Water Quality and Fecal Coliform Assessment

Peter Nguyen

Mentor: Dr. Jairo Diaz

Alcorn State University – Mississippi River Research Center

Center for Ecology and Natural Resources

1000 ASU Drive #209

Lorman, MS 39096

About Me

- Undergraduate Student at Oberlin College
  - Third Year – Environmental Studies
    - Pathway – Environmental Geology
    - Focus on Water Sustainability

My Mentor: Dr. Jairo Diaz

- Director of Mississippi River Research Center
- Assistant Professor at Alcorn State University
- Received Ph.D. from Mississippi State University in Civil Engineering
- Research Interests:
  - Surface Hydrology and Watershed Studies
- Mentoring NOAA-NGI Students since 2010:
  - Carina Lopez, Polytechnic University of Puerto Rico, 2010
  - Gabriel Roman, University of Puerto Rico, 2011
  - Amy Mayedo, University of Florida, 2013

Internship Overview

- Water Sampling as part of Acid Neutralizing Capacity of National Forests in Louisiana and Mississippi Project (Homochitto, Kisatchie, and Desoto)
- Water Quality Assessment of 4 lakes at ASU campus
  - Fecal Coliforms and E.Coli tests
    - Comparing two different incubators (egg vs. lab standard)
  - Physical Parameters
- Daily Variation of Dissolved Oxygen of water samples
- Vertical Profiles of ASU lakes
- Outreach and Education

Water Sampling in Kisatchie and Desoto National Forests

- May 24th to June 8th
- Sent Samples to US Forest Service Biogeochemistry Lab in Fort Collins, CO

