoir located on the Kaskaskia River, one-half mile east and one-fourth mile north of the town of Shelbyville, Illinois and 120 miles northeast of St. Louis. The lake is 20 miles long and is 1 to 1.5 miles wide and has approximately 11,100 acres of water surface at summer pool. The lake is located on the Kaskaskia River at river mile 222 upstream from its confluence with the Mississippi River.

The water of Shelbyville Lake and the downstream river channel is generally good. The lake is a shallow reservoir susceptible to high winds. These conditions prevent the lake from stratifying for long periods during the summer months. Several years ago a remote sensor was installed on the spillway wall to allow the project as well as water quality personnel to remotely monitor temperature and oxygen readings to avoid fish kills by changing release rates. No fish kills were observed during this past year.

All sampling sites met the appropriate state standards during 2012 except for E. coli beach samples at Dam West in July and Wilborn Creek in July and August. Phosphorous levels at the lake sites have exceeded the state standard on a routine basis. Generally phosphorous levels in the tailwater and lake site near dam (site 2) are lower than the incoming tributary flows, which indicates that the lake is sinking the phosphorous. This is also occurring with nitrogen. The project area has several pollution potentials, with agriculture probably being the major contributor, but at present time, no major form of degradation to the lake or streams is apparent. Constant water quality monitoring will continue to check future degradation of the watershed.

WATER QUALITY MONITORING PROGRAM

1.0 GENERAL OVERVIEW

This report summarizes water quality activities of the St. Louis District for Fiscal Year 2012 in accordance with ER 1110-2-8154 Water Quality & Environmental management for Corps Civil Works Projects and ETL 1110-2-362 Environmental Engineering Initiatives for Water Management.

Water quality monitoring remains one of the Sections major responsibilities. The objective is to maintain a reasonable environmental monitoring program for the Mississippi River and the 5 lakes under the St. Louis District's control. The District's reservoirs consist of Mark Twain and Wappapello Lakes in Missouri, and Shelbyville, Carlyle and Rend Lakes in Illinois. Water quality sampling is conducted within the lakes and their tributaries to establish trend analysis and maintain water quality at or above state and federal regulations.

The main objective is to provide technical expertise of an environmental nature to all Corps elements requesting assistance in accordance with ER 1110-2-8154. This would include updating the water quality management priorities for the district's projects to ensure water quality meets the state and federal regulations, for protection of human health and the environment, and for the safety and economic welfare of those at Corps projects. Ongoing goals include ensuring that downstream water quality meets all state and federal regulations, is suitable for aquatic and human life, and continue to evaluate trend analysis in relation to baseline conditions at all projects.

Water quality data is provided to the Illinois Environmental Protection Agency (IEPA) to be used in the Illinois Integrated Water Quality Report which is required every two years by the Clean Water Act Sections 303(d) and 305(b). IEPA does not monitor Shelbyville Lake. However, IEPA has stated that since the Corps lakes are the 3 largest lakes in the state, it is critical that their quality be routinely assessed. The state indicated that having the federally collected water quality data available now and in the future is critical to the state of Illinois meeting their mission in complying with the Clean Water Act Sections 305(b) and 303(d).

The National Water Quality Inventory Report to Congress 305(b) report is the primary vehicle for informing Congress and the public about general water quality conditions in the United States. This document characterizes our water quality, identifies widespread water quality problems of national significance, and describes various programs implemented to restore and protect our waters.

Under Section 303(d) of the 1972 Clean Water Act, states, territories and authorized tribes are required to develop a list of water quality limited segments. These waters on the list do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for water on the lists and develop action plans, called as Total Maximum Daily Loads (TMDL), to improve water quality.

Currently the Illinois Environmental Protection Agency (IEPA) has listed Shelbyville Lake impaired for Total Suspended Solids and aquatic plants. The lists of sources for these impairments are runoff, crop production, shore modifications, and recreational pollution. Continued monitoring of the lake and its tributaries is vital in assisting the future assessment of the lake for these and other possible impairments. The water quality monitoring program represents the single metric that encompasses the overall health of the watershed as it is a direct measure of how well the environmental stewardship programs are working.

1.1 INTRODUCTION

Shelbyville Lake is within the Kaskaskia River basin in central Illinois. The lake serves as a heavy recreational usage lake. The land surrounding the lake is used predominately for agriculture. Surrounding communities have existing industrial/commercial operations and residents which discharge wastewater into municipal wastewater treatment plants which ultimately discharge treated water into the Kaskaskia River basin. Agricultural runoff and municipal wastewater treatment facilities are the primary potential source of pollution into the Shelbyville Lake watershed. Additional sources are marinas, recreational watercraft discharges and wildlife fecal material runoff.

Water quality monitoring was conducted during 2012 to assure the safe conditions for human recreation, wildlife and aquatic life was maintained and managed within the lake system. In 2012 3 sampling events were conducted at 6 sites. The 2012 water quality monitoring program began in May and continued through August. During the past couple of years, water quality monitoring has been reduced due to funding. Prior to 2009 five sampling events were conducted during the recreational season. In the initial phase of the sampling program during the 1970’s and 80’s six or seven sampling events were conducted. A restored number of sampling events would provide the ability to better evaluate water quality trends, to better defend project operations (lake levels, releases, maintenance projects, construction projects, etc.), to better confirm that we meet state water quality standards, and to better confirm that human health and safety are adequately protected. During each sampling period one site was selected for quality control duplication and denoted as SBV-15. The locations of the six sampling sites are depicted on the lake map in Figure 1.

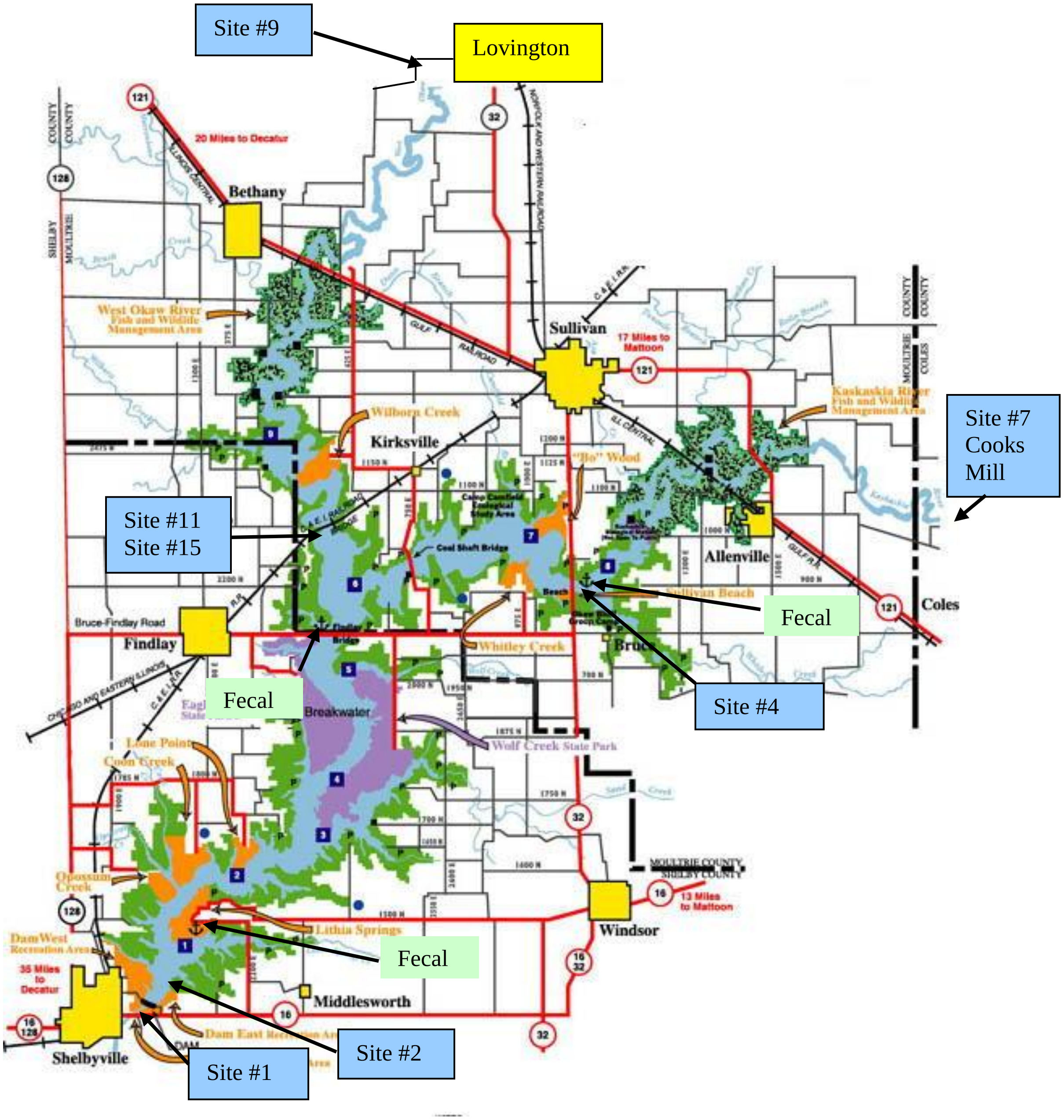


Figure 1
Location of sample sites

2.0 WATER QUALITY ASSESSMENT CRITERIA

2.1 Water Quality

The water quality assessment criteria were based upon the State of Illinois regulatory limits for certain contaminants, which has been generally accepted criteria for sustaining adequate aquatic plant and animal growth. The samplings and analysis which were conducted at the Shelbyville Lake sites reflect the minimal set of parameters needed to analyze the current status of water quality for the Shelbyville Lake system.

The following parameters were analyzed in the Fiscal Year 2012 samplings at Shelbyville Lake: Total Organic Carbon (TOC), iron, manganese, ammonia-nitrogen, nitrate-nitrogen, orthophosphate, total phosphate, Total Suspended Solids (TSS), Total Volatile Suspended Solids (TVSS), fecal coliform, pH, temperature, dissolved oxygen, specific conductance, oxidation-reduction potential (ORP), chlorophyll, pheophytin-a, pesticides and herbicides,

The Illinois Environmental Protection Agency in Title 35, Subtitle, C, classifies water quality criteria based on end usage. Subpart B contains regulations for general use water, while subparts C and D delineate those for public and food processing water and secondary contact and indigenous aquatic life standards, respectively. These standards are used to determine the aquatic water quality of the lake. Table 2.1 provides a listing of the regulatory limits for the parameters analyzed where a limit has been established.

TABLE 2.1

State of Illinois
Water Quality Standards

PARAMETER	LIMIT
Temperature	Rise of 2.8°C above normal seasonal temp
Ammonia Nitrogen	15 mg/L
Nitrate Nitrogen	10 mg/L
Total Iron	2.0 mg/L (2nd Contact & Aquatic Life)
Manganese	1.0 mg/L
Total Phosphate	0.05 mg/L Lakes; 0.61 mg/L Streams
E. Coli	Illinois standard is 235 E. coli per 100ml for single sample or 126 for geometric mean.
pH	Range: 6.5 to 9.0
DO	> 5.0 mg/L
Conductivity	1,667 *u*S/cm≈TDS of 1,000 mg/L
Total Suspended Solids (TSS)	116mg/L (Streams); >=12mg/L (Lakes)
Atrazine	0.003 mg/L[1]; 82ug/L[2]; 9ug/L[3]
Alachlor	0.002 mg/L (Drinking Water Standard)
Cyanazine	370ug/L Acute; 30ug/L[3]
Metolachlor	1.7mg/L Acute
Simazine	4.0ug/L [1]
Trifluralin	26ug/L Acute; 1.1ug/L[3]

Pendimethalin (PROWL)	70ug/L HSBL, 20ug/L[1]

[1] Drinking Water Standard
[2] Acute
[3] Chronic
Health Based Screening Levels (HBSL)

Nitrogen is an essential component of proteins, genetic material, chlorophyll, and other key organic molecules. All organisms require nitrogen in order to survive. Nitrogen exists in several forms. These forms include gaseous nitrogen (N_2), nitrites (NO_2), nitrate (NO_3), ammonia nitrogen (NH_3-N), and ammonium (NH_4). Ammonia can be toxic to fish and other aquatic organisms at certain levels. Unlike ammonia, ammonium (NH4) is not toxic to aquatic organisms and is readily available for uptake by plankton and macrophytes. Nitrogen levels have increased as human activities have accelerated the rate of fixed nitrogen being put into circulation. High nitrogen levels can cause eutrophication. Eutrophication increases biomass of phytoplankton, decrease water transparency, and causes oxygen depletion. Ammonia nitrogen is monitored so that the effects on fish spawning, hatching, growth rate and pathologic changes in gills, liver and kidney tissue can be related to the detected levels of ammonia nitrogen. Nitrate-nitrogen degrades to nitrite or produces ammonia which has a detrimental effect on aquatic life and, therefore, has been monitored to assure levels are below the regulatory "safe" limit.

Phosphate has been analyzed as phosphorus and has been monitored due to the potential for uptake by nuisance algae. Levels of phosphate can indicate the potential for rapid growth of algae (algae bloom) which can cause serious oxygen depletion during the algae decay process. Phosphorous is typically the limiting nutrient in a water body. Therefore, addition of phosphorous to the ecosystem stimulates the growth of plants and algae. Phosphorous is delivered to lakes and streams by way of storm water runoff from agricultural fields, residential property, and construction sites. Other sources of phosphorous are anaerobic decomposition of organic matter, leaking sewer systems, waterfowl, and point source pollution. The general standard for phosphorous in lake water is 0.05mg/L. Dissolved phosphorous also called ortho-phosphorous is generally found in much smaller concentrations than total phosphorous and is readily available for uptake. For this reason dissolved phosphorous concentrations are variable and difficult to use as an indicator of nutrient availability.

The metals manganese and iron are nutrients for both plants and animals. Living organisms require trace amounts of metals. However, excessive amounts can be harmful to the organism. Heavy metals exist in surface waters in three forms, colloidal, particulate, and dissolved. Water chemistry determines the rate of adsorption and desorption of metals to and from sediment. Metals are desorbed from the sediment if the water experiences increases in salinity, decreases in redox potential, or decreases in pH. Metals in surface waters can be from natural or human sources. Currently human sources contribute more metals than natural sources. Metals levels in surface water may pose a health risk to humans and the environment.

Photosynthetic activity can be hindered by the levels of total suspended solids. Total suspended solids concentrations, which cause the photosynthetic activity to be reduced by more than 10% from the seasonably established norm, can have a detrimental effect on aquatic life. Soil particles, organic material, and other debris comprise suspended solids in the water column.

Secchi disk measurements are inverse to suspended solid measurements. As the total suspended solids (TSS) increase, the secchi disk depth or water transparency decreases. Total suspended solids can be an important indicator of the type and degree of turbidity. TSS measurements represent a combination volatile suspended solids (VSS) which is comprised of organic material and nonvolatile suspended solids (NVSS) which is comprised of inorganic mineral particles in the water. In order to more accurately determine the types and amounts of suspended solids, volatile suspended solids (VSS) are analyzed. VSS concentration represents the organic portion of the total suspended solids. Organic material often includes plankton and additional plant and animal debris that is present in water. Total volatile solids indicate the presence of organics in suspension and, therefore, show additional demand levels of oxygen. Illinois recommends a TSS standard of 116mg/L for streams and ≥12mg/L for lakes. Literature suggests that Nonvolatile Suspended Solids (NVSS) which is a subdivision of TSS above 15mg/L could highly impair recreational lake use and a NVSS of 3 to 7mg/L might cause slight impairment.

Chlorophyll and pheophytin-a are monitored to provide indicators of algae growth and, therefore, potential oxygen depletion activity. Chlorophyll is measured in lakes to estimate the type and amount of algal productivity in the water column. Chlorophyll a is present in green algae, blue-green algae, and in diatoms. Chlorophyll a is often used to indicate the degree of eutrophication. Chlorophyll b and c are used to estimate the extent of algal diversity and productivity. Chlorophyll b is common in green algae and is used as an auxiliary pigment for photosynthesis. Chlorophyll c is most common in diatom species and serves as an auxiliary pigment. Algal productivity and diversity can be determined by the concentrations of the individual pigments. For example high concentrations of chlorophyll a and b would indicate that green algae is abundant. High concentrations of chlorophyll a would indicate abundance of blue-green algae and concentrations of chlorophyll a and c would indicate diatoms are the dominant species. Chlorophyll production is currently being connected with hypoxia.

Fecal coliform bacteria is monitored for the protection of human health as it relates to full body contact of recreational waters. People can be exposed to disease-causing organisms, such as bacteria, viruses and protozoa in beach and recreational waters mainly through accidental ingestion of contaminated water or through skin contact. These organisms, called pathogens, usually come from the feces of humans and other warm-blooded animals. If taken into the body, pathogens can cause various illnesses and on rare occasions, even death. Waterborne illnesses include diseases resulting from bacteria infection such as cholera, salmonellosis, and gastroenteritis, viral infections such as hepatitis, gastroenteritis, and intestinal diseases, and protozoan infections such as ameobic dysentery and giardiasis. The most commonly monitored recreational water indicator organisms are fecal coliform, Escherichia coli, (E. coli) and enterococci. Fecal coliform are bacteria that live in the intestinal tracts of warm-blooded animals. The standard for fecal coliform is less than 500 colonies per 100ml of sample water. Fecal coliform was originally recommended in 1968 by the Federal Water Pollution Control Administration (predecessor to EPA) as an effective water quality indicator organism for recreational waters. Recent studies indicate that fecal coliform show less correlation to illness than other indicator organisms such as E. coli and enterococci. The Environmental Protection Agency (EPA) currently recommends E. coli or enterococci as an indicator organism for fresh waters. Since 2009 the St. Louis District has been using E. coli as the standard indicator.

Atrazine and Alachlor herbicides are commonly used agricultural chemicals which can be readily transported by rainfall runoff. Both compounds are suspected of causing cancer and, therefore, were monitored for the protection of human and aquatic health. Organic compounds include many pesticides. A pesticide can be any substance that is intended to prevent, destroy, repel, or mitigate any pest. This includes insecticides, herbicides, fungicides, fumigants, algaecides and other substances. Herbicides which are pesticides used to kill vegetation are the most widely used and sampled. Ten of the most frequently used herbicides and detected in water are Atrazine, Metolachlor, Alachlor, 2,4-D, Trifluralin, Glyphosate, Dicamba, Cyanazine, Simazine, and 2,4,5-T. Two of the most widely used pesticides are Atrazine and Alachlor. Atrazine is a preemergence or postemergence herbicide use to control broadleaf weeds and annual grasses. Atrazine is most commonly detected in ground and surface water due to its wide use, and its ability to persist in soil and move in water. Alachlor is a Restricted Use Pesticide (RUP) due to the potential to contaminate groundwater. The drinking water standard for Atrazine is 0.003mg/L and 0.002 mg/L for Alachlor.

Temperature, dissolved oxygen and pH are monitored for the protection of aquatic life. Temperature is important because it controls several aspects of water quality. Cold water holds more dissolved oxygen which is required by aquatic organisms. Plants grow more rapidly and use more oxygen in warmer water. Decomposition of organic matter which uses oxygen is accelerated in warmer water. Temperature can also determine the availability of toxic compounds such as ammonia. Since aquatic organisms are cold blooded, water temperature regulates their metabolism and ability to survive. The number and kinds of organisms that are found in streams or lakes is directly related to temperature. Certain organisms require a specific temperature range, such as trout, which require water temperatures below 20^{o}C. Most aquatic organisms require a minimum concentration of dissolved oxygen to survive. In spring, surface waters of the lake mix with the water below through wind and thermal action. This mixing diminishes as the upper layer of water becomes warmer and less dense. Solar insulation during the summer months stratifies the lake into three zones. The upper warmer water zone is called the epilimnion and the lower cooler water zone is called the hypolimnion. The epilimnion and the hypolimnion zones are divided by a transition zone known as the metalimnion. The thermocline located within the metalimnion exhibits a rapid change in water temperature. During the summer months the hypolimnion may become anaerobic. In this anaerobic zone, chemical reduction of iron and manganese, or the production of methane and sulfides can occur. Iron rapidly oxidizes in aerobic environments, but manganese oxidizes slowly and can remain in the reduced state for long distances down stream even in aerobic environments. The degree of acidity of water is measured by a logarithmetic scale ranging from 0 to 14 and is known as the pH scale. A reading of 7 indicates neutrality and readings below seven are acidic and above are alkaline. Most Illinois lakes range from 6 to 9 on the pH scale. The buffering capacity of water is the ability to neutralize acid better known as alkalinity. A high alkalinity concentration indicates an increased ability to neutralize pH and resist changes, whereas a low alkalinity concentration indicates that a water body is vulnerable to changes in pH.

Conductivity is a measure of a water’s ability to conduct an electrical current. The ability to carry a current is often driven by the dissolved materials present in a water column. These materials can include dissolved ions and other materials in the water and thus are directly proportional to the concentration of total dissolved solids (TDS) present in the water column.

Typically TDS concentrations represent 50-60% of the conductivity measurements. Conductivity is also affected by water temperature. The warmer the water, the higher the conductivity. Conductivity in streams and rivers is affected by the geology of the area. Streams running through granite areas tend to have lower conductivity due to granite being composed of inert material, materials that do not ionize or dissolve into ionic compounds in water. On the other hand streams that run through areas of limestone or clay soils tend to have higher conductivity readings because of the presence of materials that ionize. Conductivity is useful as a general measure of water quality. A stream tends to have a relatively constant range of conductivity that once establish can be used as a baseline. Significant changes either high or low might indicate a source of pollution has been introduced into the water. The pollution source could be a treatment plant which raises the conductivity or an oil spill which would lower the conductivity.

Redox or Oxidation-Reduction Potential (ORP) is a measurement to oxidize materials. Oxidation involves an exchange of electrons between 2 atoms. The atom that loses an electron is oxidized and the one that gains an electron is reduced. ORP sensors measure the electrochemical potential between the solution and a reference electrode. Readings are expressed in millivolts with positive readings indicating increased oxidizing potential and negative readings being increased reduction. The ORP probe is essentially a millivolt meter, measuring the voltage across 2 electrodes with the water in between. ORP values are used much like pH values to determine water quality. While pH readings characterize the state of a system relative to the receiving or donating hydrogen ions (base or acid), ORP readings characterize the relative state of losing or gaining electrons. The conversion of ammonia (NH_3) requires an oxidating environment to convert it into nitrites (NO_2) and nitrates (NO_3). Ammonia levels as low as 0.002mg/L can be harmful to fish. Generally ORP readings above 400mV are harmful to aquatic life. However, ORP is a non-specific measurement which is a reflection of a combination of effects of all the dissolved materials in the water. Therefore, the measurement of ORP in relatively clean water has only limited utility unless a predominant redox-active material is known to be present.

Water clarity is intuitively used by the public to judge water quality. Secchi depth has been used for many years as a limnological characterization tool for characterizing water clarity. Secchi depth is a measure of light penetration into a waterbody and is a function of the absorption and scattering of light in the water. There are three characteristics of water which affect the penetration of light. The three factors are the color of water, amount of phytoplankton in the water column, and amount of inorganic material in the water column. Secchi depth integrates the combined impacts of all the factors which influence water clarity. Water transparency was measured using a Secchi disk. Secchi disk readings were taken at all lake sites.

2.2 Sediment

In accordance with EM-1110-2-1201, sediment samples should be taken to monitor and assess potential impacts to aquatic and human health. To assess ecological risk, sample values were compared against toxicity information published in the National Oceanic Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQRT) or similar references for ecological receptors in freshwater sediment. Without standards or other widely applicable numerical tools, NOAA scientists found it difficult to estimate the possible toxicological significance of chemical concentrations in sediment. Therefore, numerical sediment quality guidelines (SQG's) were developed as informal, interpretive tools. The SQGs were not promulgated as regulatory standards, but rather as informal, non-regulatory guidelines for interpreting chemical data from analyses of sediments. For potential ecological risk from inorganic contaminants, seven metals are typically of "most concern" with regards to fish and wildlife: Arsenic, Copper, Cadmium, Selenium, Mercury, Lead, and Zinc. Avian species are thought to be particularly sensitive to arsenic, but is also considered a carcinogenic, mutagenic, and teratogenic contaminant in a variety of species in elevated doses over time. Avian species are also known to be particularly sensitive to lead in the environment with effects ranging from mortality, reduced growth and reproductive output, behavior changes, blood chemistry alterations, and lesions of major organs. Finally, the embryo stages in fish and avian species are known to be the most sensitive life stage to selenium effecting reproductive success.

It is recommended that the next round of sediment samples focus on organochlorines in freshwater sediment to assess potential chronic aquatic impacts (e.g. aldrin, chlordane, endrin, endosulfan, DDT, methoxychlor).

For potential human health risk, there are no known values in Illinois for sediments. While not a direct correlation, sample results were compared against Illinois Tiered Approach to Corrective Action Objectives (TACO) and Non-TACO lowest default target levels for all soil types and exposure pathways for soils.

3.0 SUMMARY OF MONITORING RESULTS

3.1 Water Quality Summary

The monitoring program for Shelbyville Lake during Fiscal Year 2012 revealed good water quality when compared to limits established by the Illinois Environmental Protection Agency (IEPA) for general use, secondary contact, and indigenous aquatic life. Normally seasonal change brings on gradual lake stratification during the summer months. Water quality trends on a yearly basis are hard to determine when only conducting 3 to 4 sampling events. However, over the course of a 5 year period these 3 to 4 sampling events per year are adequate to determine trends in water quality. Agricultural nutrient runoffs were primary concerns for the lake's water quality. Better land management practices, erosion control and buffering zones are methods used to reduce such contaminants from entering the lake. The St. Louis District Environmental Engineering Section participates in the annual Kaskaskia Watershed Summit which provides information about the condition of the entire watershed.

E. coli are sampled at the marinas to ensure that the marina areas are not being contaminated by boats with restroom facilities. E. coli levels were below the Illinois standard of 235 mpn/100ml. The project office will be notified as soon as any readings not meeting standards are received. Two samples at each beach are collected by the project every 2 weeks during the recreation season. All beaches were below the 235 standard during the recreational season except Dam West on July 18 (2,419), and Wilborn Creek on July 2 (1046) and August 15 (980). The cause for these high readings are most likely from rainfall events that occurred on July 2 (0.97 "), July and August 17 (0.31"). According to the Illinois Department of Health an E.

coli count of greater than 235 colonies/100ml in any single of a two sample set shall require the submission of 2 additional samples to be collected on the same day within 24 hours after notification by the Department. Follow up samples were taken and the results were below the standard.

Total iron and total manganese are sampled above the dam near the bottom of the channel (SBV-2-10) and in the spillway area (SBV-1). As was previously stated living organisms require trace amounts of metals, however excessive amounts can be harmful to the organism. Manganese did not exceed the IL standard of 1.0mg/L for general use. Iron cycling is a function of oxidation-reduction processes. Elevated levels of iron near the bottom of a lake is not an immediately detrimental to the overall lake system. Iron oxidizes relatively rapidly (minutes to hours); therefore any iron released through the spillway will be oxidized in a short period of time. Illinois does not currently have a general use standard for iron.

