

Natural treatment of surface runoff from urban catchments



Revd David Walker BSc BA

Global Future Trends Director Detectronic Ltd

Jiaqi Liu Phd - Student

Department of Civil and Structural Engineering University of Sheffield

Image: Gosforth Valley SuDS(Surface Water Attenuation Scheme)
Dronfield Woodhouse

Gosforth Valley SuDS(Surface Water Attenuation Scheme) Dronfield Woodhouse

50 Years of protection

A superb example of hydraulic engineering & nature working together in
harmony!

Gosforth Valley SuDS (Surface Water Attenuation Scheme) Dronfield Woodhouse

Year of construction circ 1973



Demographics (North East Derbyshire, England)

Dronfield Woodhouse 1,946 Population [2021] – Census 4.191 km²

Area 464.3/km² Population Density [2021]

Pint of beer	18½p
20 cigarettes	26.5p
Pint of milk	5½p
Large loaf of bread	11½p

Nature Fest 2019 Post Construction



Bird Ringing



Bird Ringing



Bird Ringing



Setting up Nature Fest



The Various Displays at Nature Fest 2019



Birds of Prey exhibition

Results post the Biodiversity Enhancement Project



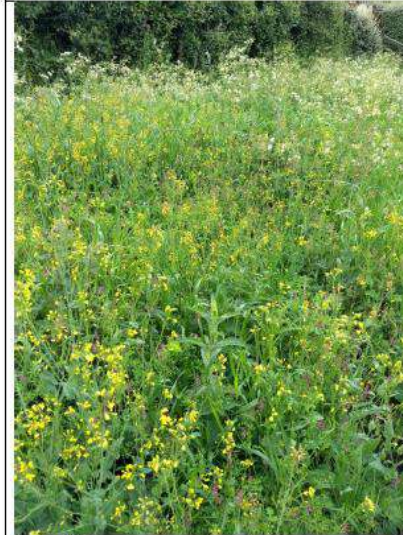
After Construction May – June 2019



New Smaller Pond



Existing Pond with Reedbeds cleared



Flora & Fauna re introduced



Newly installed Viewing Platform



Why Natural SuDS ?

HM Government

TOGETHER FOR OUR PLANET

Net Zero Strategy: Build Back Greener

October 2021



NATURE FEST

A Lea Brook Valley Festival
SATURDAY 15TH JULY 2017
10am - 4pm

Something for everyone!!
Find us on the field by Gosforth Drive and Coniston Road, Dronfield (SAT NAV: S18 1QS)



- Nature Trail • Art Exhibition • Wildlife Photography •
- RSPB • Arts & Craft • Shelter •
- Agricultural Machines • B...
- Wood Carving & Turning • Ref...





Gosforth Valley Natural SuDS(Surface Water Attenuation Scheme) Dronfield Woodhouse

Who Benefits

- Biodiversity
- Local residents
- Health & Wellbeing
- Schools / education
- MSc Students



Dronfield
11 May 2019 07:31

Ed



Dronfield
11 May 2019 07:31

Edit



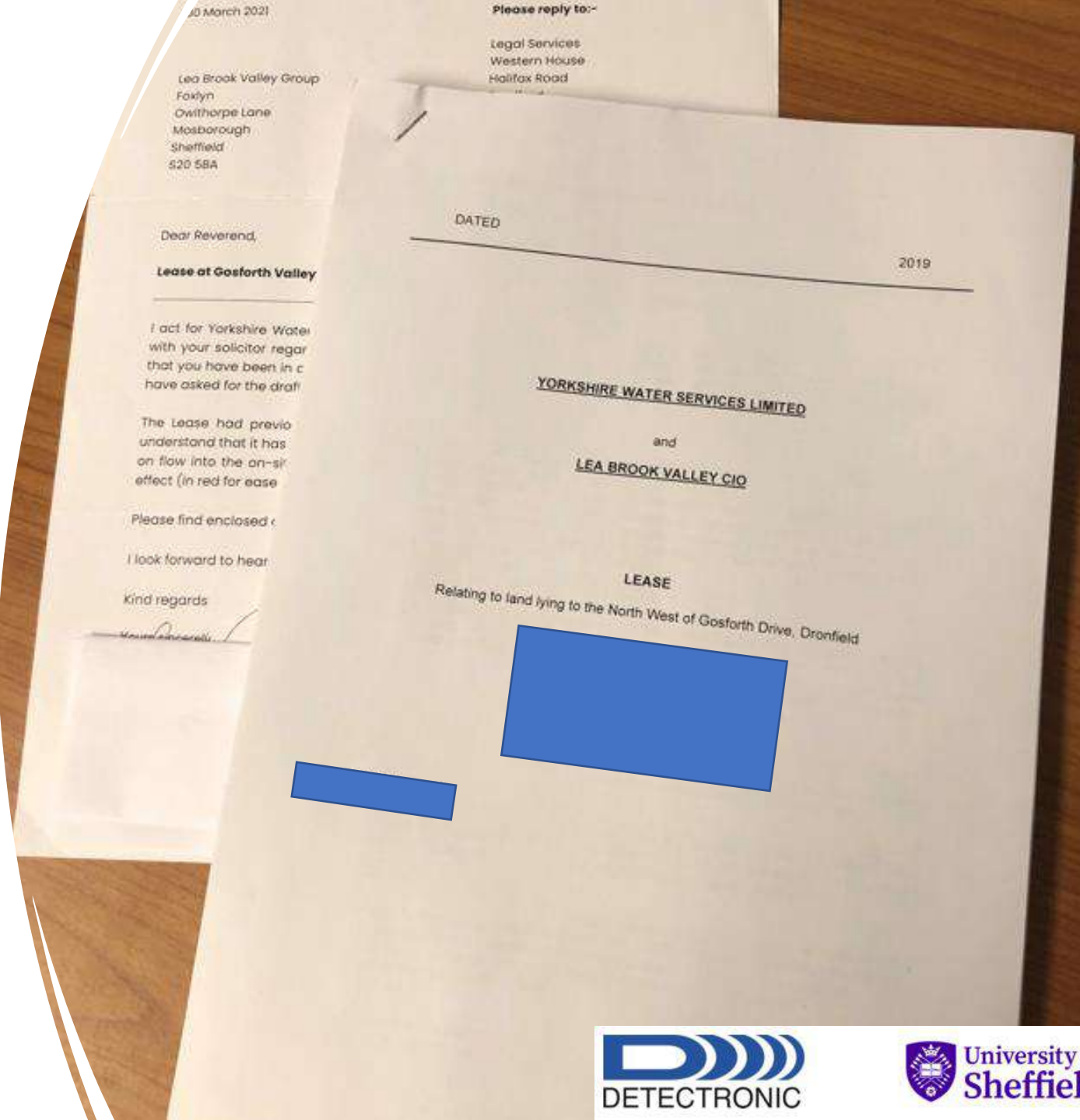
Dronfield
11 May 2019 07:34



25 Year Management Plan and Lease Agreement for SuDS

Yorkshire Water Services and
Lea Brook Valley Cio

Agreement signed 18th November 2021



Surface Water Input

The Lea Brook +
Road Drainage
925mm culvert



225mm Diameter
Surface Water Drain

525mm Industrial
estate + Residential

Lea Brook Valley SuDS Nature Reserve



Natural treatment of surface runoff from urban catchments

The Clever Bit !

