

**COMPUTER PROGRAMMING TOOLS  
TO SUPPORT  
WATER RESOURCES STUDIES  
AT THE  
GEOSCIENCES RESEARCH INSTITUTE**

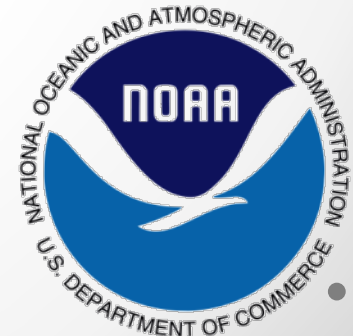
**Mentor: John Ramirez-Avila & Sandra Ortega-Achury**

**Internship Location: Walker Engineering Building at  
Mississippi State University**

**By: Augustine Tran**



**NGI**  
NORTHERN GULF INSTITUTE



# Things about...me.

- My name is Augustine Tran.
- I am currently attending Mississippi State University.
- I am 3<sup>rd</sup> year junior and will be a senior this coming Fall.
- I am majoring Electrical Engineering .



**MISSISSIPPI STATE**  
**UNIVERSITY**

# Things about...

## Dr. John J. Ramirez-Avila.

- **Education:**

Ph.D. in Civil Engineering. College of Engineering.  
Mississippi State University, MS, U.S.A., 2011

M.S. in Soils Science. University of Puerto Rico.  
Mayagüez, Puerto Rico, 2005

B.S. Agricultural Engineering. Universidad  
Nacional de Colombia. Bogotá D.C., Colombia,  
1999

**Area of Expertise / Interest:**

Environmental physics, quality, management and conservation of soils, water and watersheds; field and laboratory methods and procedures for the assessment and monitoring of soil and water resources.



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Things about...

# Sandra L. Ortega Achury.

- **Education**

MS, Soil Science, University of Puerto Rico, 2005

BS, Agricultural Engineer, Universidad Curcolombiana, Colombia, 2002

- **Research Interest**

Water Quality Monitoring and Modeling

Water and Soil Conservation

Soil and Water Sampling and Analysis

Procedures

Sediment Transport

Soil Erosion



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# Internship Outline

## I. Laboratory Work

- Clean & Sterilize Lab Equipment
- Dry & Organize Lab Equipment

## II. Data Collection for Tombigbee River Basin

- USGS Ground Water , Surface Water, & Peak Flows
- NCDC Precipitation & Air Temperature

## III. Programming Tools for Data Analysis

### PROGRAMS

- Daily Flows (File Conversion & Monthly / Yearly Statistics)
- Water Level (File Conversion & Monthly / Yearly Statistics)
- Move & Make (Column Correction & Retrieval)
- Soil Test Analysis(Parameter Statistics & Summary)

## IV. Software Application

- PKFQWin

# Laboratory Work



## Cleaning Procedure

- I. Rinse with water
- II. Remove labels
- III. Wash with brush and phosphate free detergent
- IV. Rinse with deionized water
- V. Rinse with 10% HCL
- VI. Rinse 3x with deionized water
- VII. Dry and store in cabinetry

# Data Collection

## USGS Ground & Surface Water

Individual sites can be obtained by selecting the site number below

Agency	Site Number	Site Name
USGS	<a href="#">02376500</a>	PERDIDO RIVER AT BARRINEAU PARK, FL
USGS	<a href="#">02377500</a>	STYX RIVER NEAR LOXLEY, AL.
USGS	<a href="#">02377570</a>	STYX RIVER NEAR ELSANOR, AL.
USGS	<a href="#">02377960</a>	BLACKWATER RIVER AT CO RD 87 NEAR ELSANOR, AL.
USGS	<a href="#">02378170</a>	WOLF CREEK BELOW FOLEY, ALA
USGS	<a href="#">02378300</a>	MAGNOLIA RIVER AT US 98 NEAR FOLEY, ALA
USGS	<a href="#">02378500</a>	FISH RIVER NEAR SILVER HILL AL
USGS	<a href="#">02450250</a>	SIPSEY FORK NEAR GRAYSON AL
USGS	<a href="#">02450500</a>	SIPSEY FORK NEAR FALLS CITY AL
USGS	<a href="#">02450825</a>	CLEAR C AT NEW HOPE CHURCH NR POPLAR S
USGS	<a href="#">02451000</a>	CLEAR CREEK AT FALLS CITY AL
USGS	<a href="#">02451500</a>	SIPSEY FORK NEAR ARLEY AL
USGS	<a href="#">02452000</a>	SIPSEY FORK NEAR JASPER AL
USGS	<a href="#">02452500</a>	SIPSEY FORK NEAR SIPSEY AL
USGS	<a href="#">02453000</a>	BLACKWATER CREEK NEAR MANCHESTER AL

