

**The impact of a poultry processing plant on
the concentration of antibiotic-resistant
bacteria in a stream in northwestern South
Carolina**

**Steve McCauley, Kelly Funderburk, Taylor Edwards, Greg
Lewis and Min-Ken Liao**

Furman University, Biology Department



Introduction

- Human activity can have a serious impact on stream ecology
- Streams in urban areas tend to have more solutes and higher concentrations of bacteria than pristine streams
- Contaminants from two kinds of sources:
 - Non-point sources: impervious surfaces (e.g. paved areas, roads), agricultural fields, lawns
 - Point sources: sewage treatment plants

Location

- House of Raeford's Columbia Farms chicken processing plant in Greenville, SC
- Plant has drainage pipe that releases wastewater effluent into a nearby stream
 - Bacteria of animal fecal origin
 - Antibiotic-resistant bacteria





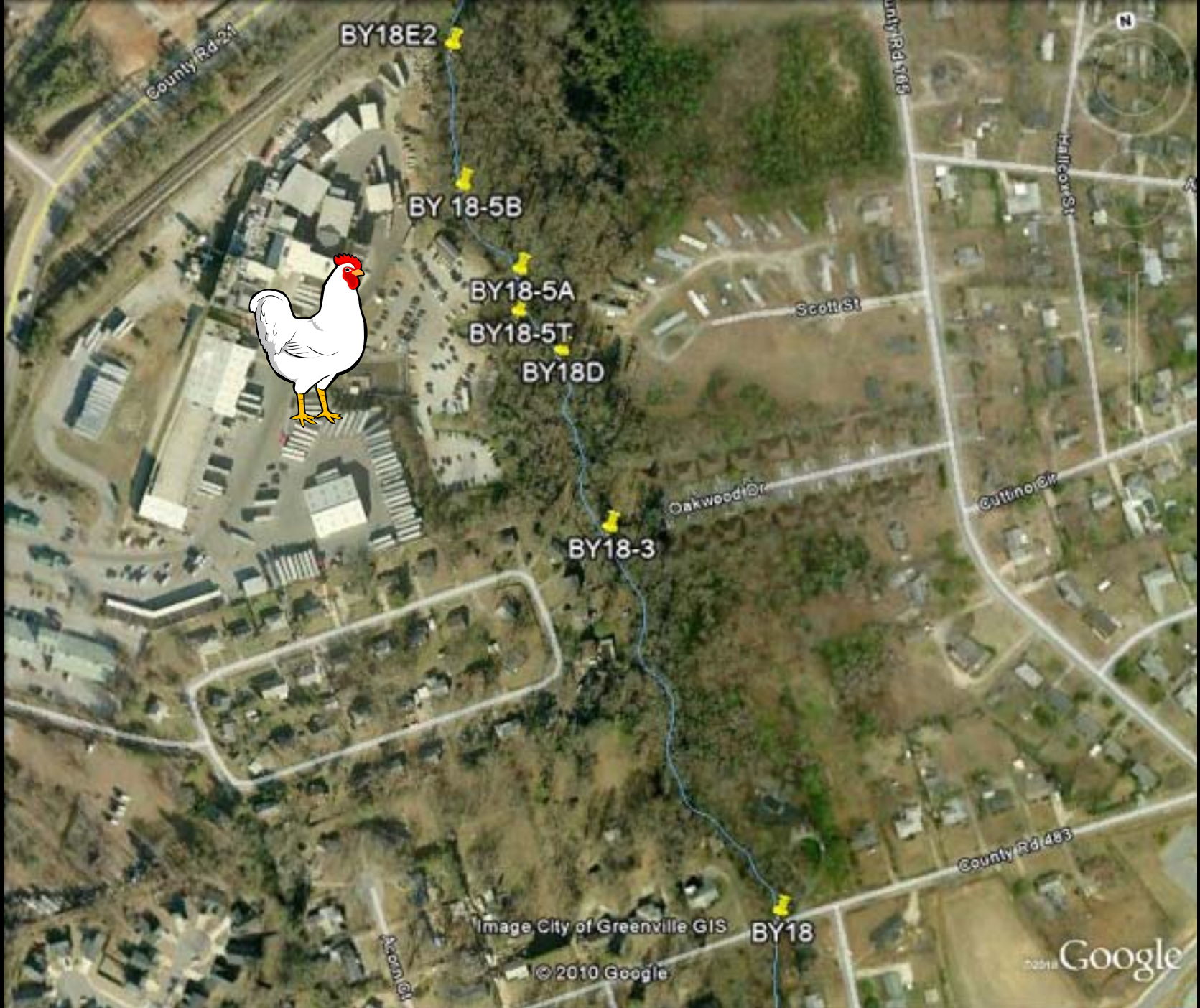
Hypotheses

- Higher levels of solutes and fecal bacteria downstream from the drainage pipe
- Higher levels of antibiotic-resistant bacteria downstream from the pipe
- Differences in the genetic diversity of *Escherichia coli* populations



Sampling Methods

- Two water sampling trips
 - July 6th and July 26th in 2010
- Analyzed water chemistry
- Indicator bacteria analyzed using IDEXX
- Bacteria were isolated using the EPA's standard membrane filtration protocol
- Investigated phylogenetic diversity of *E. coli* using multiplex PCR