Water Quality Assessment of ASU Lakes

Fecal Coliforms & E. Coli Tests

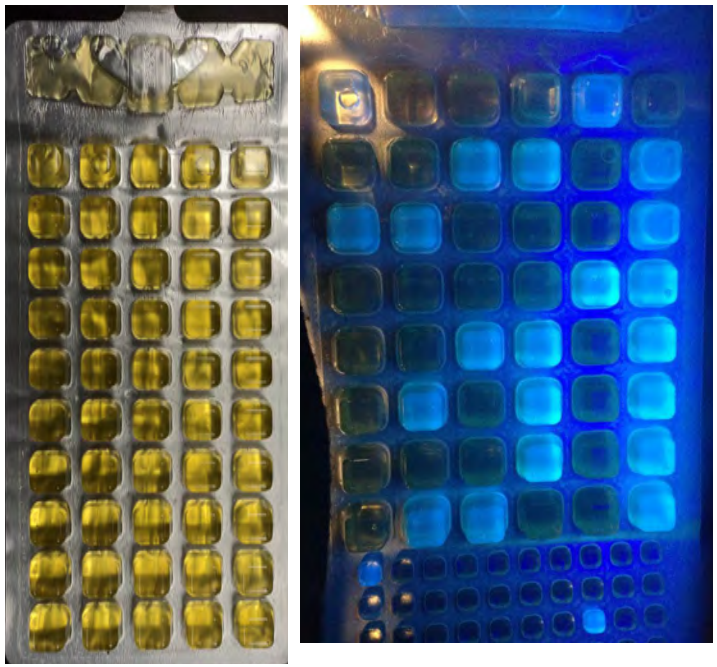
Colitag IDEXX Quanti-Trays

Coliscan Membrane Filters

3M Petrifilm
Count Plates

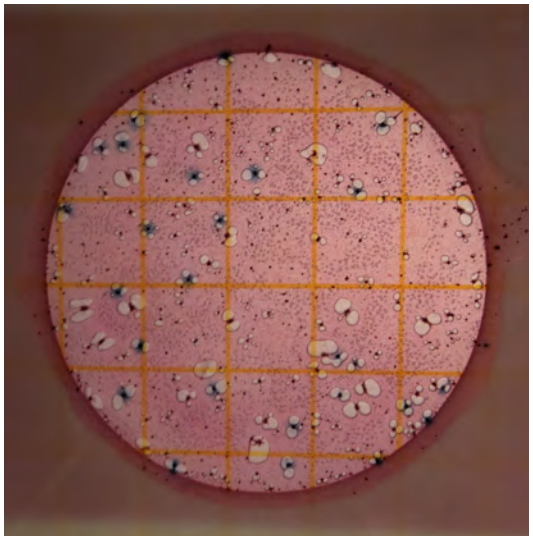
After 24 – 48 Hour Incubation

Colitag IDEXX Quanti-Trays



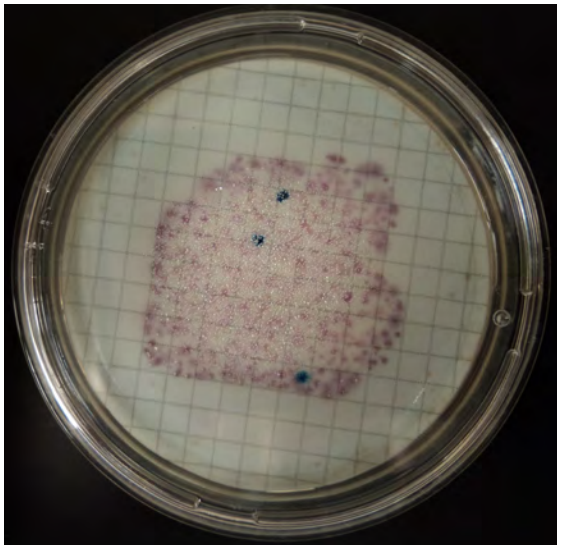
Unit: Most Probable Number (MPN) / 100 mL

