Evaluation of the Effectiveness of "No Dumping" Signs in Preventing Chemical Contamination of Inlet Stormwater (Preliminary Research)

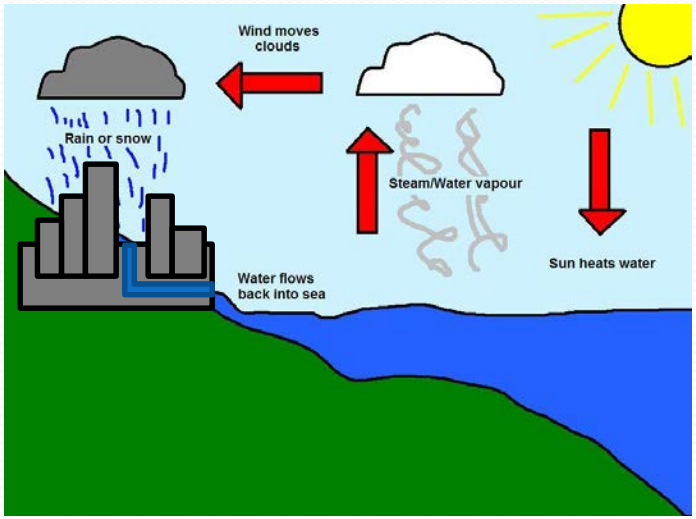
Dana A. Lackey
University of Alabama at Birmingham
September 10, 2015

Introduction

- Since the summer of 2010, I have collaborated with several researchers and other individuals for an ongoing project regarding stormwater runoff and its effects on local watersheds.
  - Dr. Robert W. Peters, P.E.
  - Dr. Atul Kajale
  - J. David Hagan, UAB OHS
- Here is a brief outline of this presentation:
  - Problem Statement
  - Background research
  - Planned/Future research
    - Research Tasks
    - Methodology
  - Limitations
  - Conclusions

Problem Statement and Overview

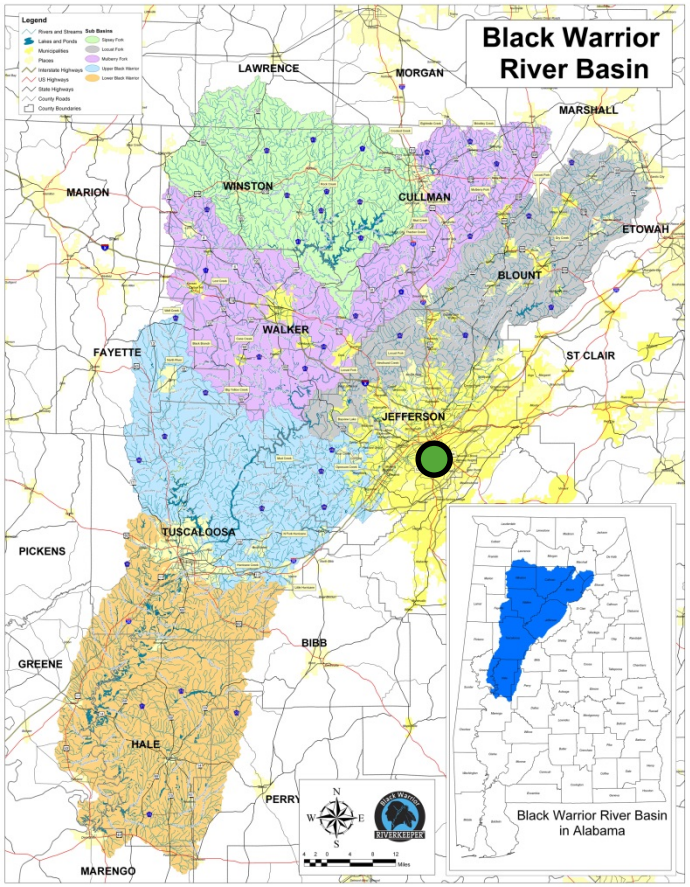
- Why Storm Drains?
  - Hydrologic Cycle



  - Natural State vs. Developed State

- Runoff can easily become contaminated
- Sources of contamination may be nearby or further away
- Risk assessment of contamination done at UAB (UAH later)
- Good to consider watersheds