Jiaqi Liu – PhD student Department of Civil and Structural
Engineering University of Sheffield

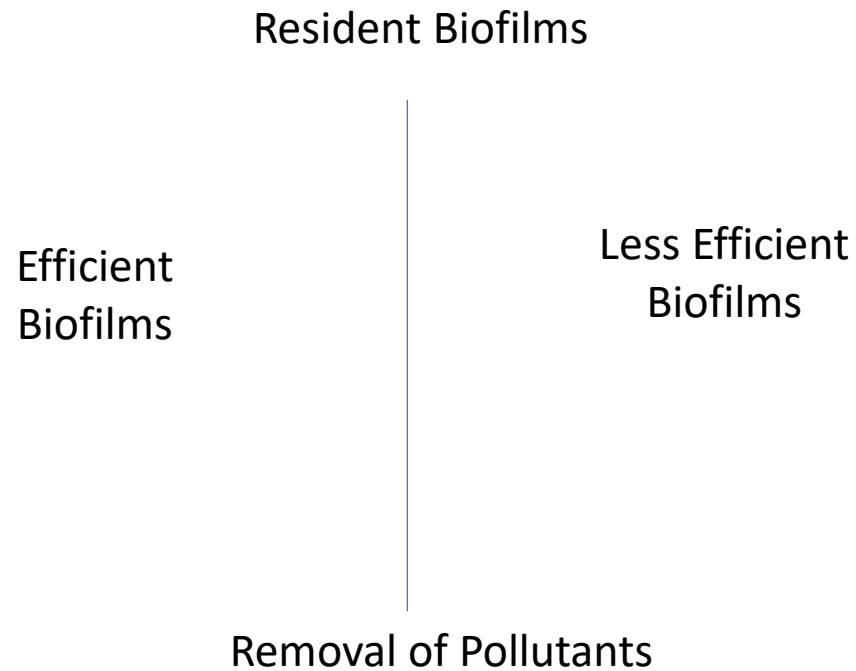


Exploring the efficiency of Biofilms in the removal of pollutants in surface water runoff.

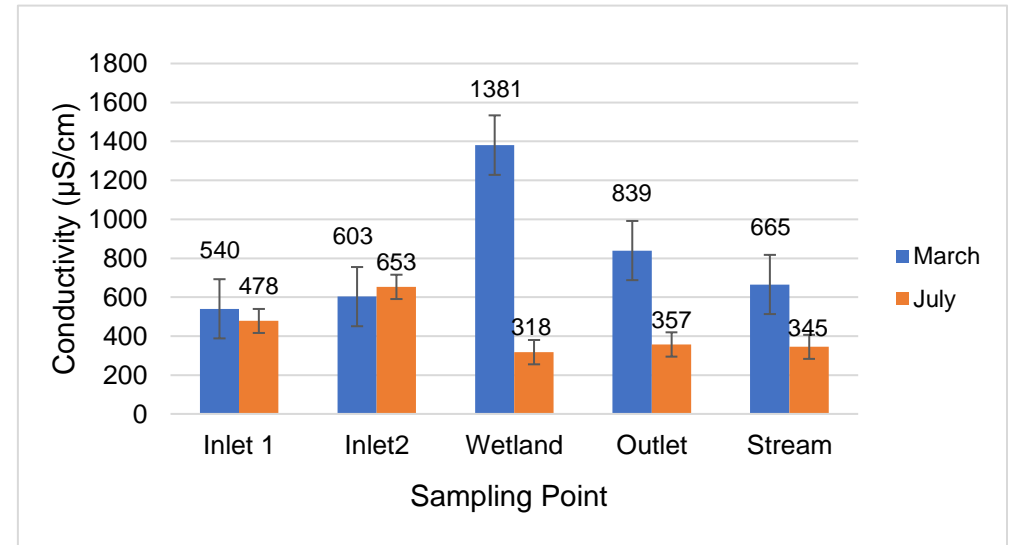
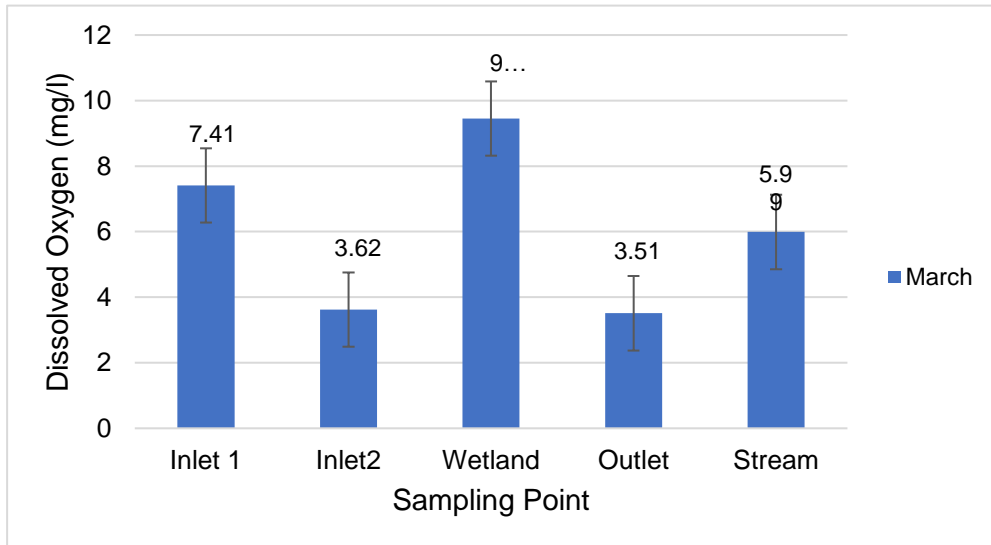
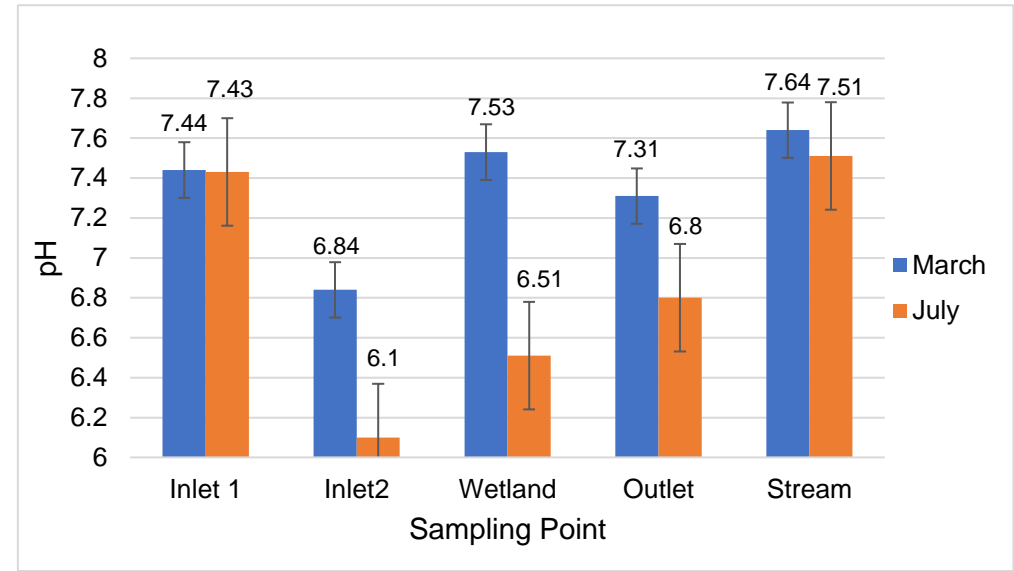
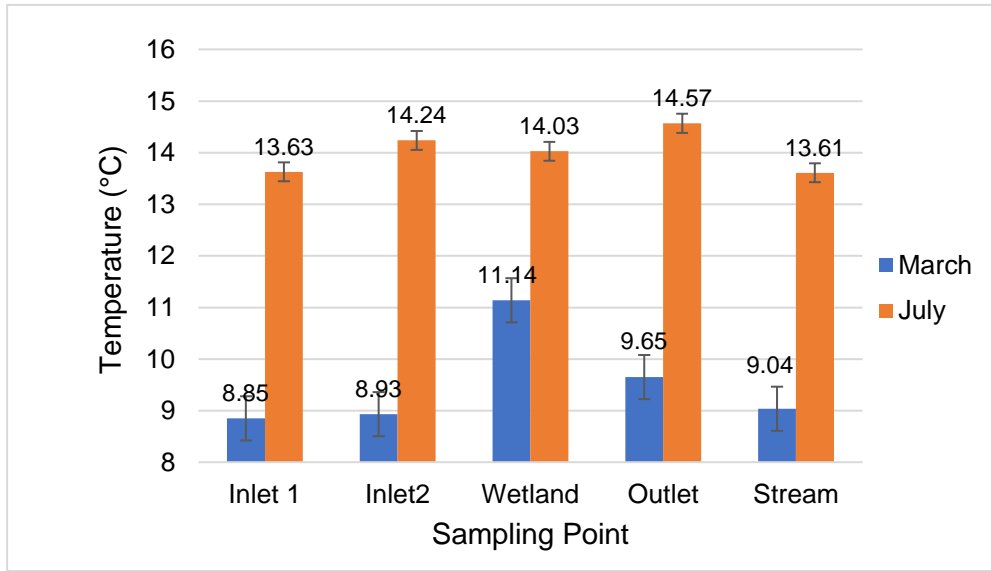
- 1. What parameters in constructed wetlands assist in the removal of nitrogen and phosphorus?
- 2. Can microbial enzyme activity be used as a tool to assess the removal efficiency of nitrogen and phosphorus using biofilms?
- 3. What types of microorganisms are involved in the removal of nitrogen and phosphorus?