3M Petrifilm



Unit: Number of Colonies / 1 mL

Coliscan MF



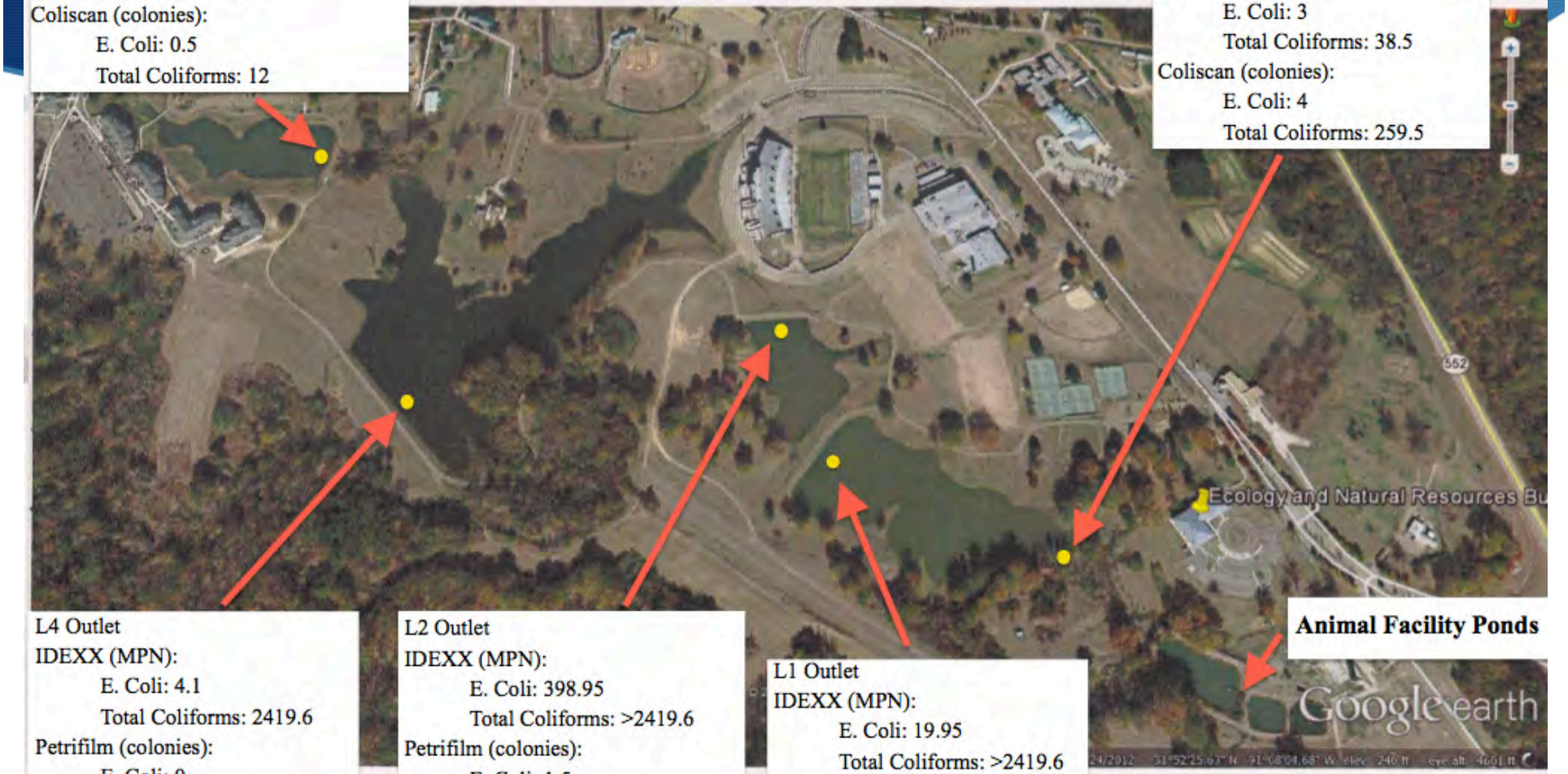
Unit: Number of Colonies / 1 mL

Median Values of Total Coliforms and E. Coli Counts

Alcorn State University's Lakes

L3 Outlet
IDEXX (MPN):
E. Coli: 14.55
Total Coliforms: 1483.35
Petrifilm (colonies):
E. Coli: 1
Total Coliforms: 8.5
Coliscan (colonies):
E. Coli: 0.5
Total Coliforms: 12

L1 Inlet
IDEXX (MPN):
E. Coli: 54.75
Total Coliforms: >2419.6
Petrifilm (colonies):
E. Coli: 3
Total Coliforms: 38.5
Coliscan (colonies):
E. Coli: 4
Total Coliforms: 259.5



L4 Outlet
IDEXX (MPN):
E. Coli: 4.1
Total Coliforms: 2419.6
Petrifilm (colonies):
E. Coli: 0
Total Coliforms: 14.5
Coliscan (colonies):
E. Coli: 0
Total Coliforms: 331

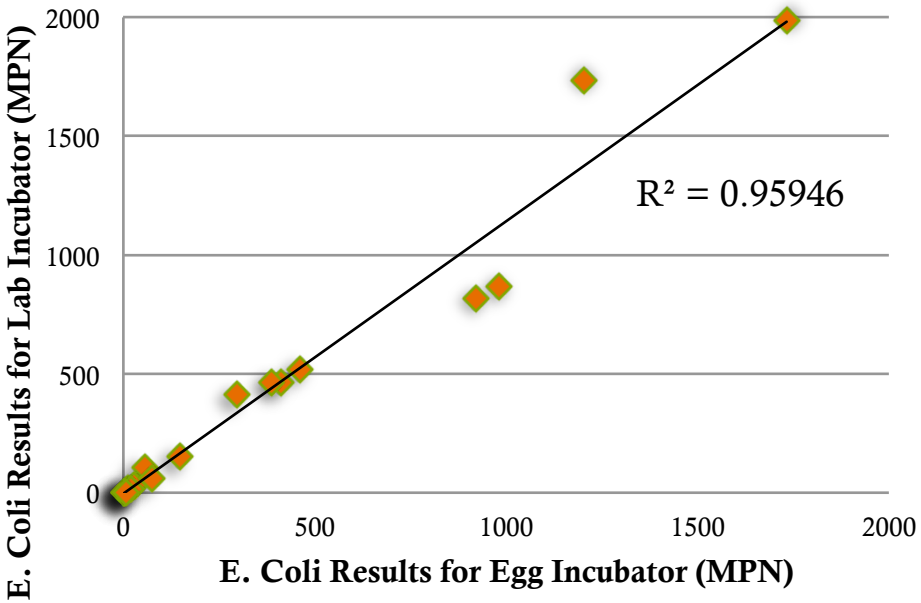
L2 Outlet
IDEXX (MPN):
E. Coli: 398.95
Total Coliforms: >2419.6
Petrifilm (colonies):
E. Coli: 1.5
Total Coliforms: 32.5
Coliscan (colonies):
E. Coli: 1.5
Total Coliforms: 160.5