Each county provided stations along with daily water discharge and ground water depth values

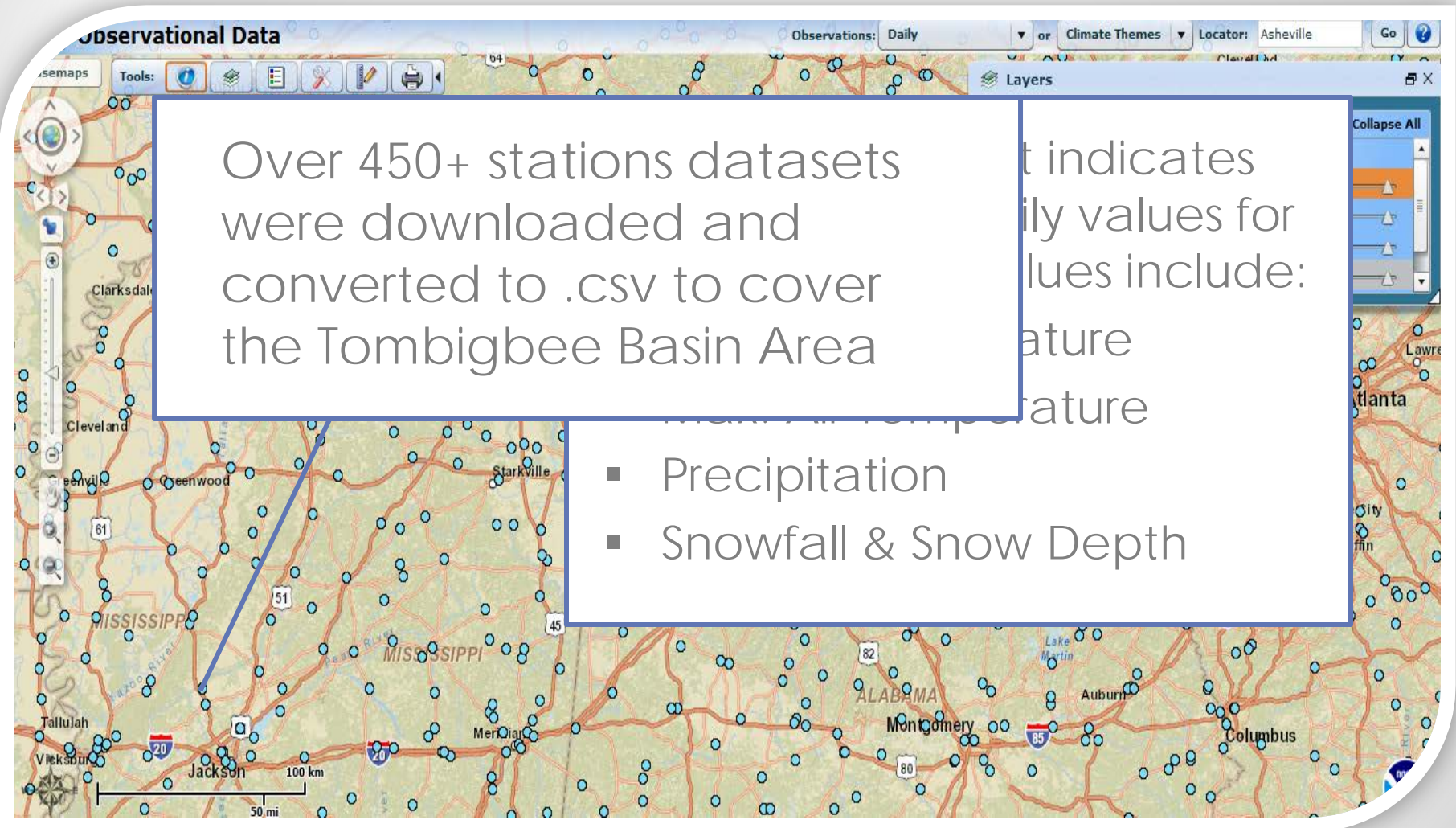
For every county in the Tombigbee Basin, all listed site numbers were downloaded and converted to .xslm files.

Agency	Site Number	Site Name
USGS	<a href="#">02453390</a>	TOWN CREEK AT 26TH ST AT JASPER, AL.
USGS	<a href="#">02453500</a>	MULBERRY FORK AT CORDOVA AL
USGS	<a href="#">02453835</a>	TRINITY CREEK NEAR CARBON HILL AL
USGS	<a href="#">02454000</a>	LOST CREEK NEAR OAKMAN AL
USGS	<a href="#">02454055</a>	LOST CREEK ABOVE PARRISH, AL.
USGS	<a href="#">02454200</a>	WOLF CREEK NEAR OAKMAN AL
USGS	<a href="#">302416087505501</a>	ww 13-usgs 302416087505501

ted.

