

# Topsoil exhibits greater bacterial diversity compared to subsoil.

## Hypothesis

- The topsoil will exhibit more bacterial diversity due to exposure to plant detritus, human foot traffic, and insect activity and the subsoil will host fewer bacterial species due to limited exposure to these factors.

## Background

- The presence and distribution of certain bacterial species in soil environments are indicative of soil and plant health. In this experiment, bacterial diversity among soil layers in the Wissahickon Valley Park were explored.
- Differences between bacterial species composition have been noted at varying soil depths, specifically in forested regions<sup>3</sup>. Decreasing diversity is thought to be linked to the availability of organic compounds in the soil<sup>4</sup>
- Previous work conducted in the Wissahickon Valley Park on soil respiration suggested substantial bacterial activity in the soil<sup>5</sup>, and prompted our hypothesis about environmental factors that specifically impact the park.
- The objective of this experiment was to analyze soil samples to determine if bacterial diversity varied by soil depth.

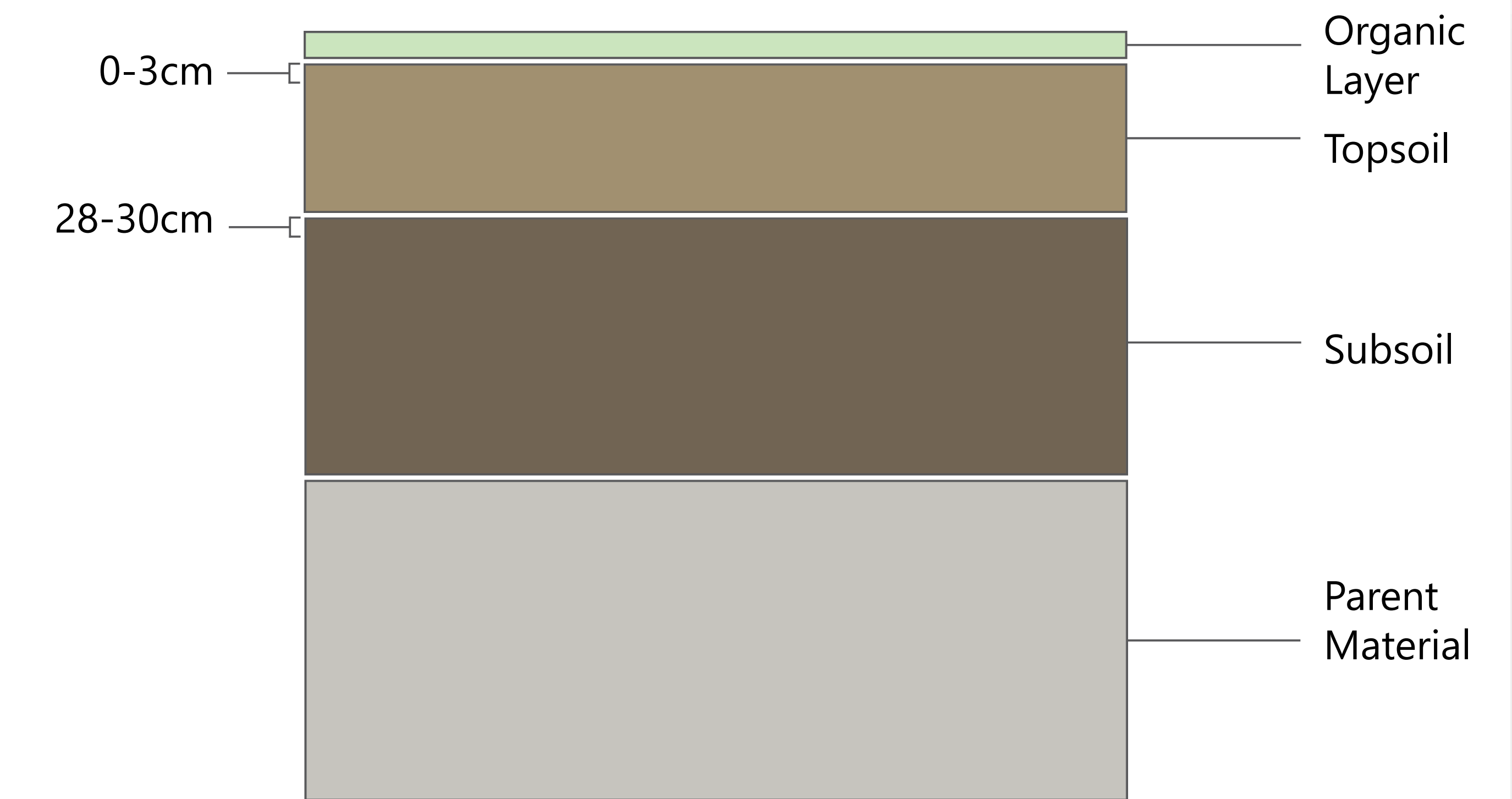


Figure 1. 2D model of soil depths sampled in the study

## Methods

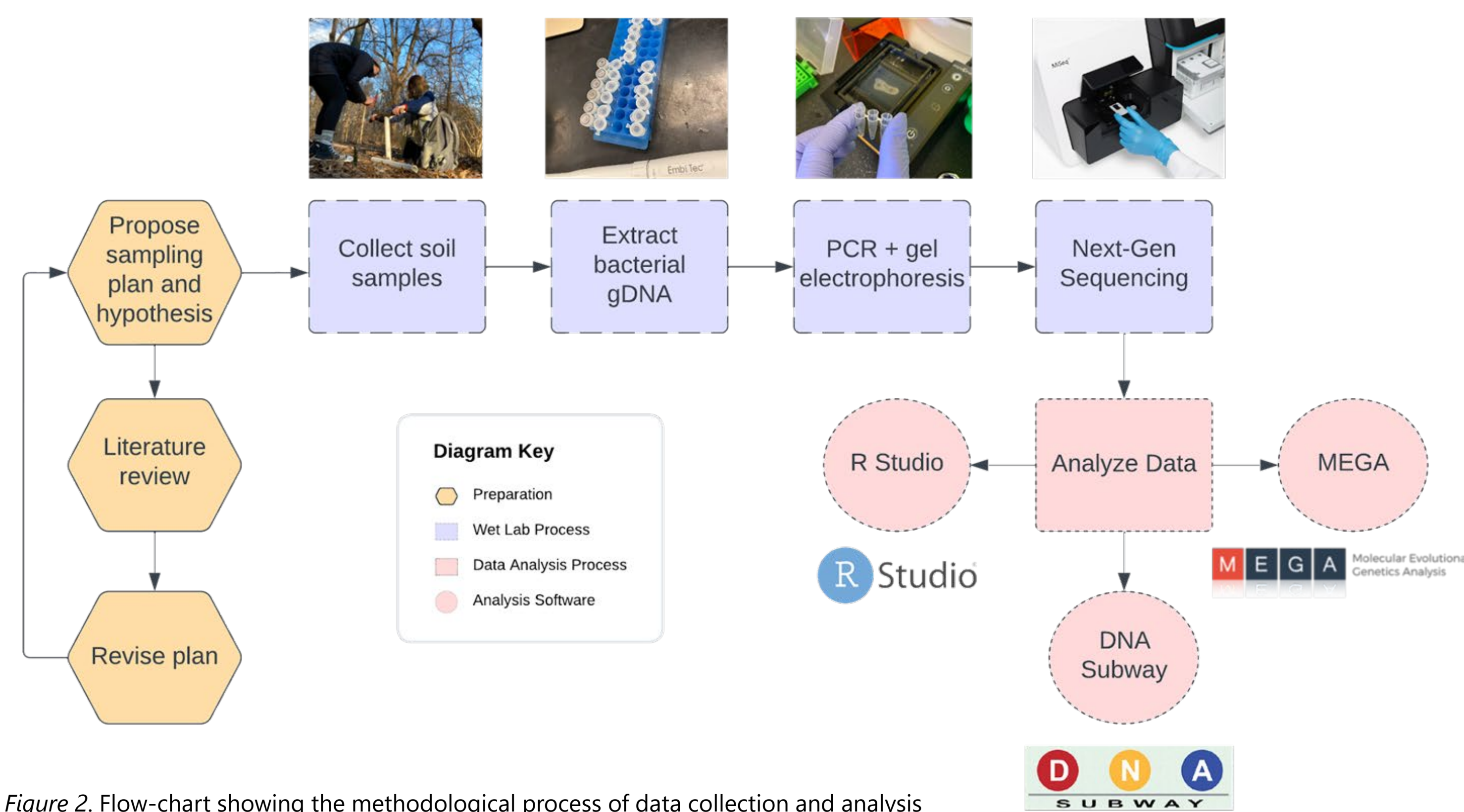


Figure 2. Flow-chart showing the methodological process of data collection and analysis

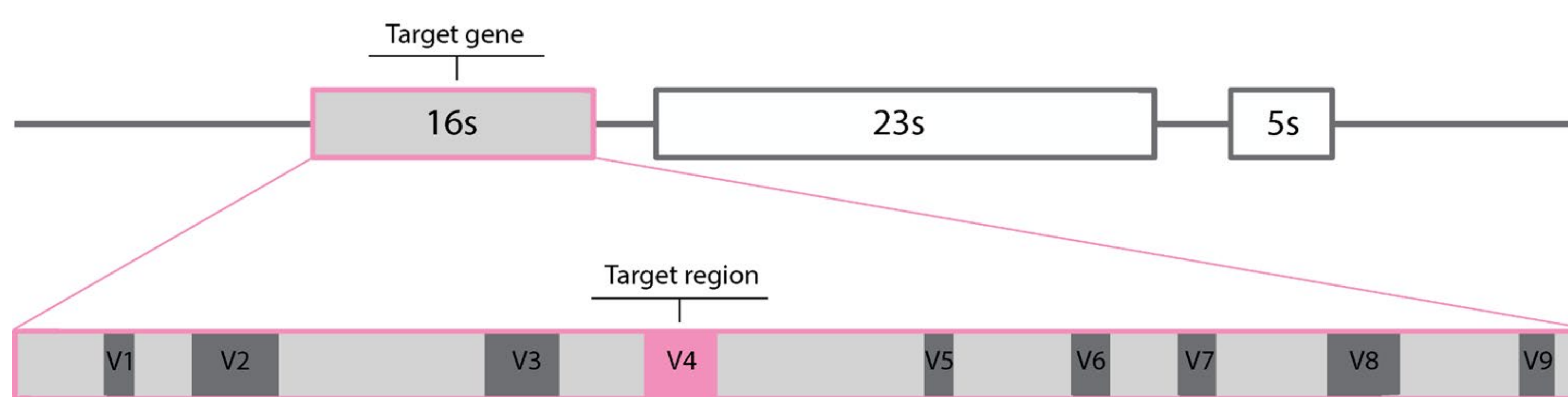


Figure 3V4 fragment of the 16s rRNA bacterial barcode gene amplified via PCR in the study

## Discussion

- Temperate forests like the Wissahickon Valley Park have large amounts of organic matter in their soil layers due to the tons of leaf litter per hectare which fall yearly.
- Food sources such as this are expected to be concentrated on the surface and decrease as soil depth increases<sup>6</sup>.
- This leads to an influx of bacterial species and competition between species, indicated by the high OTU count in topsoil samples.
- The subsoil samples contained significant amounts of species in the genus *Bacillus*, suggesting that it plays a significant role in the subsoil niche.
- To further the experiment, more taxonomic analysis should be done to identify species in the genus *Bacillus*, soil nutrient levels, and conducting an RNA-based study to determine which bacterial species are more active.

## Results

Sample	OTU Count	Unique OTUs	Shannon Index
Topsoil 1	365	217	188.78
Topsoil 2	219		89.5
Subsoil 1	298	179	70.27
Subsoil 2	212		63.69
Subsoil 3	242		69.24
Control	7	7	6.76

Table 1. Total counts of operational taxonomic units (OTU), reads, and the Shannon diversity index for each of 5 soil samples and the positive control. OTU counts and reads retrieved from DNA Subway level 7 taxonomic diversity; Diversity index retrieved from R using ggplot2.