L1 Outlet
IDEXX (MPN):
E. Coli: 19.95
Total Coliforms: >2419.6
Petrifilm (colonies):
E. Coli: 0.5
Total Coliforms: 47
Coliscan (colonies):
E. Coli: 1
Total Coliforms: 166.5

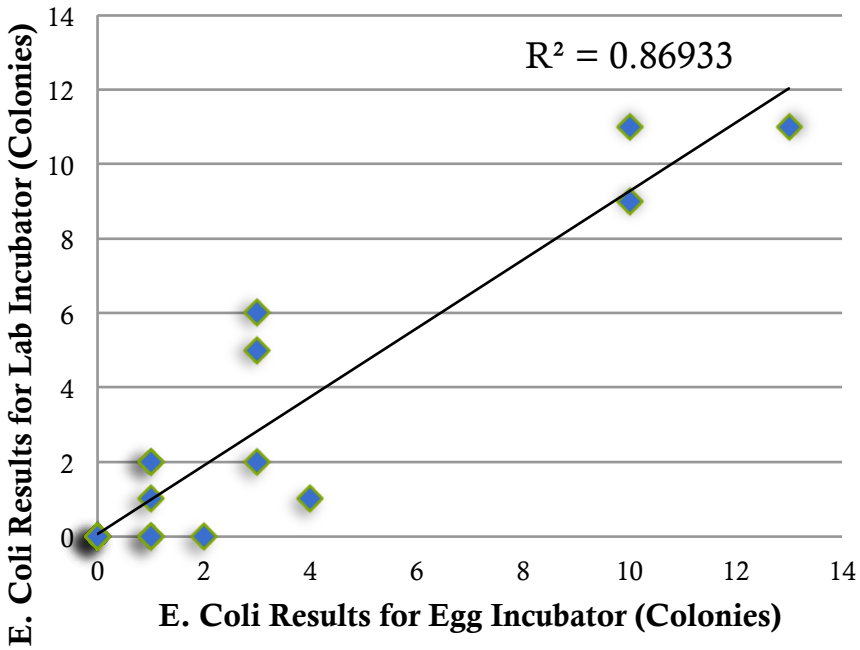
Animal Facility Ponds

Egg vs. Lab Incubator

Colitag IDEXX Quanti-Trays
Egg vs. Lab (MPN) Incubators (E. Coli)



3M Petrifilm - Egg vs. Lab (Colonies)
Incubators (E. Coli)



Physical Parameters

- Weekly Samples from June 11 to July 21, 2014
  - Example of Recording Data for L1 Inlet