Nitrogen and phosphates are sampled at all sites. As for the past several years the 2012 phosphate results at the upper lake sites are above the 0.05 mg/L standard at one time or another during the sampling season. These higher levels may be contributed to application of fertilizers and/or rain events. The tributaries contribute high levels of phosphates into the lake. However, the lake reduces these amounts by consuming phosphate before it is discharged downstream through the dam. In effect the lake is improving water quality. Phosphorous in water is not considered directly toxic to humans and animals therefore, no drinking water standards have been established for phosphorous. However, phosphorous can cause health threats through the stimulation of toxic algal blooms and the resulting oxygen depletion. Nitrates can pose a threat to human and animal health. Nitrate in water is toxic at high levels and has been linked to toxic effects of livestock and to blue baby disease (methemoglobinemia) in infants. The Maximum Contaminant Level (MCL) for nitrate-N in drinking water is 10mg/L to protect babies 3 to 6 months of age. The Illinois Water Quality Standard for ammonia nitrogen (NH_3-N) is 15mg/L. The increased levels of phosphate in combination with nitrogen and other lake conditions, such as temperature, pH and stagnant lake conditions, can lead to increased algae growth. Eutrophication is currently the most widespread water quality problem in the U.S. and many other countries. Restoration of eutrophic waters requires the reduction of nonpoint inputs of phosphorous and nitrogen. The resulting detrimental effects of algae toxins and oxygen depletion could result in health problems for fish and other aquatic species as well as land animals utilizing the water supply. There were no signs of any of these effects throughout 2012. Sample sites SBV-4 and SBV-7 on the Kaskaskia River arm of the lake showed elevated levels of nitrogen. The lake appears to be capturing and utilizing this nutrient thus improving down stream water quality.

Chlorophyll *a* was sampled at 4 sites, SBV-2, SBV-4, SBV-11, and SBV-15. Chlorophyll a is a green pigment found in plants. Chlorophyll *a* concentrations are an indicator of phytoplankton abundance and biomass. They can be an effective measure of trophic status, and used as a measure of water quality. Chlorophyll levels were in the moderate range during the 3 sampling events. High levels often indicate poor water quality and low levels suggest good conditions. However, elevated levels are not necessarily bad. It is the long term persistence of elevated levels that is the problem. It is natural for chlorophyll *a* levels to fluctuate over time. Chlorophyll *a* tends to be higher after storm events and during the summer months when water temperatures and light levels are elevated. Chlorophyll can reduce the clarity of the water and the amount of oxygen available to other organisms. Chlorophyll is monitored to provide indicators of algae growth and therefore, potential oxygen depletion activity. Chlorophyll concentrations and cyanobacteria cell counts serve as proxies for the actual presence of algal toxins. Exposure to cyanobacteria or their toxins may produce allergic reactions such as skin rashes, eye irritations, respiratory symptoms, and in some cases more severe health effects. Microcystin is currently believed to be the most common cyanotoxin in lakes. While EPA does not currently have water quality criteria for algal toxins, the World Health Organization (WHO) has established recreational exposure guidelines for Chlorophyll-a, cyanobacterial cell counts, and microcystin. Shelbyville Lake was in the moderate risk of exposure category for chlorophyll. Illinois does not currently have a standard for chlorophyll. The data indicates a normal increase in chlorophyll levels during the warmer summer months, which is not a concern.

Atrazine and Alachlor are pesticides that were sampled at all sites. These chemicals are herbicides used to control weed growth. Normally pesticides are detected early in the year, in the months of April and May when farmers apply the chemicals. Cyanizine, Metolachlor, Trifluralin and Simazine were also analyized as part of the pesticide screening. None of these constituents exceeded Illinois standards. These substances can enter water bodies as a result of drift during spraying, surface runoff, and leaching through soil. In order to eliminate pesticide contamination of waters it is important for the public to be educated and institute best manage practices when using these chemicals.

Total Suspended Solids (TSS) and Total Volatile Suspended Solids (TVSS) samples are collected at all sites. Tributary sites did not exceed the Illinois standard of 116mg/L for streams. All lake samples exceeded the Illinois standard of 12mg/L for lakes except site 2. Solids can affect water quality by increasing temperature through the absorption of sunlight by the particles in the water, which also affects the clarity of the water. This can then affect the amount of oxygen in the water. As is the case with many of the Illinois lakes they are shallow and susceptible to high winds. These winds are constantly producing wave erosion of the banks and suspending material in the water. These conditions attribute to the lake exceeding the Illinois standard for TSS in lakes. Literature suggests that Nonvolatile Suspended Solids (NVSS) which is a subdivision of TSS above 15mg/L could highly impair recreational lake use and a NVSS of 3 to 7mg/L might cause slight impairment. Suspended solids within the lake were significantly decreased from levels in the tributaries. The solids appear to be dropping out of the water column as the water moves toward the dam. This results in improved water quality down stream.

Total Organic Carbon (TOC) is collected at all sites. Data indicates that TOC is higher in the upper portions of the lake. TOC is an indicator of the organic character of water. The larger the carbon or organic content, the more oxygen is consumed. Illinois does not currently have a standard for TOC. Since Illinois does not have a standard for this parameter, observations of high or low are relative to the current sampling period.

Temperature and dissolved oxygen levels were taken at all sites. Measurements were taken at 1 meter intervals at the lake sites. During the summer months the lake stratifies and a boundary is formed between the upper warmer water and the lower cooler water. This transition area is known as the thermocline, the area where the temperature drops significantly. Oxygen levels can also change drastically as a function of depth. This area where the oxygen level significantly drops is called the oxycline. The depth of the thermocline and oxycline can have an effect on the aquatic organisms. Occasionally the thermocline and oxycline are at or near the same depth.

pH is taken at all sites and at 1 meter intervals at lake sites. All sites except site 9 on August 20 were within the 6 to 9 pH range. Variances in pH can be caused by increase runoff due to a rainfall event, unusual temperature extremes, or erosion from land disturbances. Another cause may be that photosynthesis uses up dissolved carbon dioxide, which acts like carbonic acid (H_2CO_3) in water. CO_2 removal in effect reduces the acidity of the water thus the pH increases.

Seechi disk readings indicate that as the water travels down the lake it becomes clearer. This is most likely the result of sediments dropping out of the water column as the water moves down stream toward the dam.

Conductivity and redox are taken at all sites and at 1 meter intervals at lake sites. Illinois does not currently have a standard for redox, but does have a standard of less than 1,667 uS/cm for conductivity. No sampling sites even approached this standard.

The remote sensor in the spillway was monitored and maintained throughout the year to allow the project as well as water quality personnel to remotely monitor temperature and oxygen readings to acquire data to inform operational actions in order to avoid fish kills. During low flow, water is discharged through the sluice gates from the bottom of the lake. This water is low in oxygen and can create a low oxygen area below the dam. The sensor allows the project to monitor oxygen levels below the dam and make appropriate adjustments to avoid a possible fish kill. Normally allowing water to spill through the tainter gates or increase the flow through the sluice gate will alleviate low oxygen levels below the dam. No fish kills were observed this year. The sonde was serviced approximately once each month from May through September. Dissolved oxygen dropped below the 5mg/l standard a few times during July and August and some of these times correlated to the changing out of the sonde.

3.2 Sediment Summary

Sediment sampling was not conducted in 2012. Sediment sampling is normally conducted every 5 years if funding is available. Sediment sampling was last conducted in 2007.

4.0 PLANNED 2013 STUDIES

The Shelbyville Lake water quality monitoring will continue in Fiscal Year 2013 on a limited basis. Because of budgetary constraints there will only be 3 sampling events in 2013. A restored number of sampling events would provide the ability to better evaluate water quality trends, to better defend project operations (lake levels, releases, maintenance projects, construction projects, etc.), to better confirm that we meet state water quality standards, and to better confirm that human health and safety are adequately protected. Shelbyville Lake is a high usage recreational lake. The monitoring of water quality is imperative to assure the water quality is within acceptable limits for the designated usage.

The sampling sites include the following: Site 1 SBV-1 Spillway, Site 2 SBV-02 Lake side in front of Dam, Site 4 SBV-04 Kaskaskia River arm near Sullivan Marina, Site 7, SBV-7, at Cooks Mill, Site 9 SBV-9, at Hwy 32 at Lovington, and Site 11 SBV-11, Okaw River Arm near the C. & E. I. railroad bridge. This combination of sites effectively represents the incoming contaminants and their effects on the lake.

In addition, water quality personnel will continue to maintain and remotely monitor the DO & temperature probe in the spillway.

APPENDIX A

DATA

LAB DATA
WATER SAMPLES

Sample Site	Date Collected	Result	Qualifier	Units	Parameter
SVL-1	5/22/12	0.20	<	UG/L	Alachlor
SVL-1	6/19/12	0.20	<	UG/L	Alachlor
SVL-1	8/20/12	0.20	<	UG/L	Alachlor
SVL-11	5/22/12	0.20	<	UG/L	Alachlor
SVL-11	6/19/12	0.20	<	UG/L	Alachlor
SVL-11	8/20/12	0.20	<	UG/L	Alachlor
SVL-15	5/22/12	0.20	<	UG/L	Alachlor
SVL-15	6/19/12	0.20	<	UG/L	Alachlor
SVL-15	8/20/12	0.20	<	UG/L	Alachlor
SVL-2	5/22/12	0.20	<	UG/L	Alachlor
SVL-2	6/19/12	0.20	<	UG/L	Alachlor
SVL-2	8/20/12	0.20	<	UG/L	Alachlor
SVL-4	5/22/12	0.20	<	UG/L	Alachlor
SVL-4	6/19/12	0.20	<	UG/L	Alachlor
SVL-4	8/20/12	0.20	<	UG/L	Alachlor
SVL-7	5/22/12	0.20	<	UG/L	Alachlor
SVL-7	6/19/12	0.20	<	UG/L	Alachlor
SVL-7	8/20/12	0.20	<	UG/L	Alachlor
SVL-9	5/22/12	0.20	<	UG/L	Alachlor
SVL-9	6/19/12	0.20	<	UG/L	Alachlor
SVL-9	8/20/12	0.20	<	UG/L	Alachlor
SVL-1	5/22/12	0.18		MG/L	Ammonia Nitrogen
SVL-1	6/19/12	0.42		MG/L	Ammonia Nitrogen
SVL-1	8/20/12	1.7		MG/L	Ammonia Nitrogen
SVL-11	5/22/12	0.085		MG/L	Ammonia Nitrogen
SVL-11	6/19/12	0.067		MG/L	Ammonia Nitrogen
SVL-11	8/20/12	0.068		MG/L	Ammonia Nitrogen
SVL-15	5/22/12	0.096		MG/L	Ammonia Nitrogen
SVL-15	6/19/12	0.030	<	MG/L	Ammonia Nitrogen
SVL-15	8/20/12	0.17		MG/L	Ammonia Nitrogen
SVL-2	5/22/12	0.081		MG/L	Ammonia Nitrogen
SVL-2	6/19/12	0.062		MG/L	Ammonia Nitrogen
SVL-2	8/20/12	0.20		MG/L	Ammonia Nitrogen
SVL-2-10	5/22/12	0.083		MG/L	Ammonia Nitrogen

Sample Site	Date Collected	Result	Qualifier	Units	Parameter
SVL-2-10	6/19/12	0.064		MG/L	Ammonia Nitrogen
SVL-2-10	8/20/12	0.11		MG/L	Ammonia Nitrogen
SVL-4	5/22/12	0.043		MG/L	Ammonia Nitrogen
SVL-4	6/19/12	0.048		MG/L	Ammonia Nitrogen
SVL-4	8/20/12	0.093		MG/L	Ammonia Nitrogen
SVL-7	5/22/12	0.074		MG/L	Ammonia Nitrogen
SVL-7	6/19/12	0.097		MG/L	Ammonia Nitrogen
SVL-7	8/20/12	0.23		MG/L	Ammonia Nitrogen
SVL-9	5/22/12	0.040		MG/L	Ammonia Nitrogen
SVL-9	6/19/12	0.070		MG/L	Ammonia Nitrogen
SVL-9	8/20/12	0.092		MG/L	Ammonia Nitrogen
SVL-1	5/22/12	0.57		UG/L	Atrazine
SVL-1	6/19/12	0.30		UG/L	Atrazine
SVL-1	8/20/12	0.31		UG/L	Atrazine
SVL-11	5/22/12	0.32		UG/L	Atrazine
SVL-11	6/19/12	0.49		UG/L	Atrazine
SVL-11	8/20/12	0.20	<	UG/L	Atrazine
SVL-15	5/22/12	0.47		UG/L	Atrazine
SVL-15	6/19/12	0.42		UG/L	Atrazine
SVL-15	8/20/12	0.20	<	UG/L	Atrazine
SVL-2	5/22/12	0.36		UG/L	Atrazine
SVL-2	6/19/12	0.34		UG/L	Atrazine
SVL-2	8/20/12	0.24		UG/L	Atrazine
SVL-4	5/22/12	0.23		UG/L	Atrazine
SVL-4	6/19/12	0.36		UG/L	Atrazine
SVL-4	8/20/12	0.30		UG/L	Atrazine
SVL-7	5/22/12	0.20	<	UG/L	Atrazine
SVL-7	6/19/12	0.55		UG/L	Atrazine
SVL-7	8/20/12	0.20	<	UG/L	Atrazine
SVL-9	5/22/12	0.20	<	UG/L	Atrazine
SVL-9	6/19/12	0.20	<	UG/L	Atrazine
SVL-9	8/20/12	0.20	<	UG/L	Atrazine
SVL-11	5/22/12	35.4		MG/CU.M.	Chlorophyll a
SVL-11	6/19/12	37.0		MG/CU.M.	Chlorophyll a
SVL-11	8/20/12	14.2		MG/CU.M.	Chlorophyll a
SVL-15	5/22/12	32.4		MG/CU.M.	Chlorophyll a
SVL-15	6/19/12	16.0		MG/CU.M.	Chlorophyll a
SVL-15	8/20/12	16.0		MG/CU.M.	Chlorophyll a

Sample Site	Date Collected	Result	Qualifier	Units	Parameter
SVL-2	5/22/12	3.2		MG/CU.M.	Chlorophyll a
SVL-2	6/19/12	3.3		MG/CU.M.	Chlorophyll a
SVL-2	8/20/12	4.5		MG/CU.M.	Chlorophyll a
SVL-4	5/22/12	86.0		MG/CU.M.	Chlorophyll a
SVL-4	6/19/12	12.0		MG/CU.M.	Chlorophyll a
SVL-4	8/20/12	13.2		MG/CU.M.	Chlorophyll a
SVL-1	5/22/12	0.20	<	UG/L	Chloropyrifos
SVL-1	6/19/12	0.20	<	UG/L	Chloropyrifos
SVL-1	8/20/12	0.20	<	UG/L	Chloropyrifos
SVL-11	5/22/12	0.20	<	UG/L	Chloropyrifos
SVL-11	6/19/12	0.20	<	UG/L	Chloropyrifos
SVL-11	8/20/12	0.20	<	UG/L	Chloropyrifos
SVL-15	5/22/12	0.20	<	UG/L	Chloropyrifos
SVL-15	6/19/12	0.20	<	UG/L	Chloropyrifos
SVL-15	8/20/12	0.20	<	UG/L	Chloropyrifos
SVL-2	5/22/12	0.20	<	UG/L	Chloropyrifos
SVL-2	6/19/12	0.20	<	UG/L	Chloropyrifos
SVL-2	8/20/12	0.20	<	UG/L	Chloropyrifos
SVL-4	5/22/12	0.20	<	UG/L	Chloropyrifos
SVL-4	6/19/12	0.20	<	UG/L	Chloropyrifos
SVL-4	8/20/12	0.20	<	UG/L	Chloropyrifos
SVL-7	5/22/12	0.20	<	UG/L	Chloropyrifos
SVL-7	6/19/12	0.20	<	UG/L	Chloropyrifos
SVL-7	8/20/12	0.20	<	UG/L	Chloropyrifos
SVL-9	5/22/12	0.20	<	UG/L	Chloropyrifos
SVL-9	6/19/12	0.20	<	UG/L	Chloropyrifos
SVL-9	8/20/12	0.20	<	UG/L	Chloropyrifos
SVL-1	5/22/12	0.20	<	UG/L	Cyanazine
SVL-1	6/19/12	0.20	<	UG/L	Cyanazine
SVL-1	8/20/12	0.20	<	UG/L	Cyanazine
SVL-11	5/22/12	0.20	<	UG/L	Cyanazine
SVL-11	6/19/12	0.20	<	UG/L	Cyanazine
SVL-11	8/20/12	0.20	<	UG/L	Cyanazine
SVL-15	5/22/12	0.20	<	UG/L	Cyanazine
SVL-15	6/19/12	0.20	<	UG/L	Cyanazine
SVL-15	8/20/12	0.20	<	UG/L	Cyanazine
SVL-2	5/22/12	0.20	<	UG/L	Cyanazine
SVL-2	6/19/12	0.20	<	UG/L	Cyanazine

Sample Site	Date Collected	Result	Qualifier	Units	Parameter
SVL-2	8/20/12	0.20	<	UG/L	Cyanazine
SVL-4	5/22/12	0.20	<	UG/L	Cyanazine
SVL-4	6/19/12	0.20	<	UG/L	Cyanazine
SVL-4	8/20/12	0.20	<	UG/L	Cyanazine
SVL-7	5/22/12	0.20	<	UG/L	Cyanazine
SVL-7	6/19/12	0.20	<	UG/L	Cyanazine
SVL-7	8/20/12	0.20	<	UG/L	Cyanazine
SVL-9	5/22/12	0.20	<	UG/L	Cyanazine
SVL-9	6/19/12	0.20	<	UG/L	Cyanazine
SVL-9	8/20/12	0.20	<	UG/L	Cyanazine
SVL-1	5/22/12	0.14		MG/L	Iron
SVL-1	6/19/12	0.19		MG/L	Iron
SVL-1	8/20/12	0.61		MG/L	Iron
SVL-2-10	5/22/12	0.11		MG/L	Iron
SVL-2-10	6/19/12	0.27		MG/L	Iron
SVL-2-10	8/20/12	0.64		MG/L	Iron
SVL-1	5/22/12	0.074		MG/L	Manganese
SVL-1	6/19/12	0.27		MG/L	Manganese
SVL-1	8/20/12	0.82		MG/L	Manganese
SVL-2-10	5/22/12	0.013		MG/L	Manganese
SVL-2-10	6/19/12	0.031		MG/L	Manganese
SVL-2-10	8/20/12	0.018		MG/L	Manganese
SVL-1	5/22/12	0.20	<	UG/L	Metolachlor
SVL-1	6/19/12	0.20	<	UG/L	Metolachlor
SVL-1	8/20/12	0.20	<	UG/L	Metolachlor
SVL-11	5/22/12	0.20	<	UG/L	Metolachlor
SVL-11	6/19/12	0.20	<	UG/L	Metolachlor
SVL-11	8/20/12	0.20	<	UG/L	Metolachlor
SVL-15	5/22/12	0.24		UG/L	Metolachlor
SVL-15	6/19/12	0.20	<	UG/L	Metolachlor
SVL-15	8/20/12	0.20	<	UG/L	Metolachlor
SVL-2	5/22/12	0.20	<	UG/L	Metolachlor
SVL-2	6/19/12	0.20	<	UG/L	Metolachlor
SVL-2	8/20/12	0.20	<	UG/L	Metolachlor
SVL-4	5/22/12	0.20	<	UG/L	Metolachlor
SVL-4	6/19/12	0.20	<	UG/L	Metolachlor
SVL-4	8/20/12	0.20	<	UG/L	Metolachlor
SVL-7	5/22/12	0.20	<	UG/L	Metolachlor

Sample Site	Date Collected	Result	Qualifier	Units	Parameter
SVL-7	6/19/12	0.52		UG/L	Metolachlor
SVL-7	8/20/12	0.20	<	UG/L	Metolachlor
SVL-9	5/22/12	0.20	<	UG/L	Metolachlor
SVL-9	6/19/12	0.20	<	UG/L	Metolachlor
SVL-9	8/20/12	0.20	<	UG/L	Metolachlor
SVL-1	5/22/12	0.20	<	UG/L	Metribuzin
SVL-1	6/19/12	0.20	<	UG/L	Metribuzin
SVL-1	8/20/12	0.20	<	UG/L	Metribuzin
SVL-11	5/22/12	0.20	<	UG/L	Metribuzin
SVL-11	6/19/12	0.20	<	UG/L	Metribuzin
SVL-11	8/20/12	0.20	<	UG/L	Metribuzin
SVL-15	5/22/12	0.20	<	UG/L	Metribuzin
SVL-15	6/19/12	0.20	<	UG/L	Metribuzin
SVL-15	8/20/12	0.20	<	UG/L	Metribuzin
SVL-2	5/22/12	0.20	<	UG/L	Metribuzin
SVL-2	6/19/12	0.20	<	UG/L	Metribuzin
SVL-2	8/20/12	0.20	<	UG/L	Metribuzin
SVL-4	5/22/12	0.20	<	UG/L	Metribuzin
SVL-4	6/19/12	0.20	<	UG/L	Metribuzin
SVL-4	8/20/12	0.20	<	UG/L	Metribuzin
SVL-7	5/22/12	0.20	<	UG/L	Metribuzin
SVL-7	6/19/12	0.20	<	UG/L	Metribuzin
SVL-7	8/20/12	0.20	<	UG/L	Metribuzin
SVL-9	5/22/12	0.20	<	UG/L	Metribuzin
SVL-9	6/19/12	0.20	<	UG/L	Metribuzin
SVL-9	8/20/12	0.20	<	UG/L	Metribuzin
SVL-1	5/22/12	1.7		MG/L	Nitrate as Nitrogen
SVL-1	6/19/12	1.1		MG/L	Nitrate as Nitrogen
SVL-1	8/20/12	0.12		MG/L	Nitrate as Nitrogen
SVL-11	5/22/12	2.0		MG/L	Nitrate as Nitrogen
SVL-11	6/19/12	0.75		MG/L	Nitrate as Nitrogen
SVL-11	8/20/12	0.020	<	MG/L	Nitrate as Nitrogen
SVL-15	5/22/12	2.1		MG/L	Nitrate as Nitrogen
SVL-15	6/19/12	1.1		MG/L	Nitrate as Nitrogen
SVL-15	8/20/12	0.020	<	MG/L	Nitrate as Nitrogen
SVL-2	5/22/12	1.8		MG/L	Nitrate as Nitrogen
SVL-2	6/19/12	1.6		MG/L	Nitrate as Nitrogen
SVL-2	8/20/12	0.020	<	MG/L	Nitrate as Nitrogen

Sample Site	Date Collected	Result	Qualifier	Units	Parameter
SVL-2-10	5/22/12	1.9		MG/L	Nitrate as Nitrogen
SVL-2-10	6/19/12	1.7		MG/L	Nitrate as Nitrogen
SVL-2-10	8/20/12	0.020	<	MG/L	Nitrate as Nitrogen
SVL-4	5/22/12	6.5		MG/L	Nitrate as Nitrogen
SVL-4	6/19/12	1.1		MG/L	Nitrate as Nitrogen
SVL-4	8/20/12	0.020	<	MG/L	Nitrate as Nitrogen
SVL-7	5/22/12	7.8		MG/L	Nitrate as Nitrogen
SVL-7	6/19/12	1.2		MG/L	Nitrate as Nitrogen
SVL-7	8/20/12	0.28		MG/L	Nitrate as Nitrogen
SVL-9	5/22/12	5.0		MG/L	Nitrate as Nitrogen
SVL-9	6/19/12	0.48		MG/L	Nitrate as Nitrogen
SVL-9	8/20/12	0.020	<	MG/L	Nitrate as Nitrogen
SVL-1	5/22/12	0.20	<	UG/L	Pendimethalin
SVL-1	6/19/12	0.20	<	UG/L	Pendimethalin
SVL-1	8/20/12	0.20	<	UG/L	Pendimethalin
SVL-11	5/22/12	0.20	<	UG/L	Pendimethalin
SVL-11	6/19/12	0.20	<	UG/L	Pendimethalin
SVL-11	8/20/12	0.20	<	UG/L	Pendimethalin
SVL-15	5/22/12	0.20	<	UG/L	Pendimethalin
SVL-15	6/19/12	0.20	<	UG/L	Pendimethalin
SVL-15	8/20/12	0.20	<	UG/L	Pendimethalin
SVL-2	5/22/12	0.20	<	UG/L	Pendimethalin
SVL-2	6/19/12	0.20	<	UG/L	Pendimethalin
SVL-2	8/20/12	0.20	<	UG/L	Pendimethalin
SVL-4	5/22/12	0.20	<	UG/L	Pendimethalin
SVL-4	6/19/12	0.20	<	UG/L	Pendimethalin
SVL-4	8/20/12	0.20	<	UG/L	Pendimethalin
SVL-7	5/22/12	0.20	<	UG/L	Pendimethalin
SVL-7	6/19/12	0.20	<	UG/L	Pendimethalin
SVL-7	8/20/12	0.20	<	UG/L	Pendimethalin
SVL-9	5/22/12	0.20	<	UG/L	Pendimethalin
SVL-9	6/19/12	0.20	<	UG/L	Pendimethalin
SVL-9	8/20/12	0.20	<	UG/L	Pendimethalin
SVL-11	5/22/12	7.2		MG/CU.M.	Pheophytin a
SVL-11	6/19/12	12.0		MG/CU.M.	Pheophytin a
SVL-11	8/20/12	4.0		MG/CU.M.	Pheophytin a
SVL-15	5/22/12	10.2		MG/CU.M.	Pheophytin a
SVL-15	6/19/12	2.0	<	MG/CU.M.	Pheophytin a

Sample Site	Date Collected	Result	Qualifier	Units	Parameter
SVL-15	8/20/12	2.9		MG/CU.M.	Pheophytin a
SVL-2	5/22/12	2.0	<	MG/CU.M.	Pheophytin a
SVL-2	6/19/12	2.0	<	MG/CU.M.	Pheophytin a
SVL-2	8/20/12	2.0	<	MG/CU.M.	Pheophytin a
SVL-4	5/22/12	17.6		MG/CU.M.	Pheophytin a
SVL-4	6/19/12	3.8		MG/CU.M.	Pheophytin a
SVL-4	8/20/12	7.4		MG/CU.M.	Pheophytin a
SVL-1	5/22/12	0.047		MG/L	Phosphorus
SVL-1	6/19/12	0.048		MG/L	Phosphorus
SVL-1	8/20/12	0.086		MG/L	Phosphorus
SVL-11	5/22/12	0.14		MG/L	Phosphorus
SVL-11	6/19/12	0.32		MG/L	Phosphorus
SVL-11	8/20/12	0.078		MG/L	Phosphorus
SVL-15	5/22/12	0.12		MG/L	Phosphorus
SVL-15	6/19/12	0.13		MG/L	Phosphorus
SVL-15	8/20/12	0.22		MG/L	Phosphorus
SVL-2	5/22/12	0.039		MG/L	Phosphorus
SVL-2	6/19/12	0.030		MG/L	Phosphorus
SVL-2	8/20/12	0.022		MG/L	Phosphorus
SVL-2-10	5/22/12	0.043		MG/L	Phosphorus
SVL-2-10	6/19/12	0.070		MG/L	Phosphorus
SVL-2-10	8/20/12	0.043		MG/L	Phosphorus
SVL-4	5/22/12	0.28		MG/L	Phosphorus
SVL-4	6/19/12	0.12		MG/L	Phosphorus
SVL-4	8/20/12	0.64		MG/L	Phosphorus
SVL-7	5/22/12	0.17		MG/L	Phosphorus
SVL-7	6/19/12	0.29		MG/L	Phosphorus
SVL-7	8/20/12	0.28		MG/L	Phosphorus
SVL-9	5/22/12	0.10		MG/L	Phosphorus
SVL-9	6/19/12	0.23		MG/L	Phosphorus
SVL-9	8/20/12	0.55		MG/L	Phosphorus
SVL-1	5/22/12	0.010	<	MG/L	Phosphorus, -ortho
SVL-1	6/19/12	0.010	<	MG/L	Phosphorus, -ortho
SVL-1	8/20/12	0.016		MG/L	Phosphorus, -ortho
SVL-11	5/22/12	0.047		MG/L	Phosphorus, -ortho
SVL-11	6/19/12	0.087		MG/L	Phosphorus, -ortho
SVL-11	8/20/12	0.053		MG/L	Phosphorus, -ortho
SVL-15	5/22/12	0.047		MG/L	Phosphorus, -ortho

