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The Goal

- ❑ To determine how stormwater quality is affected by the type of gutter and pipe materials, environmental parameters causing degradation of the material, time of contact, and interactions of those factors.

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Prior Research


- ❑ Contribution of rooftop material to runoff water quality, for example:
 - Zinc concentrations from uncoated galvanized metal ranged between 3.5 and 9.8 mg/L (Clark, Long et al., 2008).
 - Zinc concentrations from coated galvanized metal were below 0.5 mg/L (Clark, Long et al., 2008).
- ❑ Effect of pipe material and environmental parameters on drinking water quality, for example:
 - Iron concentration from PVC pipes reached 0.058 mg/L after 3 days of exposure (Lasheen M.R., Sharaby, C.M., et. al, 2008).

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Experimental Design


- ❑ A series of long-term static leaching tests
 - ❑ Eight roof and pipe materials
 - ❑ Low and high pH condition
- ❑ Natural storm water was collected in the city of Tuscaloosa from downspouts and from storm drain inlets.

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Materials:

- Gutter Materials: vinyl, aluminum, copper, and galvanized steel.
- Pipe Materials: concrete, HDPE, PVC, and galvanized steel.
- New materials
- Concrete pipes - 15 cm long
- The rest of pipes - 30 cm long



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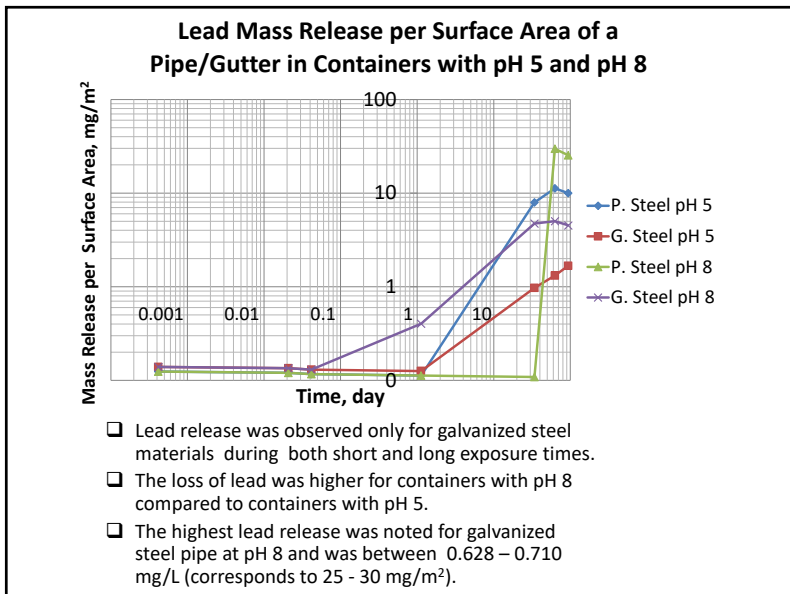
Experimental Design

- Containers with pH values of 5 and 8 (using $\text{Na}_2\text{HPO}_4 \cdot 2\text{H}_2\text{O}$ and KH_2PO_4 to create buffers)
- Sampling times: time zero, 0.5 hr, 1 hr, 27 hr, 1 mo, 2 mo, 3 mo

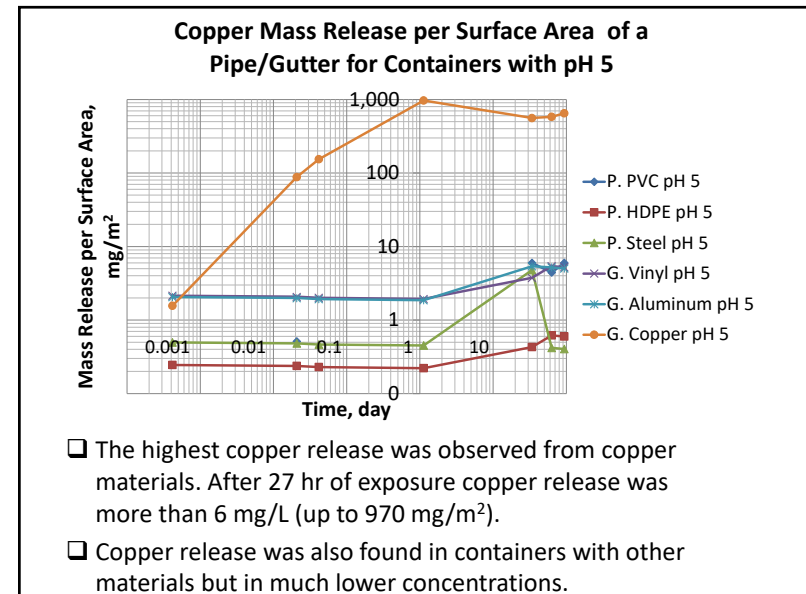
Measured Parameters:

- Metals (cadmium, chromium, lead, copper, zinc, aluminum, and iron)
- Toxicity (Microtox)
- pH
- Nutrients (ammonia nitrogen, total nitrogen, nitrate) and COD

