SEDIMENT & INVASIVE WEED REDUCTION

BIOTECHNOLOGY SOLVES LAKE'S SEDIMENT BUILD UP AND INVASIVE WEED PROBLEMS.

Roland Lake, The Plains, Virginia

SIS.bio

LEADING THE WAY TO RENEWABLE WATER

INTRODUCTION

ROLAND LAKE OCTOBER 2017

ACCUMULATION OF SEDIMENT AND INVASIVE WEEDS

Roland Lake is a 30-acre recreational lake in Virginia. In 2017 the lake was suffering from a long-term accumulation of mucky, nutrient-rich organic sediment that had allowed excessive dense invasive weeds to grow in virtually all areas of the lake 10 feet deep or less.

This meant that it had become virtually impossible to launch a boat or swim out into the lake for several years, impairing the recreational use of the lake and degrading water quality as algae blooms clustered around the tops of the weed mass as it protruded at the surface of the lake.

Three years earlier a considerable sum had been spent on dredging the lake to get rid of the organic sediment that was facilitating the excessive proliferation of invasive hydrilla, milfoil and pond weed. Despite this, the weeds and algae were blooming stronger than ever.

After completing a detailed bathymetric survey of the lake in October 2017, a detailed solution design incorporating a RADOR system and bioaugmentation treatment program was presented.

The solution was commissioned by the Clean-Flo team in April 2018, and the invasive weeds and algae were greatly improved in 2018 and the lake could once again be used for swimming and other recreational activities.

A bathymetric scan conducted in October 2019 showed that the lake’s depth has significantly improved, allowing further optimization of the RADOR system deployment and quantified the reduction in aquatic weed biovolume .

SOLUTION AND IMPLEMENTATION

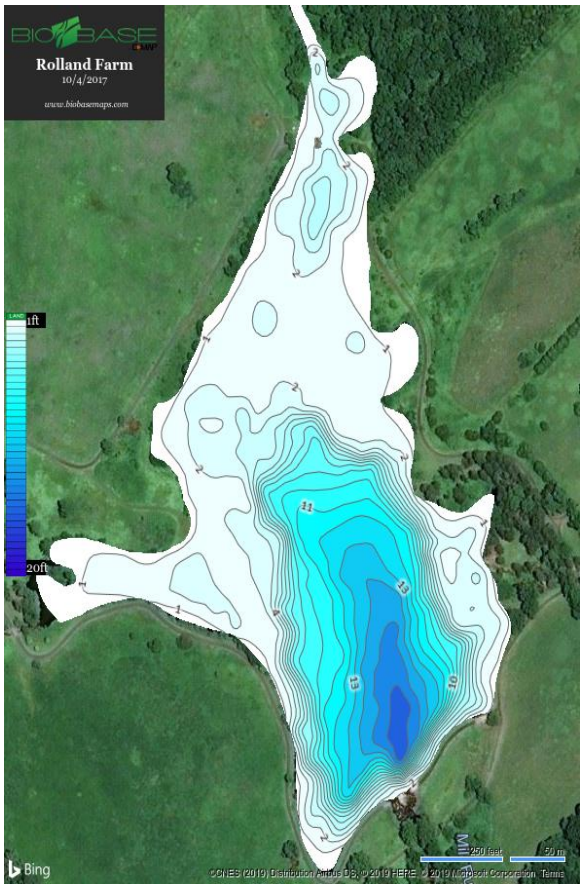
The depth profile of Roland Farm Lake in October 2017 showed that,

- the total volume of the water in the lake was 150.69 acre feet,
- the average depth was 4.14 feet, and
- the deepest point in the lake was just under 17 feet deep.