BY18E2

BY 18-5B

BY18-5A

BY18-5T

BY18D

BY18-3

BY18

County Rd 24

County Rd 163

Halliwell St

Scott St

Oakwood Dr

Culliner Dr

County Rd 483

Aspen Ct

Image City of Greenville GIS

© 2010 Google

Google

lat 34.892670 lon -82.365532 elev 325 m

Eye all 969 m



BY18-5A

BY18-5T

BY18D

Image City of Greenville GIS
Gray Buildings © City of Greenville GIS
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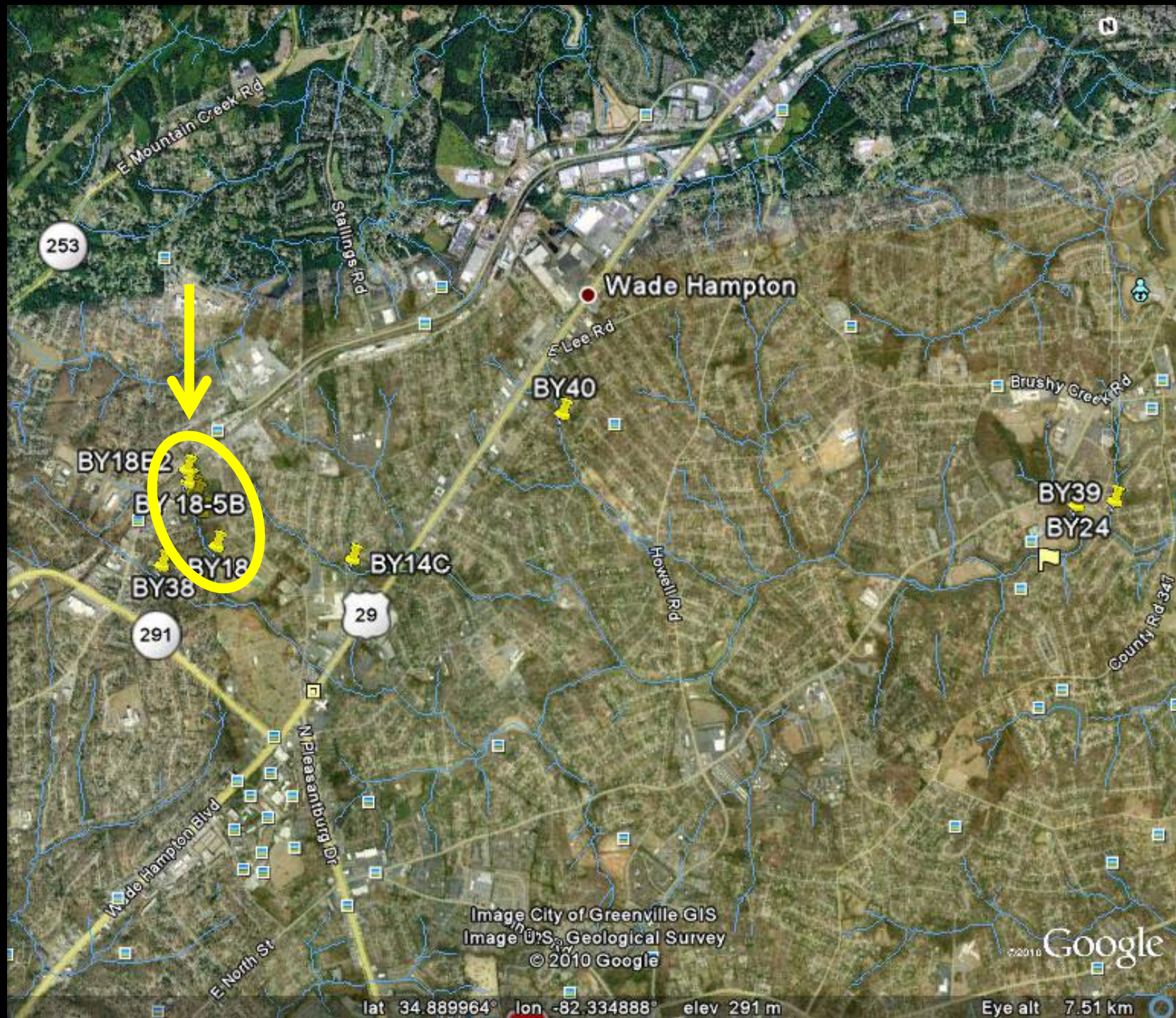
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1221 ft