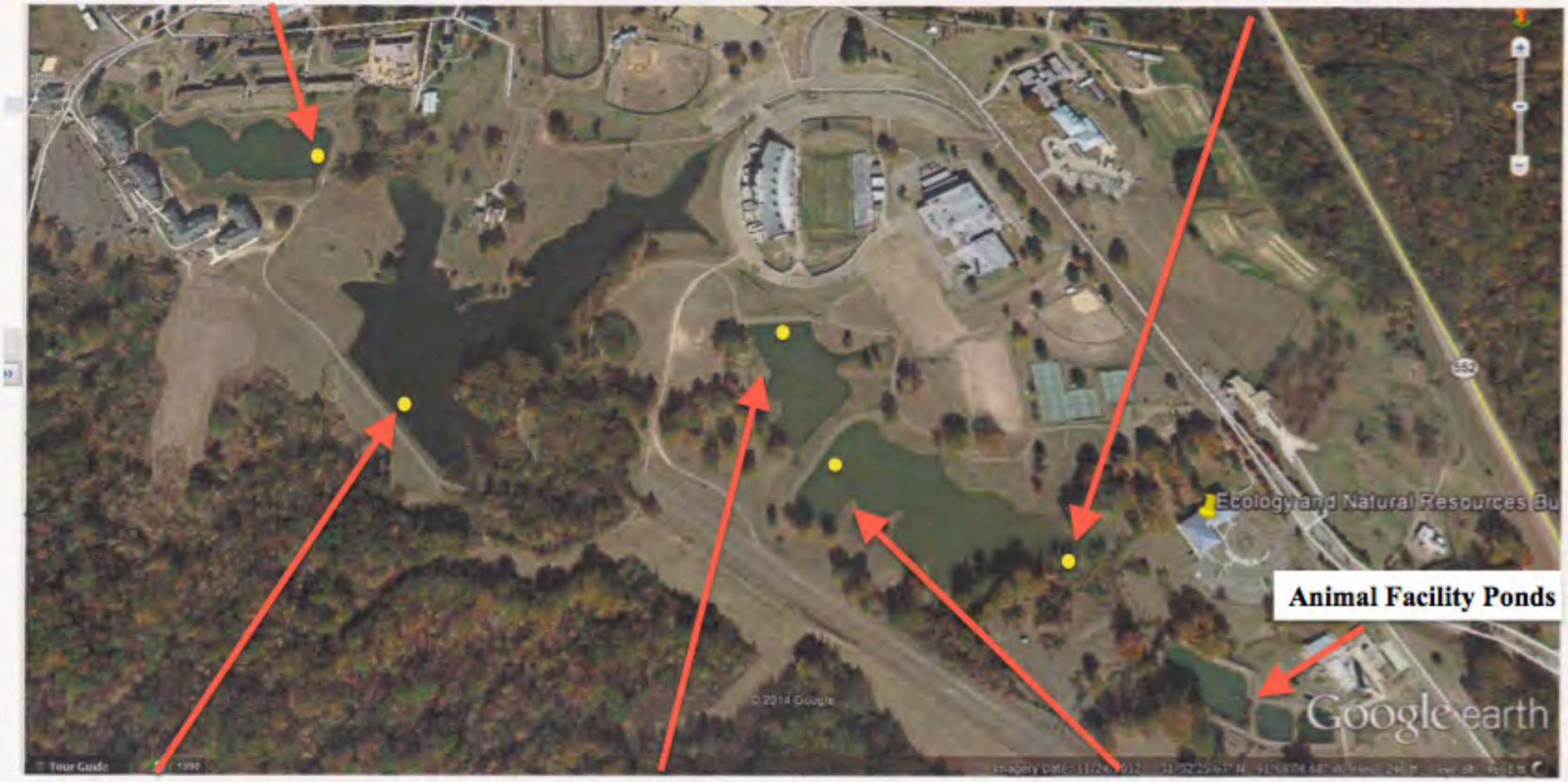
Sample Date	Site Name/ID	Time	Conductivity (uS/cm)	pH	DO (ppm)	Water Temperature_C	TDS (ppm)	Air Temperature_C
6/11/14	L1 Inlet	11:22am	113	10.15		28.4	56	28
6/16/14	L1 Inlet	11:40am	134	10.19	8.27	32.2	66	38
6/30/14	L1 Inlet	11:10am	136	8.05	4.36	32.1	68	32
7/8/14	L1 Inlet	10:15am	146	7.75	4.73	29.7	74	30
7/14/14	L1 Inlet	10:20am	110	8.97	9.28	31.1	56	29
7/21/14	L1 Inlet	11:11am	116	9.64	12.49	28.6	58	28