Sample Site	Date Collected	Result	Qualifier	Units	Parameter
SVL-15	6/19/12	0.010	<	MG/L	Phosphorus, -ortho
SVL-15	8/20/12	0.16		MG/L	Phosphorus, -ortho
SVL-2	5/22/12	0.010	<	MG/L	Phosphorus, -ortho
SVL-2	6/19/12	0.010	<	MG/L	Phosphorus, -ortho
SVL-2	8/20/12	0.010	<	MG/L	Phosphorus, -ortho
SVL-2-10	5/22/12	0.010	<	MG/L	Phosphorus, -ortho
SVL-2-10	6/19/12	0.010	<	MG/L	Phosphorus, -ortho
SVL-2-10	8/20/12	0.010	<	MG/L	Phosphorus, -ortho
SVL-4	5/22/12	0.010	<	MG/L	Phosphorus, -ortho
SVL-4	6/19/12	0.010	<	MG/L	Phosphorus, -ortho
SVL-4	8/20/12	0.35		MG/L	Phosphorus, -ortho
SVL-7	5/22/12	0.060		MG/L	Phosphorus, -ortho
SVL-7	6/19/12	0.39		MG/L	Phosphorus, -ortho
SVL-7	8/20/12	0.12		MG/L	Phosphorus, -ortho
SVL-9	5/22/12	0.018		MG/L	Phosphorus, -ortho
SVL-9	6/19/12	0.074		MG/L	Phosphorus, -ortho
SVL-9	8/20/12	0.26		MG/L	Phosphorus, -ortho
SVL-1	5/22/12	7.0		MG/L	Solids, Total Suspended
SVL-1	6/19/12	4.9		MG/L	Solids, Total Suspended
SVL-1	8/20/12	8.0		MG/L	Solids, Total Suspended
SVL-11	5/22/12	17.8		MG/L	Solids, Total Suspended
SVL-11	6/19/12	48.0		MG/L	Solids, Total Suspended
SVL-11	8/20/12	21.0		MG/L	Solids, Total Suspended
SVL-15	5/22/12	18.0		MG/L	Solids, Total Suspended
SVL-15	6/19/12	13.8		MG/L	Solids, Total Suspended
SVL-15	8/20/12	20.5		MG/L	Solids, Total Suspended
SVL-2	5/22/12	5.7		MG/L	Solids, Total Suspended
SVL-2	6/19/12	6.0		MG/L	Solids, Total Suspended
SVL-2	8/20/12	8.8		MG/L	Solids, Total Suspended
SVL-2-10	5/22/12	6.1		MG/L	Solids, Total Suspended
SVL-2-10	6/19/12	5.6		MG/L	Solids, Total Suspended
SVL-2-10	8/20/12	8.2		MG/L	Solids, Total Suspended
SVL-4	5/22/12	52.0		MG/L	Solids, Total Suspended
SVL-4	6/19/12	15.0		MG/L	Solids, Total Suspended
SVL-4	8/20/12	44.0		MG/L	Solids, Total Suspended
SVL-7	5/22/12	29.4		MG/L	Solids, Total Suspended
SVL-7	6/19/12	46.0		MG/L	Solids, Total Suspended
SVL-7	8/20/12	41.5		MG/L	Solids, Total Suspended

Sample Site	Date Collected	Result	Qualifier	Units	Parameter
SVL-9	5/22/12	34.4		MG/L	Solids, Total Suspended
SVL-9	6/19/12	20.0		MG/L	Solids, Total Suspended
SVL-9	8/20/12	19.6		MG/L	Solids, Total Suspended
SVL-1	5/22/12	2.0	<	MG/L	Solids, Volatile Suspended
SVL-1	6/19/12	1.6		MG/L	Solids, Volatile Suspended
SVL-1	8/20/12	3.3	<	MG/L	Solids, Volatile Suspended
SVL-11	5/22/12	7.2		MG/L	Solids, Volatile Suspended
SVL-11	6/19/12	10.5		MG/L	Solids, Volatile Suspended
SVL-11	8/20/12	12.0		MG/L	Solids, Volatile Suspended
SVL-15	5/22/12	7.4		MG/L	Solids, Volatile Suspended
SVL-15	6/19/12	5.0		MG/L	Solids, Volatile Suspended
SVL-15	8/20/12	12.0		MG/L	Solids, Volatile Suspended
SVL-2	5/22/12	2.2		MG/L	Solids, Volatile Suspended
SVL-2	6/19/12	3.5		MG/L	Solids, Volatile Suspended
SVL-2	8/20/12	5.5		MG/L	Solids, Volatile Suspended
SVL-2-10	5/22/12	2.3		MG/L	Solids, Volatile Suspended
SVL-2-10	6/19/12	3.8		MG/L	Solids, Volatile Suspended
SVL-2-10	8/20/12	4.2		MG/L	Solids, Volatile Suspended
SVL-4	5/22/12	12.8		MG/L	Solids, Volatile Suspended
SVL-4	6/19/12	6.0		MG/L	Solids, Volatile Suspended
SVL-4	8/20/12	13.8		MG/L	Solids, Volatile Suspended
SVL-7	5/22/12	3.6		MG/L	Solids, Volatile Suspended
SVL-7	6/19/12	5.7		MG/L	Solids, Volatile Suspended
SVL-7	8/20/12	4.8		MG/L	Solids, Volatile Suspended
SVL-9	5/22/12	4.4		MG/L	Solids, Volatile Suspended
SVL-9	6/19/12	7.0		MG/L	Solids, Volatile Suspended
SVL-9	8/20/12	9.6		MG/L	Solids, Volatile Suspended
SVL-1	5/22/12	3.5		MG/L	Total Organic Carbon
SVL-1	6/19/12	2.9		MG/L	Total Organic Carbon
SVL-1	8/20/12	3.9		MG/L	Total Organic Carbon
SVL-11	5/22/12	4.1		MG/L	Total Organic Carbon
SVL-11	6/19/12	3.2		MG/L	Total Organic Carbon
SVL-11	8/20/12	4.9		MG/L	Total Organic Carbon
SVL-15	5/22/12	3.6		MG/L	Total Organic Carbon
SVL-15	6/19/12	3.2		MG/L	Total Organic Carbon
SVL-15	8/20/12	5.3		MG/L	Total Organic Carbon
SVL-2	5/22/12	3.6		MG/L	Total Organic Carbon
SVL-2	6/19/12	3.6		MG/L	Total Organic Carbon

Sample Site	Date Collected	Result	Qualifier	Units	Parameter
SVL-2	8/20/12	4.2		MG/L	Total Organic Carbon
SVL-2-10	5/22/12	3.7		MG/L	Total Organic Carbon
SVL-2-10	6/19/12	2.9		MG/L	Total Organic Carbon
SVL-2-10	8/20/12	5.0		MG/L	Total Organic Carbon
SVL-4	5/22/12	3.6		MG/L	Total Organic Carbon
SVL-4	6/19/12	3.3		MG/L	Total Organic Carbon
SVL-4	8/20/12	6.9		MG/L	Total Organic Carbon
SVL-7	5/22/12	2.4		MG/L	Total Organic Carbon
SVL-7	6/19/12	2.4		MG/L	Total Organic Carbon
SVL-7	8/20/12	5.8		MG/L	Total Organic Carbon
SVL-9	5/22/12	2.9		MG/L	Total Organic Carbon
SVL-9	6/19/12	4.1		MG/L	Total Organic Carbon
SVL-9	8/20/12	16.4		MG/L	Total Organic Carbon
SVL-1	5/22/12	0.20	<	UG/L	Trifluralin
SVL-1	6/19/12	0.20	<	UG/L	Trifluralin
SVL-1	8/20/12	0.20	<	UG/L	Trifluralin
SVL-11	5/22/12	0.20	<	UG/L	Trifluralin
SVL-11	6/19/12	0.20	<	UG/L	Trifluralin
SVL-11	8/20/12	0.20	<	UG/L	Trifluralin
SVL-15	5/22/12	0.20	<	UG/L	Trifluralin
SVL-15	6/19/12	0.20	<	UG/L	Trifluralin
SVL-15	8/20/12	0.20	<	UG/L	Trifluralin
SVL-2	5/22/12	0.20	<	UG/L	Trifluralin
SVL-2	6/19/12	0.20	<	UG/L	Trifluralin
SVL-2	8/20/12	0.20	<	UG/L	Trifluralin
SVL-4	5/22/12	0.20	<	UG/L	Trifluralin
SVL-4	6/19/12	0.20	<	UG/L	Trifluralin
SVL-4	8/20/12	0.20	<	UG/L	Trifluralin
SVL-7	5/22/12	0.20	<	UG/L	Trifluralin
SVL-7	6/19/12	0.20	<	UG/L	Trifluralin
SVL-7	8/20/12	0.20	<	UG/L	Trifluralin
SVL-9	5/22/12	0.20	<	UG/L	Trifluralin
SVL-9	6/19/12	0.20	<	UG/L	Trifluralin
SVL-9	8/20/12	0.20	<	UG/L	Trifluralin

Marinas

Site	Date Collected	Matrix	Result	Qualifier	Unit	Analyte Name
Finlay	5/22/12	W	NEGATIVE		MPN/100ml	E. Coli
Finlay	6/19/12	W	2.0	<	MPN/100ml	E. Coli
Finlay	8/20/12	W	25.0	<	MPN/100ml	E. Coli
Lithia Springs	5/22/12	W	NEGATIVE		MPN/100ml	E. Coli
Lithia Springs	6/19/12	W	4.0		MPN/100ml	E. Coli
Lithia Springs	8/20/12	W	25.0	<	MPN/100ml	E. Coli
Sullivan	5/22/12	W	NEGATIVE		MPN/100ml	E. Coli
Sullivan	8/20/12	W	25.0	<	MPN/100ml	E. Coli
Sullivan	8/20/12	W	25.0	<	MPN/100ml	E. Coli

2012 Beach Sample Report - IDPH
Lake Shelbyville

Sample Date	Test Date	Collected By:	Location	E. coli per 100mL Shallow	Deep
5/9/2012	5/10/2012	P. Manhart	Coon Creek Recreation Area	37.9	19.9
5/23/2012	5/24/2012	L. Cordes	Coon Creek Recreation Area	5.2	7.5
6/6/2012	6/7/2012	K. Wiseman	Coon Creek Recreation Area	4.1	12.1
6/6/2012	6/7/2012	K. Pruemer	Coon Creek Recreation Area	47.3	3
7/2/2012	7/3/2012	J. Duck	Coon Creek Recreation Area	2	2
7/18/2012	7/19/2012	J. Duck	Coon Creek Recreation Area	2	1
8/1/2012	8/2/2012	E. Uphoff	Coon Creek Recreation Area	1	<1
8/15/2012	8/16/2012	J. Duck	Coon Creek Recreation Area	12.1	1
8/28/2012	8/29/2012	K. Pierson	Coon Creek Recreation Area	1	<1
5/9/2012	5/10/2012	P. Manhart	Dam West Recreation Area	4.1	2
5/23/2012	5/24/2012	L. Cordes	Dam West Recreation Area	14.5	<1
6/6/2012	6/7/2012	K. Wiseman	Dam West Recreation Area	8.5	4.1
6/6/2012	6/7/2012	K. Pruemer	Dam West Recreation Area	<1	<1
7/2/2012	7/3/2012	J. Duck	Dam West Recreation Area	38.9	1
7/18/2012	7/19/2012	J. Duck	Dam West Recreation Area	2419.6	25.9
8/1/2012	8/2/2012	E. Uphoff	Dam West Recreation Area	<1	<1
8/15/2012	8/16/2012	J. Duck	Dam West Recreation Area	23.1	4.1
8/28/2012	8/29/2012	K. Pierson	Dam West Recreation Area	96.1	3.1
5/9/2012	5/10/2012	P. Manhart	Lithia Springs Recreation Area	5.2	5.2
5/23/2012	5/24/2012	L. Cordes	Lithia Springs Recreation Area	145	<1
6/6/2012	6/7/2012	K. Wiseman	Lithia Springs Recreation Area	2	2
6/6/2012	6/7/2012	K. Pruemer	Lithia Springs Recreation Area	1	<1
7/2/2012	7/3/2012	J. Duck	Lithia Springs Recreation Area	3.1	2
7/18/2012	7/19/2012	J. Duck	Lithia Springs Recreation Area	<1	<1
8/1/2012	8/2/2012	E. Uphoff	Lithia Springs Recreation Area	<1	<1
8/15/2012	8/16/2012	J. Duck	Lithia Springs Recreation Area	<1	2
8/28/2012	8/29/2012	K. Pierson	Lithia Springs Recreation Area	<1	<1
5/9/2012	5/10/2012	P. Manhart	Sullivan Beach	40.8	26.2
5/23/2012	5/24/2012	L. Cordes	Sullivan Beach	9.8	6.3
6/6/2012	6/7/2012	K. Wiseman	Sullivan Beach	31.7	11.9
6/6/2012	6/7/2012	K. Pruemer	Sullivan Beach	22.6	14.4

Sample Date	Test Date	Collected By:	Location	E. coli per 100mL Shallow	Deep
7/2/2012	7/3/2012	J. Duck	Sullivan Beach	24.1	25.9
7/18/2012	7/19/2012	J. Duck	Sullivan Beach	12.1	11
8/1/2012	8/2/2012	E. Uphoff	Sullivan Beach	14.6	8.5
8/15/2012	8/16/2012	J. Duck	Sullivan Beach	22.8	12.1
8/28/2012	8/29/2012	K. Pierson	Sullivan Beach	27.5	3.1
5/9/2012	5/10/2012	P. Manhart	Wilborn Creek Recreation Area	79.8	27.9
5/23/2012	5/24/2012	L. Cordes	Wilborn Creek Recreation Area	10.8	1
6/6/2012	6/7/2012	K. Wiseman	Wilborn Creek Recreation Area	45.7	26.9
6/6/2012	6/7/2012	K. Pruemer	Wilborn Creek Recreation Area	1	<1
7/2/2012	7/3/2012	J. Duck	Wilborn Creek Recreation Area	1046.2	1
7/10/2012	7/11/2012	K. Pruemer	Wilborn Creek Recreation Area	6.3	2
7/18/2012	7/19/2012	J. Duck	Wilborn Creek Recreation Area	4.1	1
8/1/2012	8/2/2012	E. Uphoff	Wilborn Creek Recreation Area	<1	<1
8/15/2012	8/16/2012	J. Duck	Wilborn Creek Recreation Area	80.1	980.4
8/28/2012	8/29/2012	K. Pierson	Wilborn Creek Recreation Area	1	<1

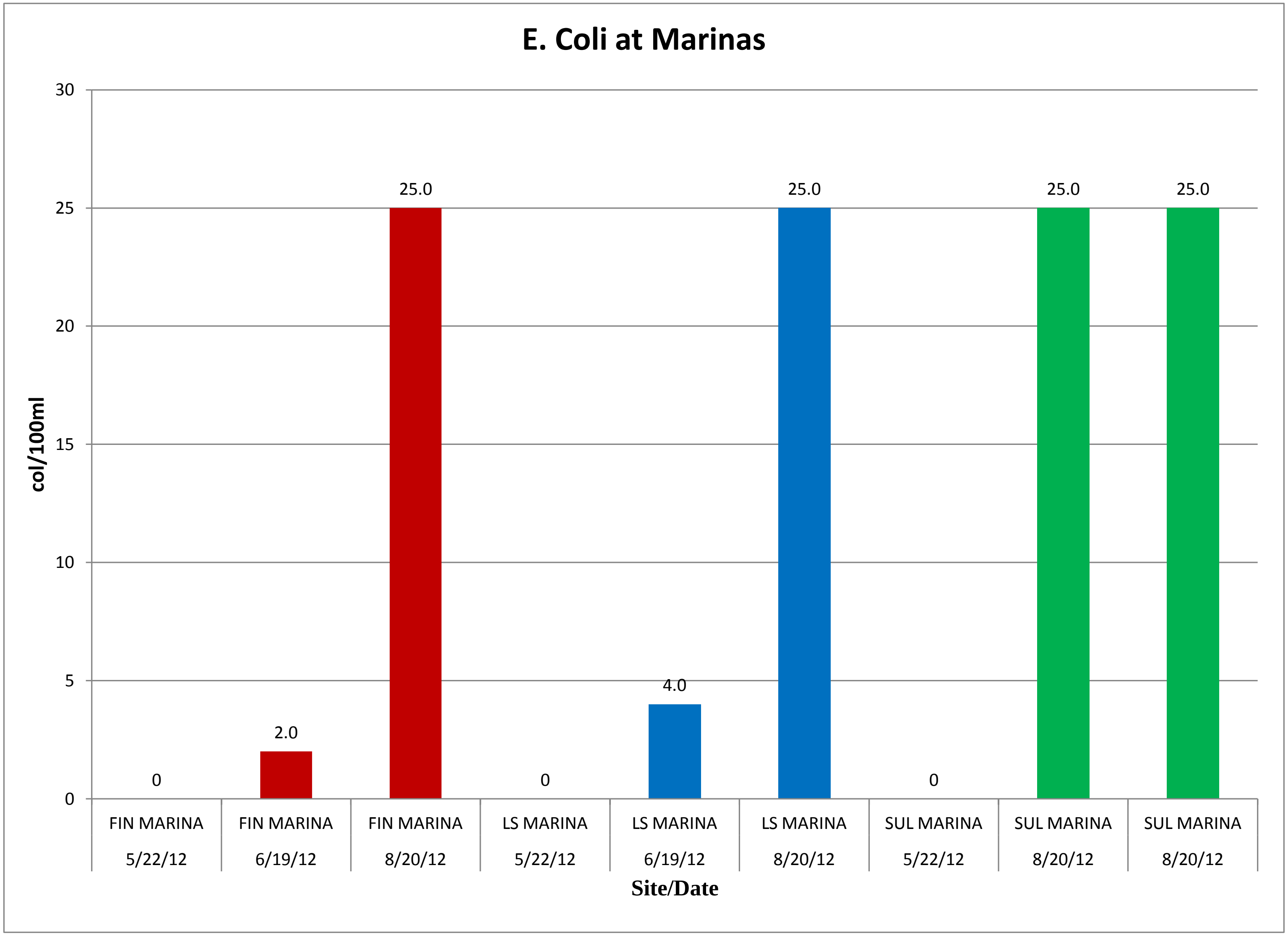
FIELD DATA

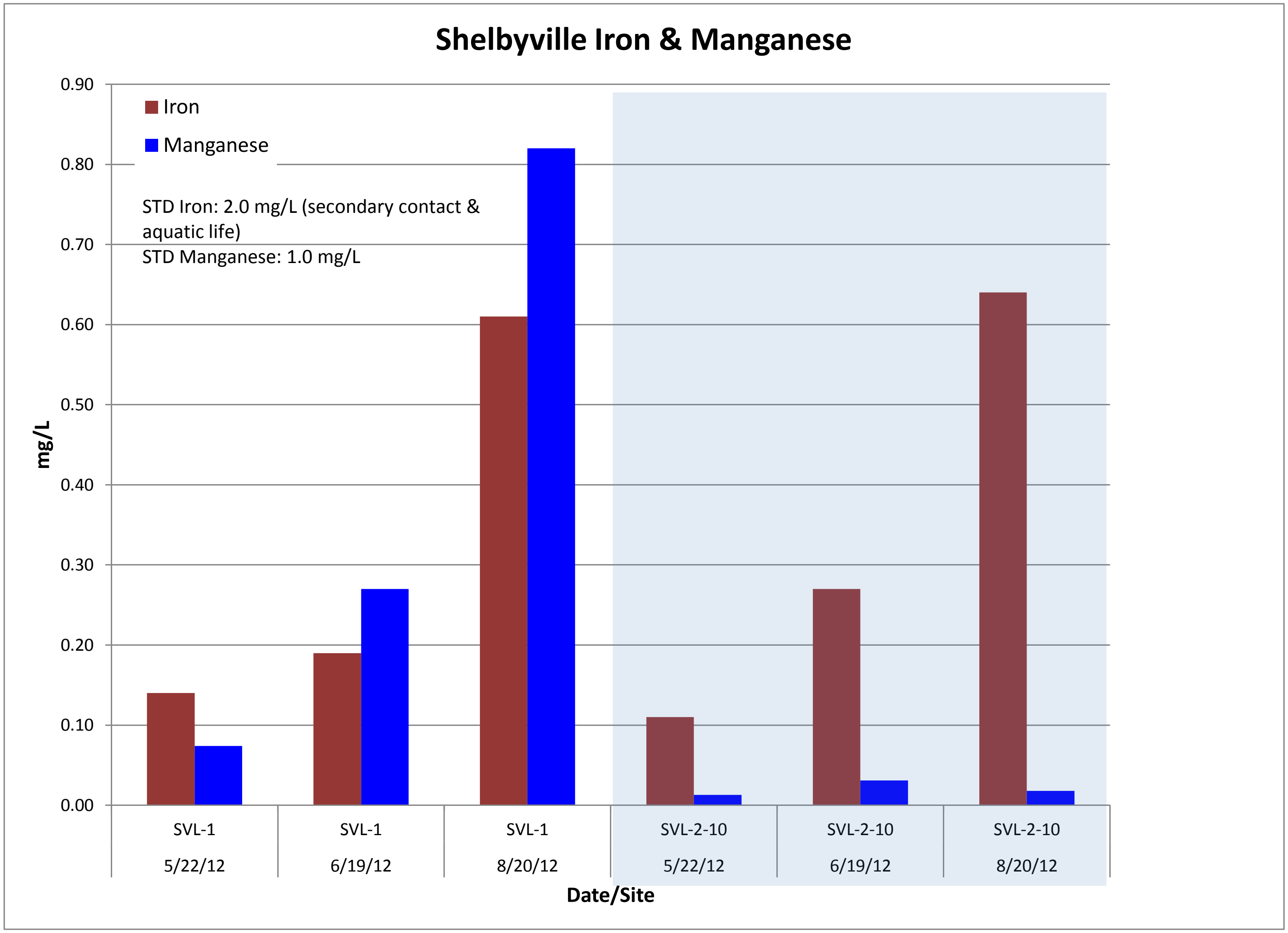
Site	Date	Depth	Water Temp (oC)	Redox (mv)	Cond (uS)	DO %	DO mg/l	pH	Time	Seechi (in)
SBV-1	5/22/2012	1.2	16.03	437	292	94	9.21	5.71	1027	
SBV-1	6/19/2012	1.1	18.96	378	303.8	90.5	8.34	4.57	954	
SBV-1	8/20/2012	0.5	20.35	351	353	68	5.96	7.19	1000	
SBV-11	5/22/2012	0.2	22.54	340	289.4	104.2	9.12	8.36	1201	
SBV-11		1	22.02	346	294.3	71.2	6.35	8.11	1202	
SBV-11		2	21.58	352	297.9	51.6	4.33	7.83	1203	
SBV-11		3	21.48	354	298.7	43.3	3.95	7.72	1204	
SBV-11		4	21.25	357	300	32.6	2.86	7.6	1205	
SBV-11	6/19/2012	0.3	26.54	369	352	99.7	7.97	8.43	1117	23
SBV-11		1	26.48	369	352	100.7	8.05	8.48	1118	
SBV-11		2	26.37	371	352	96.4	7.71	8.45	1119	
SBV-11		3	26.37	375	356	83.3	6.57	8.34	1120	
SBV-11		4	26.17	381	360	61.5	4.84	8.19	1121	
SBV-11		5	26.09	384	362	50.2	4.05	8.05	1122	
SBV-11		6	25.6	140	358	47.6	3.85	7.85	1123	
SBV-11	8/20/2012	0.2	25.19	339	397.8	99.3	8.09	8.82	1203	12
SBV-11		1	24.73	345	396	78.9	6.42	8.73	1204	
SBV-11		2	24.66	349	396	73	5.98	8.66	1205	
SBV-11		3	24.66	353	396.1	72.4	5.93	8.64	1206	
SBV-11		4	24.58	357	402.2	58.7	4.8	8.49	1207	
SBV-11		5	24.57	361	405.2	53	4.27	8.38	1208	
SBV-11		6	24.56	363	406.2	46.1	3.73	8.31	1209	
SBV-11		7	24.54	369	414.1	23.4	1.9	8.05	1210	
SBV-11		7.2	24.53	365	417.9	12.6	1.03	8.19	1211	
SBV-2	5/22/2012	0.2	21.55	407	278.2	97	8.48	8.28	1055	46
SBV-2		1	21.58	405	278.1	96.9	8.47	8.29	1056	
SBV-2		2	21.52	404	278.2	96.5	8.45	8.29	1057	
SBV-2		3	21.52	403	278.1	96.4	8.44	8.28	1058	
SBV-2		4	21.51	402	278.1	96.1	8.42	8.27	1059	
SBV-2		5	21.51	402	278.1	96	8.41	8.27	1100	
SBV-2		6	21.52	401	277.9	95.8	8.4	8.25	1101	
SBV-2		7	21.46	401	278.3	94.5	8.29	8.25	1102	
SBV-2		7.5	21.46	369	282.4	69.3	0.34	7.67	1103	