Imagery Date: Feb 26, 2009

34°53'37.65" N 82°21'58.52" W elev 1074 ft

Eye alt 1503 ft



BY18E2

BY18-5B

BY18

BY38

BY14C

BY40

BY39

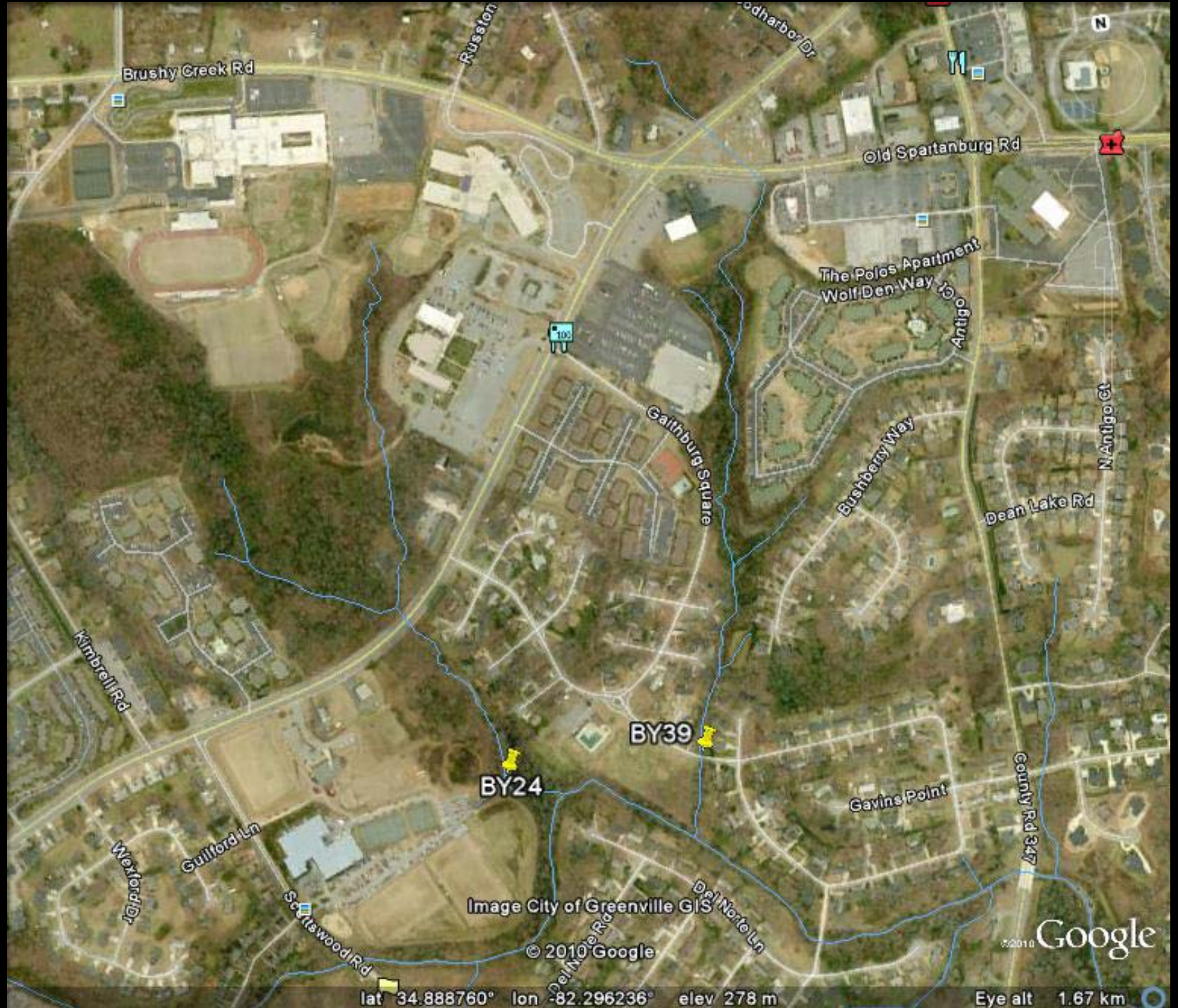
BY24

Image City of Greenville GIS
Image U.S. Geological Survey
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lat 34.889964 lon -82.334888 elev 291 m