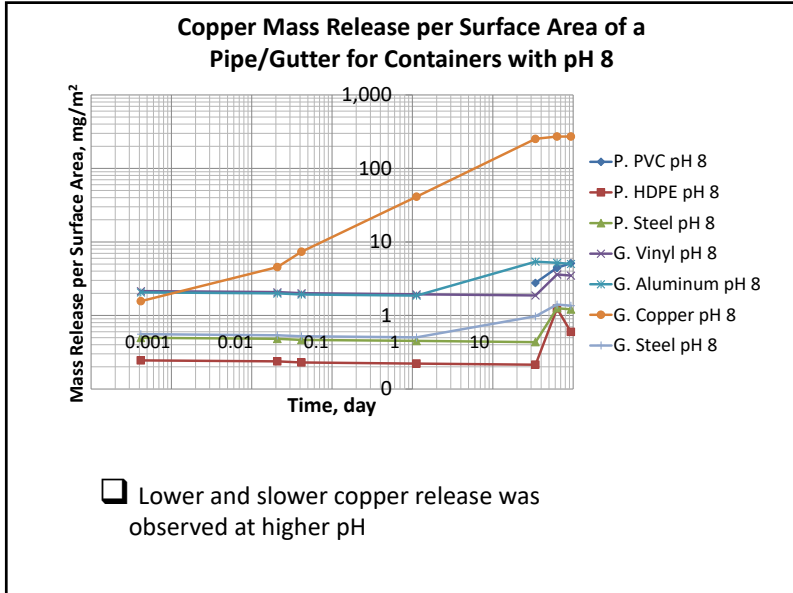
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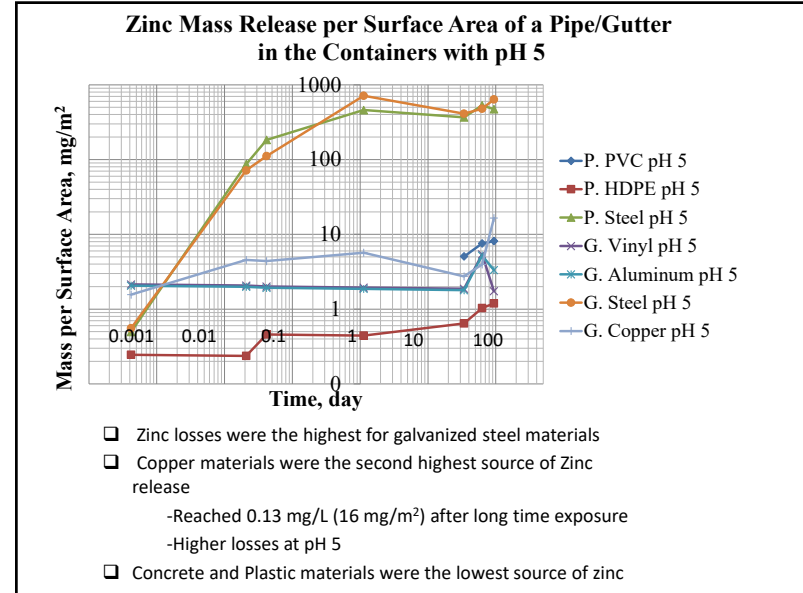
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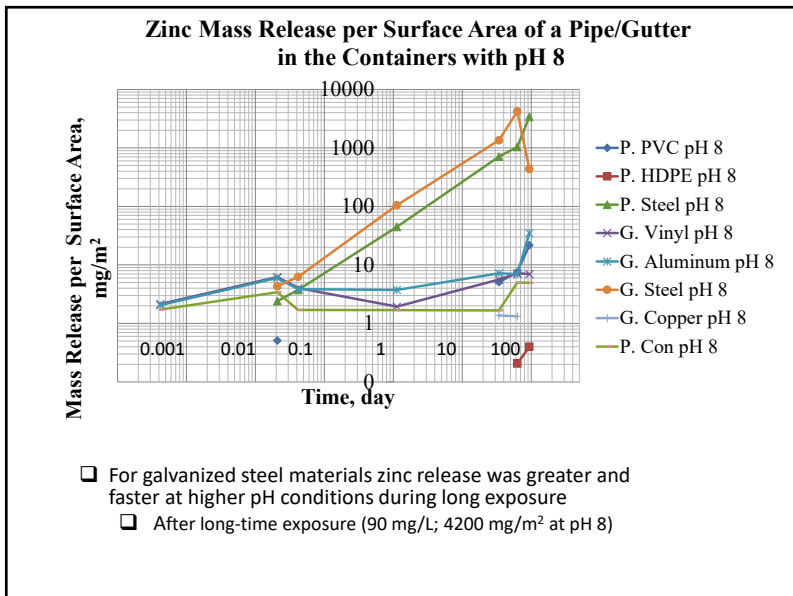
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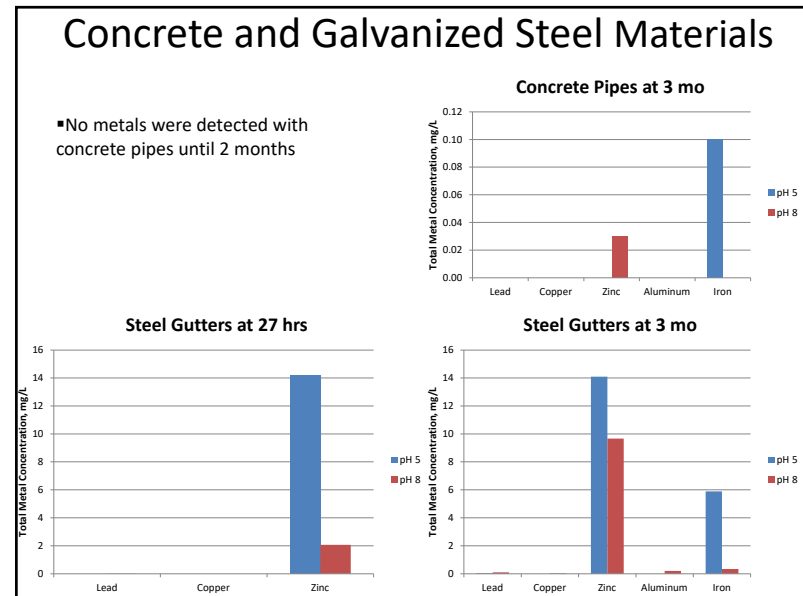
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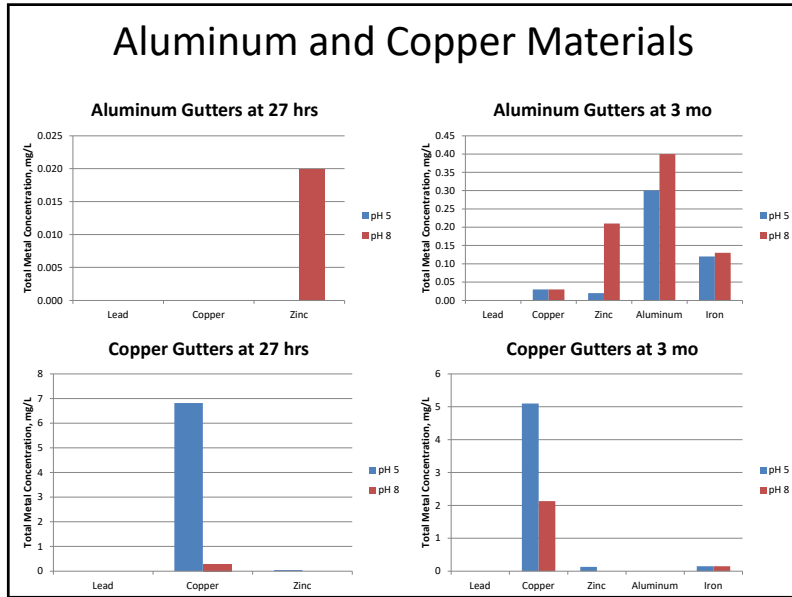
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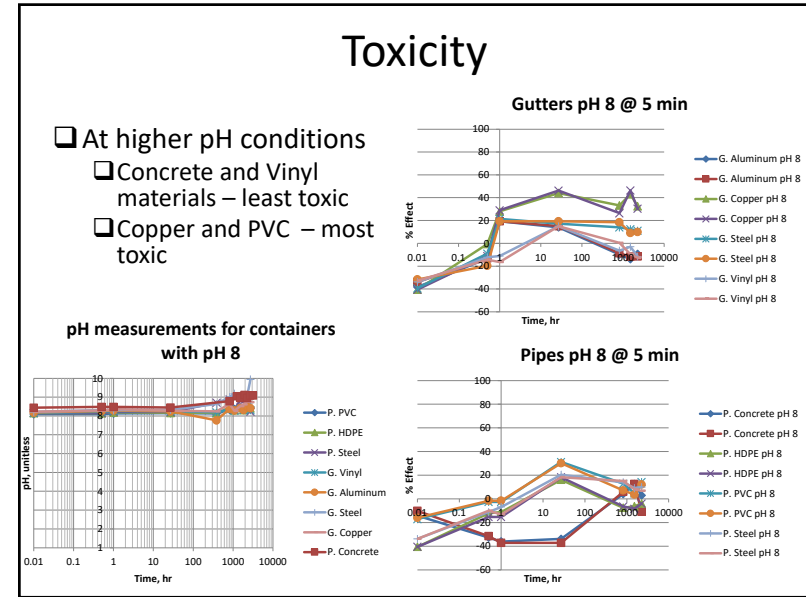
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Conclusions

- The greatest source of lead, zinc, and iron were galvanized steel materials, while copper materials were the highest source of copper.
- Lead and Zinc release was detected during both short and long exposure.
- During short exposure time copper releases were detected only for copper materials at both low and high pH
- Copper and aluminum materials had the highest toxicity, while concrete materials were least toxic.

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References

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Acknowledgements

- NSF EPSCoR

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Thank you!