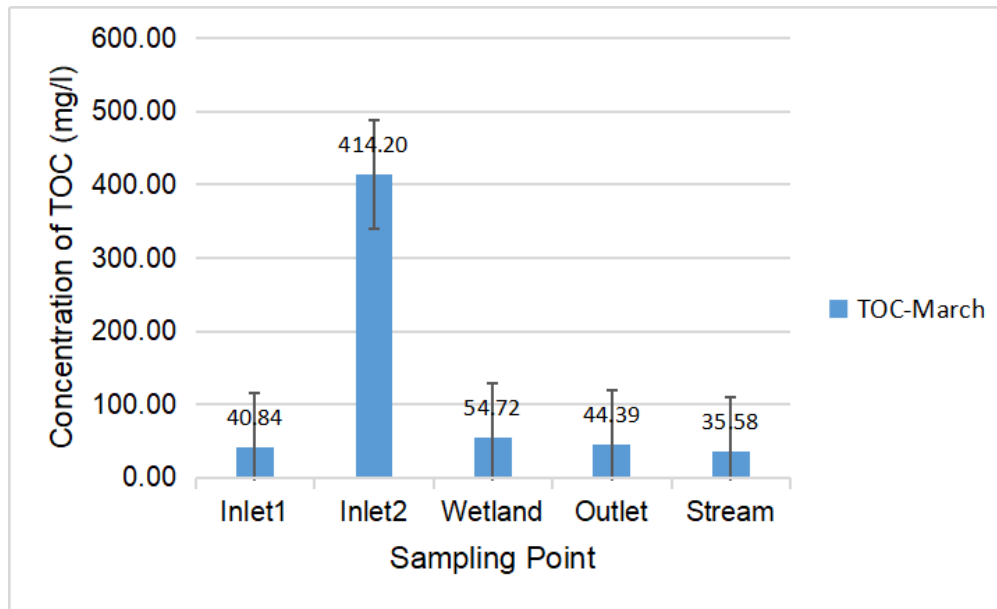
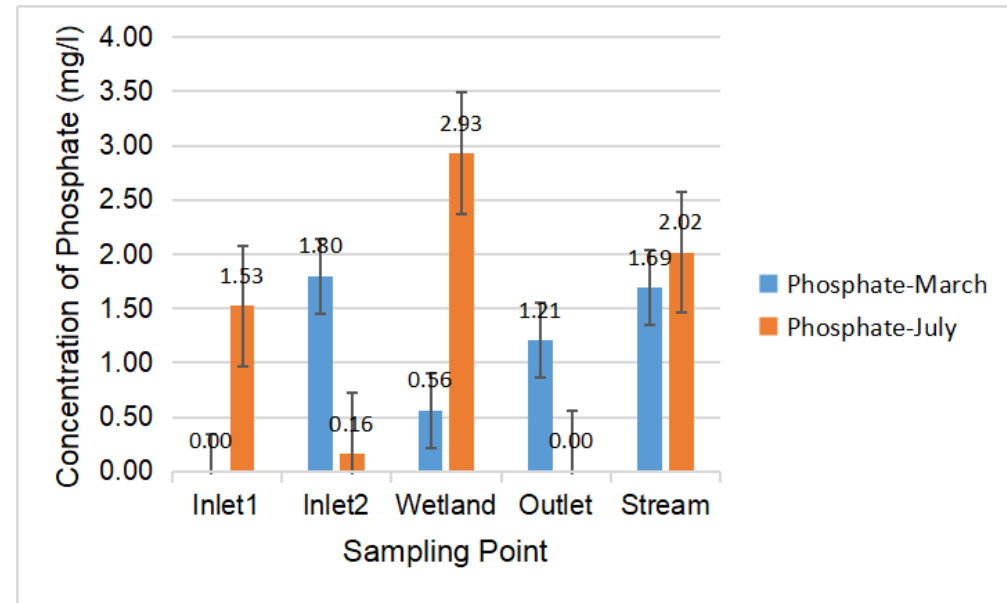
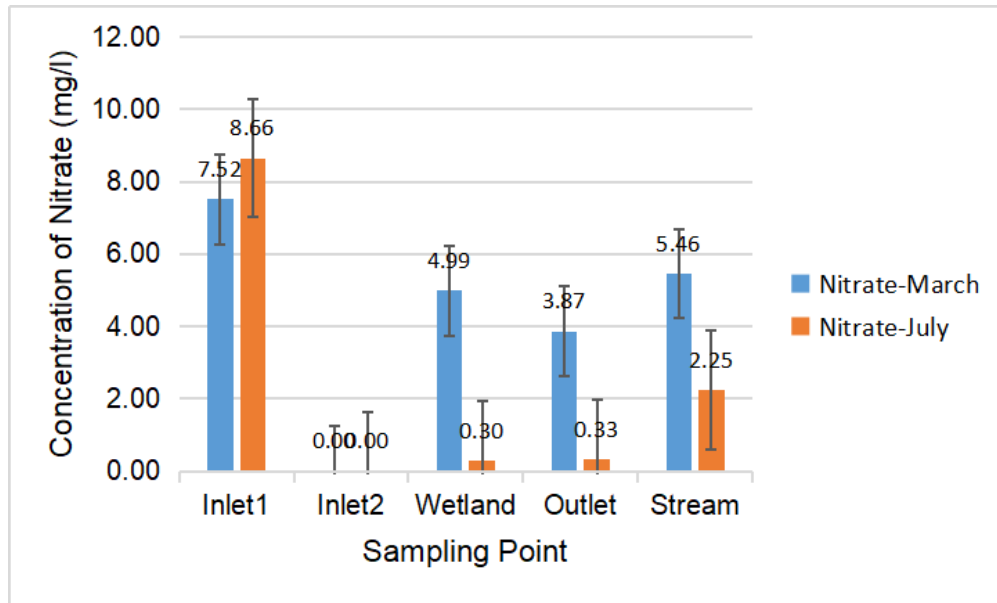
What is a biofilm?