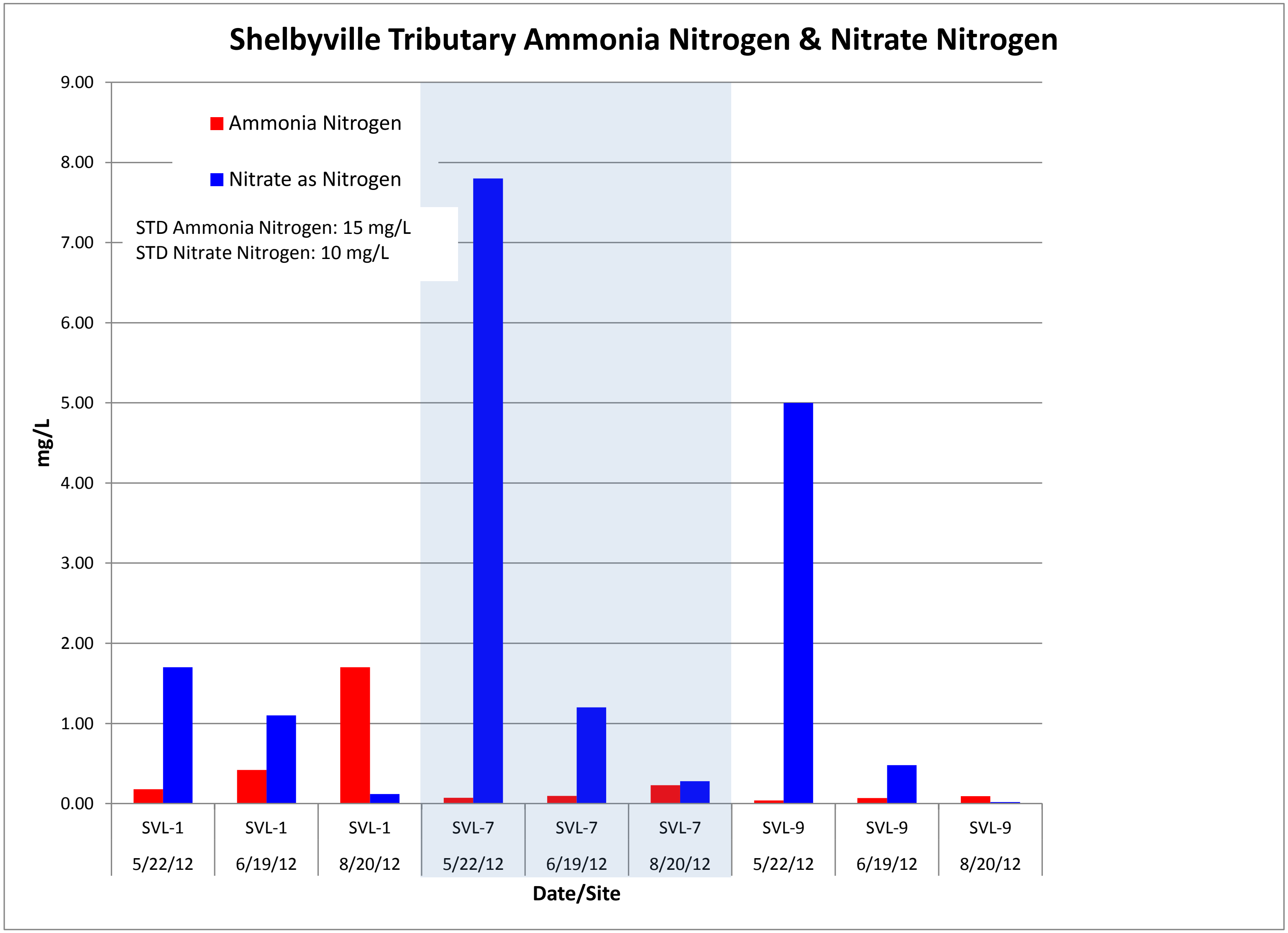
Site	Date	Depth	Water Temp (oC)	Redox (mv)	Cond (uS)	DO %	DO mg/l	pH	Time	Seechi (in)
SBV-2	6/19/2012	0.3	23.11	398	354	68	5.79	7.81	1026	61
SBV-2		1	23.1	402	355	67	5.71	7.83	1027	
SBV-2		2	23.04	404	354	66.6	5.68	7.81	1028	
SBV-2		3	23.05	405	354	67.2	5.74	7.82	1029	
SBV-2		4	22.99	406	355	65.7	5.6	7.8	1030	
SBV-2		4.2	22.94	385	354	64.8	5.54	7.76	1031	
SBV-2	8/20/2012	0.3	25.88	383	377.1	110.8	8.89	9.02	1059	27
SBV-2		1	25.85	384	376.8	110.5	8.89	9.02	1100	
SBV-2		2	25.52	387	378.4	95	7.63	8.91	1101	
SBV-2		3	25.49	387	377.6	98.8	8.01	8.92	1102	
SBV-2		4	25.49	388	377.6	96.7	7.84	8.91	1103	
SBV-2		5	25.49	389	377.8	101.2	8.15	8.91	1104	
SBV-2		6	25.43	397	381.4	58.2	4.65	8.55	1105	
SBV-2		7	25.23	402	384.4	37.3	3.03	8.29	1106	
SBV-2		8	25.01	406	390	27.2	2.17	8.08	1107	
SBV-2		9	24.78	410	392.7	15.2	1.21	7.96	1108	
SBV-2		10	23.26	217	439.8	3.2	0.26	7.62	1109	
SBV-4	5/22/2012	0.3	24.33	330	349.6	159.8	13.27	8.44	1215	14
SBV-4		1	23.45	336	352.4	120.9	10.13	8.23	1216	
SBV-4	6/19/2012	0.4	27.87	351	465	100.5	7.84	8.32	1145	9
SBV-4		1	27.11	356	469	85.4	6.65	8.25	1146	
SBV-4		1.9	26.71	225	477	68.8	5.53	8.1	1147	
SBV-4		2	26.68	36	479	16.1	1.01	7.56	1148	
SBV-4	8/20/2012	0.25	25.77	348	519	107.6	8.7	8.74	1234	7
SBV-4		1	23.98	359	520.6	51.3	4.22	8.34	1235	
SBV-4		1.8	23.99	218	520.2	48.1	3.94	8.28	1236	
SBV-7	5/22/2012	1.3	21.37	244	424	85.7	7.57	7.52	1205	
SBV-7	6/19/2012	0.4	27.34	325	461	76	5.49	7.18	1140	
SBV-7	8/20/2012	0.2	21.56	315	527	68.7	5.96	7.42	1122	
SBV-9	5/22/2012	1.2	19.28	96	342	43.7	5.1	7.75	1230	
SBV-9	6/19/2012	0.5	28.31	314	388	78	6.05	7.05	1231	
SBV-9	8/20/2012	0.1	24.5	226	300	75.9	6.45	9.2	1225	

APPENDIX B

LAB DATA
GRAPHS


E. Coli at Marinas
col/100ml
30
25
20
15
10
5
0
0
2.0
25.0
0
4.0
25.0
0
25.0
25.0
FIN MARINA 5/22/12
FIN MARINA 6/19/12
FIN MARINA 8/20/12
LS MARINA 5/22/12
LS MARINA 6/19/12
LS MARINA 8/20/12
SUL MARINA 5/22/12
SUL MARINA 8/20/12
SUL MARINA 8/20/12
Site/Date


Shelbyville Iron & Manganese
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
mg/L
Iron
Manganese
STD Iron: 2.0 mg/L (secondary contact & aquatic life)
STD Manganese: 1.0 mg/L
SVL-1
5/22/12
SVL-1
6/19/12
SVL-1
8/20/12
SVL-2-10
5/22/12
SVL-2-10
6/19/12
SVL-2-10
8/20/12
Date/Site


Shelbyville Tributary Ammonia Nitrogen & Nitrate Nitrogen
🟥 Ammonia Nitrogen
🟦 Nitrate as Nitrogen
STD Ammonia Nitrogen: 15 mg/L
STD Nitrate Nitrogen: 10 mg/L
mg/L
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
SVL-1 5/22/12
SVL-1 6/19/12
SVL-1 8/20/12
SVL-7 5/22/12
SVL-7 6/19/12
SVL-7 8/20/12
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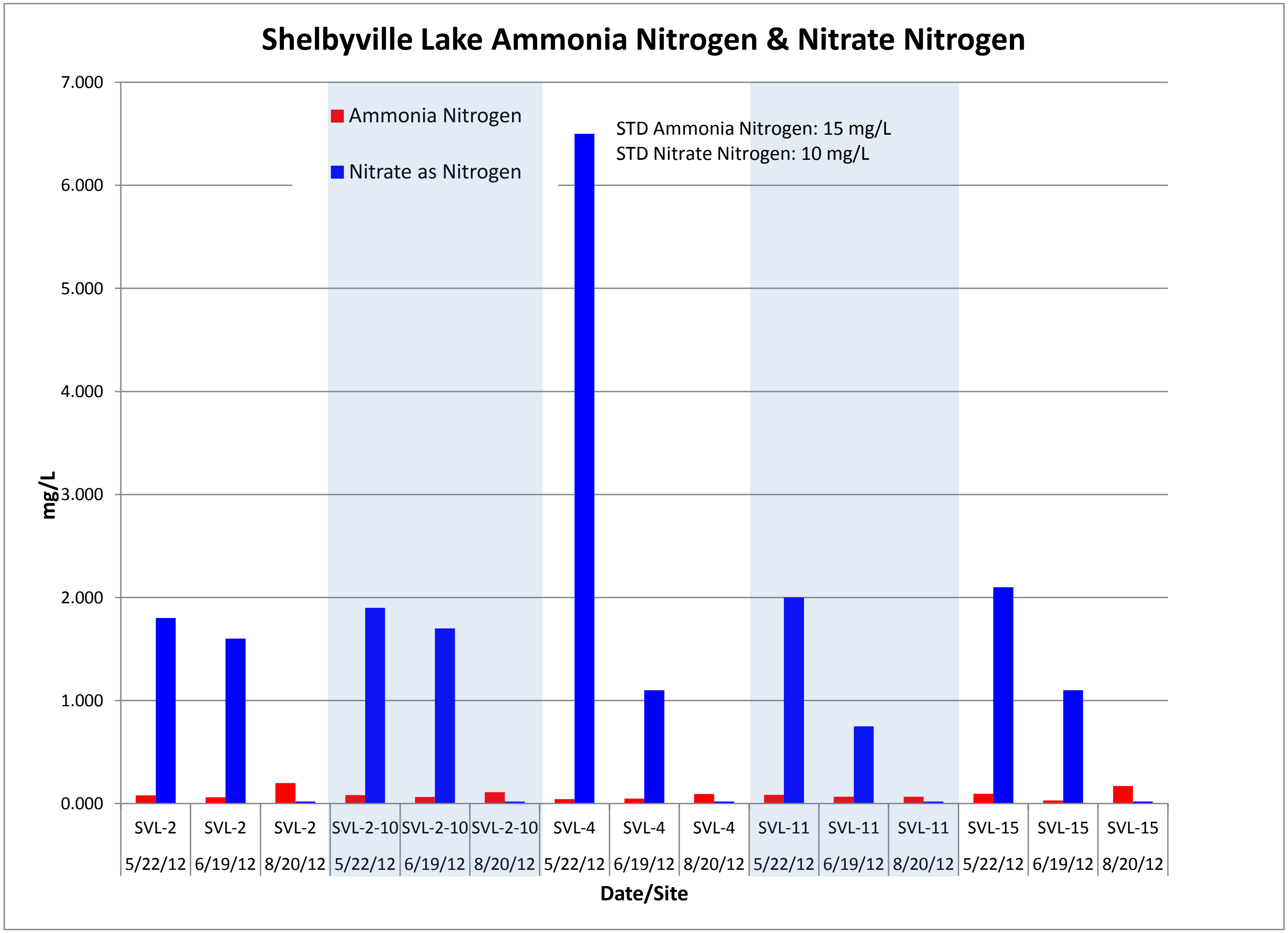
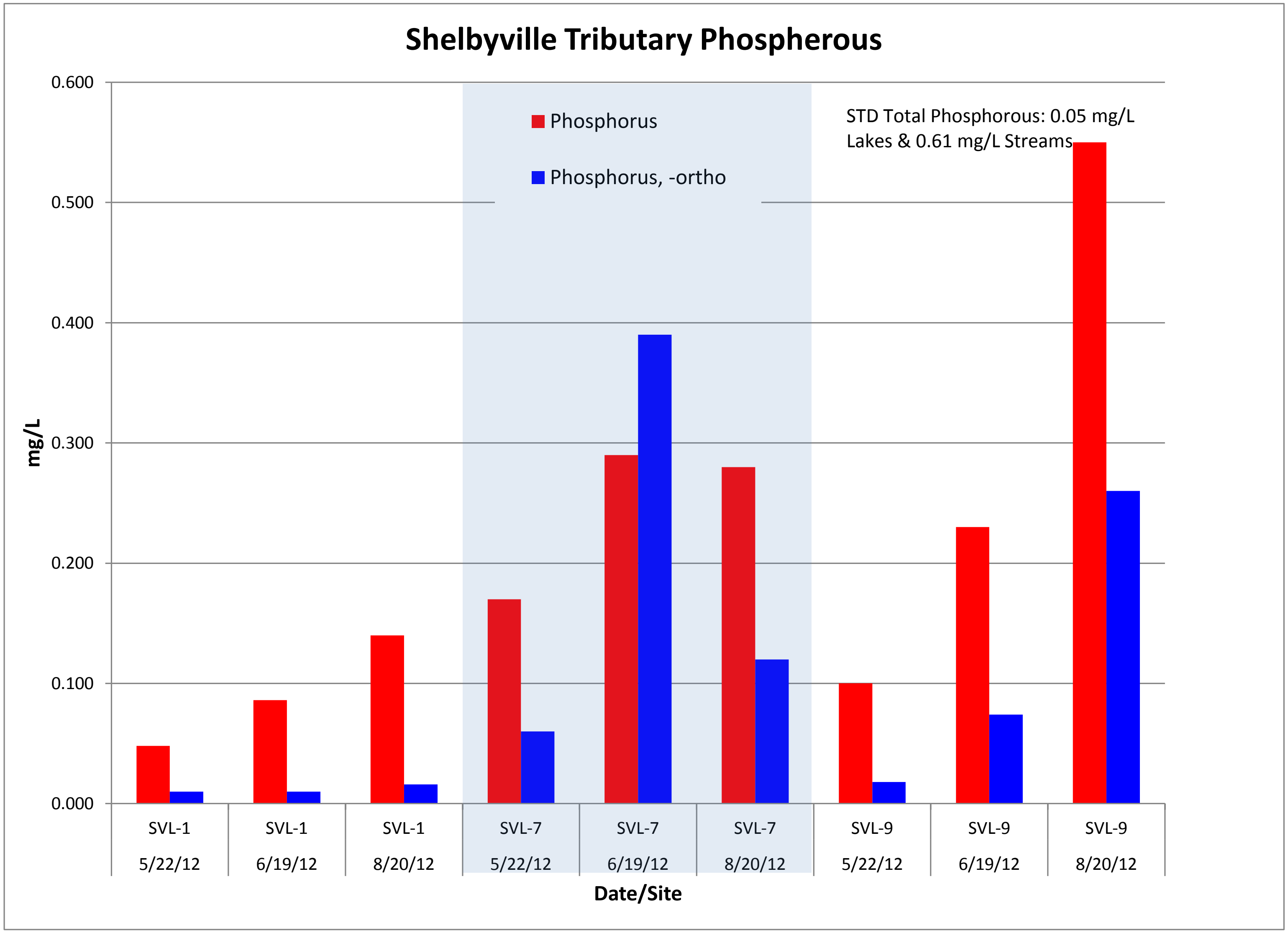
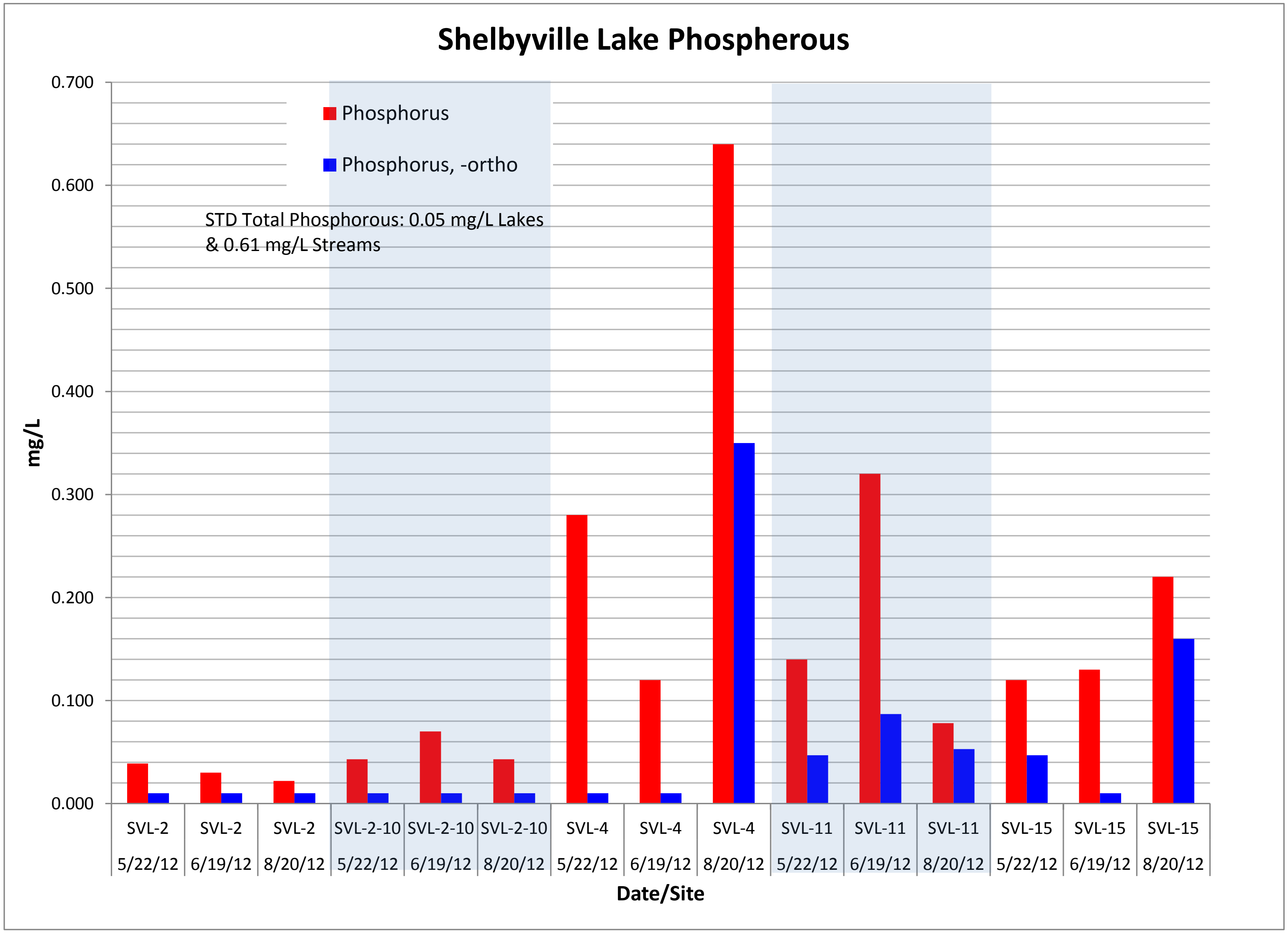
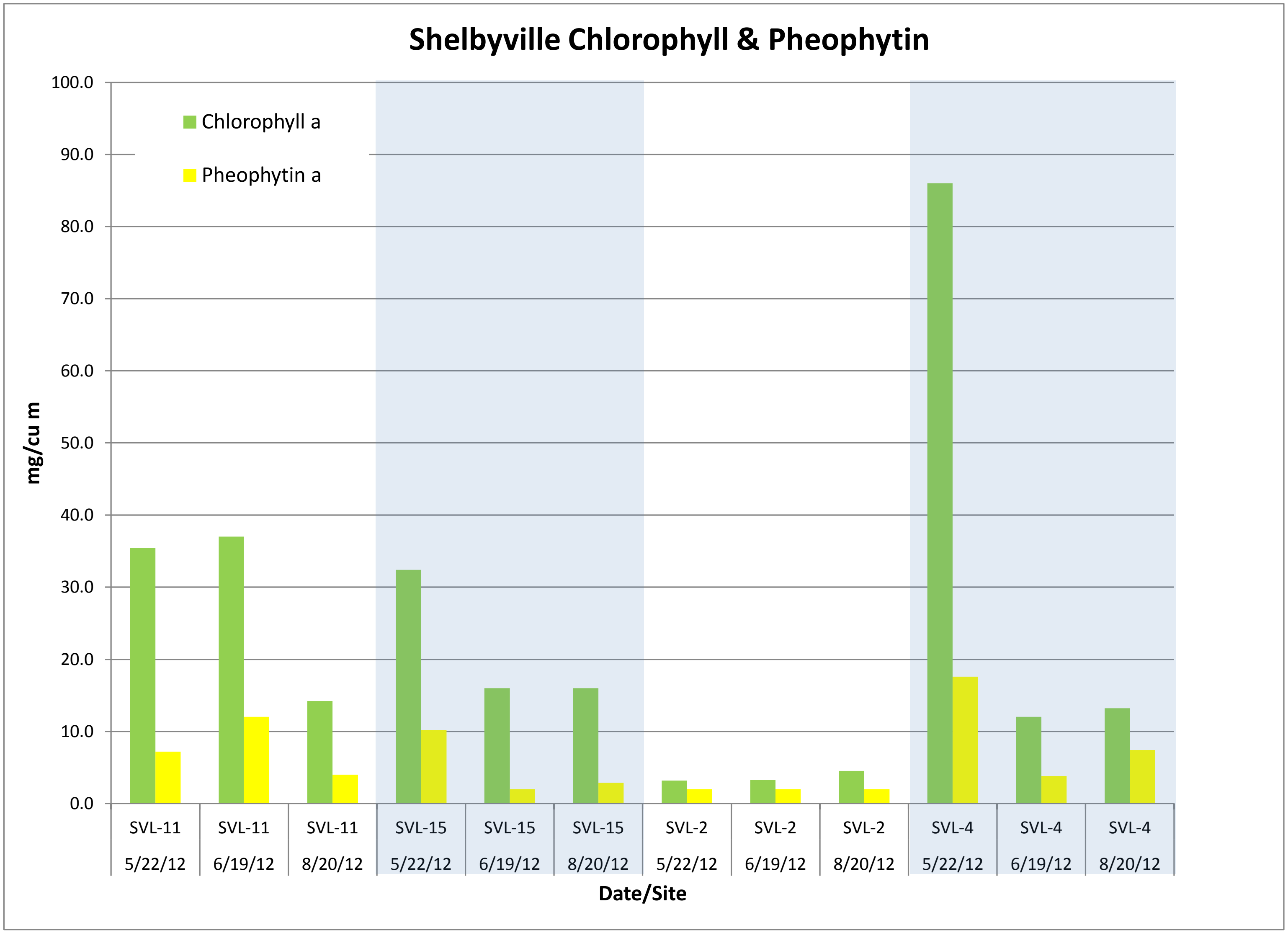
SVL-9 8/20/12
Date/Site

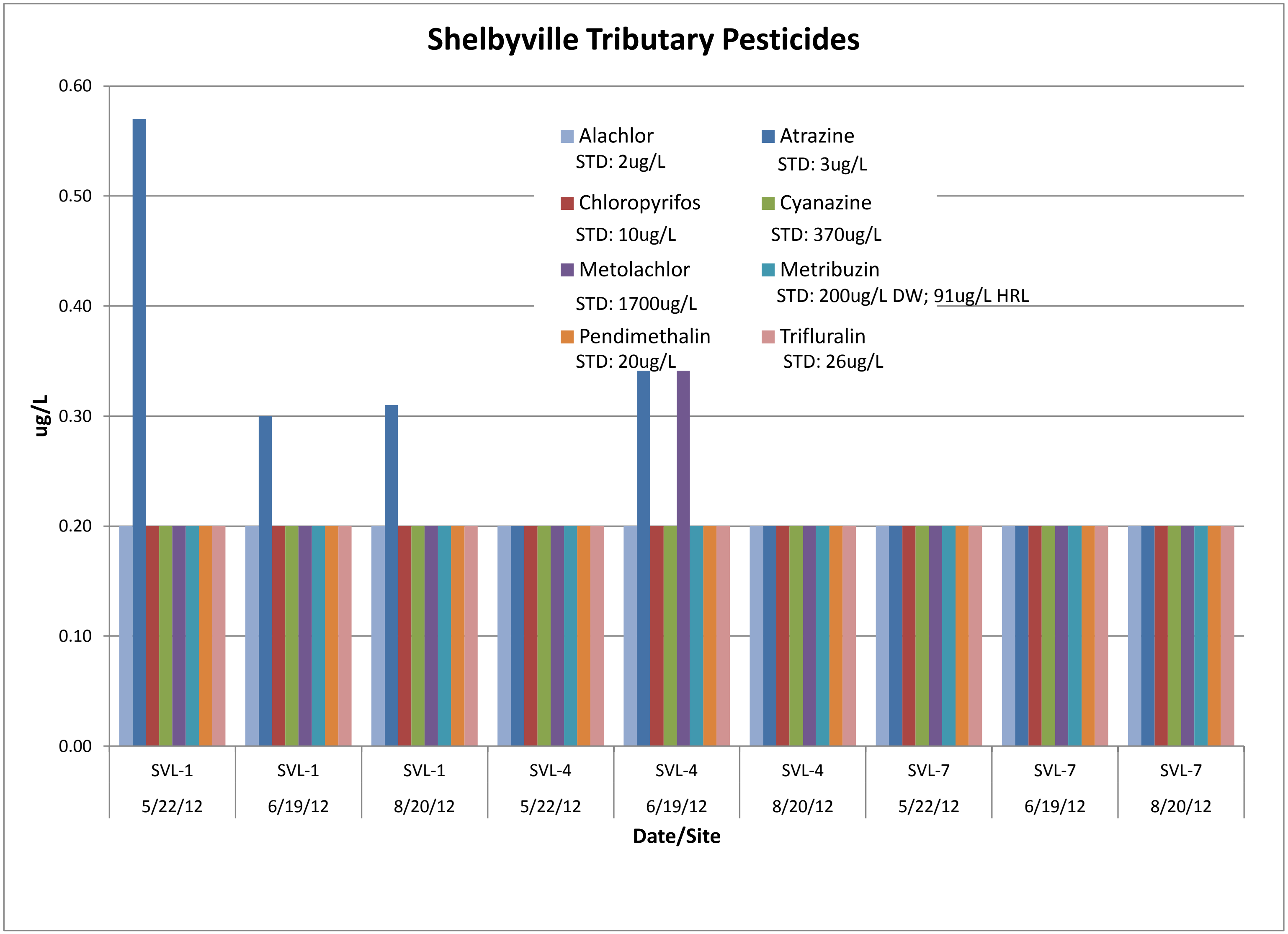

Shelbyville Lake Ammonia Nitrogen & Nitrate Nitrogen
🟥 Ammonia Nitrogen
🟦 Nitrate as Nitrogen
STD Ammonia Nitrogen: 15 mg/L
STD Nitrate Nitrogen: 10 mg/L
mg/L
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
SVL-2 5/22/12
SVL-2 6/19/12
SVL-2 8/20/12
SVL-2-10 5/22/12
SVL-2-10 6/19/12
SVL-2-10 8/20/12
SVL-4 5/22/12
SVL-4 6/19/12
SVL-4 8/20/12
SVL-11 5/22/12
SVL-11 6/19/12
SVL-11 8/20/12
SVL-15 5/22/12
SVL-15 6/19/12
SVL-15 8/20/12
Date/Site