Eye alt 7.51 km



Brushy Creek Rd

Rushton

Godharbor Dr

Old Spartanburg Rd

The Poles Apartment
Wolf Den Way

Gaithburg Square

Bushberry Way

N Antigo Ct

Dean Lake Rd

Kimbrell Rd

BY39

BY24

Gavins Point

County Rd 247

Westford Rd

Gullford Ln

Scottswood Rd

Image City of Greenville GIS

Del Norte Ln

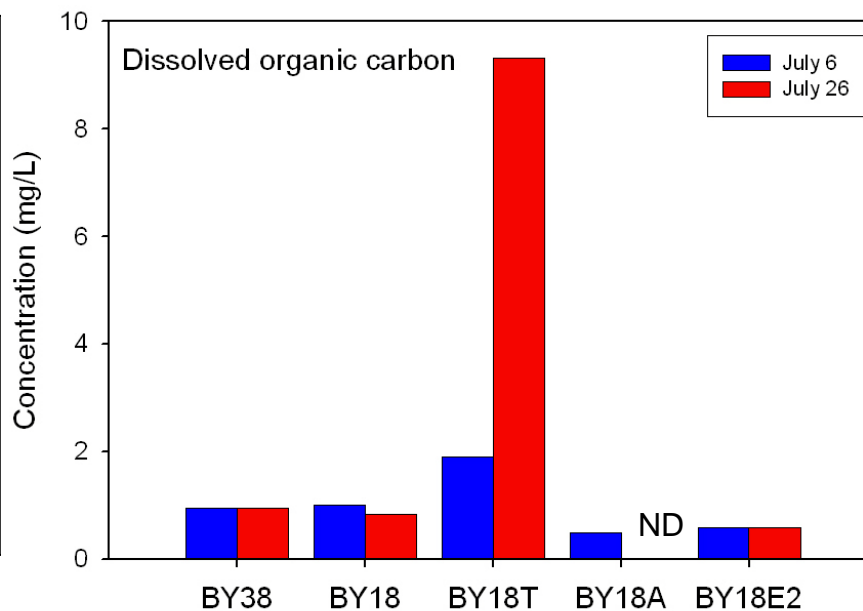
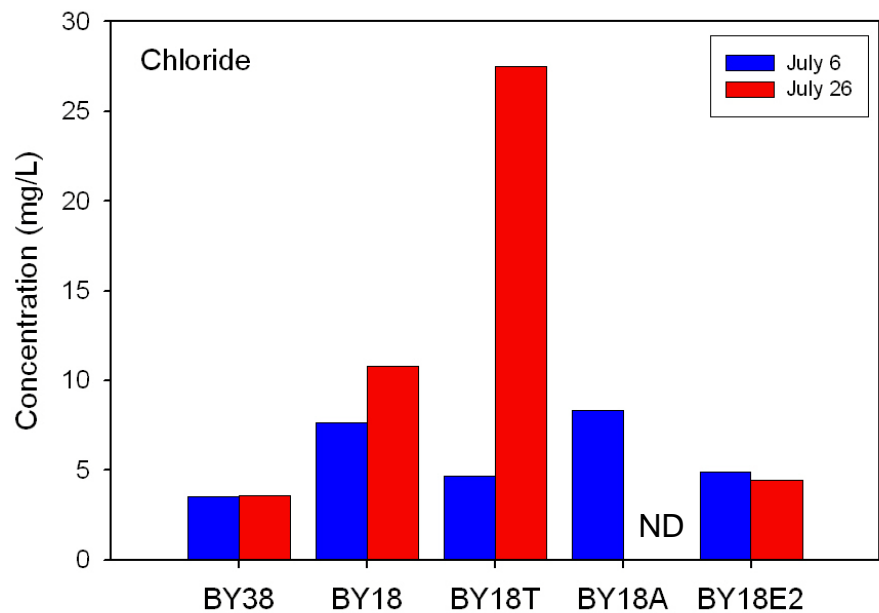
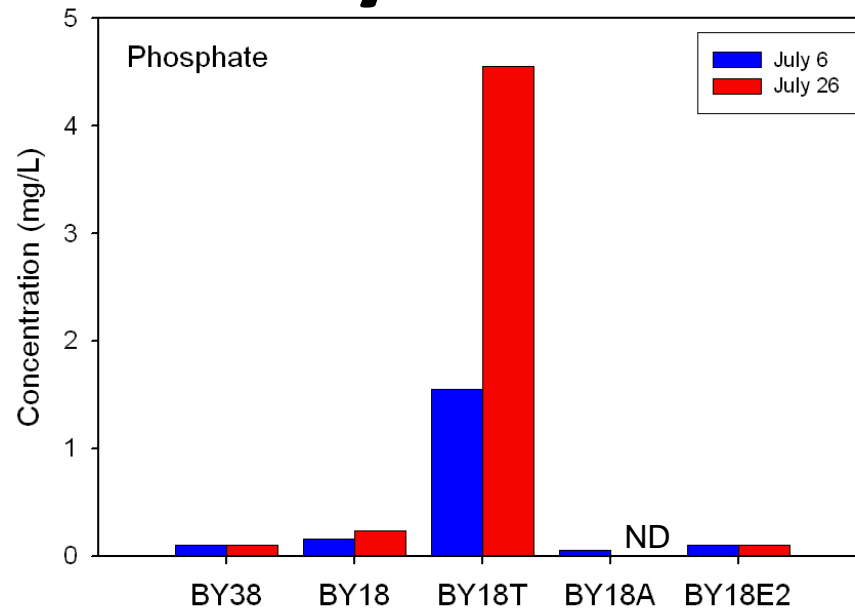
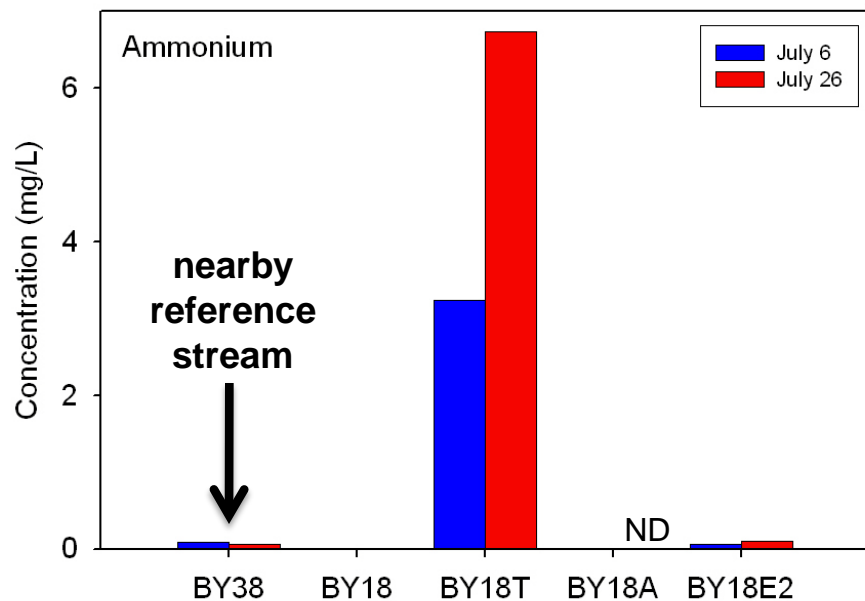
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Google