Microorganisms attached to surfaces. I.e. substrates and plants within the wetland.



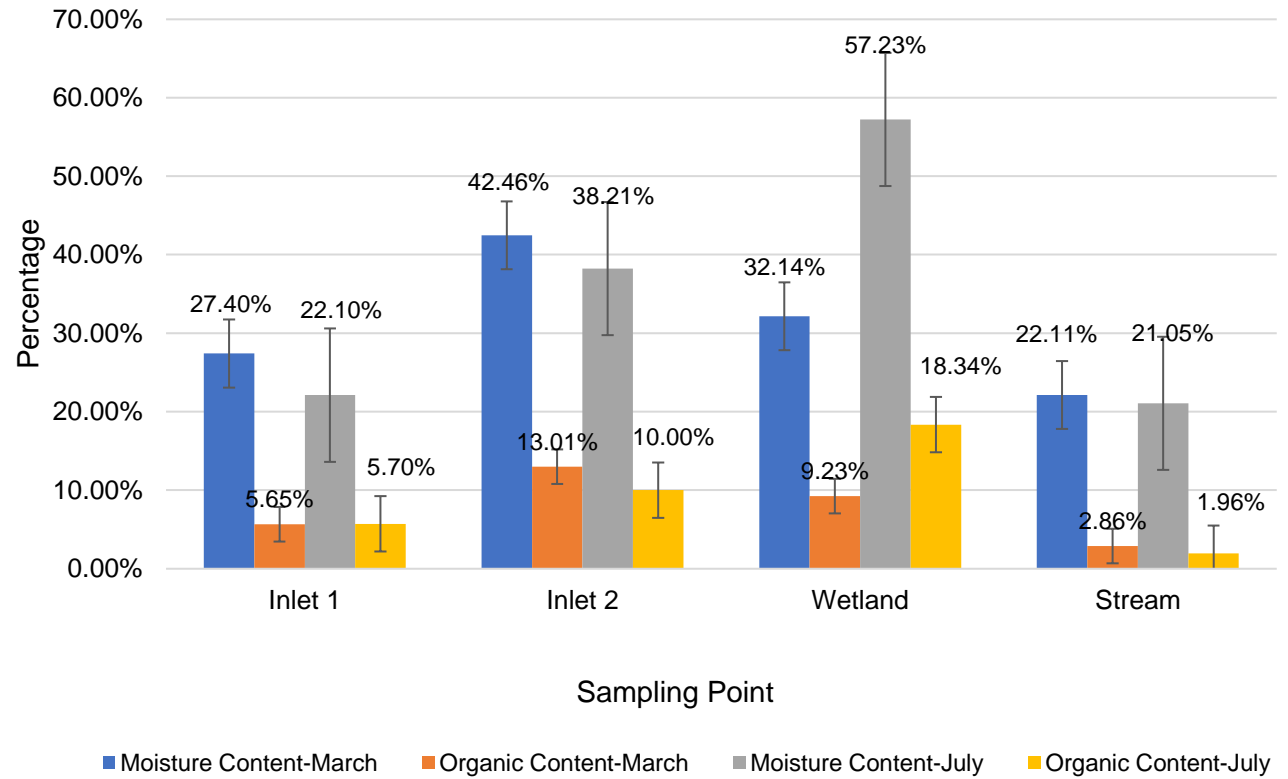
Physico-Chemical Analysis





Nutrient Concentrations

Moisture and Organic Matter Content



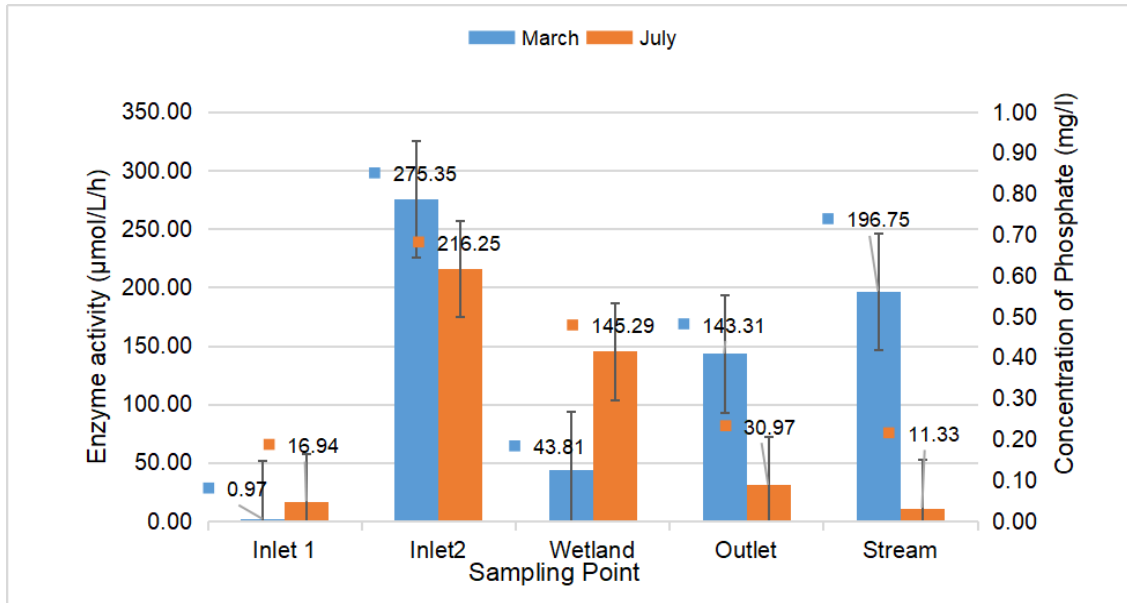
Enzyme Activity Analysis

- Phosphatase
- Beta-glucosidase
- Urease

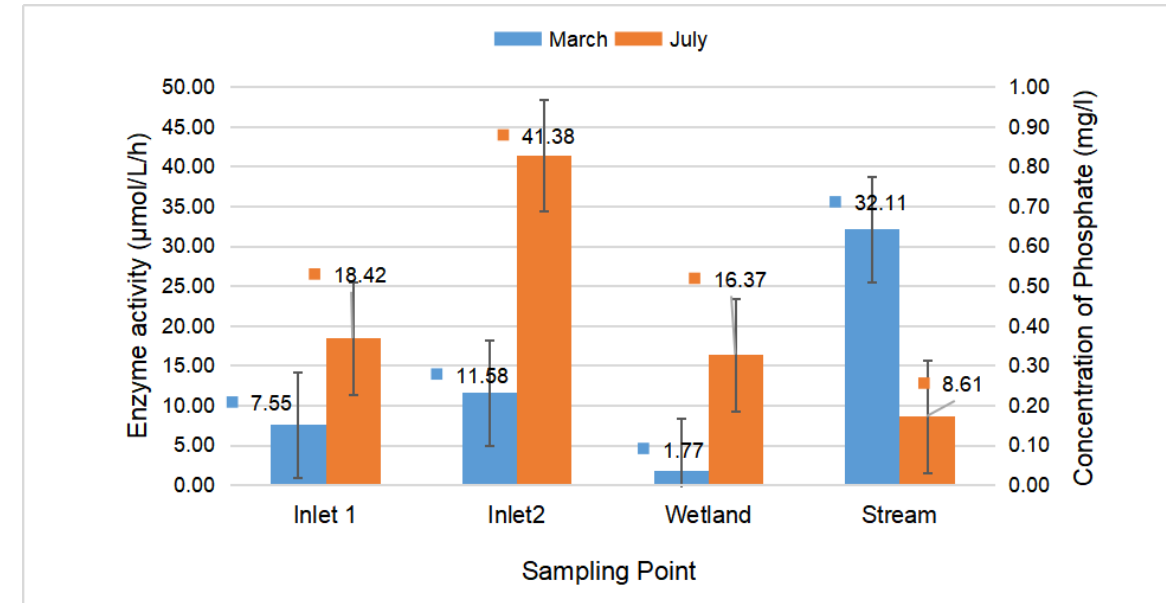
How good is the Biofilm ?