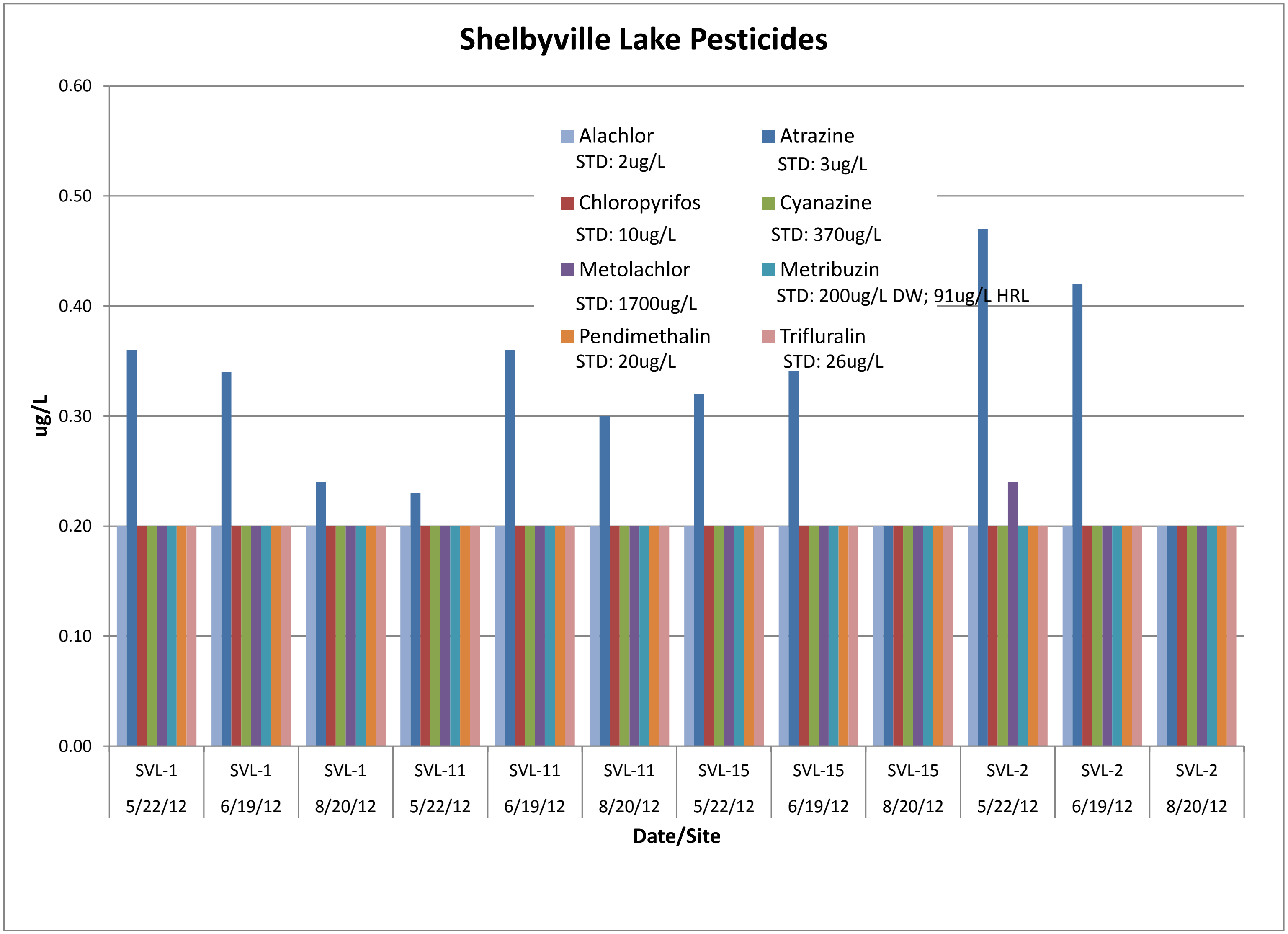

Shelbyville Tributary Phospherous
mg/L
0.600
0.500
0.400
0.300
0.200
0.100
0.000
🟥 Phosphorus
🟦 Phosphorus, -ortho
STD Total Phosphorous: 0.05 mg/L Lakes & 0.61 mg/L Streams
SVL-1 5/22/12
SVL-1 6/19/12
SVL-1 8/20/12
SVL-7 5/22/12
SVL-7 6/19/12
SVL-7 8/20/12
SVL-9 5/22/12
SVL-9 6/19/12
SVL-9 8/20/12
Date/Site

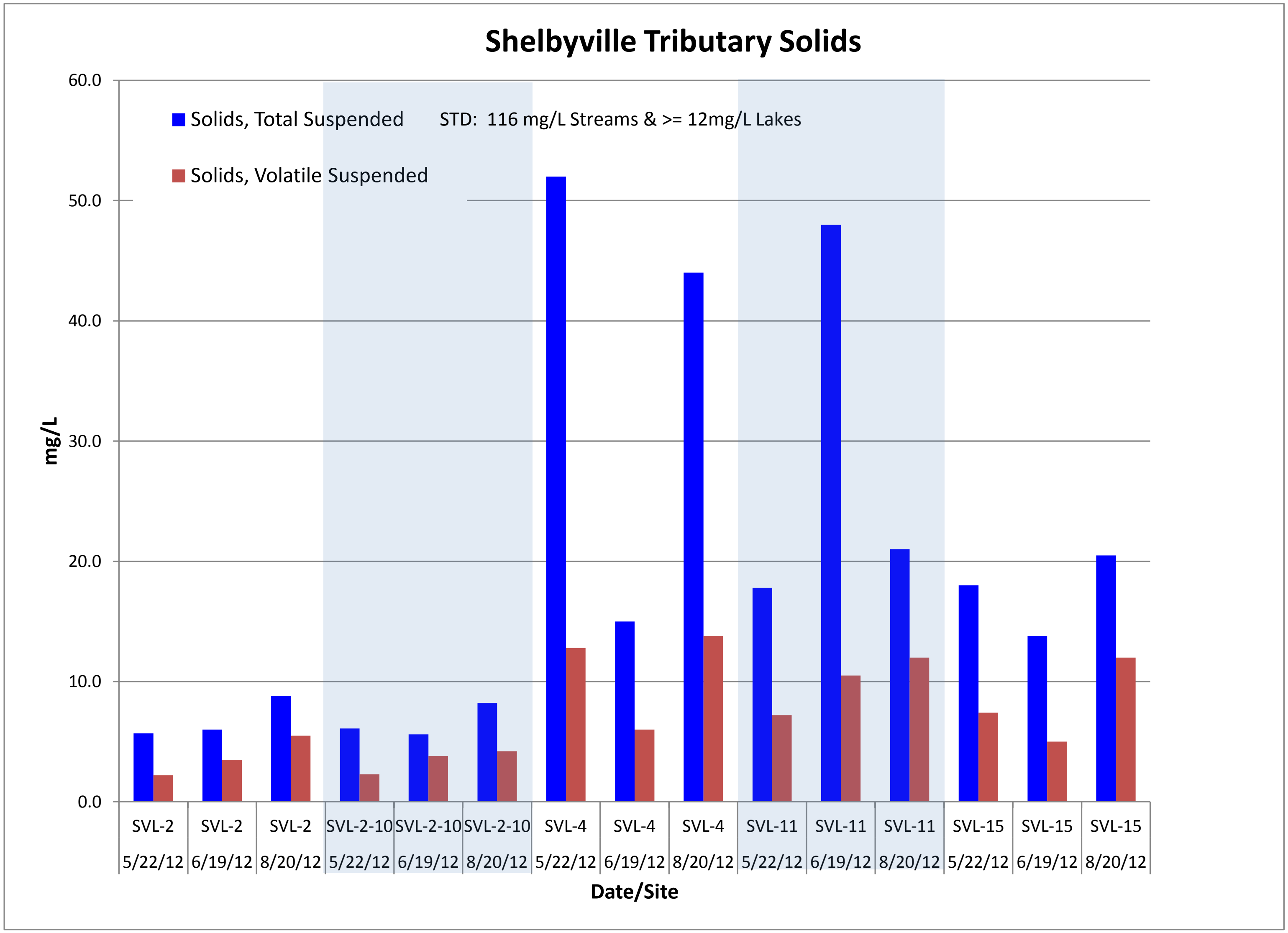

Shelbyville Lake Phospherous

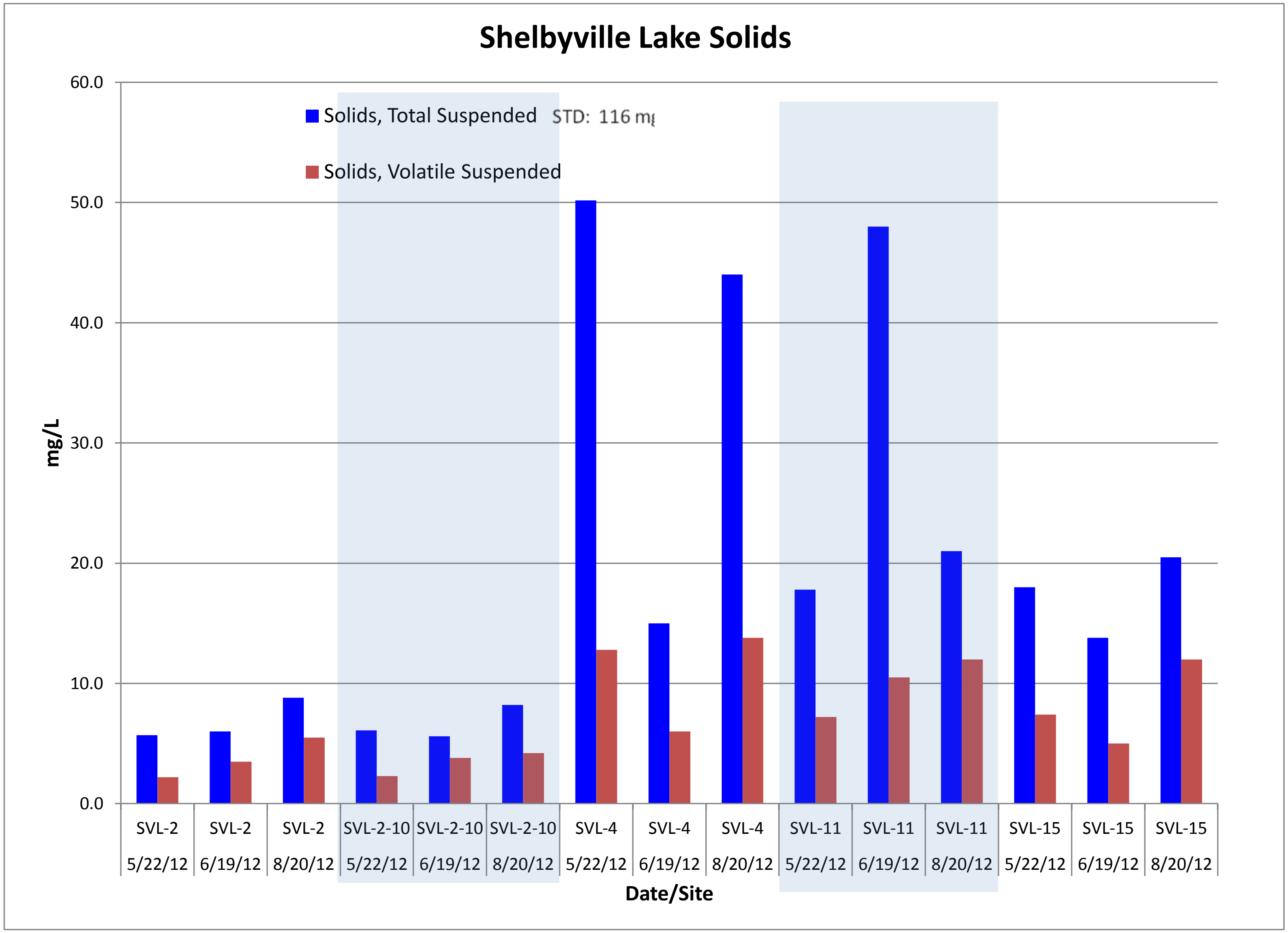
STD Total Phosphorous: 0.05 mg/L Lakes & 0.61 mg/L Streams

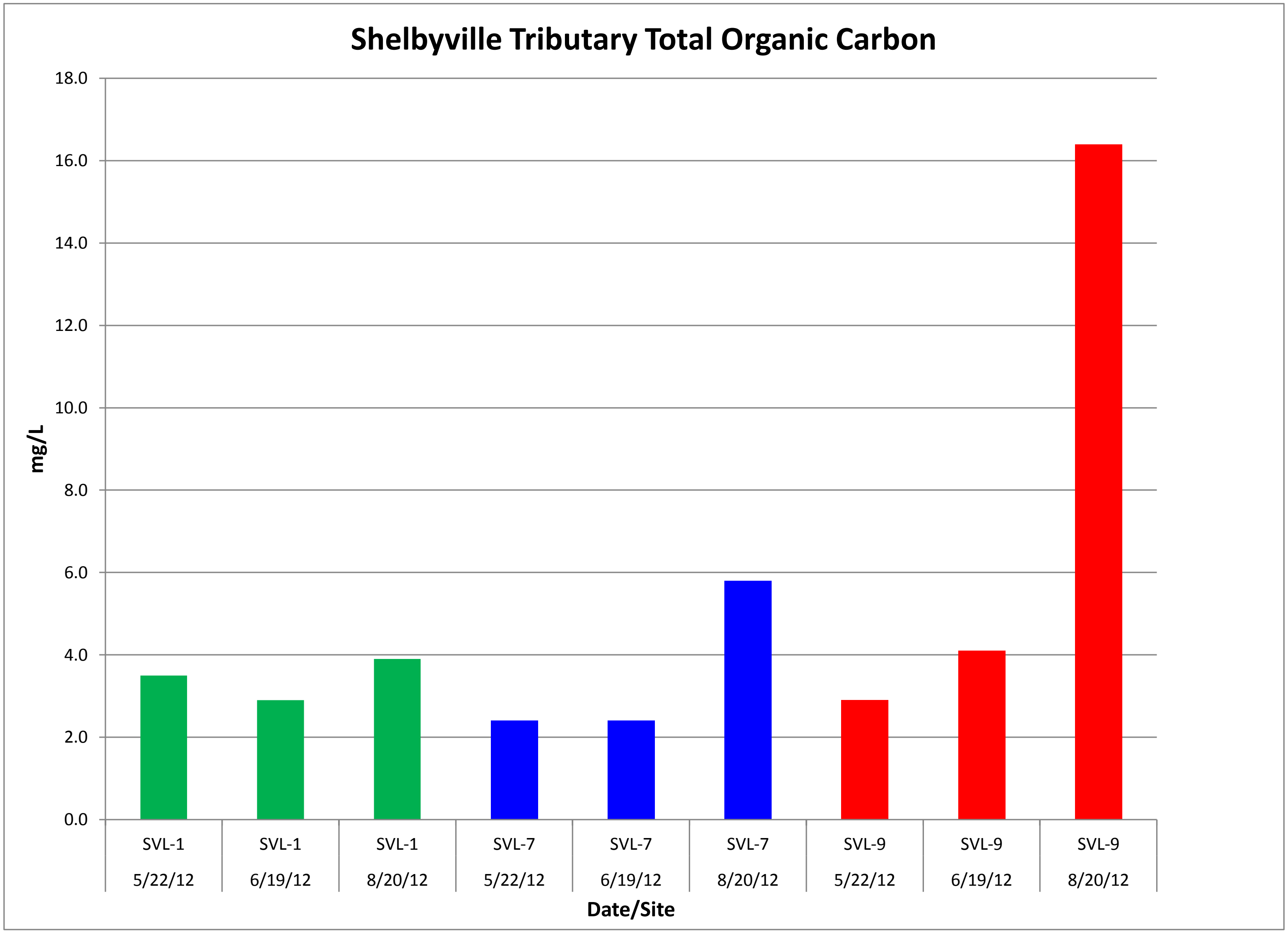

Shelbyville Chlorophyll & Pheophytin
Chlorophyll a
Pheophytin a
mg/cu m
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
SVL-11 5/22/12
SVL-11 6/19/12
SVL-11 8/20/12
SVL-15 5/22/12
SVL-15 6/19/12
SVL-15 8/20/12
SVL-2 5/22/12
SVL-2 6/19/12
SVL-2 8/20/12
SVL-4 5/22/12
SVL-4 6/19/12
SVL-4 8/20/12
Date/Site

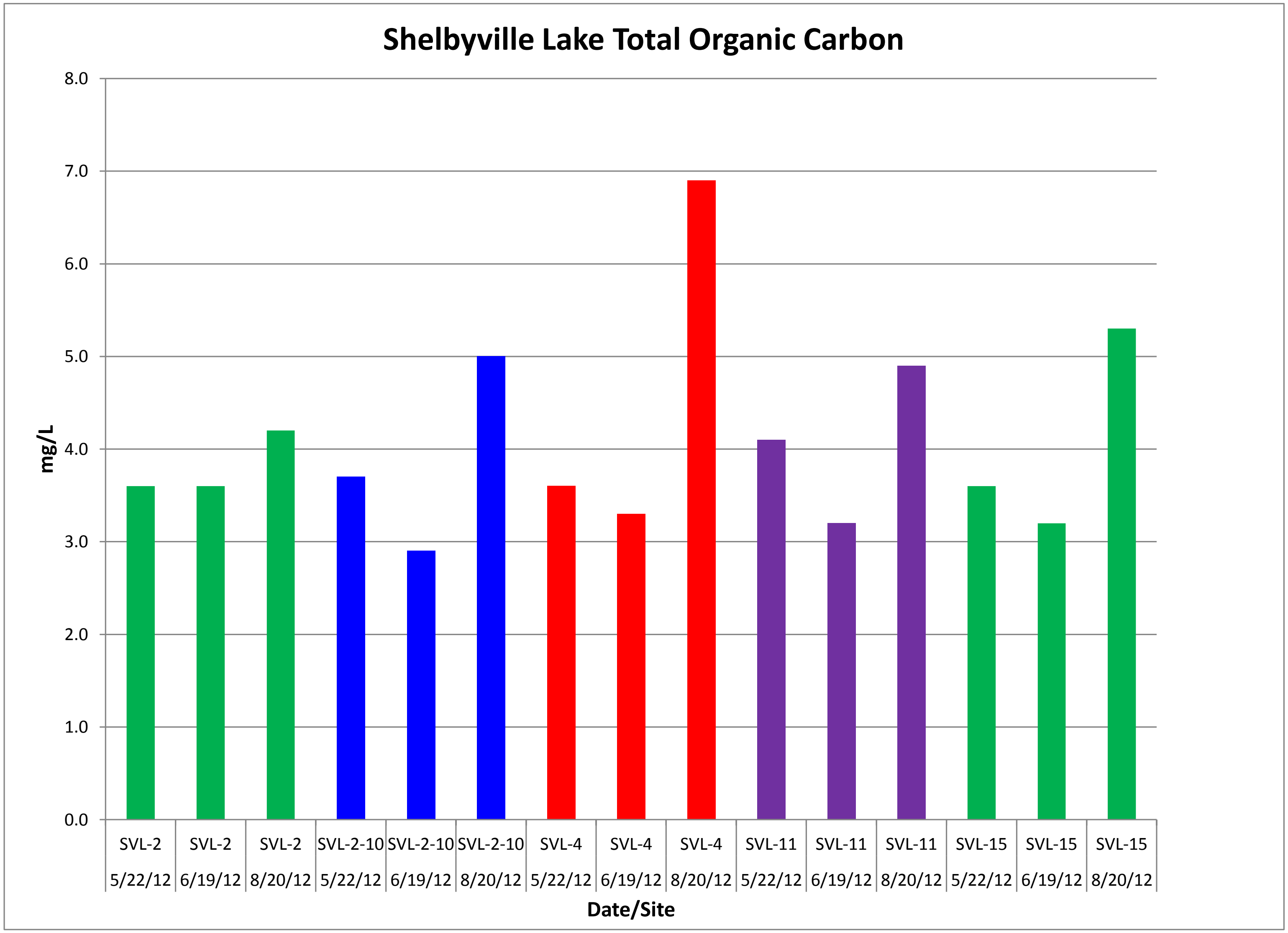

Shelbyville Tributary Pesticides
ug/L
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Alachlor
STD: 2ug/L
Atrazine
STD: 3ug/L
Chloropyrifos
STD: 10ug/L
Cyanazine
STD: 370ug/L
Metolachlor
STD: 1700ug/L
Metribuzin
STD: 200ug/L DW; 91ug/L HRL
Pendimethalin
STD: 20ug/L
Trifluralin
STD: 26ug/L
SVL-1 5/22/12
SVL-1 6/19/12
SVL-1 8/20/12
SVL-4 5/22/12
SVL-4 6/19/12
SVL-4 8/20/12
SVL-7 5/22/12
SVL-7 6/19/12
SVL-7 8/20/12
Date/Site


Shelbyville Lake Pesticides
0.60
0.50
0.40
0.30
0.20
0.10
0.00
ug/L
Alachlor
STD: 2ug/L
Atrazine
STD: 3ug/L
Chloropyrifos
STD: 10ug/L
Cyanazine
STD: 370ug/L
Metolachlor
STD: 1700ug/L
Metribuzin
STD: 200ug/L DW; 91ug/L HRL
Pendimethalin
STD: 20ug/L
Trifluralin
STD: 26ug/L
SVL-1 5/22/12
SVL-1 6/19/12
SVL-1 8/20/12
SVL-11 5/22/12
SVL-11 6/19/12
SVL-11 8/20/12
SVL-15 5/22/12
SVL-15 6/19/12
SVL-15 8/20/12
SVL-2 5/22/12
SVL-2 6/19/12
SVL-2 8/20/12
Date/Site


Shelbyville Tributary Solids
Solids, Total Suspended
STD: 116 mg/L Streams & >= 12mg/L Lakes
Solids, Volatile Suspended
mg/L
60.0
50.0
40.0
30.0
20.0
10.0
0.0
SVL-2 5/22/12
SVL-2 6/19/12
SVL-2 8/20/12
SVL-2-10 5/22/12
SVL-2-10 6/19/12
SVL-2-10 8/20/12
SVL-4 5/22/12
SVL-4 6/19/12
SVL-4 8/20/12
SVL-11 5/22/12
SVL-11 6/19/12
SVL-11 8/20/12
SVL-15 5/22/12
SVL-15 6/19/12
SVL-15 8/20/12
Date/Site

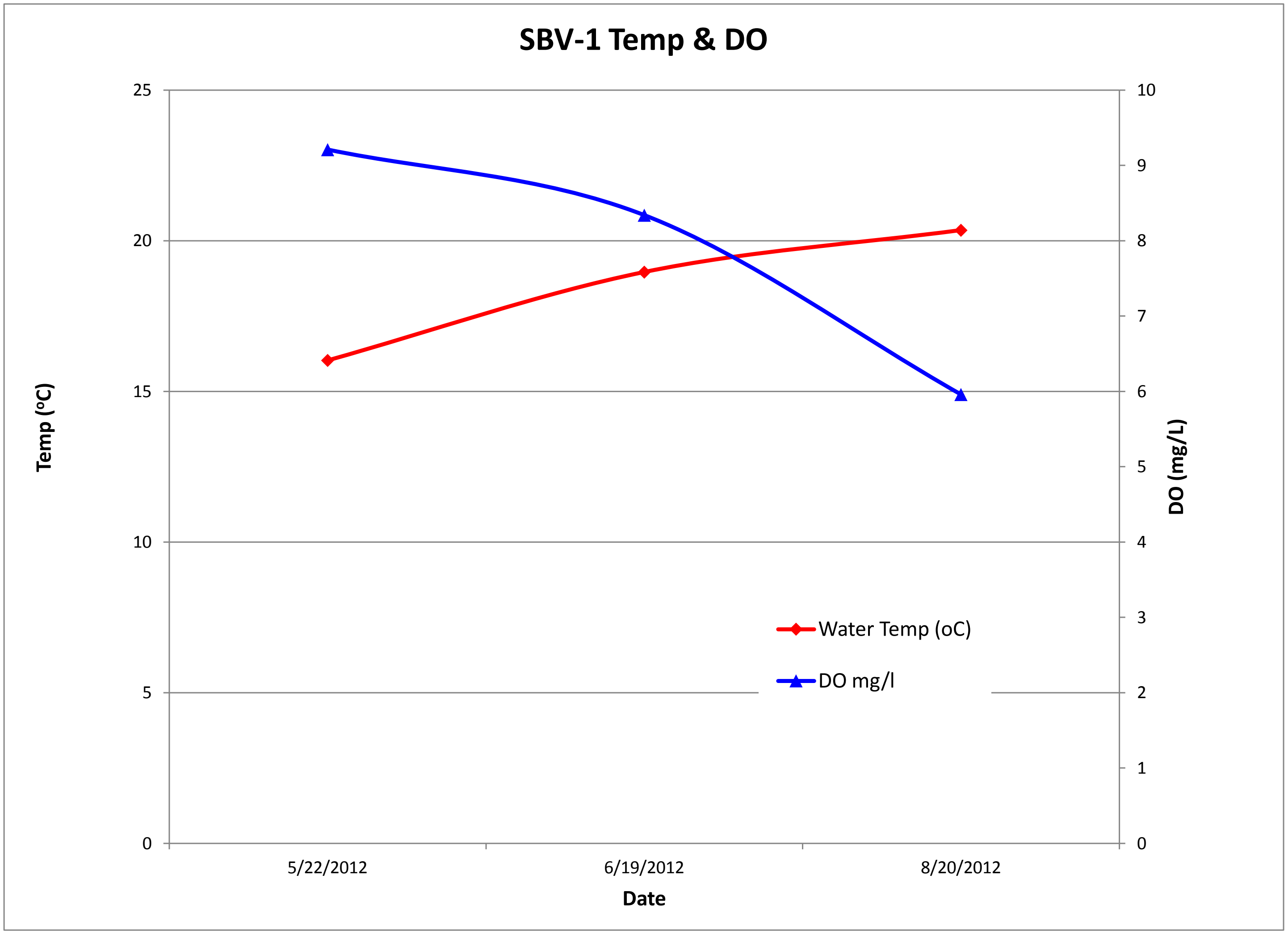

Shelbyville Lake Solids
Solids, Total Suspended
STD: 116 mg
Solids, Volatile Suspended
mg/L
60.0
50.0
40.0
30.0
20.0
10.0
0.0
SVL-2 5/22/12
SVL-2 6/19/12
SVL-2 8/20/12
SVL-2-10 5/22/12
SVL-2-10 6/19/12
SVL-2-10 8/20/12
SVL-4 5/22/12
SVL-4 6/19/12
SVL-4 8/20/12
SVL-11 5/22/12
SVL-11 6/19/12
SVL-11 8/20/12
SVL-15 5/22/12
SVL-15 6/19/12
SVL-15 8/20/12
Date/Site