lat 34.888760° lon -82.296236° elev 278 m

Eye alt 1.67 km

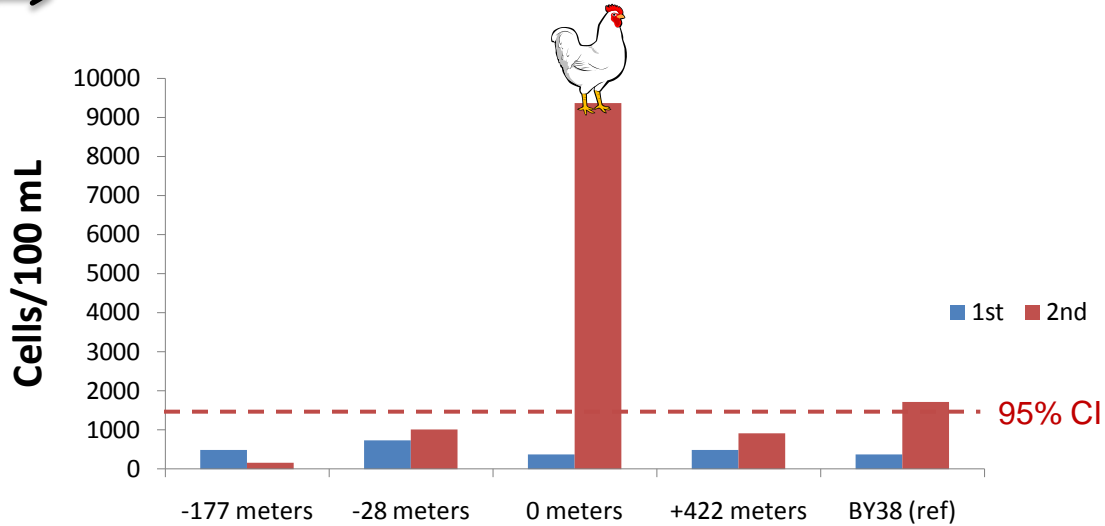
Water chemistry



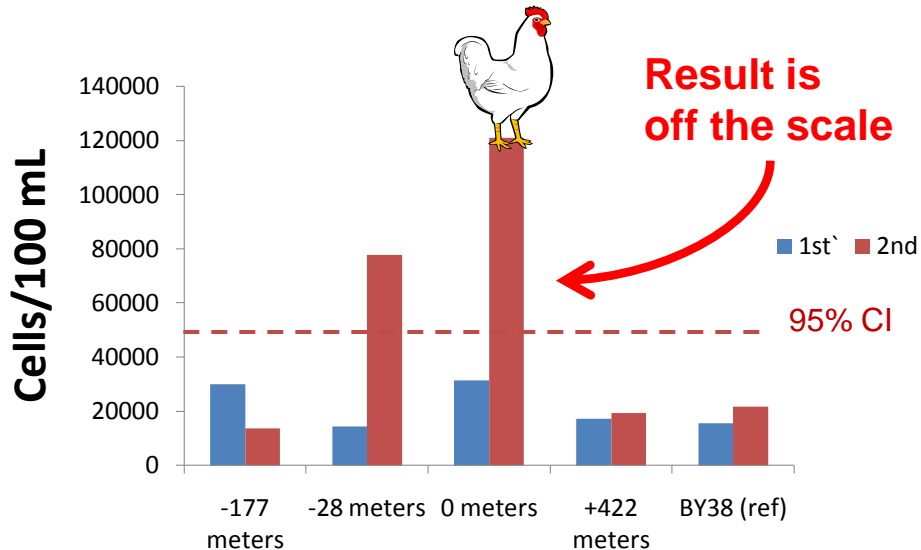
Indicator Bacteria

Downstream →

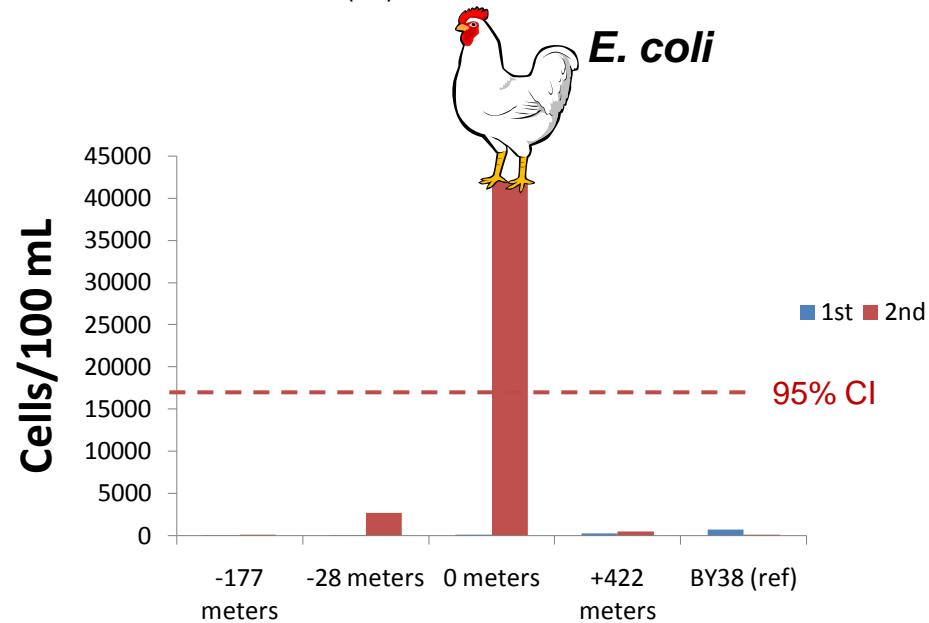