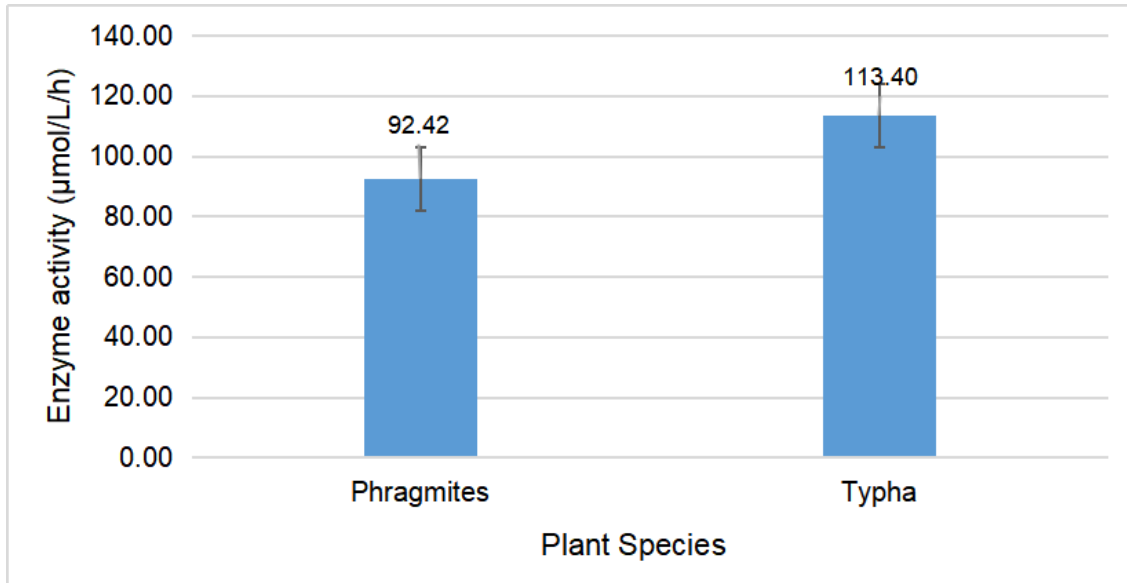
Phosphatase Analysis in Water



Phosphatase Analysis in Soil

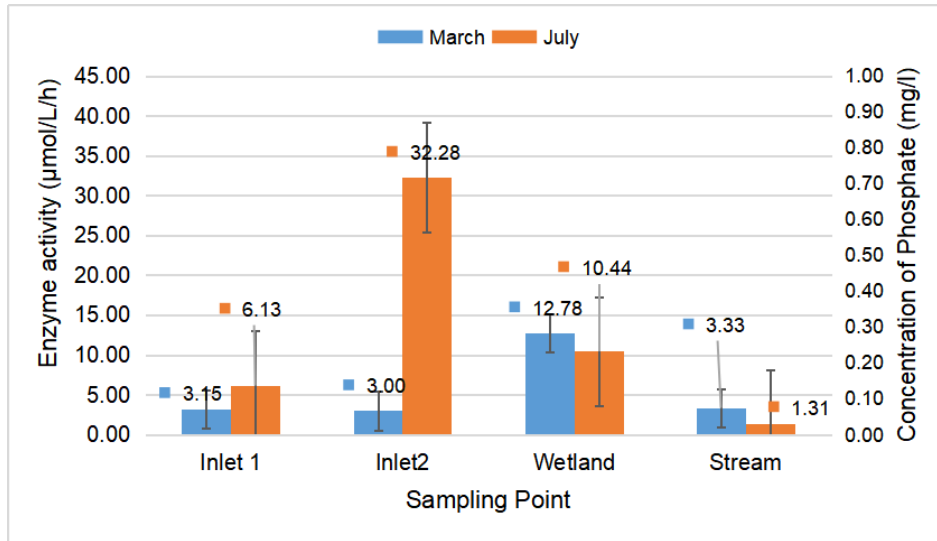


Phosphatase Analysis in Plant Type (Root)