L3 Outlet
Conductivity (uS/cm): 123.5
Total Dissolved Solids (ppm): 63
pH: 9.615
Dissolved Oxygen (ppm): 9.71
Water Temperature (°C): 31.35

Median Values of Physical Parameters From June 11 to July 21, 2014

Alcorn State University's Lakes

L1 Inlet
Conductivity (uS/cm): 125
Total Dissolved Solids (ppm): 62
pH: 9.305
Dissolved Oxygen (ppm): 8.27
Water Temperature (°C): 30.4

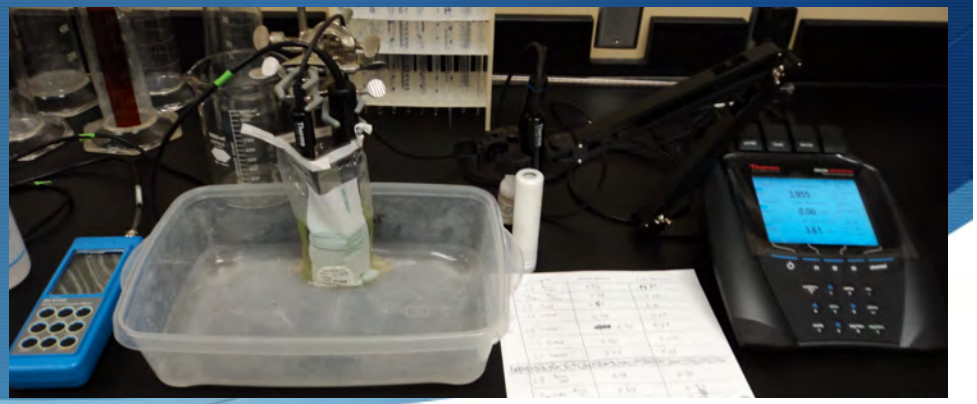


L4 Outlet
Conductivity (uS/cm): 155
Total Dissolved Solids (ppm): 77
pH: 9.975
Dissolved Oxygen (ppm): 11.365
Water Temperature (°C): 30.5

L2 Outlet
Conductivity (uS/cm): 138.5
Total Dissolved Solids (ppm): 70
pH: 9.925
Dissolved Oxygen (ppm): 11.26
Water Temperature (°C): 32.4

L1 Outlet
Conductivity (uS/cm): 126
Total Dissolved Solids (ppm): 61.5
pH: 9.965
Dissolved Oxygen (ppm): 9.62
Water Temperature (°C): 31.25

Comparing Two DO Meters



Comparing Two DO Meters (ppm)

Date/Time	Sample	HANNA HI 9146	Orion Versastar 083005MD	Difference
7/22/2014 11:30am	Lake 1 - Brown bottle	9.52	9.78	0.26
	Tap Water - Brown bottle	7.48	7.68	0.2
	L1 Inlet	6.86	5.96	-0.9
	L1 Outlet	6.43	6.69	0.26
	L2 Outlet	6.35	5.69	-0.66
	L3 Outlet	7.06	7	-0.06
	L4 Outlet	7.33	5.69	-1.64