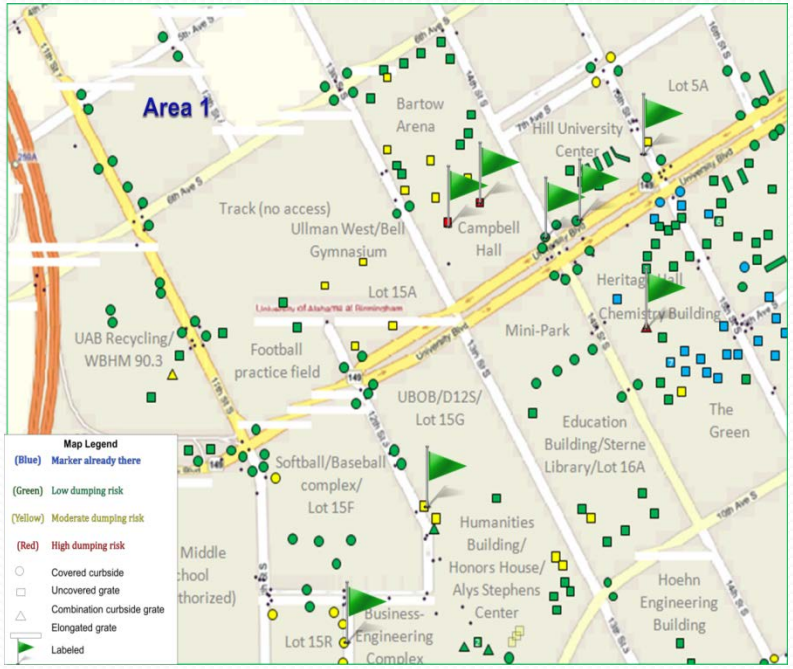
Maps of Watersheds impacted by UAB and UAH



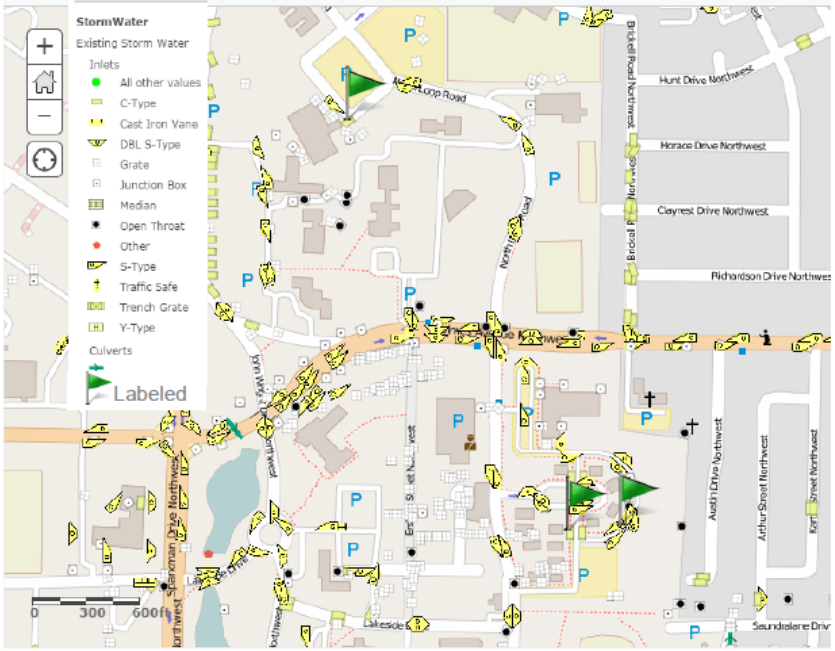
Background

- In summer of 2010, risk assessments were performed on strategic areas of the UAB campus.
  - Point sources

- Targets for labels were chosen in 2012 (UAB)