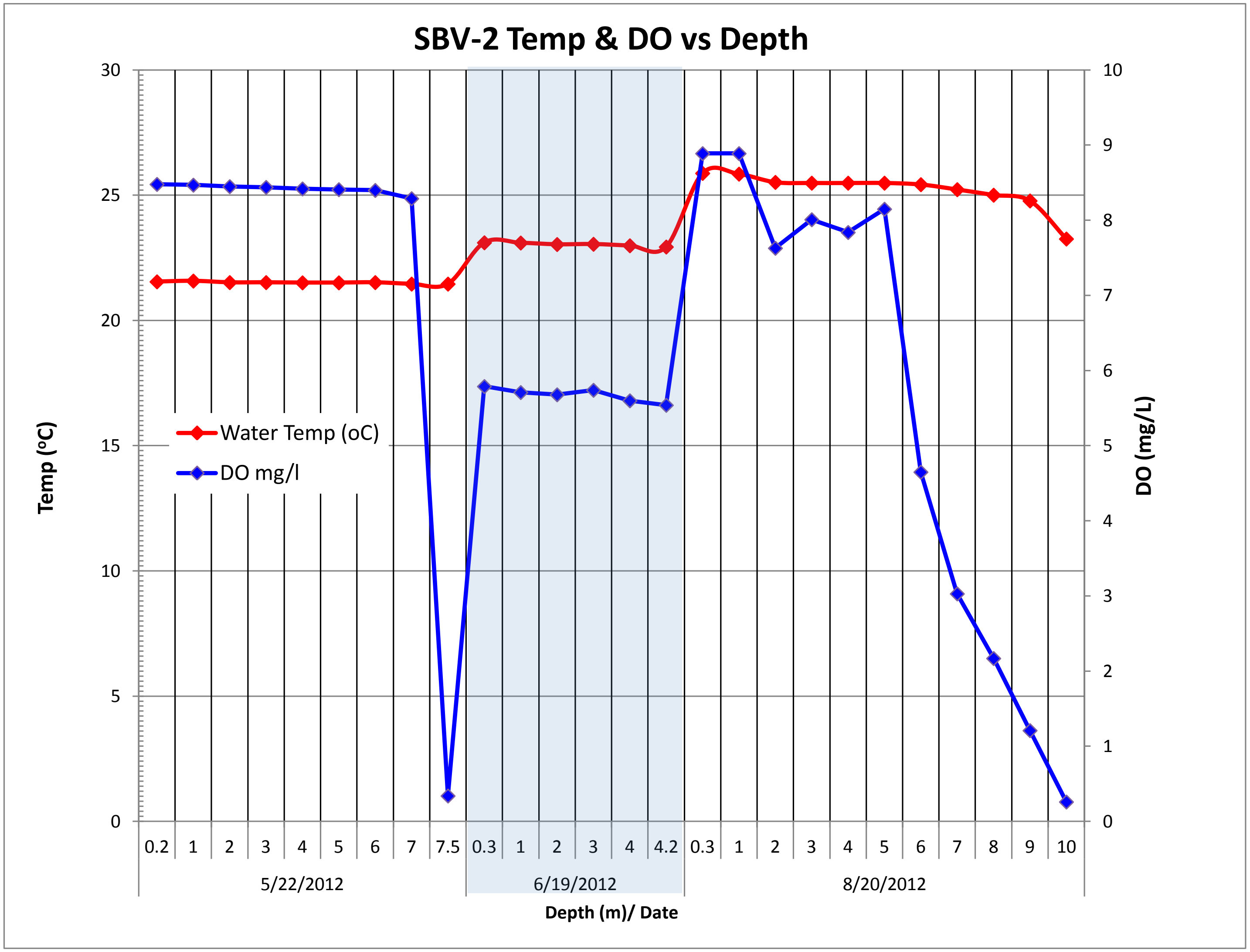

Shelbyville Tributary Total Organic Carbon
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
mg/L
SVL-1 5/22/12
SVL-1 6/19/12
SVL-1 8/20/12
SVL-7 5/22/12
SVL-7 6/19/12
SVL-7 8/20/12
SVL-9 5/22/12
SVL-9 6/19/12
SVL-9 8/20/12
Date/Site


Shelbyville Lake Total Organic Carbon
mg/L
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
SVL-2 5/22/12
SVL-2 6/19/12
SVL-2 8/20/12
SVL-2-10 5/22/12
SVL-2-10 6/19/12
SVL-2-10 8/20/12
SVL-4 5/22/12
SVL-4 6/19/12
SVL-4 8/20/12
SVL-11 5/22/12
SVL-11 6/19/12
SVL-11 8/20/12
SVL-15 5/22/12
SVL-15 6/19/12
SVL-15 8/20/12
Date/Site

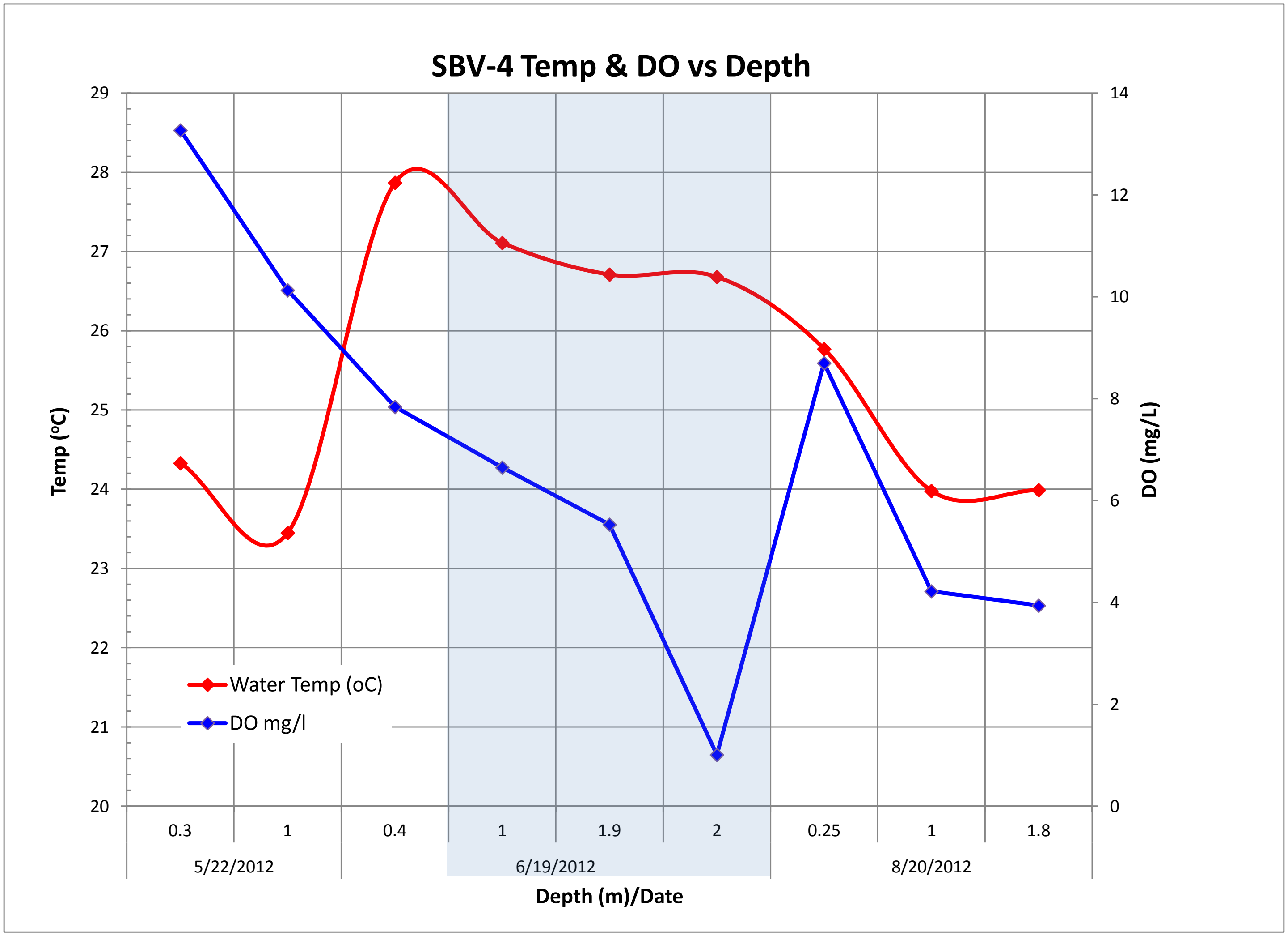
APPENDIX C

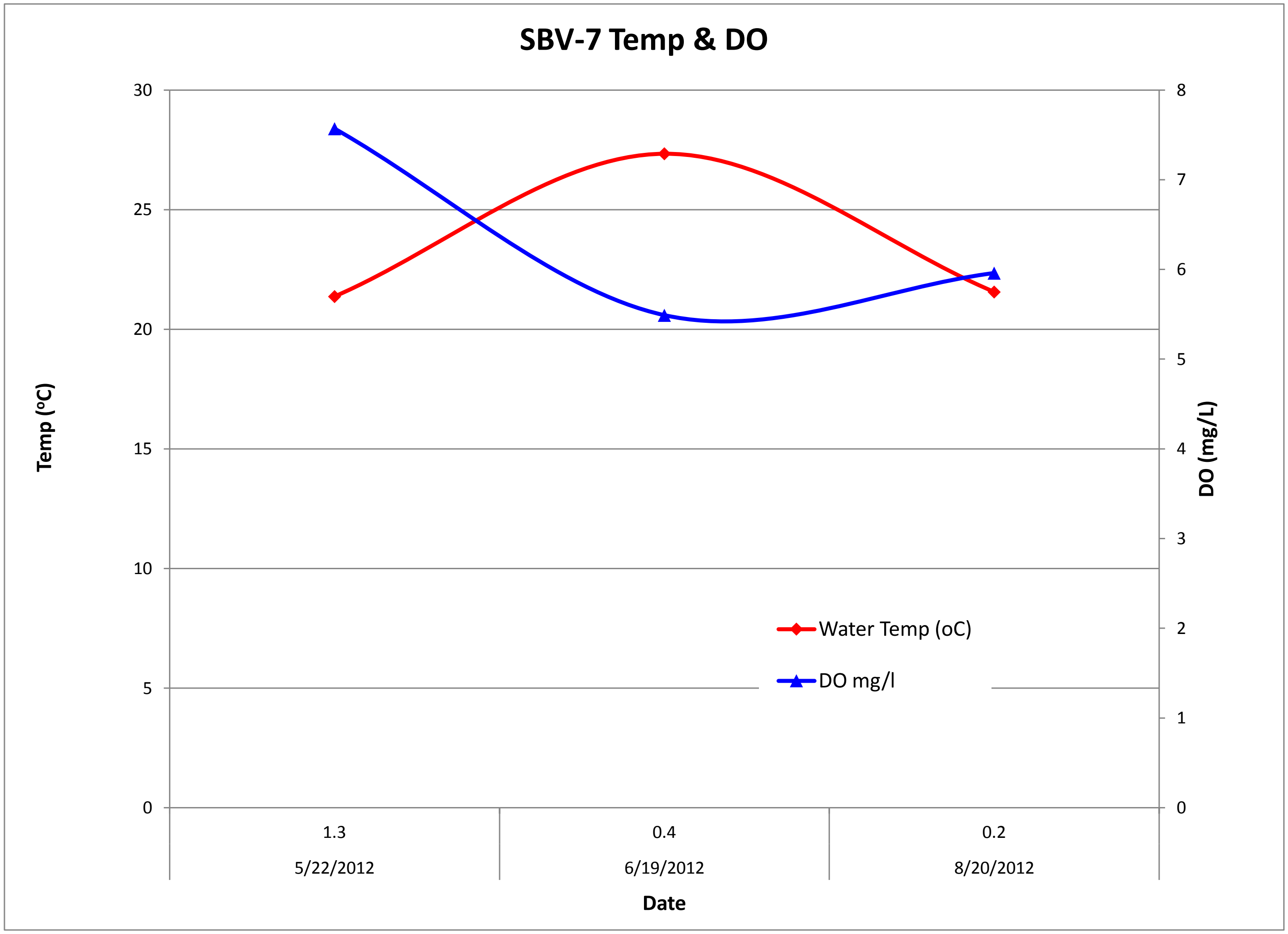
FIELD DATA GRAPHS

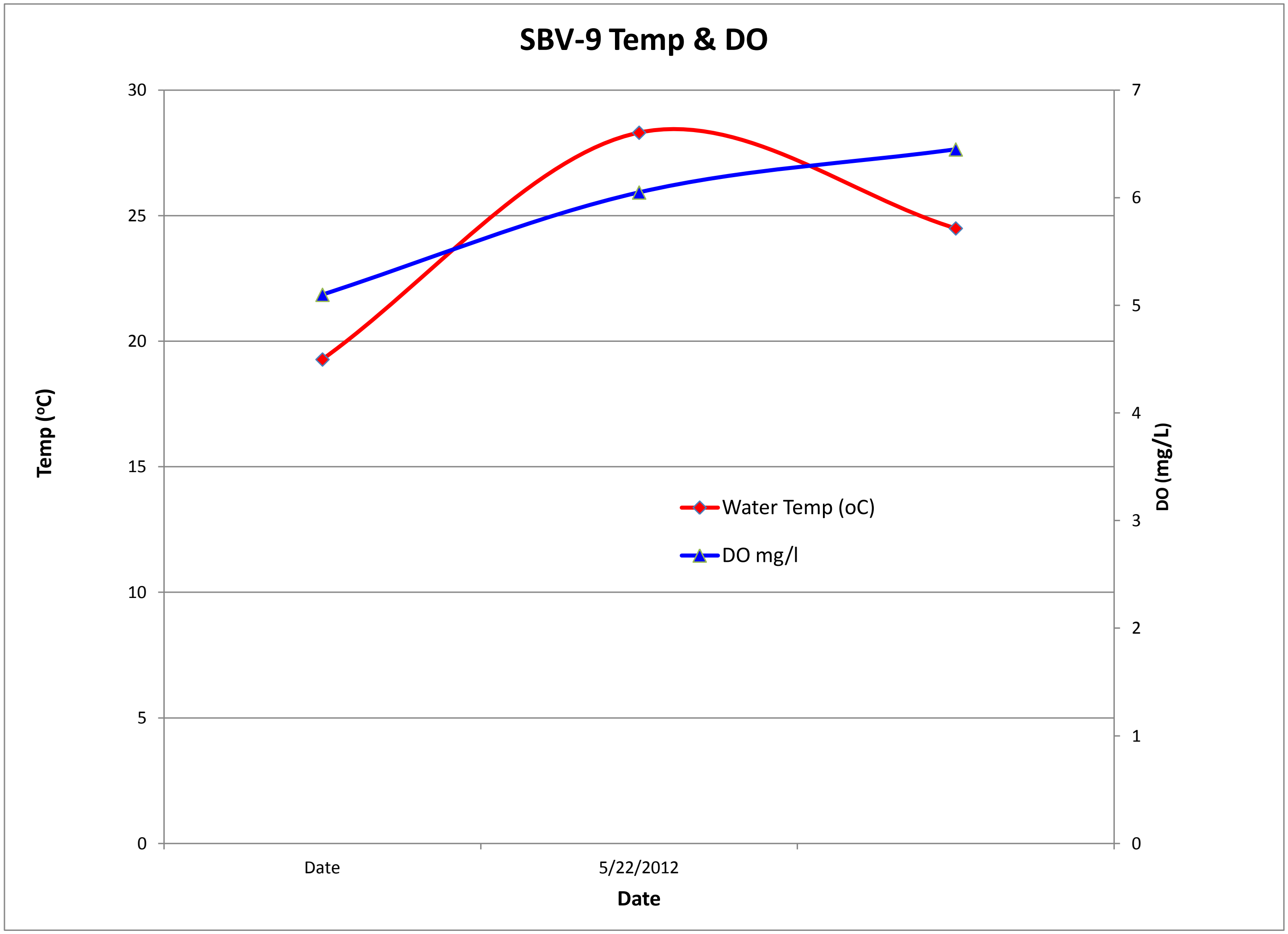

SBV-1 Temp & DO
Temp (ºC)
25
20
15
10
5
0
DO (mg/L)
10
9
8
7
6
5
4
3
2
1
0
5/22/2012
6/19/2012
8/20/2012
Date
Water Temp (oC)
DO mg/l

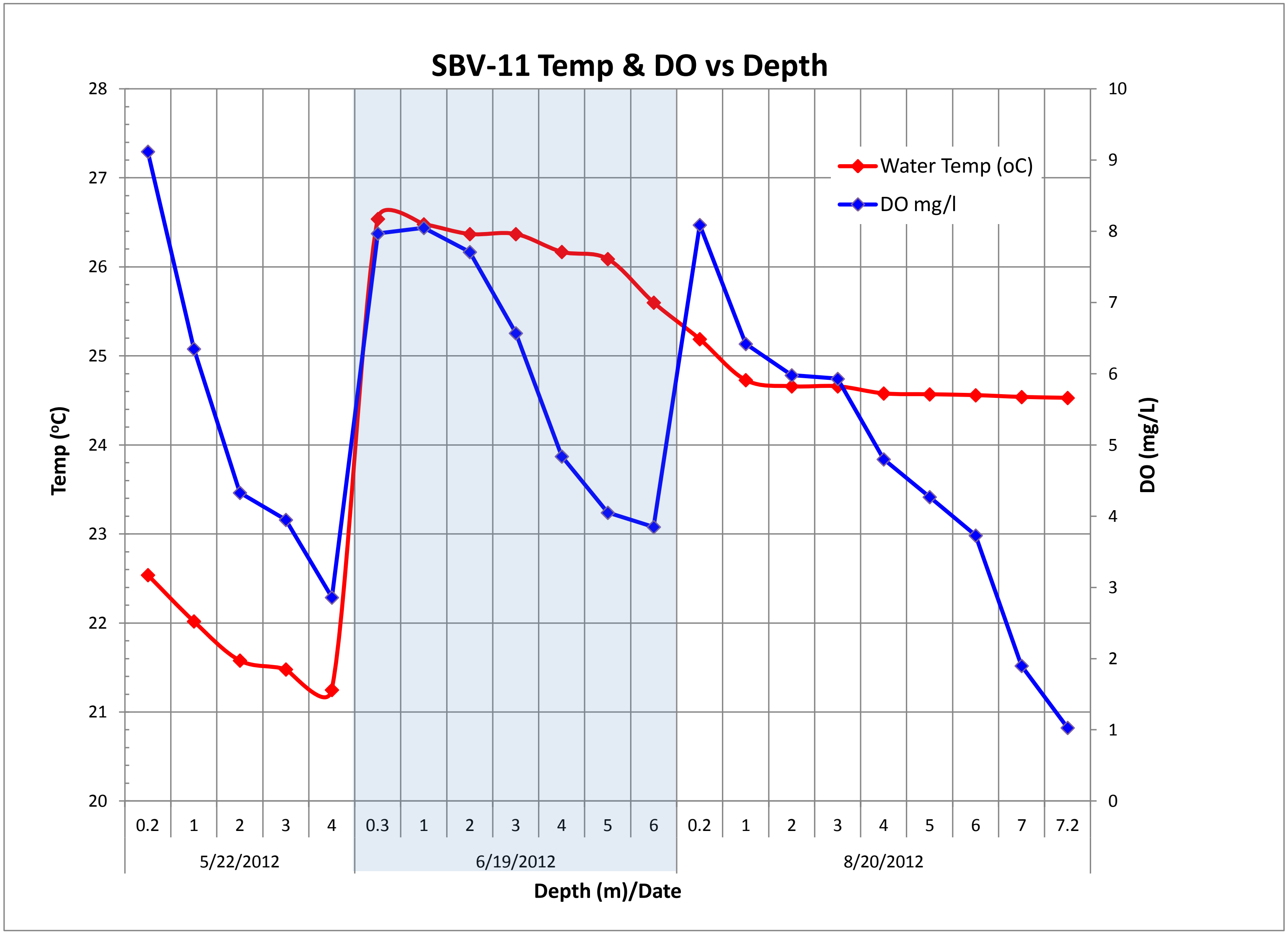


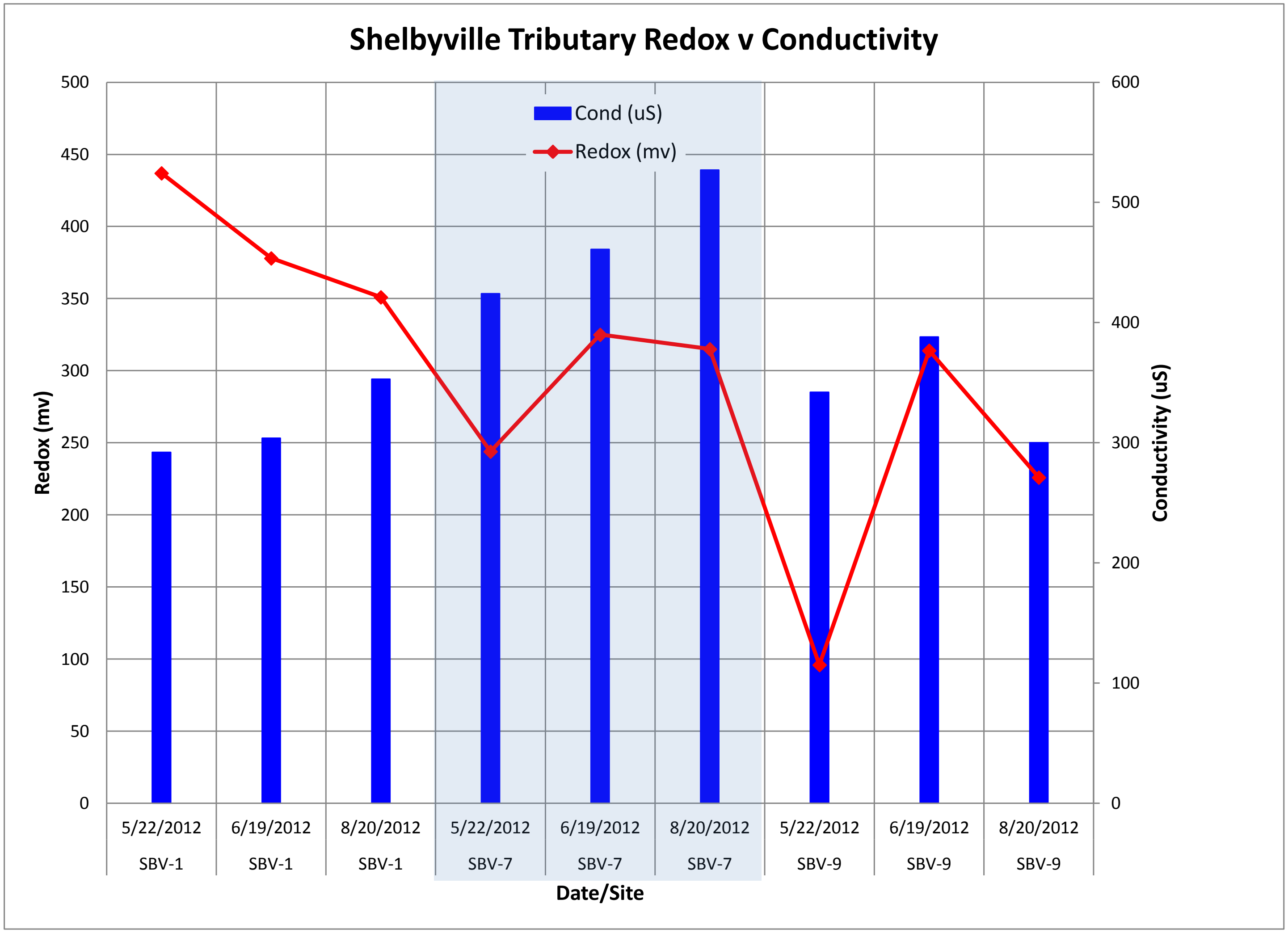
SBV-2 Temp & DO vs Depth
Temp (ºC)
30
25
20
15
10
5
0
DO (mg/L)
10
9
8
7
6
5
4
3
2
1
0
Water Temp (oC)
DO mg/l
0.2
1
2
3
4
5
6
7
7.5
0.3
1
2
3
4
4.2
0.3
1
2
3
4
5
6
7
8
9
10
5/22/2012
6/19/2012
8/20/2012
Depth (m)/ Date

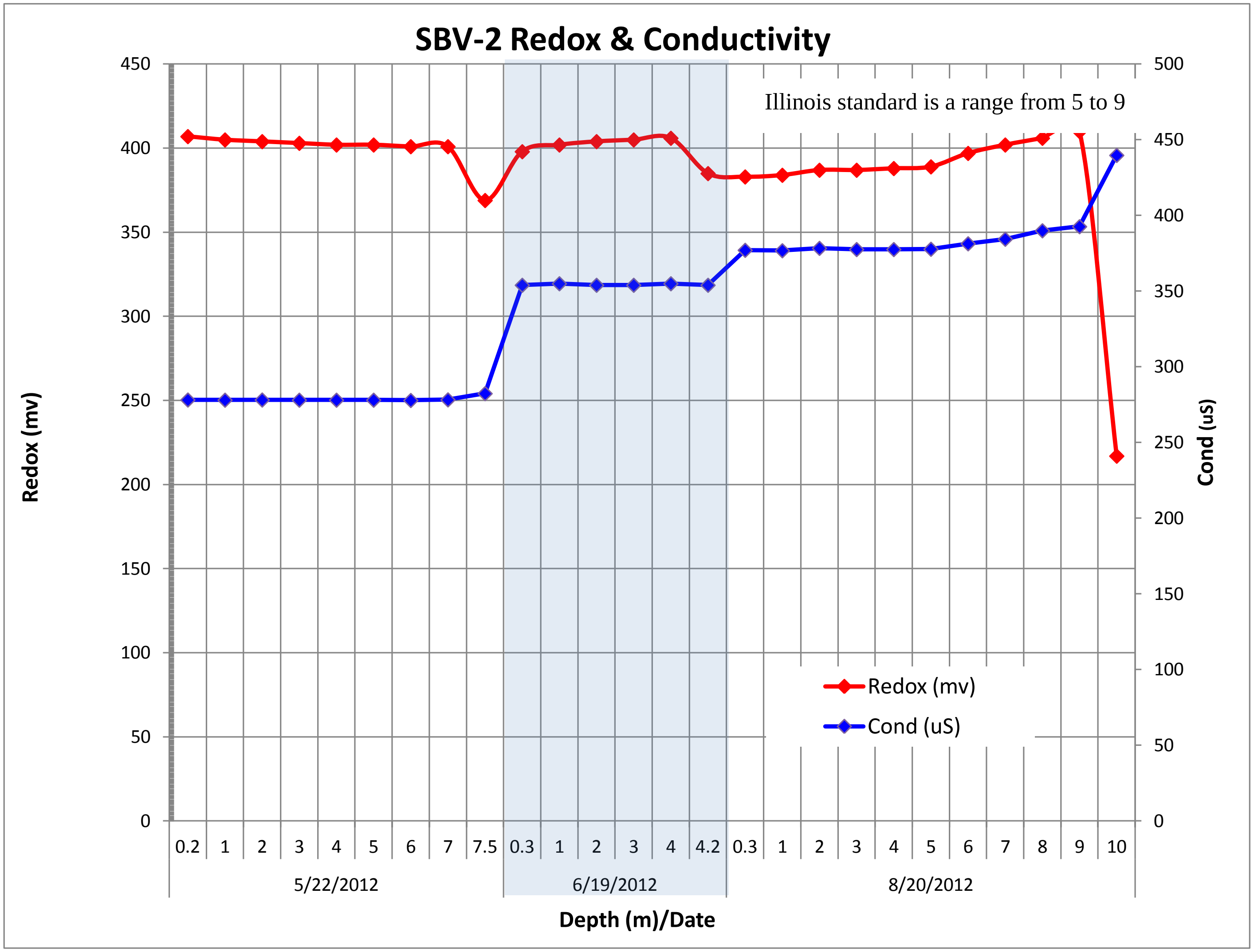

SBV-4 Temp & DO vs Depth
Temp (ºC)
29
28
27
26
25
24
23
22
21
20
DO (mg/L)
14
12
10
8
6
4
2
0
Water Temp (oC)
DO mg/l
0.3
1
0.4
1
1.9
2
0.25
1
1.8
5/22/2012
6/19/2012
8/20/2012
Depth (m)/Date