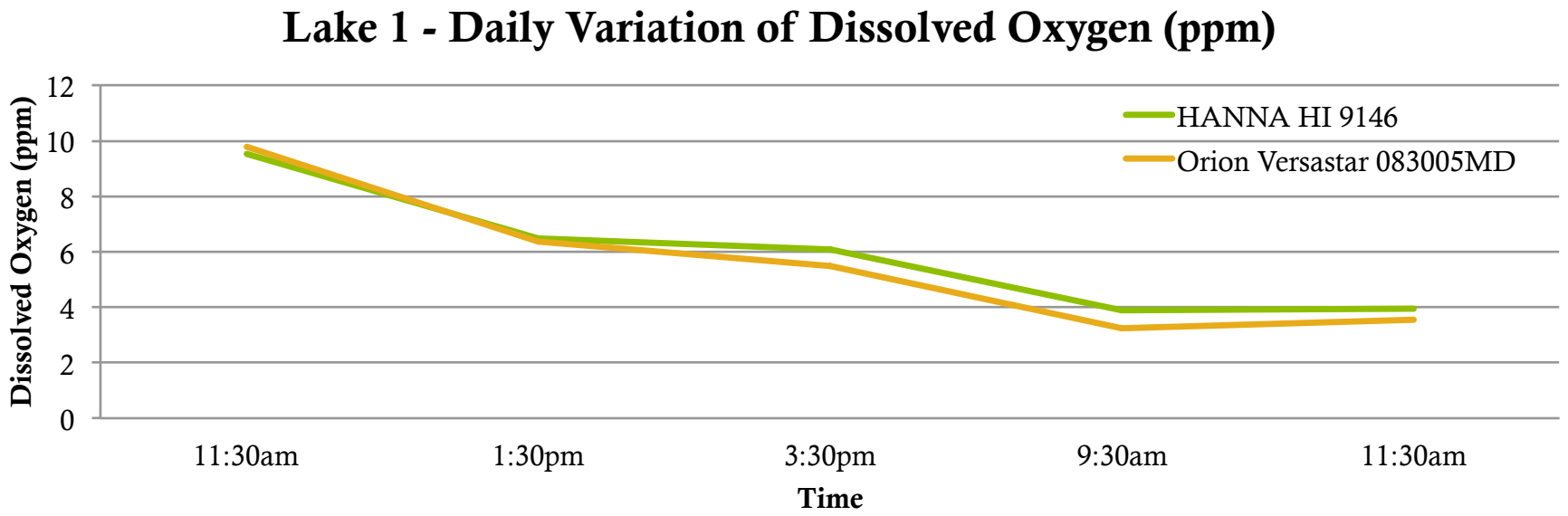
Comparing Two DO Meters (ppm)

	HANNA HI 9146	Orion Versastar 083005MD	Difference
Minimum	3.89	3.24	-1.64
Maximum	9.52	9.78	0.59
Average	5.64	5.43	-0.21
Median	5.53	5.69	-0.35
Standard Deviation	1.14	1.29	0.47
Coefficient of Variation	0.20	0.24	

Daily Variation of Dissolved Oxygen

Daily Variation of DO (ppm)			
	Time	HANNA HI 9146	Orion Versastar 083005MD
Lake 1 - Brown bottle	11:30am	9.52	9.78
	1:30pm	6.48	6.36
	3:30pm	6.09	5.49
	9:30am	3.89	3.24
	11:30am	3.94	3.55

