# Reimagining Eco-Friendly Parking Lot Design Through Simulations

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# Background

- Parking lots are considered impervious surfaces
- **Impervious surfaces** are man-made surfaces covered by water-resistant materials (concrete, asphalt, stone, and brick)
- They contribute to various environmental problems that then create public health and social justice issues
- Downtown Atlanta is covered with parking decks and lots that come up to about 93,000 parking spaces
    - Many spaces sit unoccupied

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# Purpose

- Understand the impacts that different construction materials can have on temperature and water quality
- Reimage how parking lots can be designed to not just park cars, but also solve environmental issues
- Test the hypothesis that more sustainable materials will mitigate pollutants from entering into a water body and can cool down an area

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# Experimental Design - Materials

Design Type Models

Models and the “Sun”

Just the Design Type

Design type w/ a Bioswale


Sod

Carex Stricta


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# Experimental Design - Methods

- The lights will be on the models 5 hours each day
- In each model, the Water Body column will include a some water
- At the same time each day water with table salt will be poured into the model to simulate a rain event
  - The amount poured in is the same amount that is in the the Water Body column
  - This will go on for 30 days
- Before each pour measurements will be taken
  - Temperature of the Water Body column water and the surface in the Design Type column
  - Salinity of the external water and Water Body column
- The same volume of water, but with table salt will be poured into the model
  - The Design Type column in each model is slanted at  a 15° angle
- After each pour measurements will be taken
  - Temperature of the Water Body column water and the surface in the Design Type column
  - Salinity of the Water Body column
- Before and after measurements will be compared and analyzed over the 30 days

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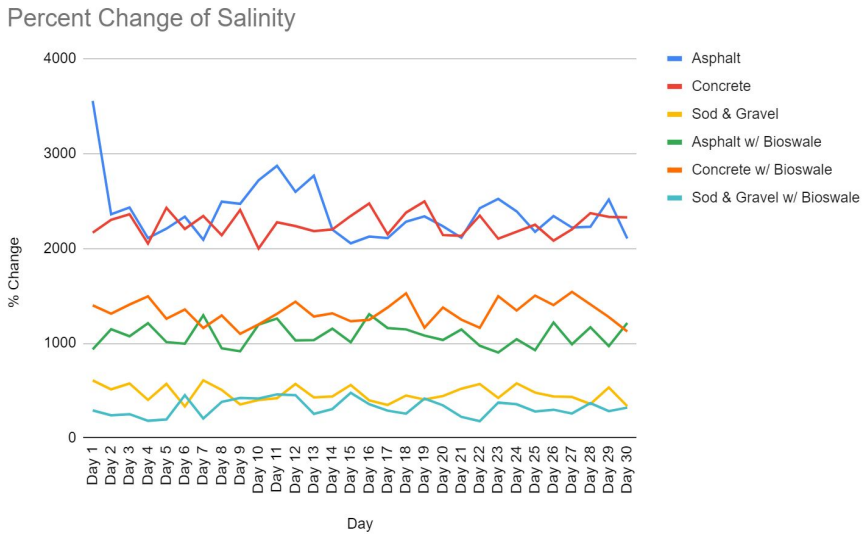
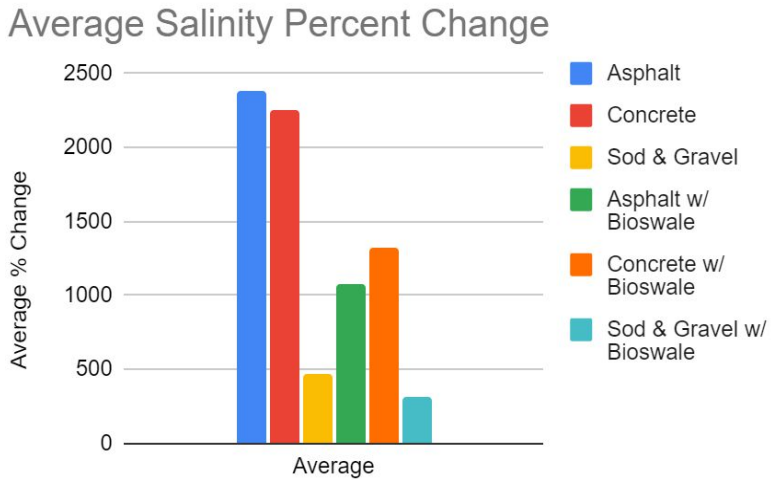
# Results - Salinity