Background Maps



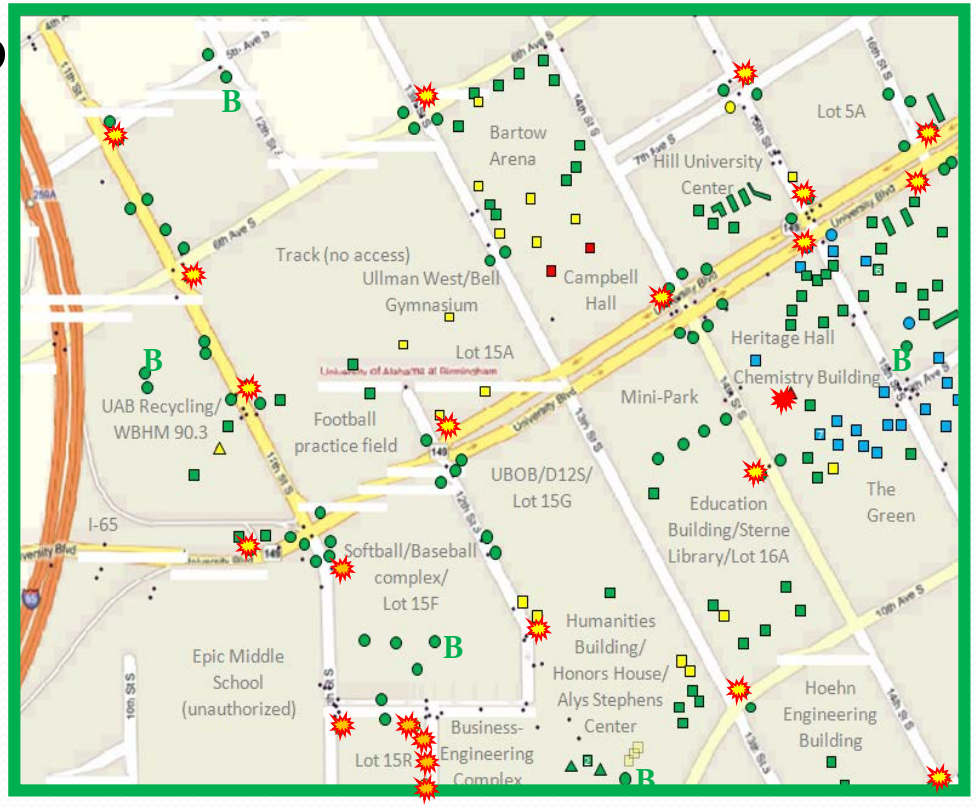
Research Tasks

- Now that the labels have been placed, it becomes natural to evaluate where illicit dumping might still be taking place.
- Chemical Sensors
  - Vapor Phase
  - Liquid Phase
- Grab Autosamplers
- Cameras

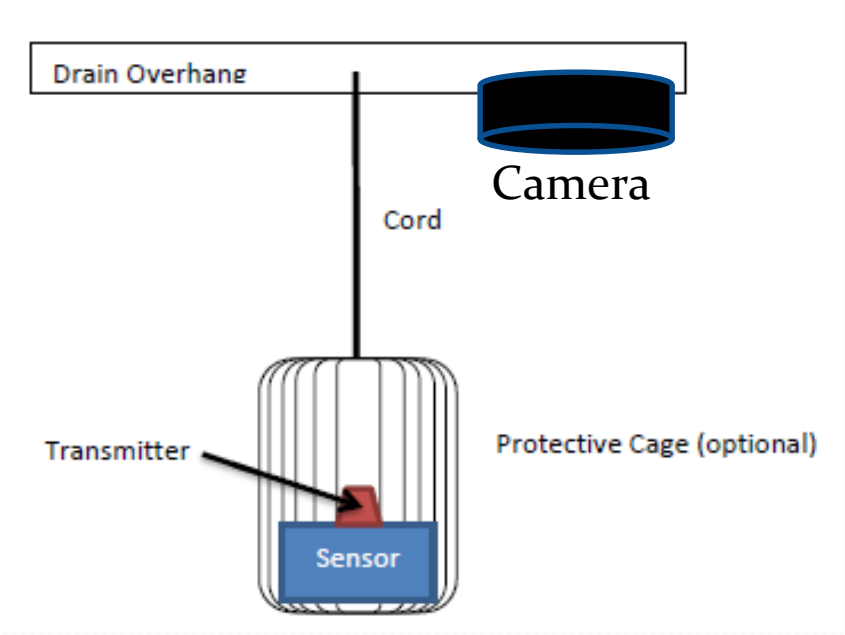
Methodology

- When deciding where to place chemical sensors, one must also consider Nonpoint sources
- New scale 1-5

	Area 1 Total
1	4
2	27
3	52
4	6
5	1



Methodology and Sample System



- A more mathematical method of sensor placement is given by the Fisher formula:

$$\max_{x_i} \sum_{i=1,\ldots,n} FI_i x_i$$

$$\text{s.t.} \sum_{i=1,\ldots,n} C_i x_i \le B; \quad x_i \in \{0,1\}, \quad i = 1,2,\ldots,n$$

Targeted Research Plans

- Fall 2015: ECE department can develop and procure the chemical sensors for first-flush concentrations
- 2015-2016: Laboratory-scale testing of sensors, autosamplers, and cameras to known contaminants; develop integrated system
- 2016-2017 Academic Year:
  - Installation of integrated systems
  - Study of storm duration effects
  - Testing of systems in-situ
- Calendar year 2017
  - Testing for potential illicit dumping
  - Assessment of municipal applications

The reality of the situation

- We believe that there is a real need to determine whether or not warning signs have any effect on runoff water quality.
- We have submitted several applications regarding different possibilities for funding sources—all rejected to this point in time.
- We would like to keep the interdisciplinary nature of the project in focus (e.g.: involvement of OH&S and/or ECE)
- We believe that this research would provide a valuable benchmark in future watershed planning (e.g.: that done by AWAWG)

Conclusion

- The risk-assessments of storm drains based on probable point and non-point sources laid the groundwork for a full chemical analysis.
  - Warning labels
  - Hot spots
- Much is still to be done that is currently not financially feasible.
- Reviewer comments are being addressed to revise proposals for re-submission.
- Any leads to a funding source we have not yet considered would be greatly appreciated.
- Looking forward to giving update at next year's AWRC.

Acknowledgements

- Dr. Robert W. Peters and Dr. Jason T. Kirby, Civil, Construction, and Environmental Engineering
- J. David Hagan and Shatha Salah, Occupational Health & Safety
- Dr. Atul Kajale

UAB SCHOOL OF ENGINEERING

You Don't Know What You Don't Know…