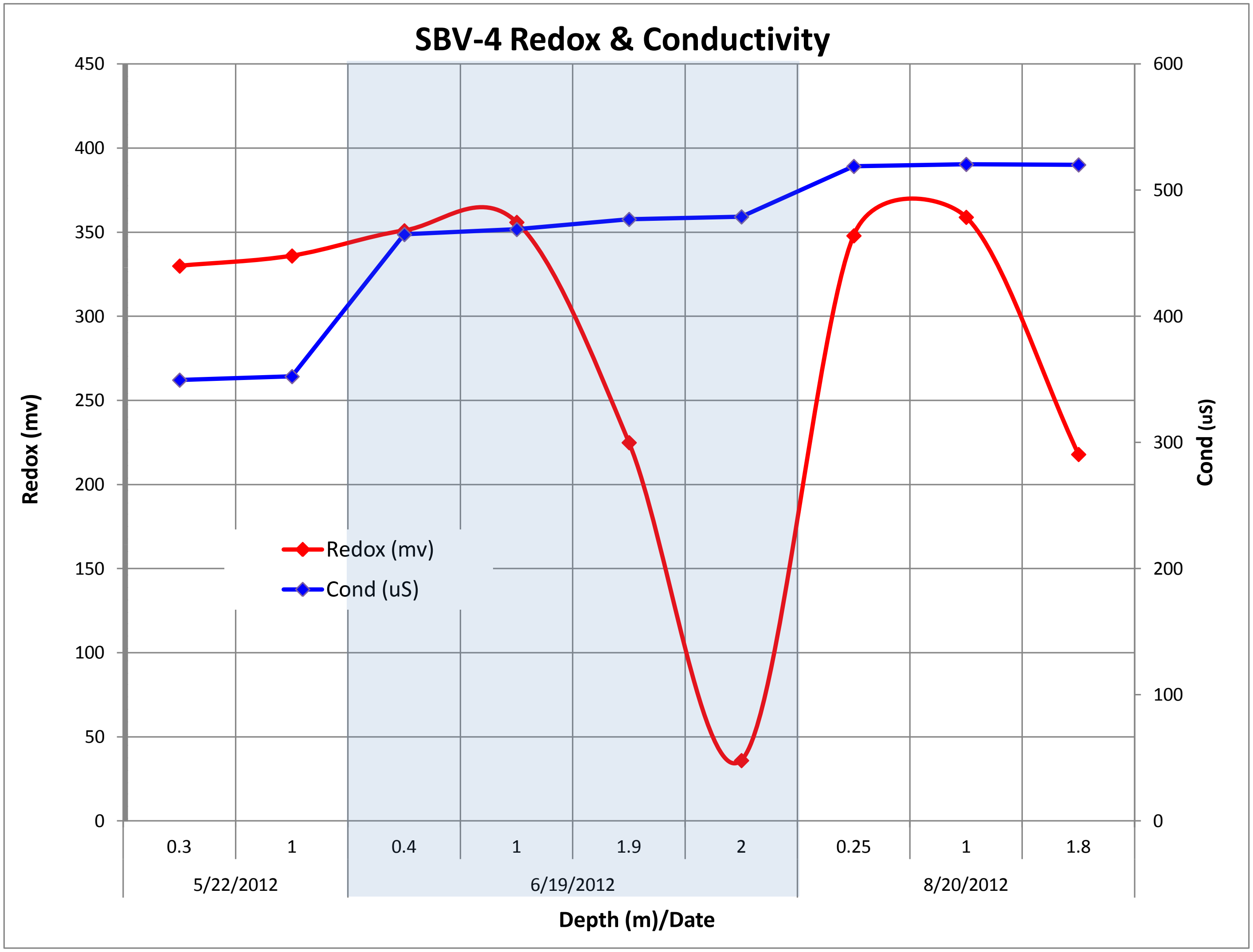

SBV-7 Temp & DO
Temp (ºC)
30
25
20
15
10
5
0
DO (mg/L)
8
7
6
5
4
3
2
1
0
Water Temp (oC)
DO mg/l
1.3
5/22/2012
0.4
6/19/2012
0.2
8/20/2012
Date

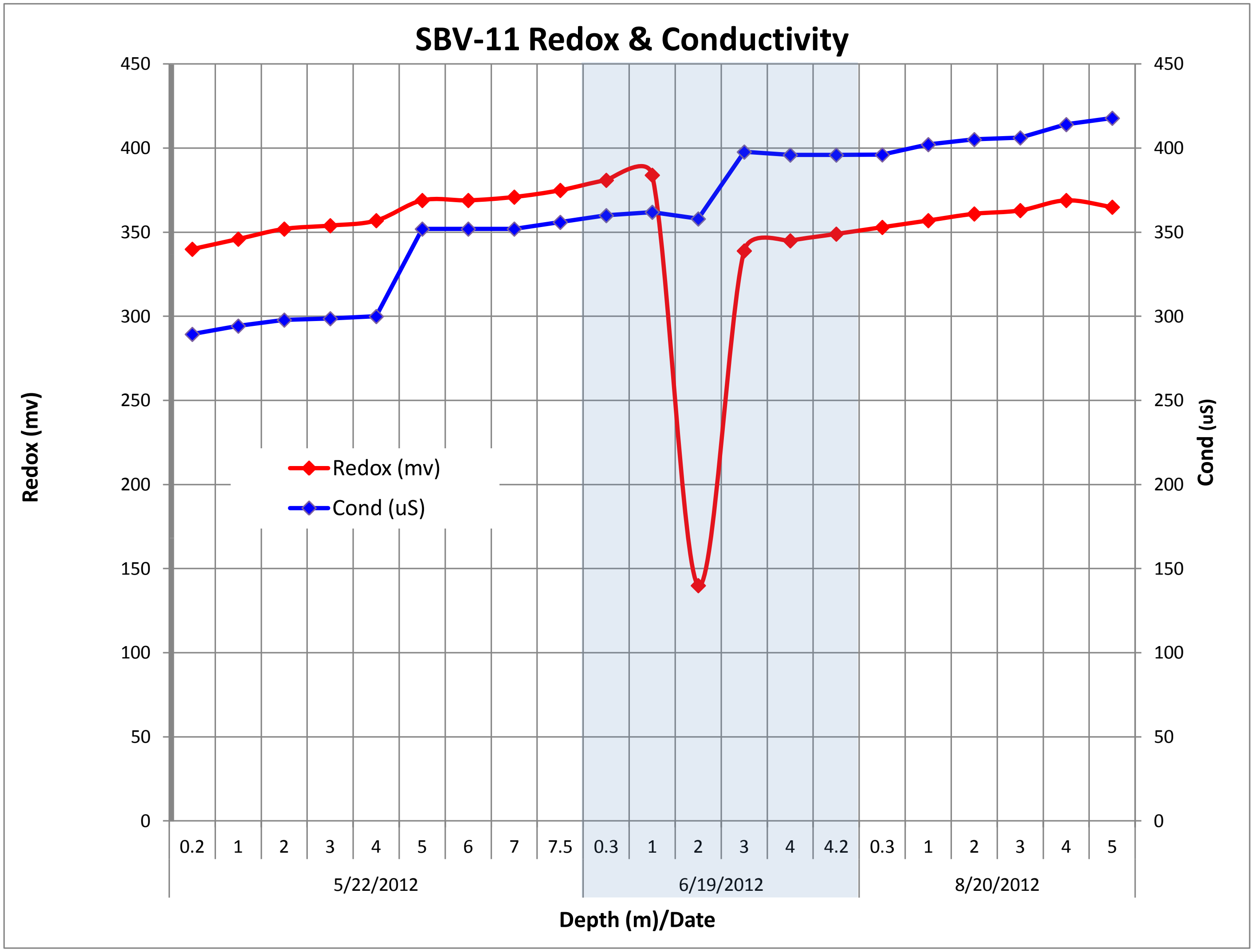

SBV-9 Temp & DO
Temp (oC)
30
25
20
15
10
5
0
7
6
5
4
3
2
1
0
DO (mg/L)
Water Temp (oC)
DO mg/l
Date
5/22/2012
Date

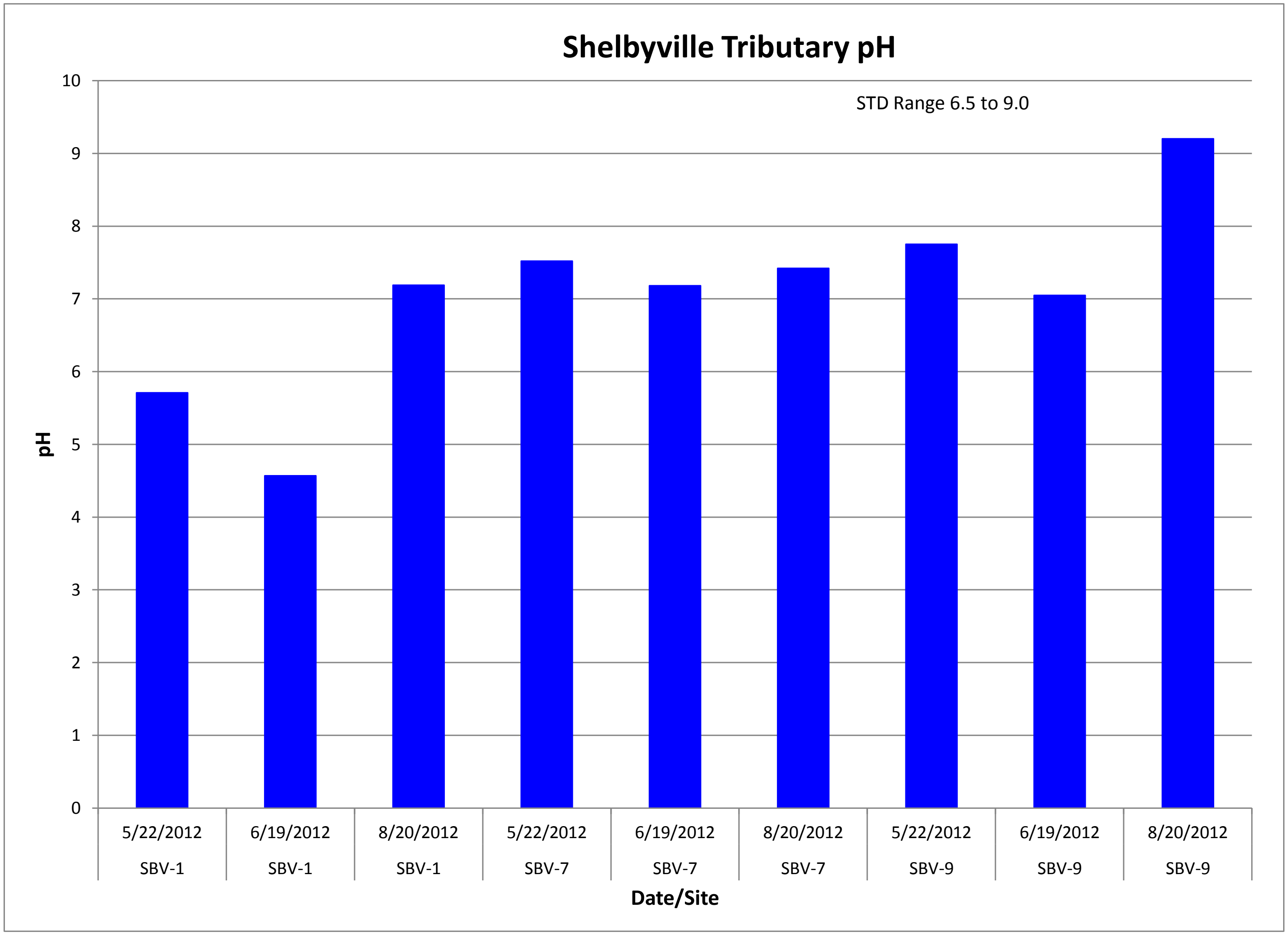

SBV-11 Temp & DO vs Depth
Temp (°C)
28
27
26
25
24
23
22
21
20
DO (mg/L)
10
9
8
7
6
5
4
3
2
1
0
Water Temp (oC)
DO mg/l
0.2
1
2
3
4
0.3
1
2
3
4
5
6
0.2
1
2
3
4
5
6
7
7.2
5/22/2012
6/19/2012
8/20/2012
Depth (m)/Date

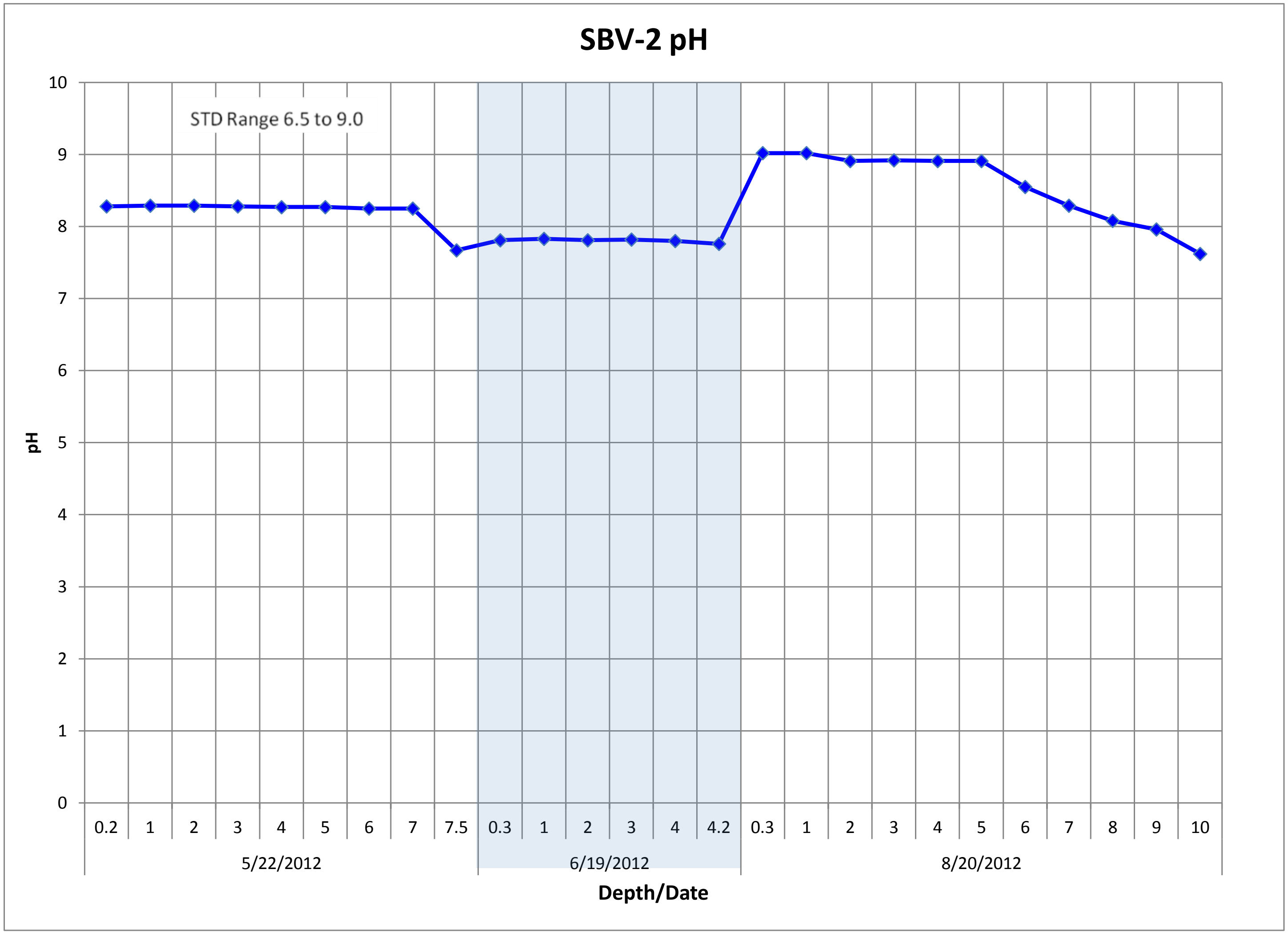

Shelbyville Tributary Redox v Conductivity
Cond (uS)
Redox (mv)
Redox (mv)
Conductivity (uS)
500
450
400
350
300
250
200
150
100
50
0
600
500
400
300
200
100
0
5/22/2012
SBV-1
6/19/2012
SBV-1
8/20/2012
SBV-1
5/22/2012
SBV-7
6/19/2012
SBV-7
8/20/2012
SBV-7
5/22/2012
SBV-9
6/19/2012
SBV-9
8/20/2012
SBV-9
Date/Site

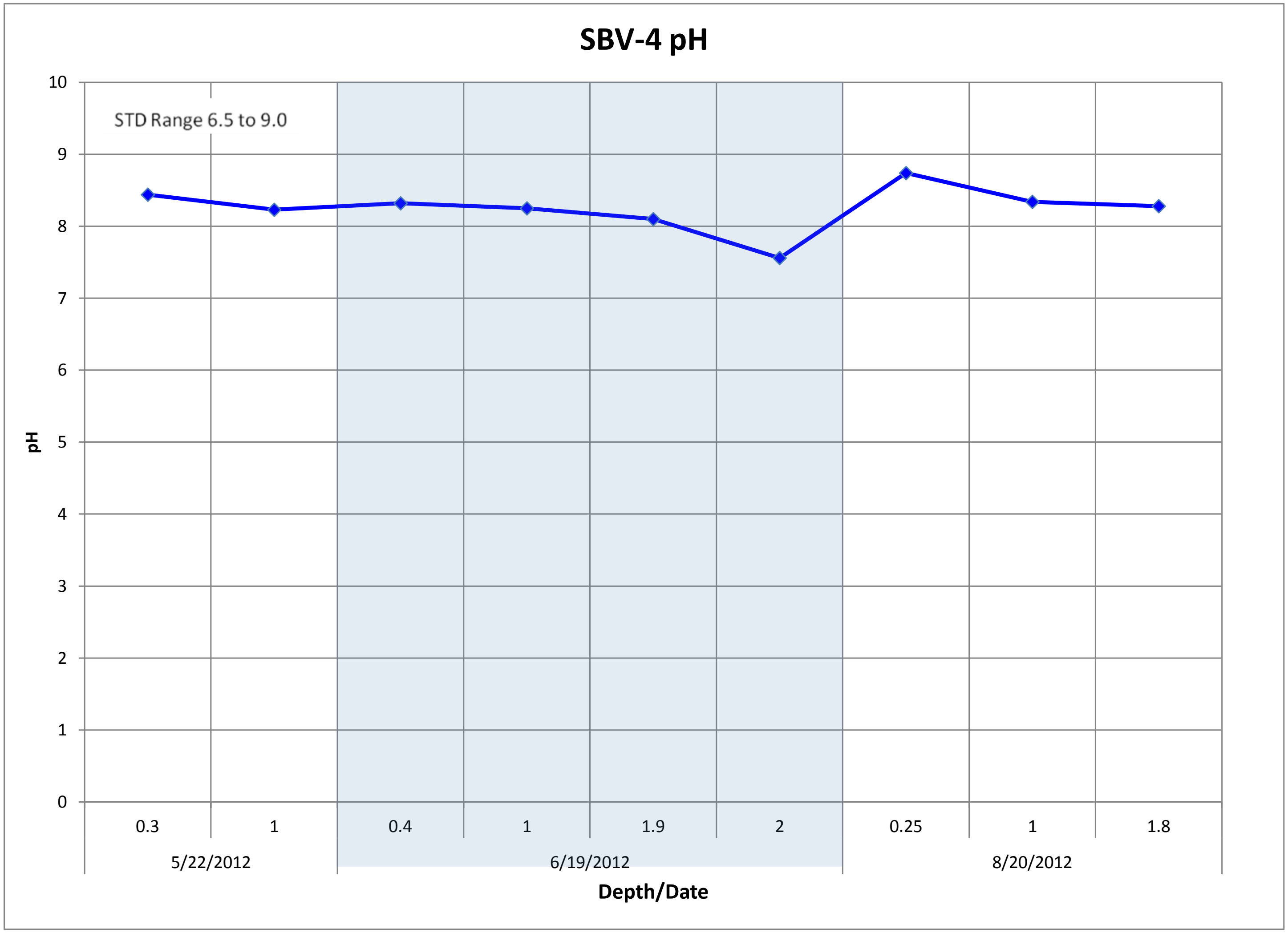

SBV-2 Redox & Conductivity
Illinois standard is a range from 5 to 9
Redox (mv)
Cond (us)
450
400
350
300
250
200
150
100
50
0
500
450
400
350
300
250
200
150
100
50
0
0.2
1
2
3
4
5
6
7
7.5
0.3
1
2
3
4
4.2
0.3
1
2
3
4
5
6
7
8
9
10
5/22/2012
6/19/2012
8/20/2012
Depth (m)/Date
Redox (mv)
Cond (uS)

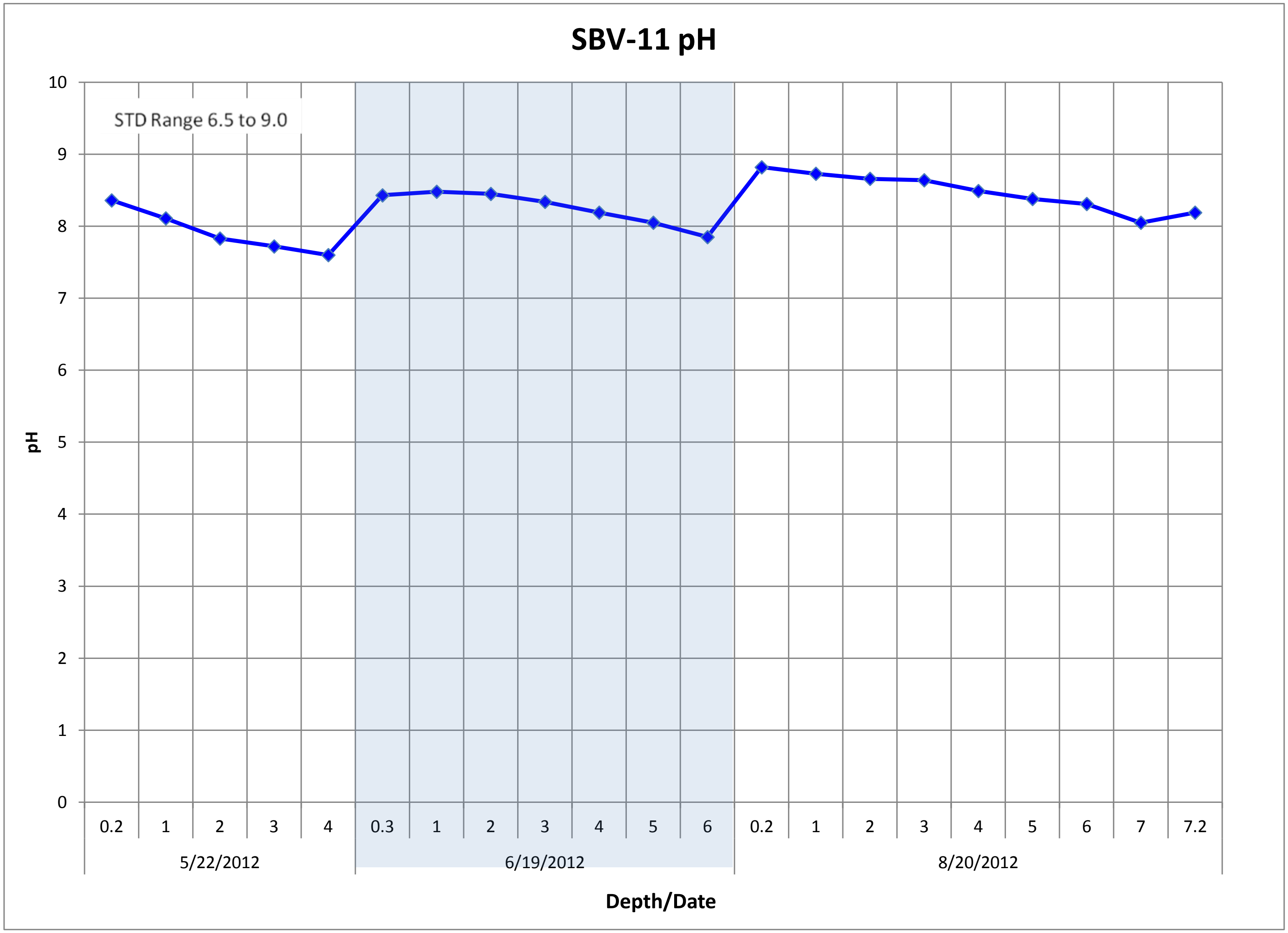

SBV-4 Redox & Conductivity
Redox (mv)
Cond (uS)
450
400
350
300
250
200
150
100
50
0
600
500
400
300
200
100
0
0.3
1
0.4
1
1.9
2
0.25
1
1.8
5/22/2012
6/19/2012
8/20/2012
Depth (m)/Date
Redox (mv)
Cond (uS)

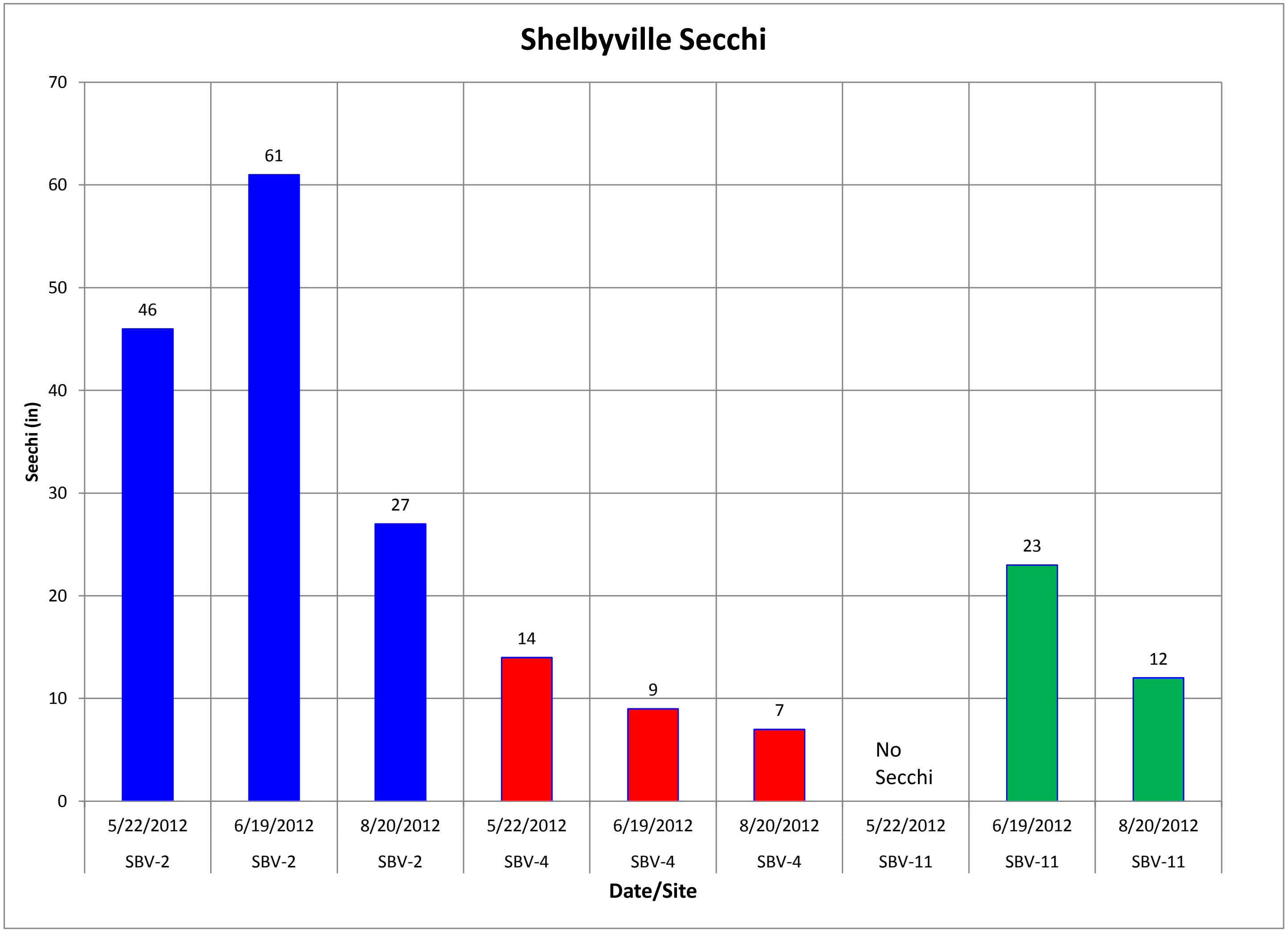

SBV-11 Redox & Conductivity
Redox (mv)
Cond (us)
450
400
350
300
250
200
150
100
50
0
Redox (mv)
Cond (uS)
0.2
1
2
3
4
5
6
7
7.5
0.3
1
2
3
4
4.2
0.3
1
2
3
4
5
5/22/2012
6/19/2012
8/20/2012
Depth (m)/Date