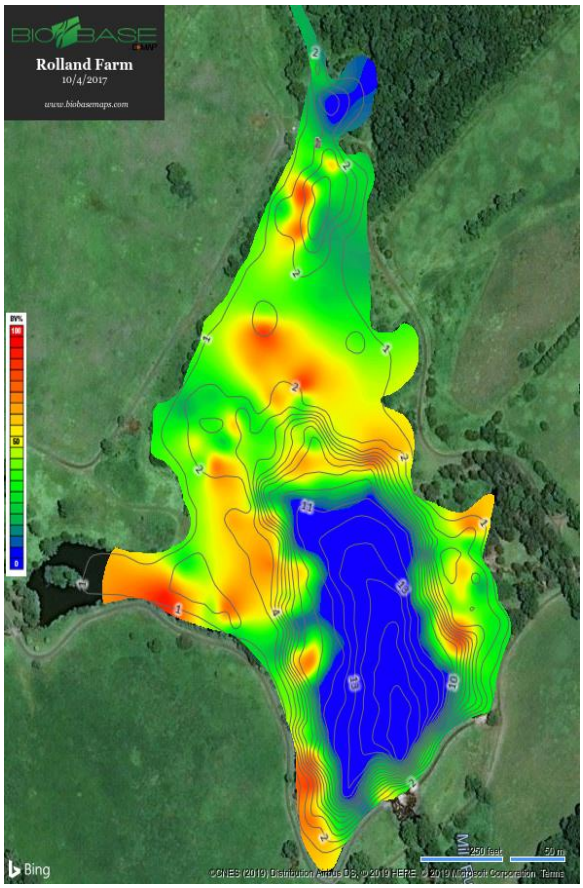
Aquatic vegetation, which consisted of overwhelmingly invasive weeds such as milfoil, hydrilla and pond weed, occupied 40.3% of the volume of the lake. The vegetation “heat map” shows that only the area of the lake 10 feet or deeper is free of weeds (blue).

The SIS.bio solution was commissioned in April 2018 and incorporated 10 RADOR units and an intensive bioaugmentation treatment program.

Bathymetric scans and analysis are conducted every October and the positioning of the RADOR units was adjusted twice to re-optimize the system in response to the changing depth profile and associated environmental benefits achieved in the lake.



ROLAND LAKE
DEPTH PROFILE OCTOBER 2017



ROLAND LAKE
VEGETATION HEAT MAP OCTOBER 2017

DEPTH PROFILE & SEDIMENT DIGESTION

The depth profile two years later, in October 2019, showed that,

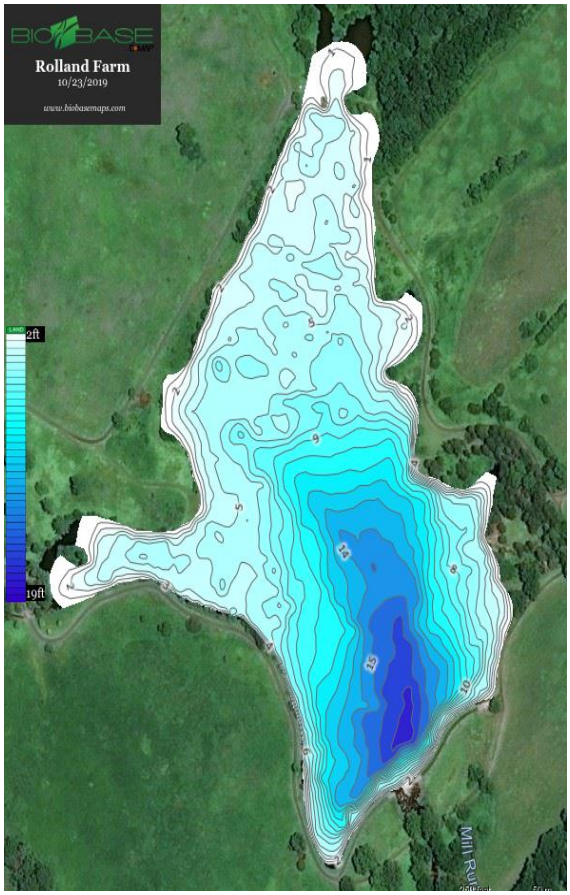
- the total volume of the water in the lake had increased to 215.71 acre feet,
- the average depth was now 6.78 feet and
- the deepest point in the lake was 18.63 feet deep.

The increase in water volume is the volume of sediment digested, which is 65.02 acre feet.