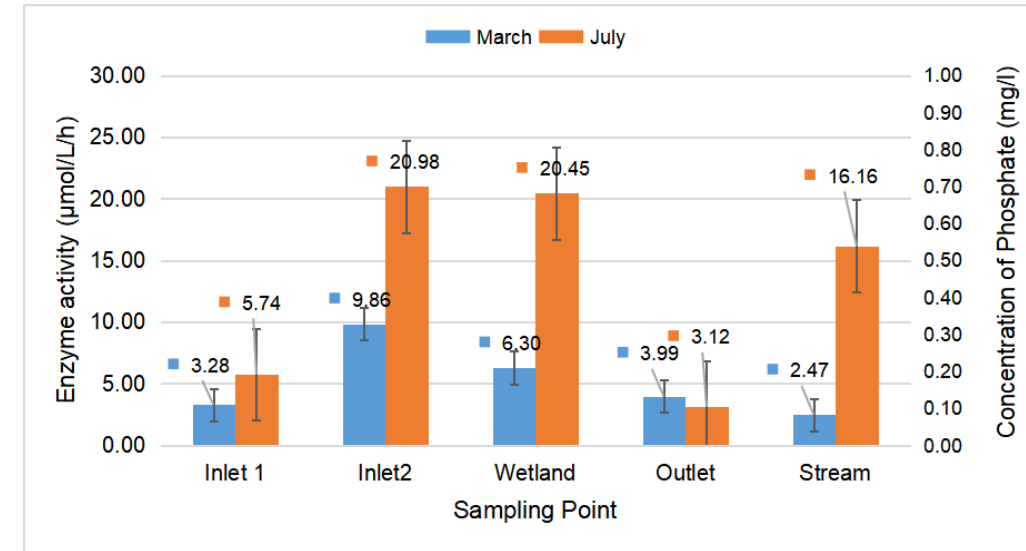


Phosphatase Analysis

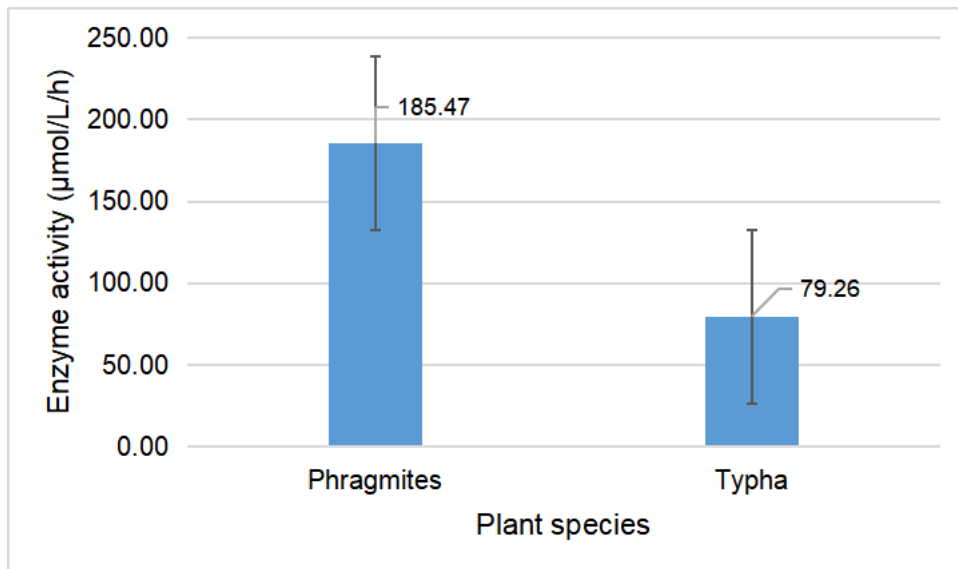
Beta-glucosidase Analysis in Soil



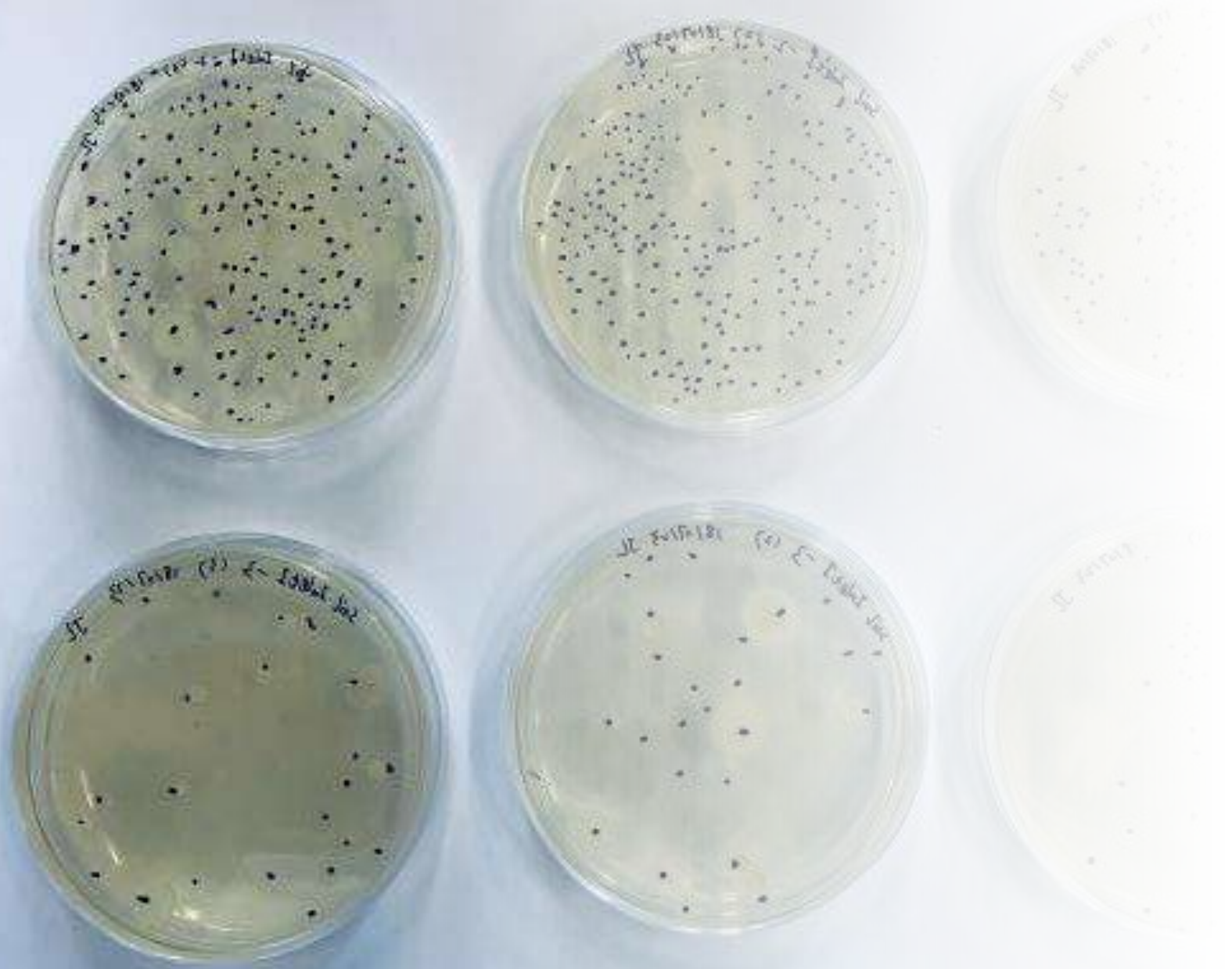
