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## Assessment of coliform bacteria from point and nonpoint sources in the Las Vegas Wash

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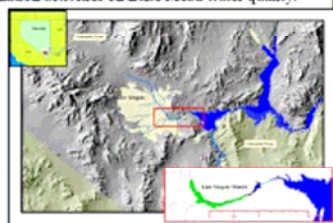
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This project focuses on an assessment of coliform bacteria from point and non point sources in Las Vegas Wash. Correlations between land use related runoffs, nutrients and organic matter loading and total coliform will be studied. Data will be collected for both daily low and high flow events. Sampling locations will cover all major land use types such as golf course, hotels, hospitals, residential areas, etc., at both the main Wash and its tributaries.

## Abstract

E. coli and total coliforms were measured in the Las Vegas Wash and its major tributary Flamingo Tropicana wash for before and after rainfall to study the impact of urban land use and water reclamation activities on Lake Mead water quality.

Bacteria counts were done using a differential agar, and water chemistry and nutrients were also measured. The results suggest that the Las Vegas Wash does have harmful fecal contaminants and those appear to be coming from wildlife and non point source rather than the treatment plants.



## Methods



- Grab samples taken at predetermined locations along Las Vegas Wash and its main tributary Tropicana/ Flamingo Wash
- Locations were determined based on representative land use types, e.g., golf courses, waste treatment plants, hospitals etc.
- YSI data collected on each site including for pH, temperature, specific conductivity, oxidation-reduction potential, and dissolved oxygen

- Samples diluted and vacuum filtered through a .45um membrane filter and grown on Coliscan MF agar to distinguish coliforms. Plates incubated at 37.0 °C.
- Diluted samples were plated on LB agar for overall bacteria count
- Total cell counts verified by Flow Cytometer for a Las Vegas Wash sample
- Water samples were also analyzed for total Phosphorus, total nitrogen and total particulate organic loading (POC)

Results continued...

### Main LV Wash

- Site 2 has highest E. coli concentrations followed by Site 1, the rest decrease downstream
- Site 1-2 have the highest total coliforms, the remaining sites decrease downstream
- Nitrate increases downstream from Site 1- Site 9
- Phosphorus is not significantly different from Site 1-Site 5, but increases in Sites 6- 8
- Particulate Organic Carbon (POC) is highest in Site 1 and statistically similar for the remaining sites
- In the main LV Wash, temperature increased by 4°C after Site 3.

### Flamingo Tropicana Tributary

- E. coli and coliform counts are significantly lower than Sites 1-2 from the main LV Wash, but higher than Sites 3-8
- E. coli and coliform counts increase post rainfall
- Nitrate and Phosphorus levels do not change after rainfall
- Small increase observed in POC for Sites 1-2

## Introduction

### Las Vegas Wash

- Las Vegas Wash is the main drainage system for entire Las Vegas Valley
- Made up of urban runoff, shallow groundwater, storm water, and to a large extent reclaimed water<sup>1</sup> from various treatment plants
- Las Vegas Wash wetlands filter water naturally and provide wildlife habitat for many birds and animals
- Drains into Lake Mead and Lower Colorado System which provide Las Vegas Valley with drinking water
- Urban runoff and non point sources carry fertilizers, oils, and debris, nutrients and other pollutants including bacteria into the Wash



Courtesy of www.browdblog

### Coliform Bacteria

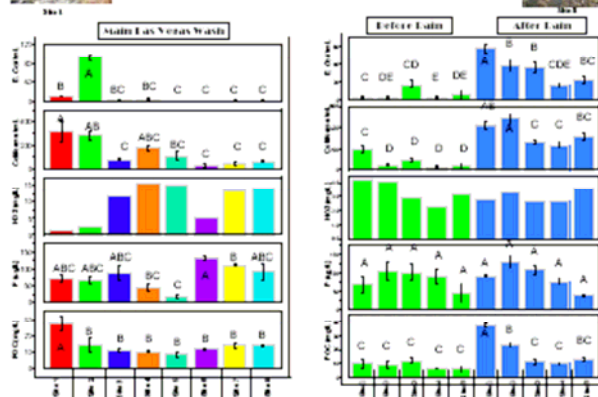
- Indicator bacteria for sewage in water system
- Often indicate presence of other pathogenic organisms of fecal origin including:
  - Giardia, Cryptosporidium, Hepatitis A, Helminths<sup>2</sup>
- General coliforms include the genus:
  - Citrobacter, Enterobacter, Escherichia, Klebsiella,
- Defined as Gram negative rods that ferment lactose and produce acid and gas
- Escherichia coli* (E. coli) is a fecal coliform that originates in the lower intestine of mammals
  - Virulent strains can cause: diarrhea, UTI's, pneumonia, respiratory illnesses, neonatal meningitis, and more<sup>2</sup>
  - Facultative anaerobe: can do aerobic respiration or fermentation

### Escherichia coli:



Courtesy of <http://microbiology.com/2007/05/bacterial-organisms-also-could-cause-cancer/>

## Results



## Discussion

### Main LV Wash

- Increase in E. coli for Site 2 due to the presence of septic systems and increased wildlife from the golf course upstream
- The decrease in E. coli and coliforms downstream due to dilution of water with outflows from wastewater treatment plants
- Nitrate increased after Site 3 due to outflows from wastewater treatment plants

### Flamingo Tropicana Tributary

- E. coli and coliforms increase after rainfall from the watershed
- Spike in organic loading from the watershed: households, streets, farms, etc.

## Conclusion

- Wastewater treatment plants did not contribute to E. coli and total coliform populations
- Bacteria increases due to wild animals and golf courses
- No significant correlation between nutrient concentrations and bacteria
- Las Vegas Wash and Tropicana Flamingo tributary showed an increase in bacteria when organic loading increased, especially after rainfall

## References

- www.cdc.org
- www.lasvegswash.org
- Madigan, M. T. & J. M. Martinko. 2006. Brock Biology of Microorganisms. Pearson Prentice Hall publication.

### Acknowledgements:

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