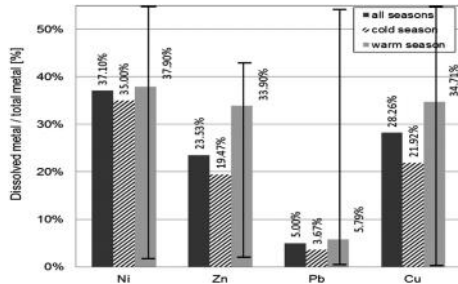


The Effects of Parking Lot Pollution on Soil Bacteria in Prince Edward County, Va

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Introduction



- The graph above is from a study that tested the amount of heavy metals present in runoff throughout different seasons; cold seasons observed more metals (Brenner et al 2017).
- Parking lot runoff contains a high percentage of heavy metals (Abed et al 2017).
- Heavy metals have been found to chemically alter the minerals in the soil, as well as the membrane of microbes. This alteration leads to better attachment of the microbes to the soil (Olson and Zhang 2012).

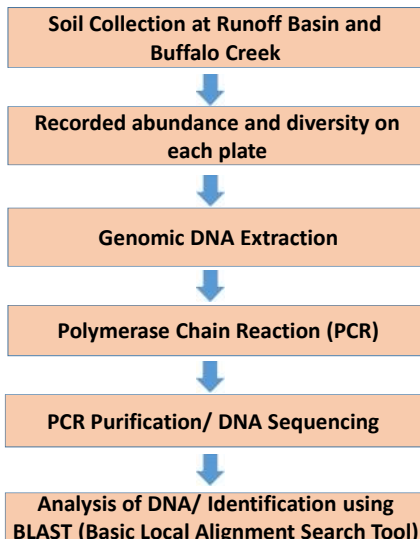


Figure 1. (A) The site of Buffalo creek soil and (B) runoff basin soil sample collections are pictured above. The soil moisture content was analyzed prior to collection. Soils of similar moisture content were obtained from each site.

Specific Aim

- How does parking lot runoff effect bacterial diversity in the soil?
- If soil from a flowing creek and a runoff basin are sampled and plated, then it is predicted more bacterial growth and diversity will be observed on the runoff basin plates.
- Microbial diversity has not been studied in Prince Edward County, this study will help to provide information about what the microbial community is like.

Methods



Results

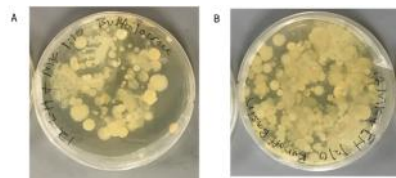


Figure 2. The Pictures of the (A) 1:10 Buffalo creek and (B) 1:10 Runoff Basin Agar Plates are shown. 0.5 g of each soil sample was collected and mixed with 25 mL of sterile water. 90 µl of LB nutrient solution was added to 10 µl of each sample. Samples were plated and incubated for five days at 30 degrees Celsius.

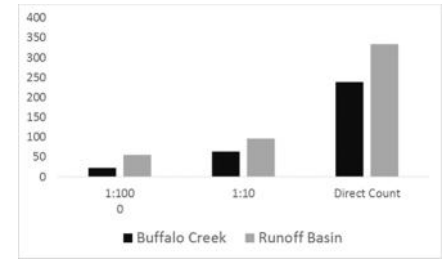


Figure 3. The abundance of bacteria colonies on each solution for Buffalo creek and runoff basin plates. After incubation, the number of bacteria colonies for each plate were counted and recorded. The recorded data is shown in the graph above.

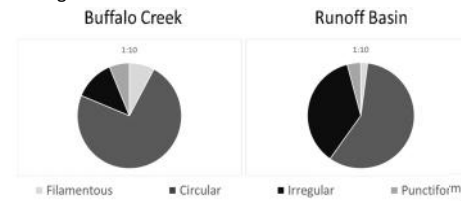


Figure 4. The diversity between the 1:10 Buffalo creek and 1:10 Runoff basin plates are shown above. The shapes of the colonies observed on each plate were noted, the number of bacteria for each shape were counted and recorded.

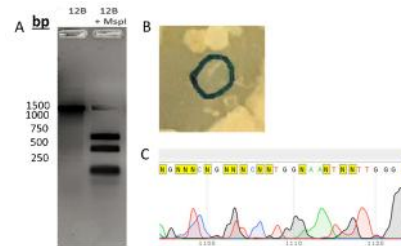


Figure 6. The results of gel electrophoresis and sequencing for Buffalo creek are shown above. (A) Gel electrophoresis of 16s rRNA PCR product and MspI digest. (B) Picture of the colony from a Buffalo creek selected for further identification. (C) A picture of the insufficient high quality chromatography.

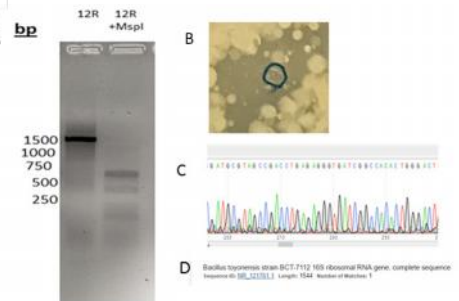


Figure 5. Identification of *Bacillus toyonensis* from soil sample at the runoff basin site. (A) Gel electrophoresis of 16s rRNA PCR product and MspI digestion. (B) Picture of the colony from a runoff basin plate selected for further identification. (C) A picture of high quality chromatogram. (D) *Bacillus toyonensis* rRNA identification from BLAST (Basic Local Alignment Search Tool).

Conclusion

- The runoff basin produced more bacteria.
- The runoff basin bacteria species was identified as *Bacillus toyonensis* BCT-7112.
- Buffalo creek bacteria was unable to be identified due to lack of high quality sequencing.
- Lancer Park used to be farm land, *Bacillus toyonensis* is a common bacteria found in farming foods, this may explain the presence of this bacteria (Bouki et al 2015).
- Or it maybe that *Bacillus toyonensis* is a PHA (Polyhydroxyalkanoates) producing bacteria ((Ardakani et al 2014).
- These bacteria are used in oil factories, this may tie in with the resistance of the bacteria in heavy metal pollutants ((Ardakani et al 2014, Olson and zhang 2012).
- This study could help validate other studies with similar research questions.
- More studies should be performed to confirm the results of this study.

References

- Abed RM, Al-Kindi S. Effect of disturbance by oil pollution on the diversity and activity of bacterial communities in biological soil crusts from the Sultanate of Oman. *Applied Soil Ecology*. 2017;110:88–96.
- Ardakani MR, Mayeli N, Motamedi H. Isolation and screening of native polyhydroxyalkanoate producing bacteria from oil contaminated soils of Abadan refinery. *Biological Journal of Microorganism*. 2015; 3(12):93-103.
- Brenner E, Endres M, Hilliges R, Marks T, Tiffert A. Characterization of road runoff with regard to seasonal variations, particle size distribution and the correlation of fine particles and pollutants. *Water Science & Technology*. 2017;75(5):1169-1176.
- Bouki P, Giavasis I, Kantas D, Papatsiros VG, Tassis PD, Tzika ED. A feed additive containing *Bacillus toyonensis* (Toyocerin®) protects against enteric pathogens in postweaning piglets. *Wiley Online Library*. 2015;118(3):727-738
- Olson MS, Zhang H. Effect of Heavy Metals on Bacterial Attachment in Soils. *Journal of Environmental Engineering*. 2012;138(11):1106–1113.