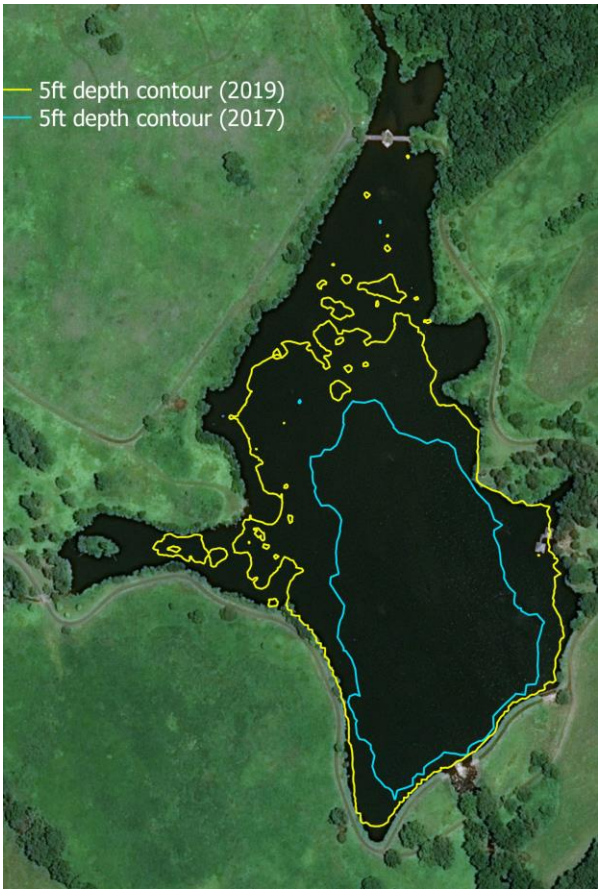
This is equivalent to 104,898 cubic yards of sediment reduction or an increase of 21,188,221 gallons of water from 2017 through 2019. It would take 5,245 tri-axle dump trucks to remove this sediment volume from the lake.

Prior to the implementation of SIS.bio's system, invasive weeds were able to root in and overwhelm the lake, steadily growing in the nutrient-rich mucky sediment. In the picture below, the 5 feet contour in 2017 is shown in blue. The area 5 feet or deeper in the lake covered a total area of 10.33 acres.

The yellow line shows the 5 feet contour in October 2019. The area 5 feet or deeper in the lake has increased to 18.96 acres, illustrating that prodigious sediment digestion and elimination has been achieved.