Enterococcus



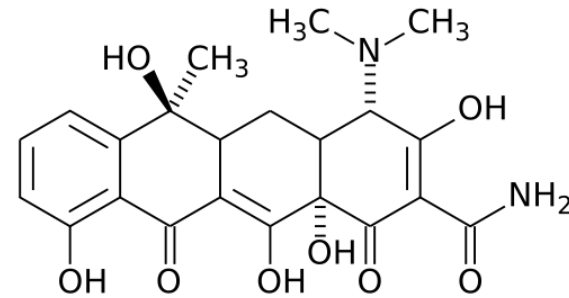
Total Coliform



E. coli

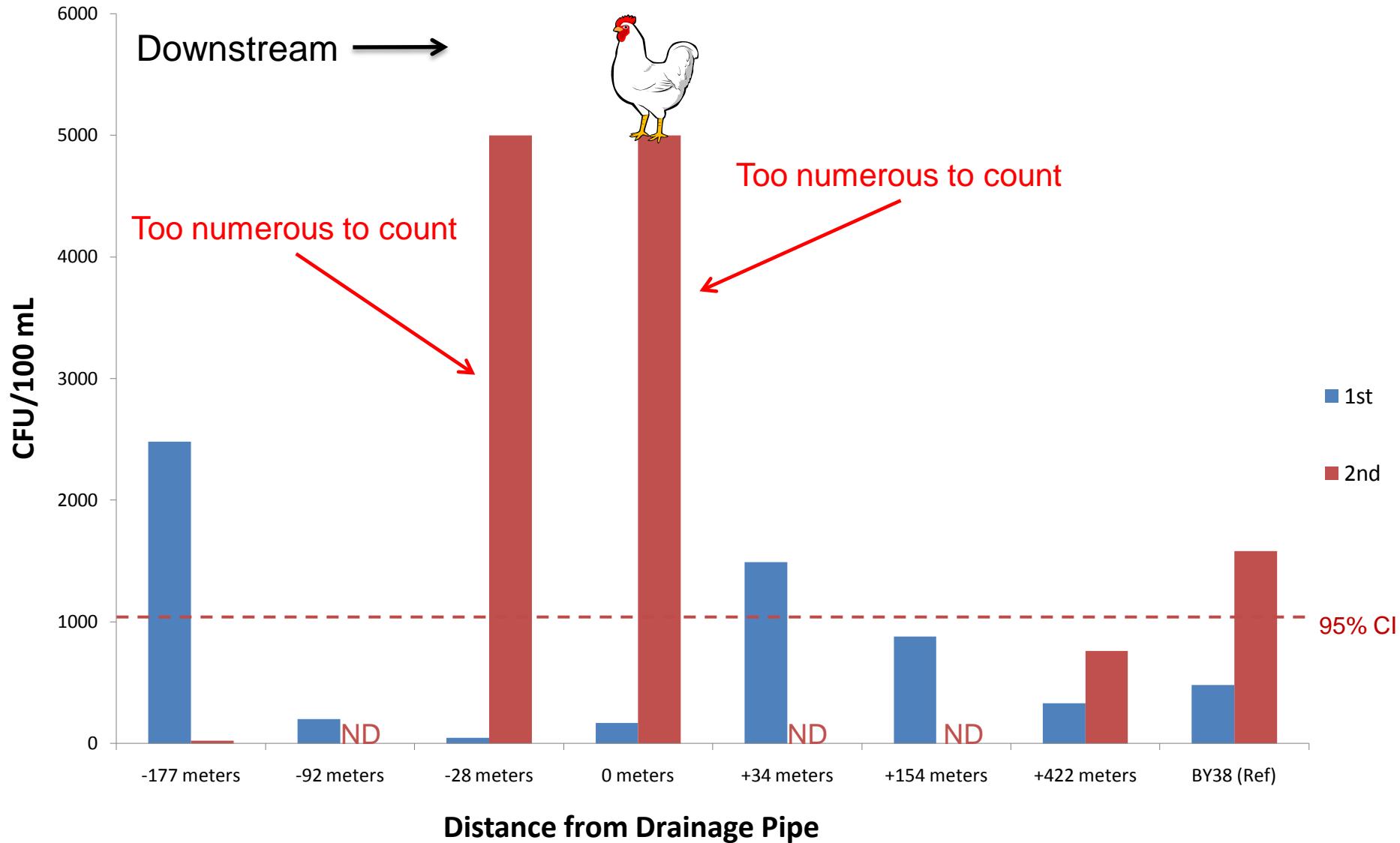


Tetracycline

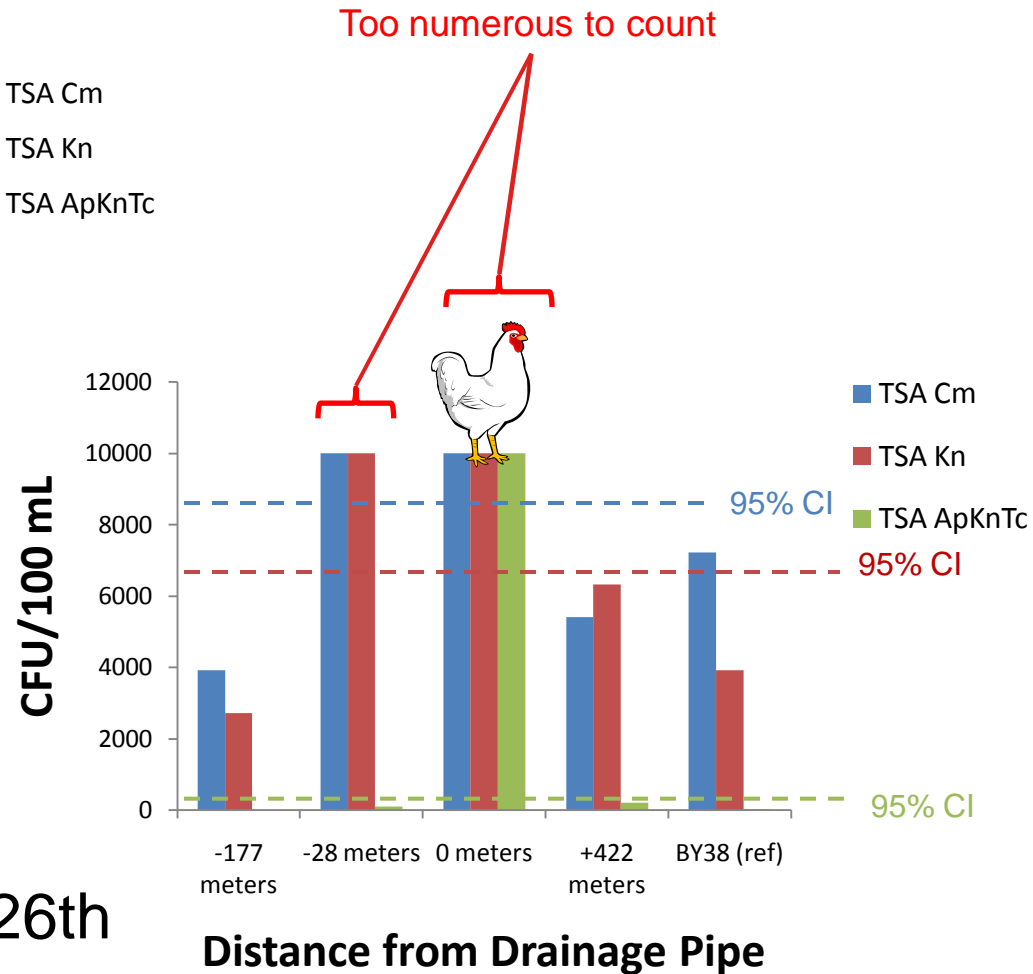
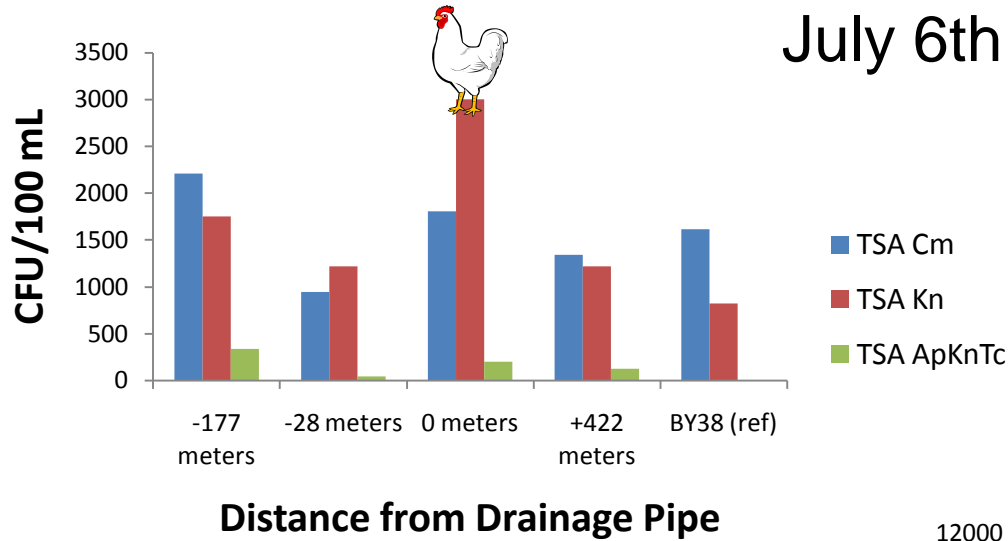