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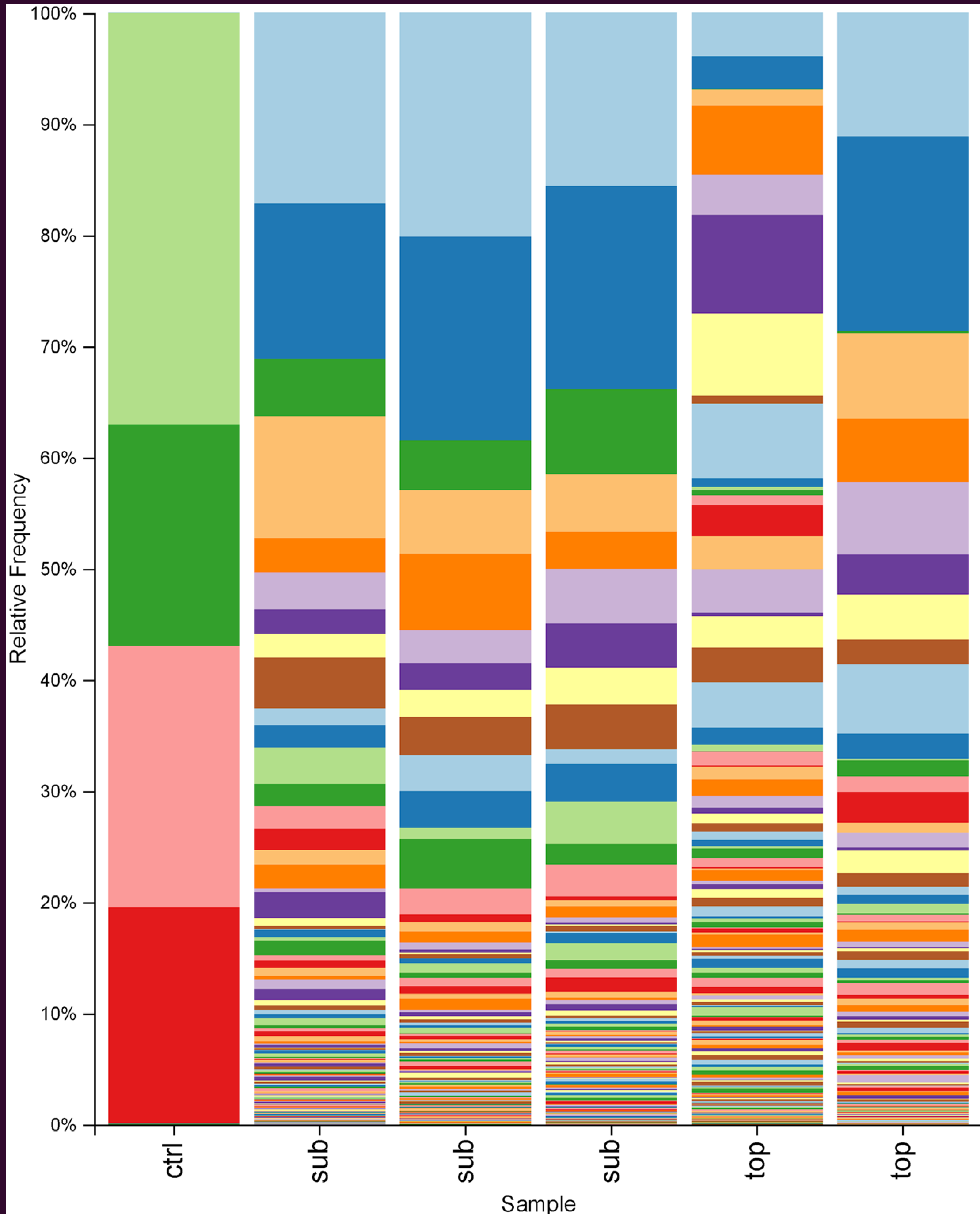


Figure 2 Taxonomic diversity data at the species level displaying individual OTUs seen in all 5 samples and the positive control. Data retrieved and analyzed in DNA Subway.