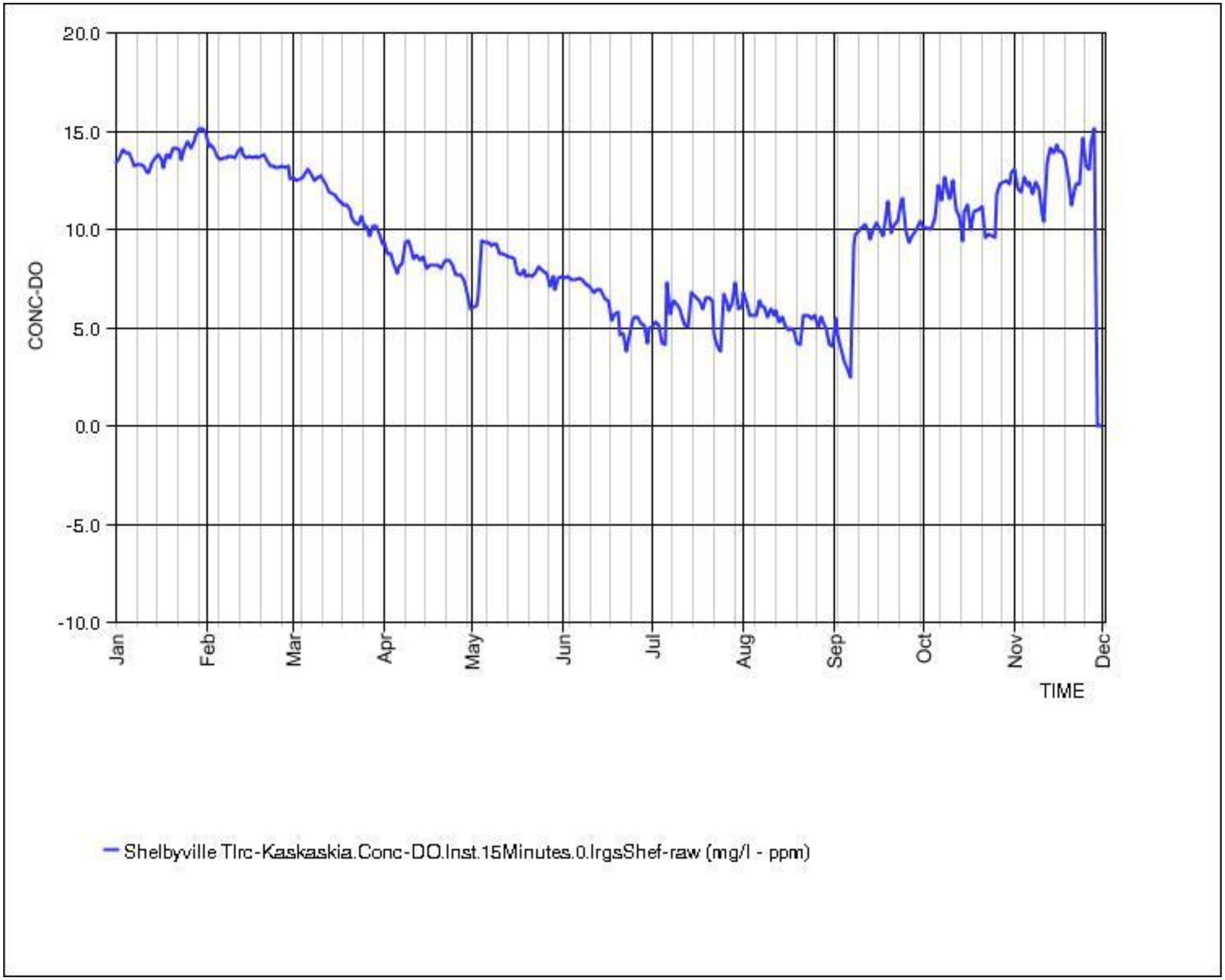

Shelbyville Tributary pH
STD Range 6.5 to 9.0
pH
10
9
8
7
6
5
4
3
2
1
0
5/22/2012
SBV-1
6/19/2012
SBV-1
8/20/2012
SBV-1
5/22/2012
SBV-7
6/19/2012
SBV-7
8/20/2012
SBV-7
5/22/2012
SBV-9
6/19/2012
SBV-9
8/20/2012
SBV-9
Date/Site


SBV-2 pH
STD Range 6.5 to 9.0
pH
10
9
8
7
6
5
4
3
2
1
0
0.2
1
2
3
4
5
6
7
7.5
0.3
1
2
3
4
4.2
0.3
1
2
3
4
5
6
7
8
9
10
5/22/2012
6/19/2012
8/20/2012
Depth/Date


SBV-4 pH
STD Range 6.5 to 9.0
pH
10
9
8
7
6
5
4
3
2
1
0
0.3
1
0.4
1
1.9
2
0.25
1
1.8
5/22/2012
6/19/2012
8/20/2012
Depth/Date


SBV-11 pH
STD Range 6.5 to 9.0
pH
10
9
8
7
6
5
4
3
2
1
0
0.2
1
2
3
4
0.3
1
2
3
4
5
6
0.2
1
2
3
4
5
6
7
7.2
5/22/2012
6/19/2012
8/20/2012
Depth/Date

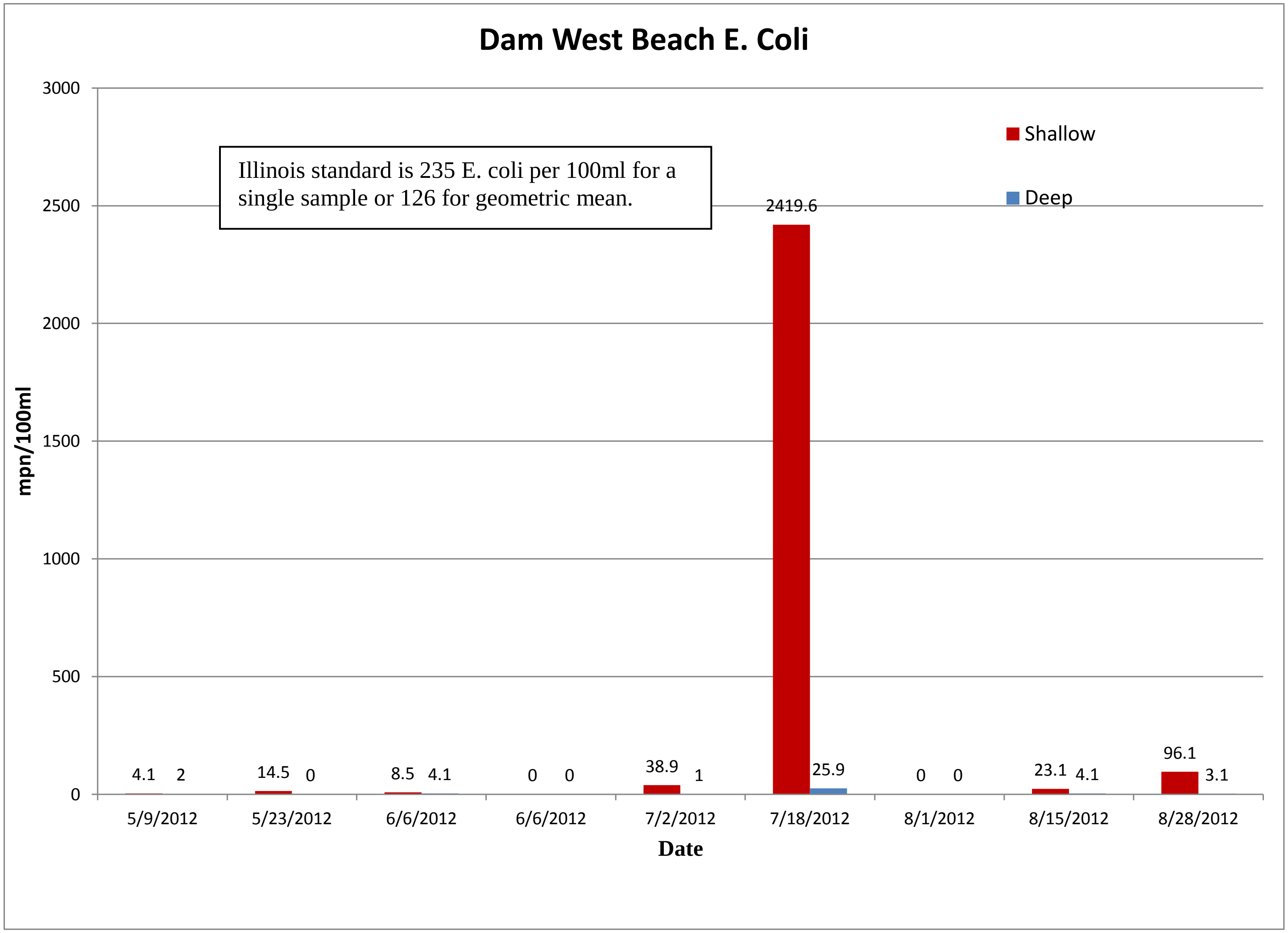

Shelbyville Secchi
Seechi (in)
70
60
50
40
30
20
10
0
46
61
27
14
9
7
No Secchi
23
12
5/22/2012 SBV-2
6/19/2012 SBV-2
8/20/2012 SBV-2
5/22/2012 SBV-4
6/19/2012 SBV-4
8/20/2012 SBV-4
5/22/2012 SBV-11
6/19/2012 SBV-11
8/20/2012 SBV-11
Date/Site



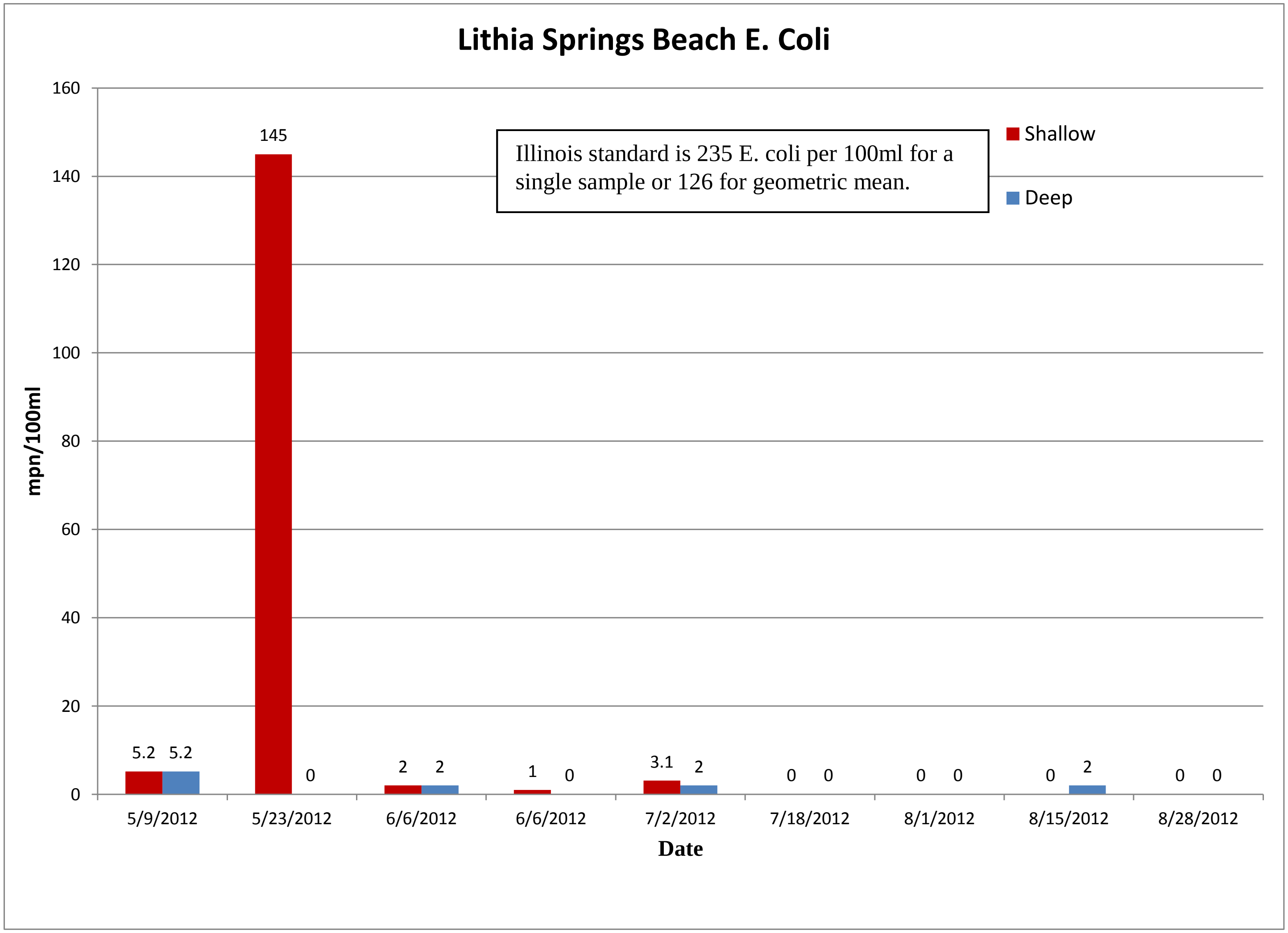
Dissolved Oxygen in spillway as monitored by remote sonde

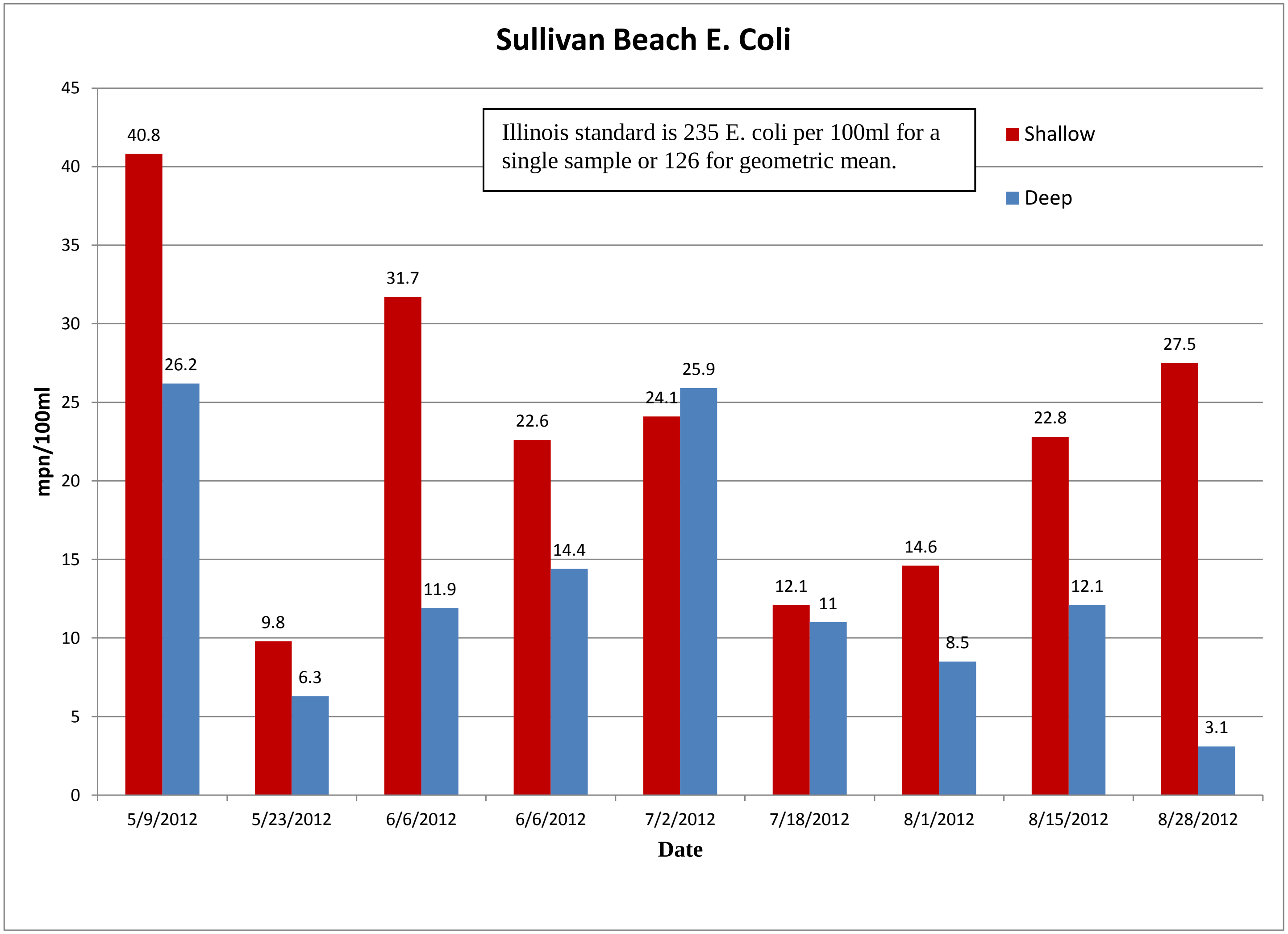
APPENDIX D

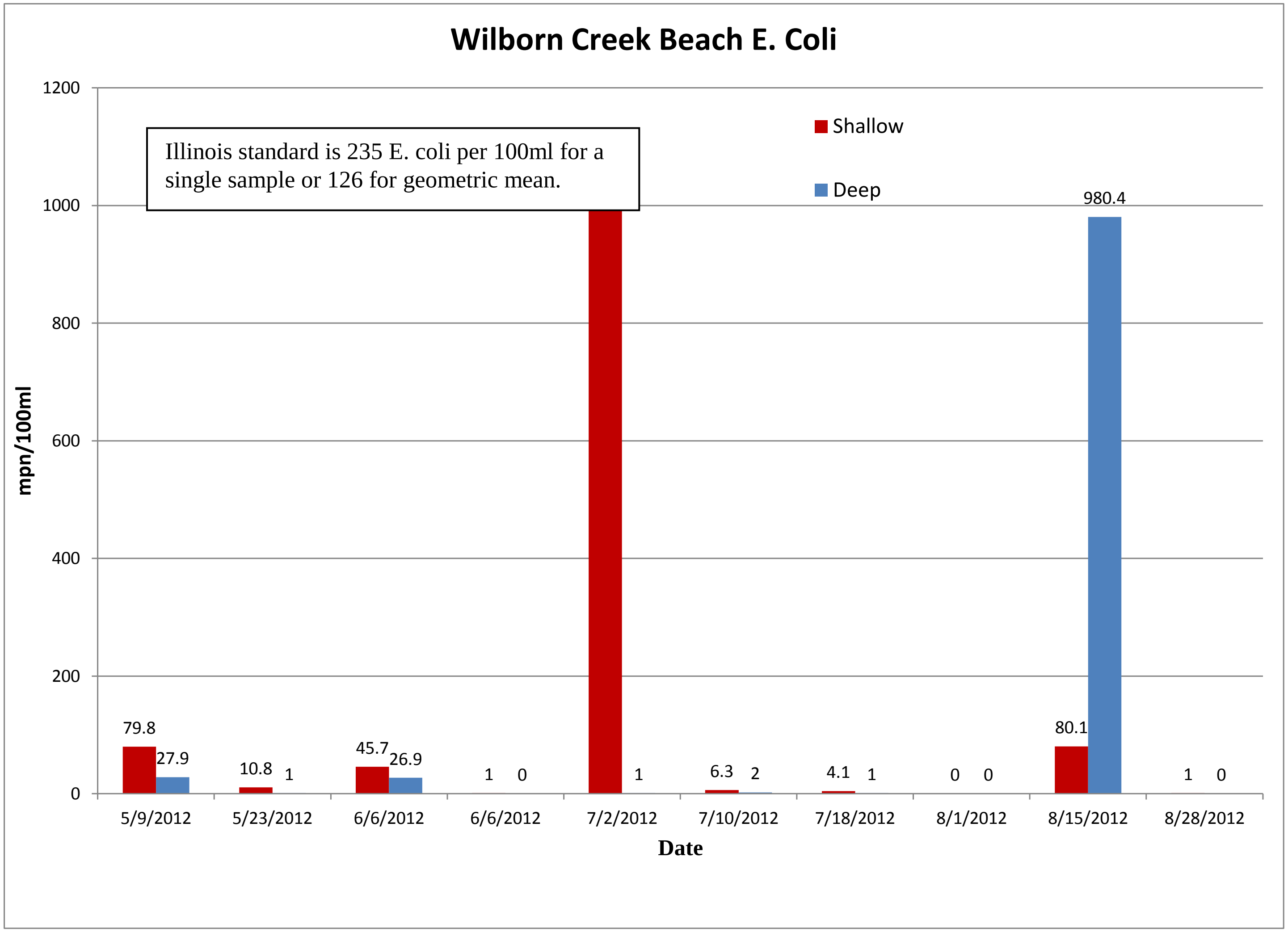
BEACH GRAPHS

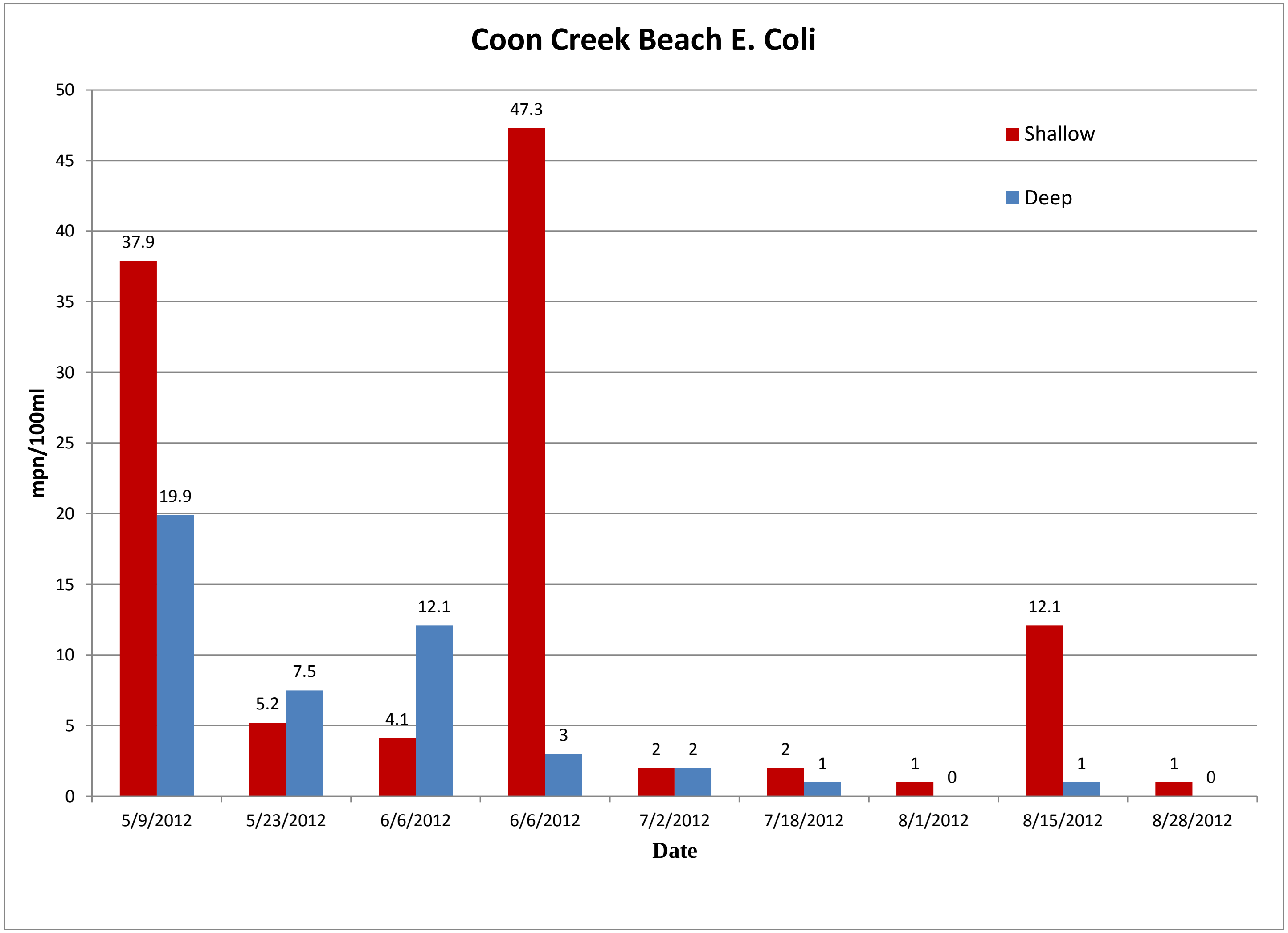


Illinois standard is 235 E. coli per 100ml for a single sample or 126 for geometric mean.


Lithia Springs Beach E. Coli
160
140
120
100
80
60
40
20
0
mpn/100ml
145
Illinois standard is 235 E. coli per 100ml for a single sample or 126 for geometric mean.
🟥 Shallow
🟦 Deep
5.2
5.2
0
2
2
1
0
3.1
2
0
0
0
0
0
2
0
0
5/9/2012
5/23/2012
6/6/2012
6/6/2012
7/2/2012
7/18/2012
8/1/2012
8/15/2012
8/28/2012
Date


Sullivan Beach E. Coli
Illinois standard is 235 E. coli per 100ml for a single sample or 126 for geometric mean.
🟥 Shallow
🟦 Deep
mpn/100ml
0
5
10
15
20
25
30
35
40
45
40.8
26.2
9.8
6.3
31.7
11.9
22.6
14.4
24.1
25.9
12.1
11
14.6
8.5
22.8
12.1
27.5
3.1
5/9/2012
5/23/2012
6/6/2012
6/6/2012
7/2/2012
7/18/2012
8/1/2012
8/15/2012
8/28/2012
Date


Wilborn Creek Beach E. Coli
Illinois standard is 235 E. coli per 100ml for a single sample or 126 for geometric mean.
🟥 Shallow
🟦 Deep
mpn/100ml
1200
1000
800
600
400
200
0
79.8
27.9
10.8
1
45.7
26.9
1
0
1
6.3
2
4.1
1
0
0
80.1
980.4
1
0
5/9/2012
5/23/2012
6/6/2012
6/6/2012
7/2/2012
7/10/2012
7/18/2012
8/1/2012
8/15/2012
8/28/2012
Date


Coon Creek Beach E. Coli
mpn/100ml
50
45
40
35
30
25
20
15
10
5
0
Shallow
Deep
37.9
19.9
5.2
7.5
4.1
12.1
47.3
3
2
2
2
1
1
0
12.1
1
1
0
5/9/2012
5/23/2012
6/6/2012
6/6/2012
7/2/2012
7/18/2012
8/1/2012
8/15/2012
8/28/2012
Date