Beta-glucosidase Analysis in Water



Beta-glucosidase Analysis in Plant Type



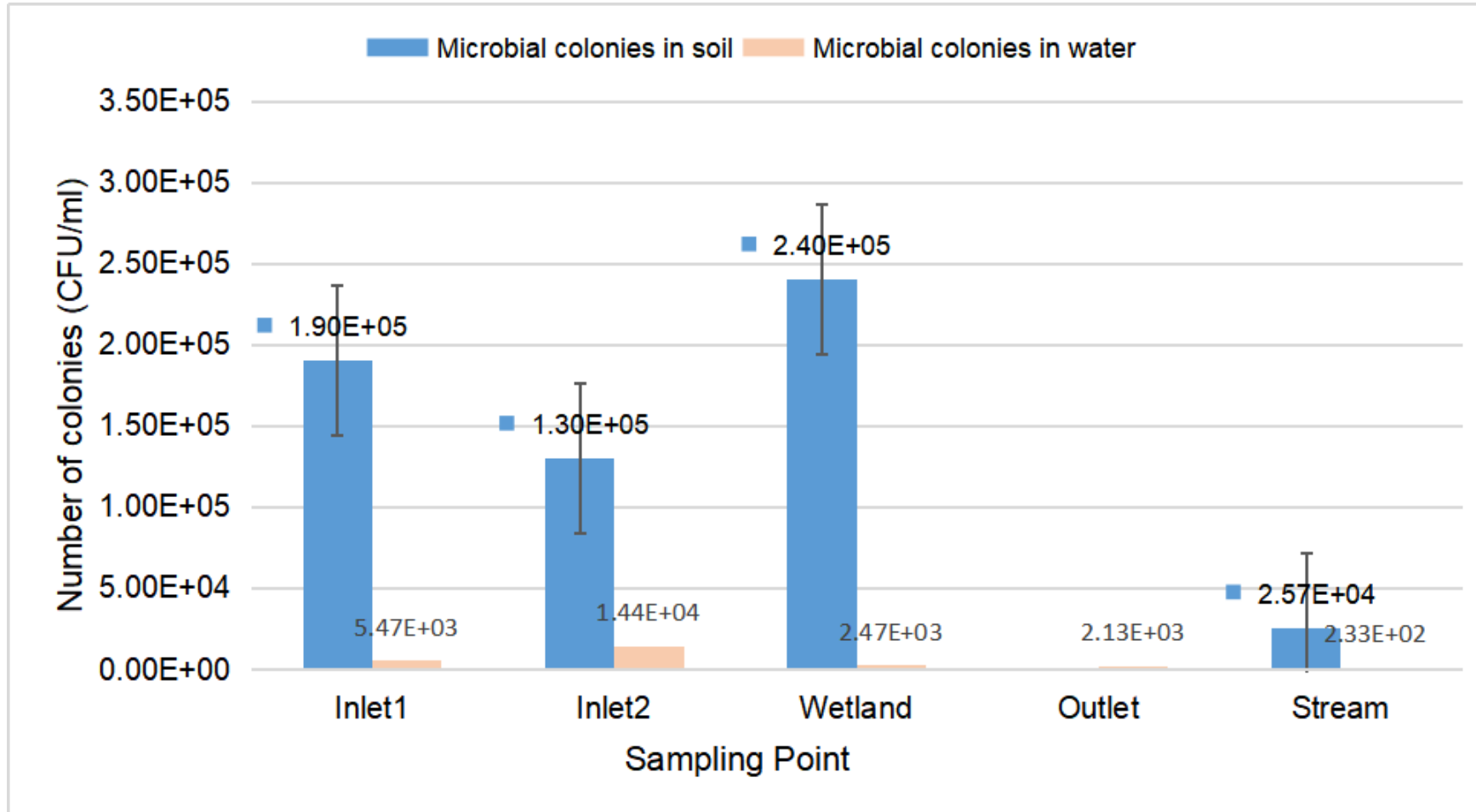
Beta-glucosidase activity analysis



Heterotrophic plate counts (HPC)