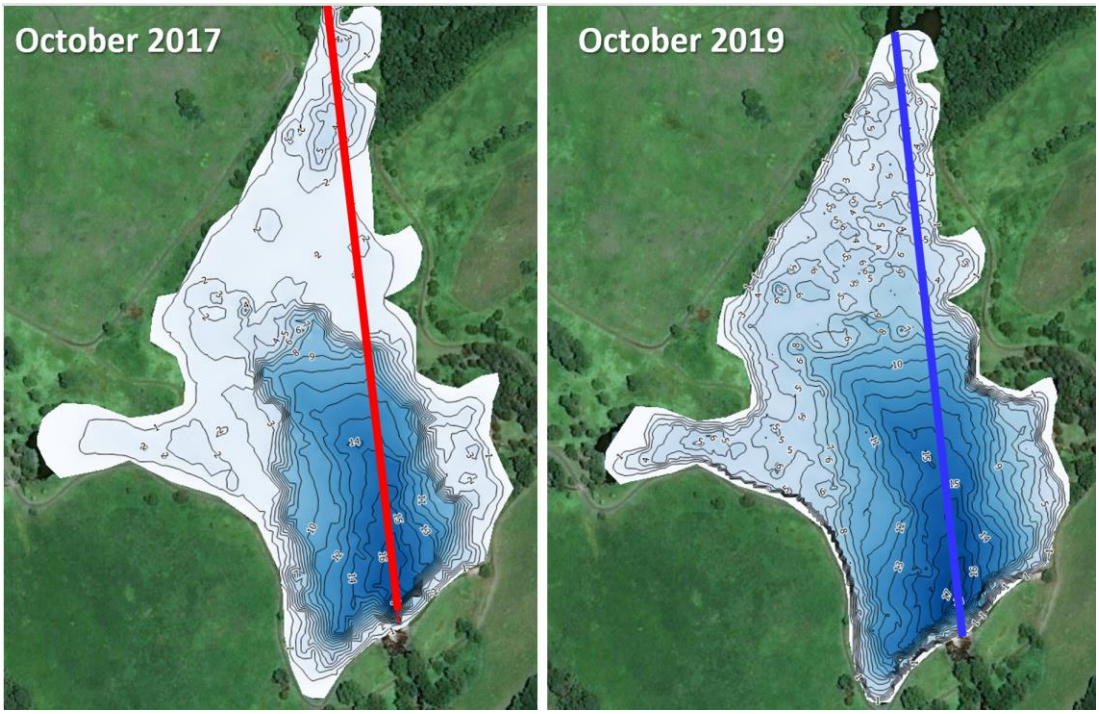
ROLAND LAKE, DEPTH PROFILE
OCTOBER 2019



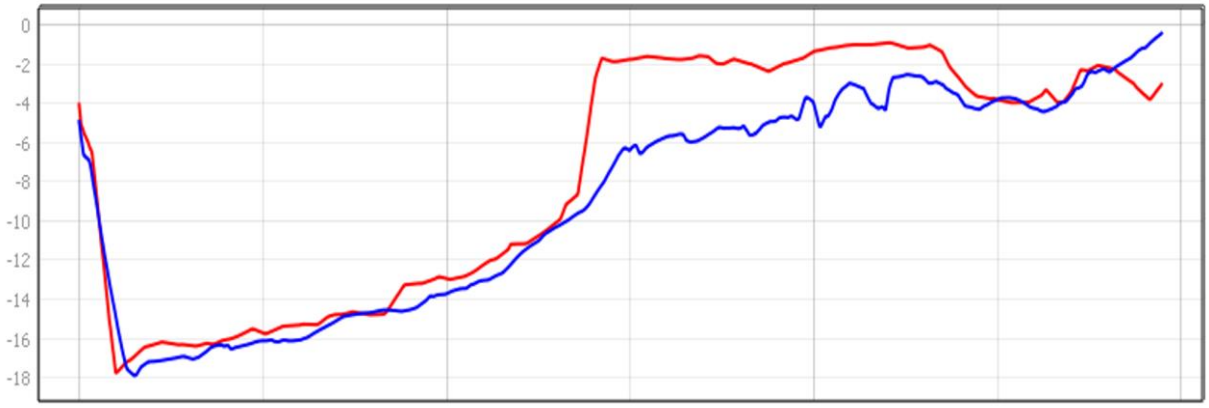
ROLAND LAKE, VEGETATION 5-FEET CONTOUR COMPARISON
OCTOBER 2017 V OCTOBER 2019

DEPTH PROFILE & SEDIMENT DIGESTION

Using sophisticated software it is possible to draw a transect down the lake and rotate the view by 90 degrees in order to examine the profile of the lake bottom.



Using sophisticated software it is possible to draw a transect down the lake and rotate the view by 90 degrees in order to examine the profile of the lake bottom. The red line shows the bottom profile in October 2017 and the blue line shows the bottom profile in October 2019.



ROLAND LAKE, BOTTOM PROFILE COMPARISONS: OCTOBER 2017 V OCTOBER 2019

Significant digestion and elimination of sediment between 2 feet and 10 feet of depth is clearly visualized. Eliminating much of this nutrient rich rooting bed for invasive weeds was a significant factor in reducing these weeds.

REDUCTION IN INVASIVE WEEDS

The vegetation heat maps from October 2017 and October 2019 are shown side by side below.

The shift away from red and orange coloration, which signifies dense weeds, to lower-density yellow and green, is easily apparent.

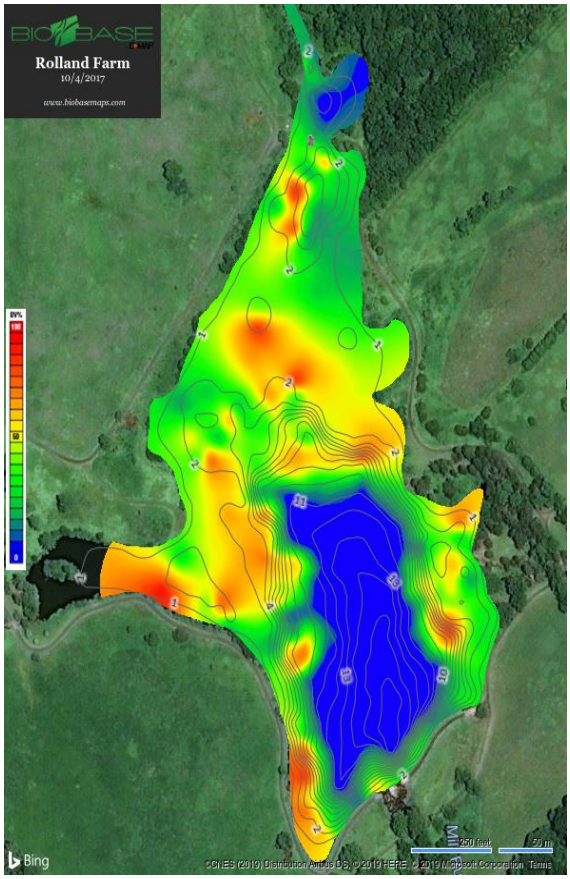
So too is the increase in blue, the area that is totally weed free.