- Promotes growth in livestock
- Agricultural use has increased 15 times in the past 30 years
- Over 70% of all antibiotics used in the US are used as feed additives
- Shown to select for resistant bacteria

Tetracycline Resistant Bacteria



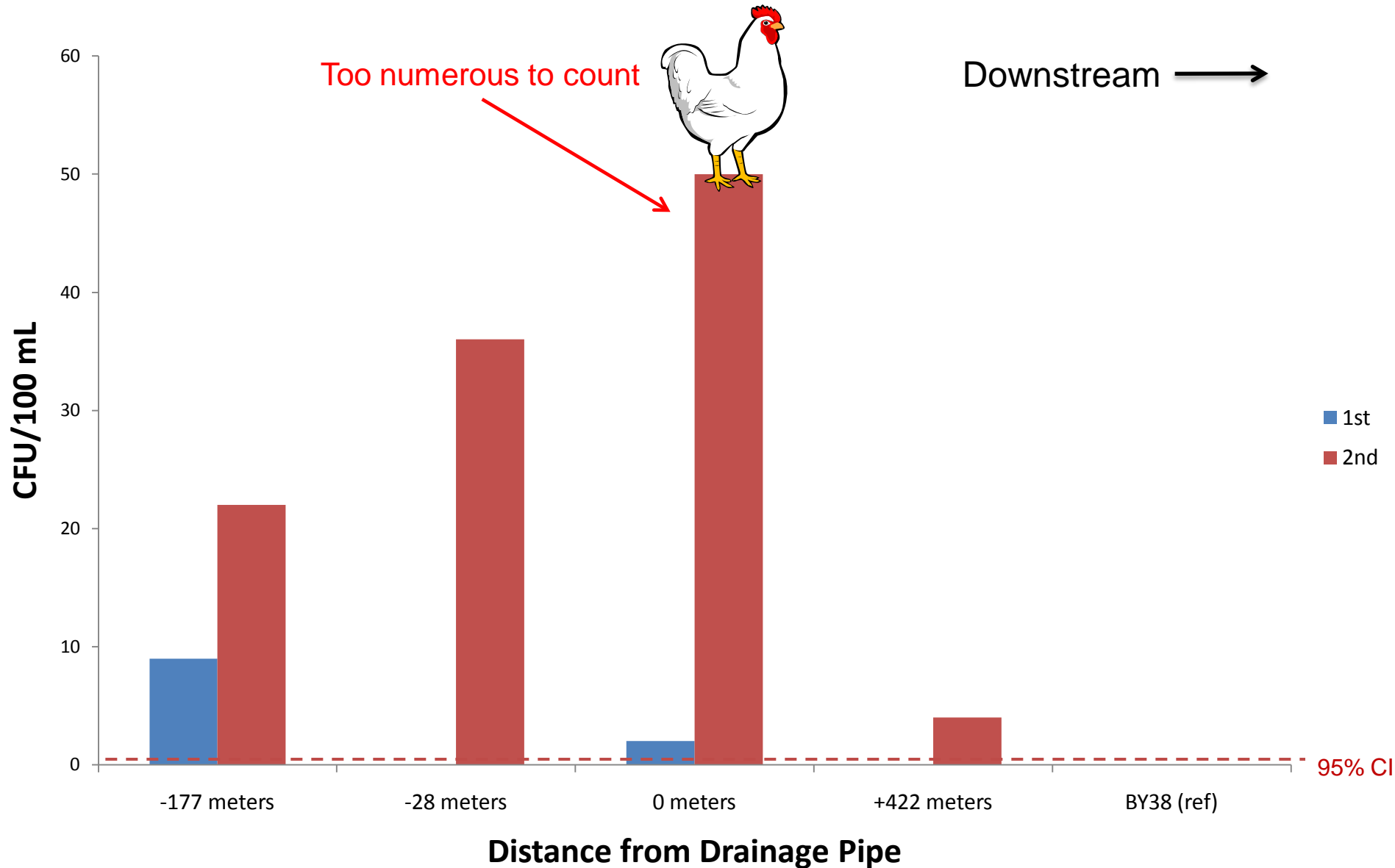
Other Antibiotic-Resistant Bacteria



July 26th

Downstream →

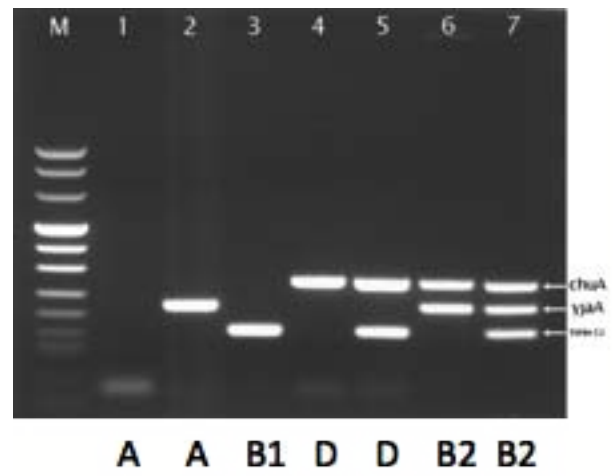
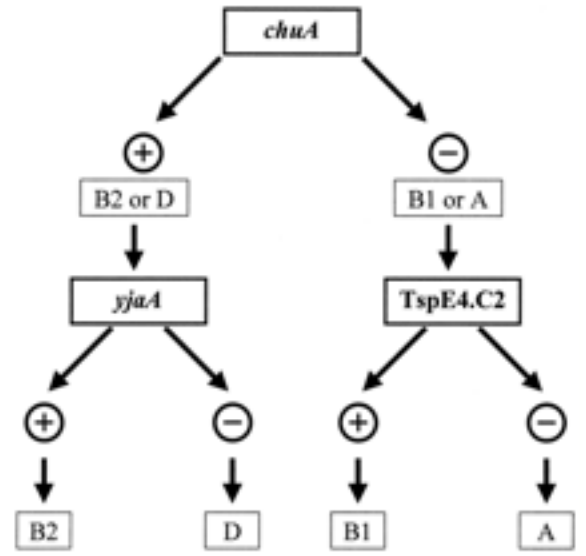
Tetracycline-resistant *E. coli*

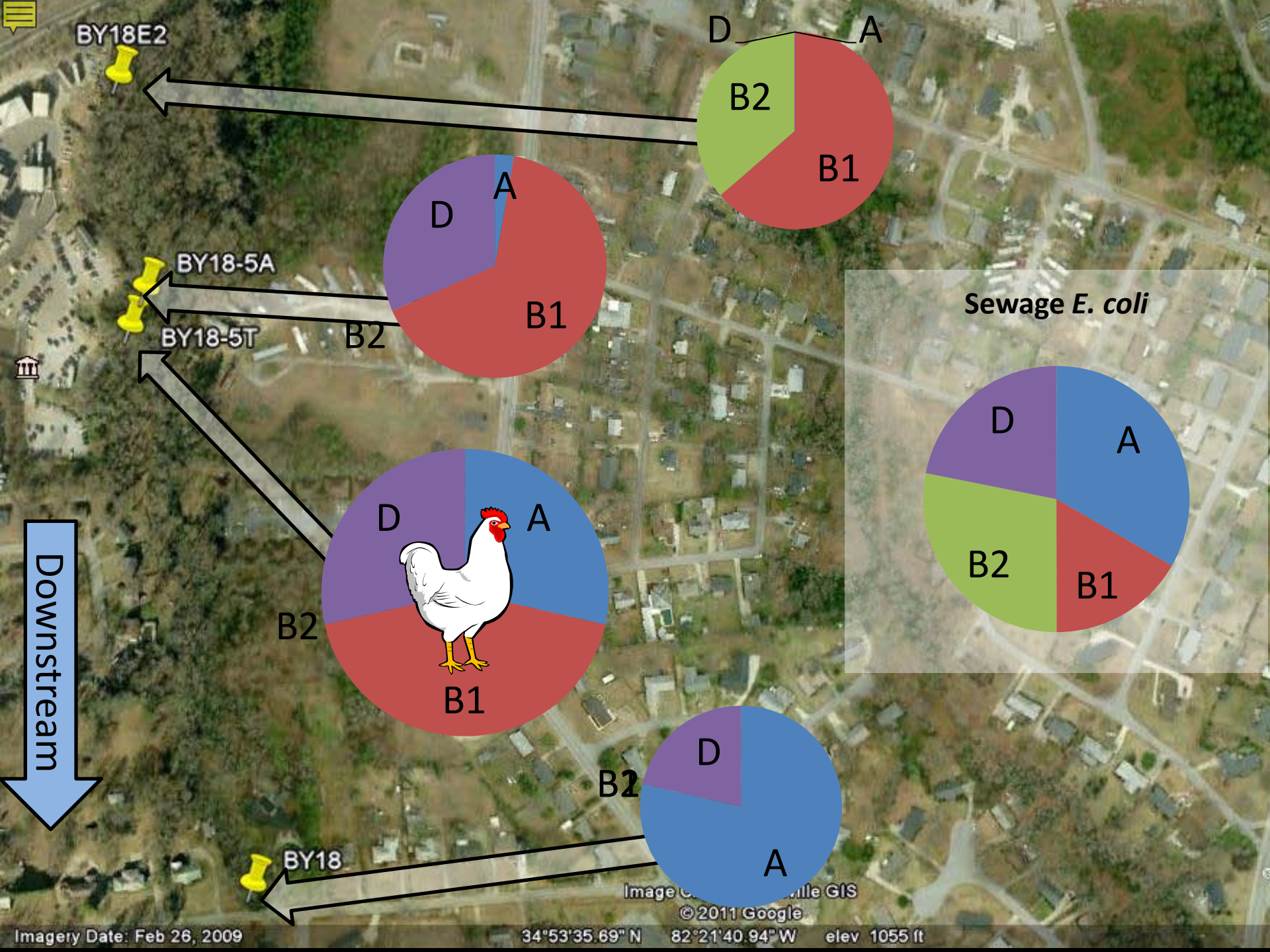




E. coli Reference Collection (ECOR)

- Established in 1984 by Hochman and Selander
- Divides environmentally-isolated *E. coli* in several large phylogenetic categories including A, B1, B2, D
- Compare to reference collection samples





Summary

- Higher levels of dissolved ions in the pipe tributary
- Higher concentrations of antibiotic resistant environmental bacteria just downstream from drainage pipe
- High concentrations of indicator bacteria at drainage pipe
- Populations of *E. coli* up and downstream of the pipe were different

Acknowledgements

- Furman Advantage
- Associated Colleges of the South, Mellon Faculty Renewal Grant
- Great Lakes WATER Institute for ECOR samples