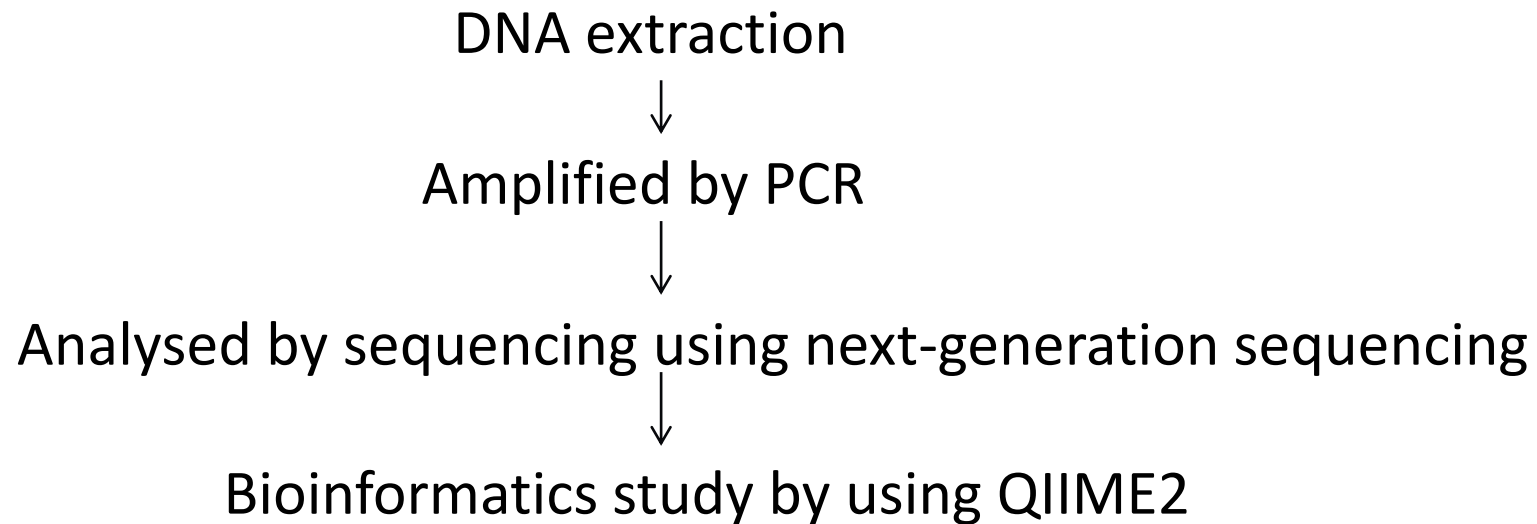
The Heterotrophic plate can be used to isolate microorganisms from soil and water samples that are able to remove nitrogen and phosphorus.

Heterotrophic plate counts (HPC)

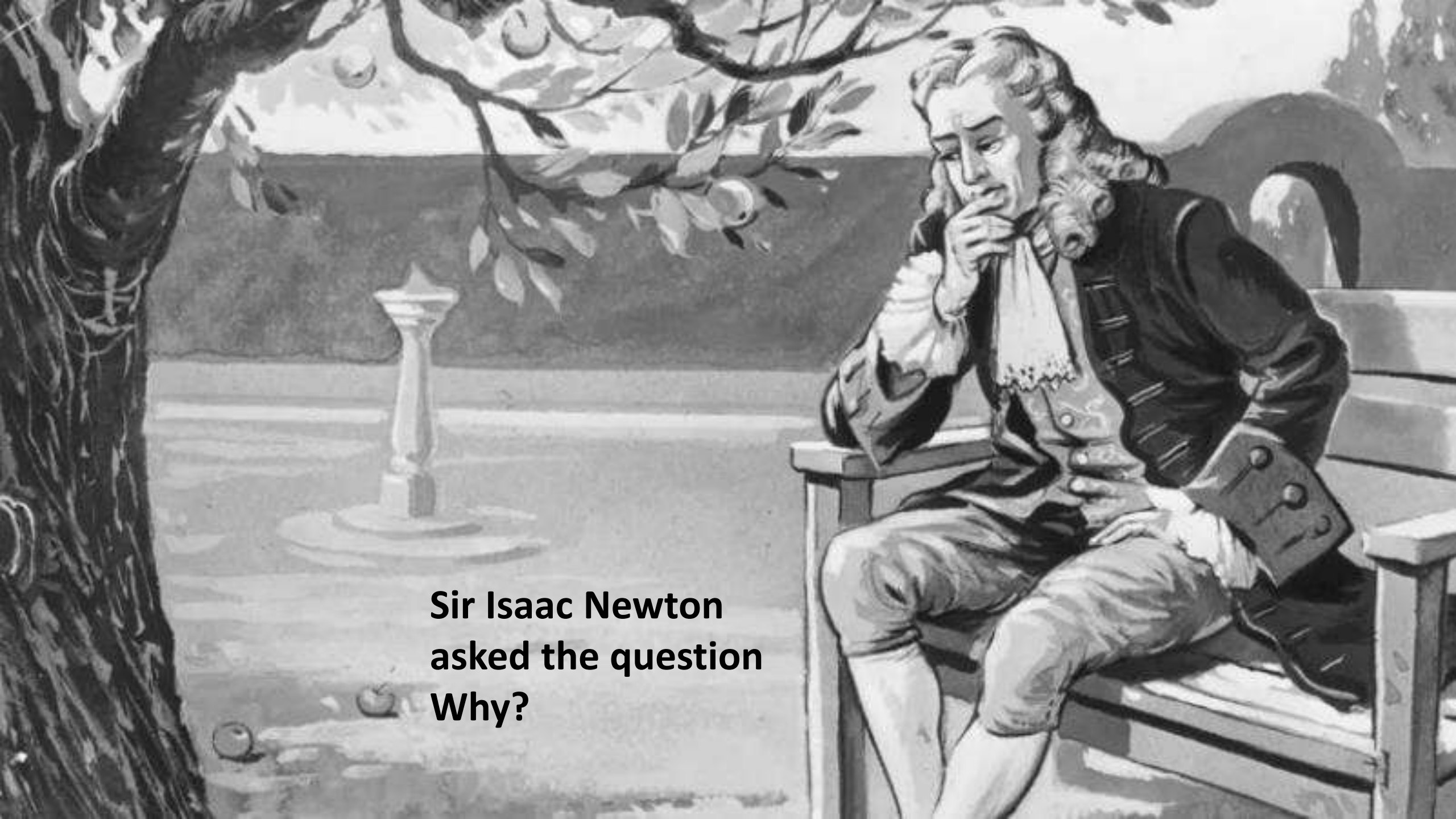


DNA extraction (Who are they)

To determine the species of microorganisms, present in the samples, molecular work was carried out to obtain genetic data.



Q. Is the wetland naturally treating surface runoff from an urban catchment?



**Sir Isaac Newton
asked the question
Why?**



Thank You !