The depth profile in October 2017 showed that the invasive weeds occupied 40.3% of the volume of the lake. In October 2019 that had dropped to 20.0% of the volume of the lake.

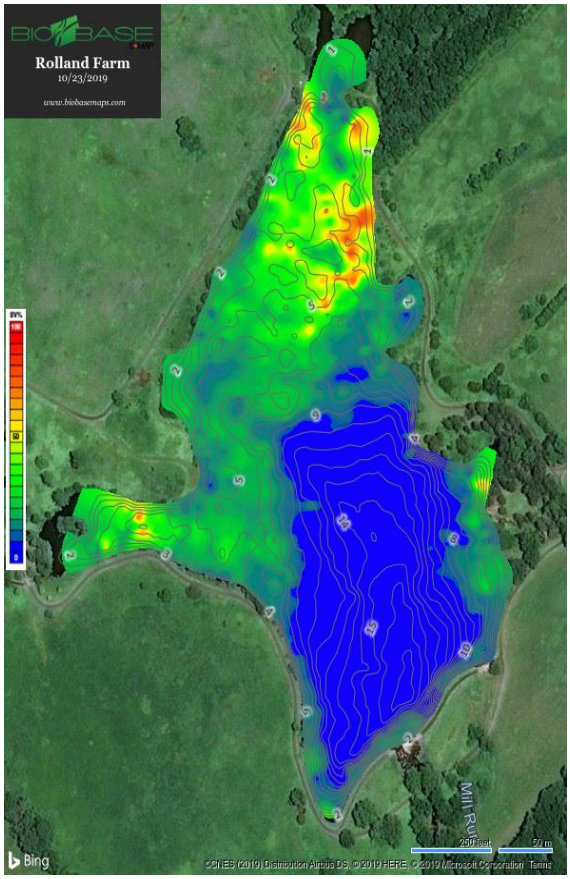
"The density of weed growth and reduction in depth due to sediment accumulation had made it difficult to swim and boat on Roland Lake.

The reduction in sediment and weeds in the first six months has been phenomenal, and the bathymetric monitoring report confirms the weed reduction and the sediment reduction. Swimming was enjoyable for the first time in quite a while due to less weed growth."

- Michael Hochstetler, Roland Lake, VA



ROLAND LAKE, VEGETATION HEAT MAP, OCTOBER 2017



ROLAND LAKE, VEGETATION HEAT MAP, OCTOBER 2019

ROLAND LAKE JULY 2020

NURTURING NATURE

Roland Lake was dying in 2017. Each year the volume of invasive weeds increased, and when they died off they fell to the bottom and decomposed, increasing the organic mucky sediment.

This positive feedback loop of more sediment promoting more invasive weeds, which create more sediment can rapidly overwhelm the ecosystem of a lake.

Deoxygenation of the water column has a negative impact on the oxygen breathing organisms that make up a robust productive Food Web.

In addition, the anaerobic mucky sediment is an ideal environment for pathogens and protozoan parasites that cause disease and sores in fosh to proliferate and further degrade the aquatic environment.

> *"A lot of the guys come down fishing, and they're remarking how before, the fish were always diseased and had a lot of open sores on them, and now they're beautiful healthy fish "*
>
> - Michael Hochstetler, Roland Lake, VA

The holistic nature of the solution delivered is validated not only by the elimination of the accumulated nutrient rich mucky sediment and the invasive weeds that grow in it, but also the improvement in fish health, numbers and size.

Eutrophication is a systemic whole lake process. A solution can only be considered effective and sustainable if it is also a systemic, whole lake solution.

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LEADING THE WAY TO RENEWABLE WATER

SIS.bio is a global leader in biotechnology solutions for water quality management. Our Biotechnology Solutions Platform ensures sustainable prevention of toxic cyanobacteria HABs in eutrophic lakes, dams and reservoirs of all sizes and depths. It also provides solutions to wastewater treatment of all kinds, aquaculture, and river remediation. We have delivered solutions in a range of climate conditions – from temperate in Canada, to tropical in Puerto Rico and from coastal Korea to over 2,500m altitude in Peru, throughout the world in Europe, Africa, Asia and Australia. Our clients include government agencies at national, state and municipal level, together with water management utilities.

For more information, please visit our website: SIS.bio