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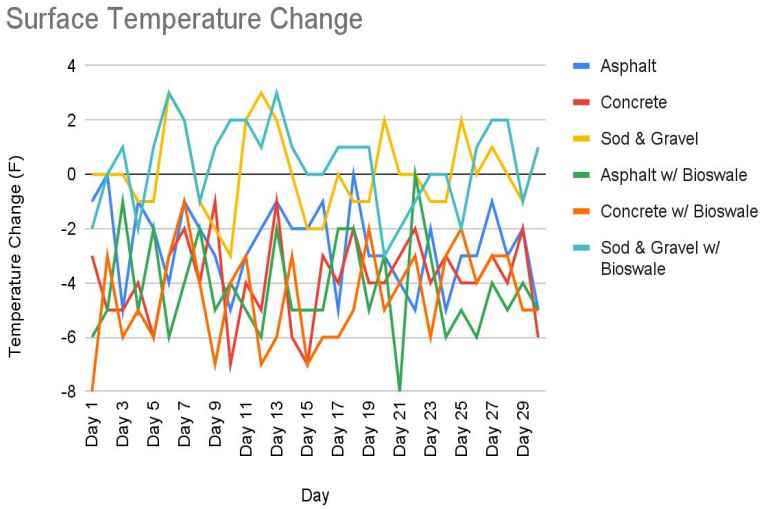
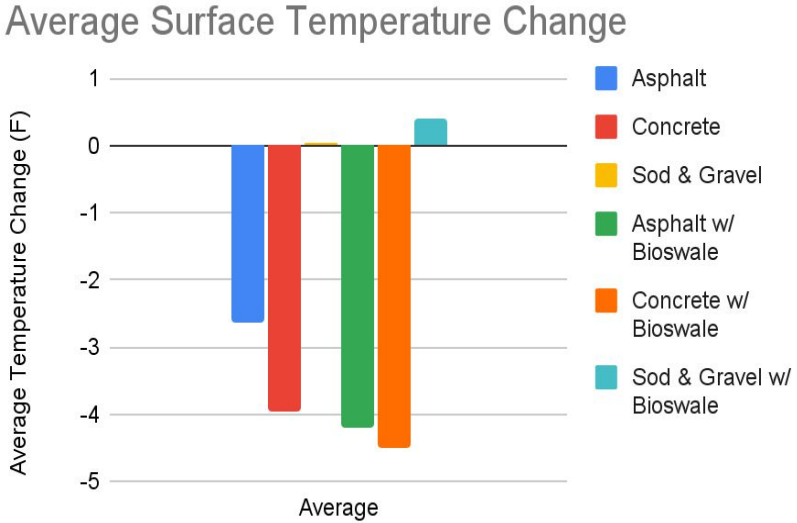
# Results - Surface Temperature

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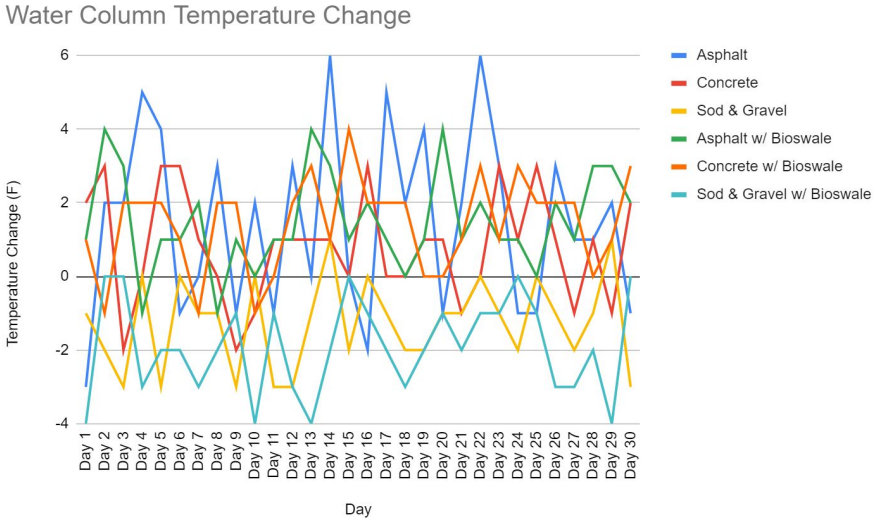
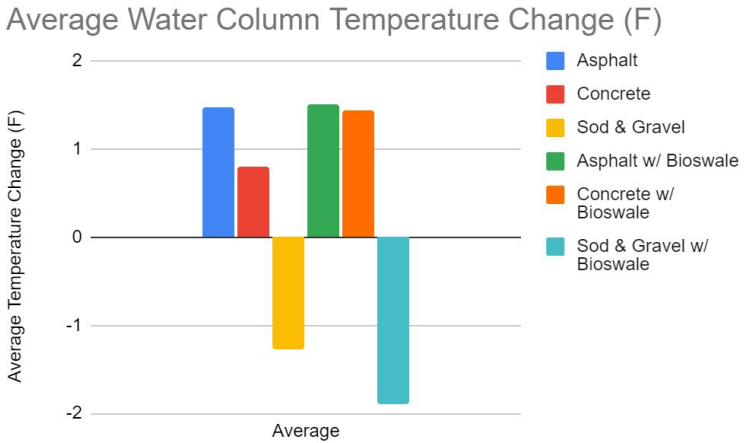
# Results - Water Temperature

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# Discussion

- Trends that I noticed:
  - The smaller the percent change in the salinity level, the more “pollutants” were mitigated
  - The smaller the average change in surface temperature, the better the material was at keeping a surface cooler
  - The smaller the average change in the Water Column temperature, the less the water heated up after each pour
- My hypothesis was proven correct
  - The sustainable materials (sod, gravel, and bioswale) mitigates “pollutants” and kept the area cooler

# Conclusion

- This can be used as a framework to visually examine the environmental impacts of new construction materials used for the built environment on a small scale
- Can be used to customize specific materials to specific environments

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# Thank you! Let's Connect!

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