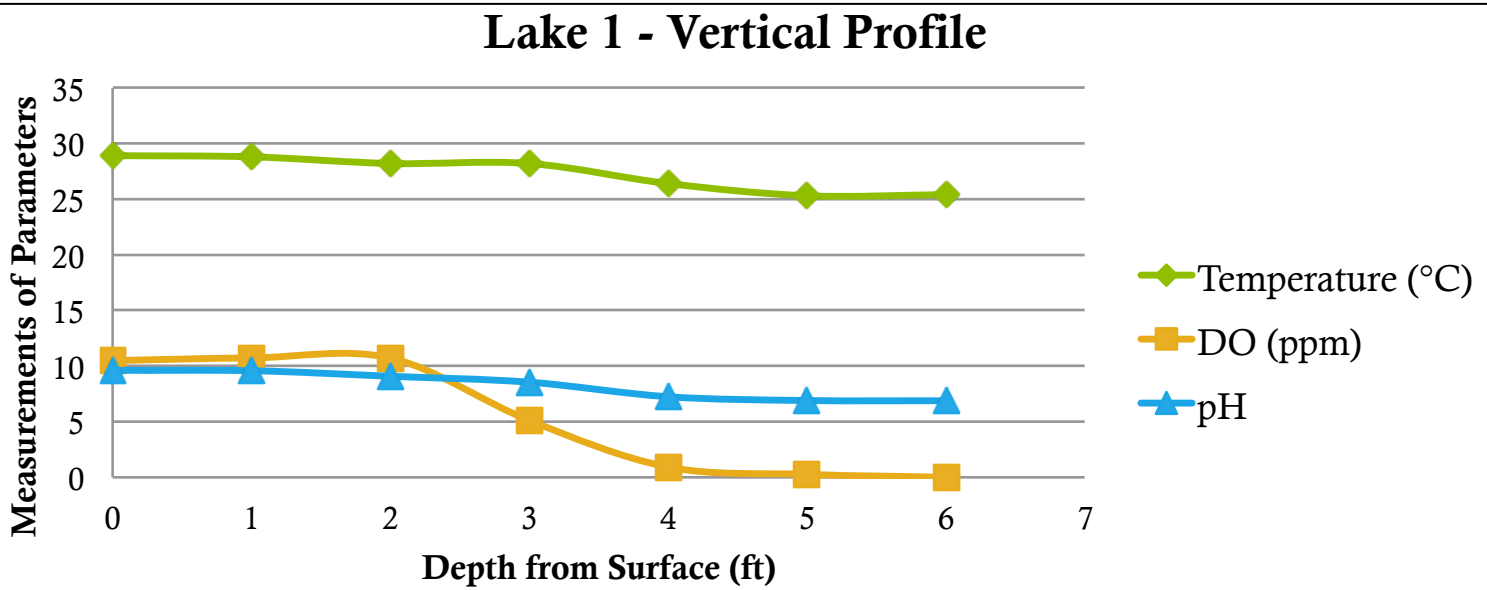
After 24 hours, the water samples' DO levels stayed constant between 4 and 6 ppm



Vertical Profiles of ASU Lakes

L1 Outlet

Depth (ft)	Temperature (°C)	DO (ppm)	pH	Conductivity (uS/cm)	TDS (ppm)
0	28.9	10.51	9.59	107	54
1	28.8	10.73	9.58	107	53
2	28.2	10.72	9.08	105	52
3	28.2	5.11	8.55	102	51
4	26.4	0.92	7.24	101	50
5	25.3	0.26	6.9	102	51
6	25.4	0	6.88	106	53



Education & Outreach

- Teacher's Workshop at Mississippi State University
- Presentation to Local Farmers
- Workshops for Local High School Students

Conclusions

- Lake 1 to Lake 4:
  - Increase in DO levels
  - Decrease in Total Coliforms / E. Coli Colonies
- 3M Petrifilm:
  - Most preferred method for farmers to test their waters for fecal coliforms and E. Coli
- Egg Incubators are good for farmers to use:
  - Cheaper, results as effective, and quicker at approaching desired temperature
- Dissolved Oxygen levels in water sample drop approximately 40% after 2 hours
- Vertical Profiles:
  - After approximately 2 feet, Dissolved Oxygen drops drastically

Challenges Encountered

- Field meters not always working properly / consistently
  - Different values from lab meters
  - Re-Calibration
- Counting the Coliforms / E. Coli colonies
- Enduring the heat when using the canoe
- Mosquitoes!

Content & Skills Learned

- Water Sampling Methods
- Compiling field measurements and applying them to spatial analyses
- How to conduct Total Coliforms / E. Coli Tests
- How to adjust sampling methods when encountering errors in measurements
- Oral presentation skills
- Scientific Researching skills
- Networking and meeting new people in environmental science

Thoughts on Internship Experience

- First time doing field work and using field instruments
- Community Outreach

- Getting a taste from each of the different tasks/projects
- Working with awesome co-workers and mentor!
- Possible career with NOAA?

Acknowledgements

- NOAA-NGI Diversity Internship Program, Dauphin Island Sea Lab
  - Tina Miller-Way
  - Natalie Ortell
- Alcorn State University, Mississippi River Research Center
  - Dr. Jairo Diaz
  - Ms. Germania Salazar
  - Ms. Nancy Morehead
  - Lesle Peavie
  - Jarian Redmond

THANK YOU!