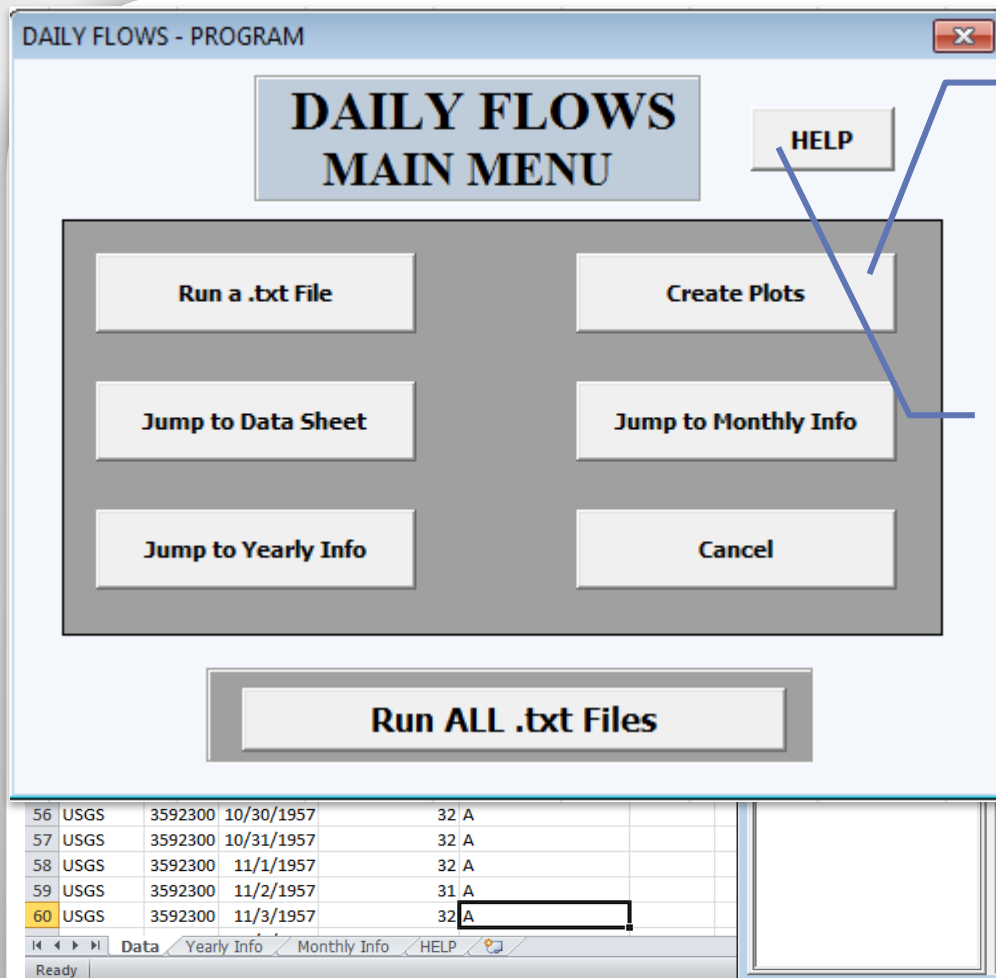
# Data Collection

## NCDC Precipitation & Air Temperature





# Program Daily Flows

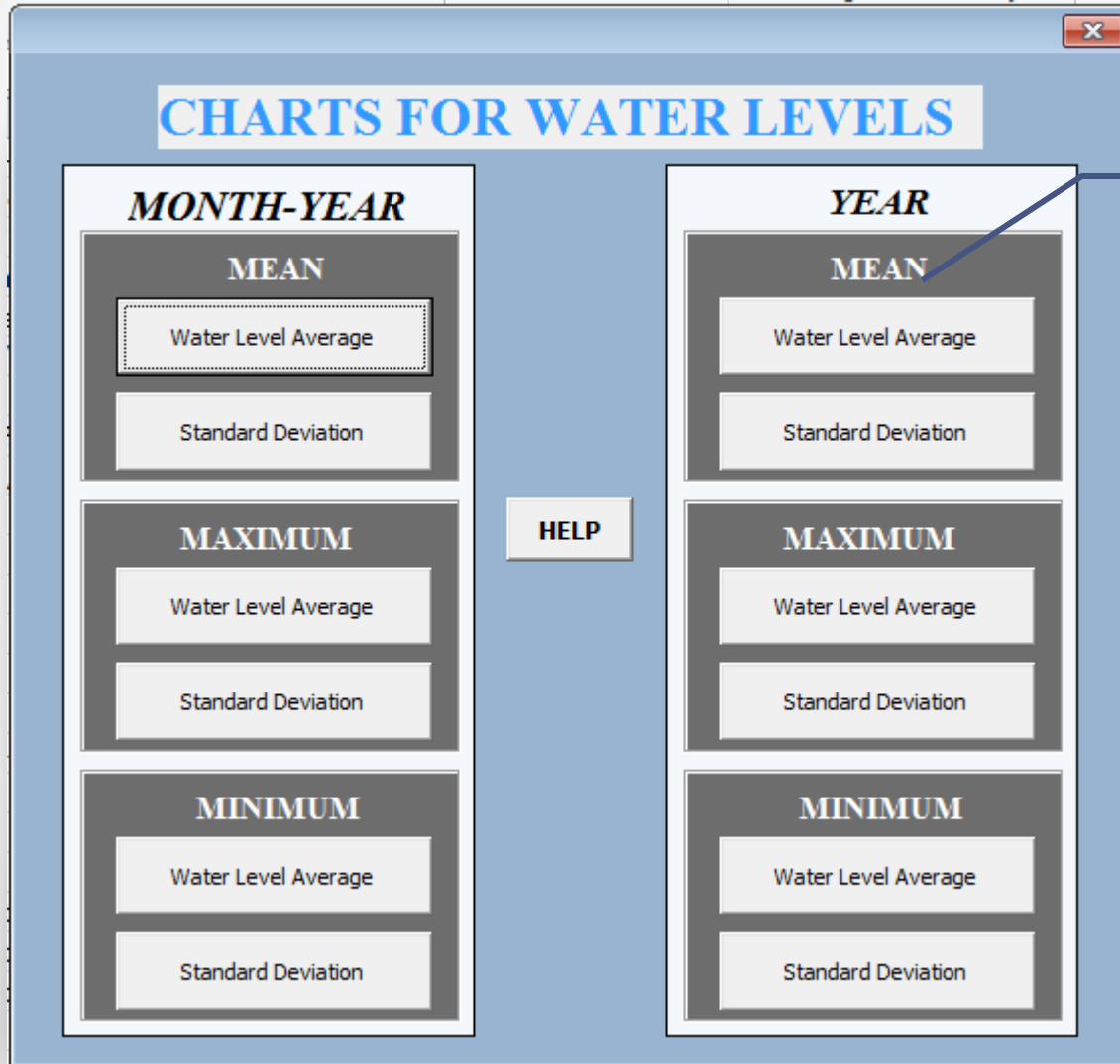


Using the data sets downloaded from the USGS website, Daily Flows allows the user to create averages, standard deviations, and cumulative values for surface water files.

```
Else  
End If  
ActiveCell.Offset(1, 0).Select  
Loop Until IsEmpty(ActiveCell)
```

```
.....  
**CALCULATES YEARLY AVERAGES & STANDARD DEV. FOR DAILY FLOWS  
.....  
'Find the first date
```

# Program Water Level



... the data from  
... this Water Level  
... Chart creation  
... te averages,  
... dard deviations,  
... cumulative values  
... round surface  
... er files.

... o features many of  
... ame options as  
... y Flows Program.

# Program Move & Make

```
Maker.xlsm - Module1 (Code)
(General) Macro1
For Each testSheet In ActiveWorkbook.Worksheets
  If testSheet.Name Like "Old Data" Then flag =
  Next

  '' Any sheet named "Old Data" it will be deleted
  If flag = True Then
    Application.DisplayAlerts = False
    ActiveWorkbook.Sheets("Old Data").Delete
    Application.DisplayAlerts = True
  End If
  '' Adds Sheet

  Sheets.Add.Name = "Old Data"

  i = i

  Worksheets(firstsheet).Activate

  Worksheets(firstsheet).Range("A2").Select
  Worksheets(firstsheet).Range(Selection, Selection.End(
  Worksheets(firstsheet).Range("A2:S2").Offset(count, 0)
  Selection.Cut
  i = i

  Worksheets("Old Data").Activate
  Range("A2").Select
  Selection.Paste

  Worksheets(firstsheet).Activate
  i = i
  If IsEmpty(Range("A2").Offset(count + 1, 0)) Then

  Else
  Range("A2").Offset(count + 1, 0).Select
  Range(Selection, Selection.End(xlToRight)).Select

Maker.xlsm - Module2 (Code)
(General) play
Application.DisplayAlerts = False
Dim file
Dim path As String

With this program, the
files collected from
NCDC were converted
into .cvs and sorted by
date.

The program also
retrieved site names and
station numbers to assist
the user in verifying
specific locations.

Call Macro1

ActiveWorkbook.Close SaveChanges:=True
```

# Program

## Soil Test Analysis

### Instruction / Details

**1. Select a Folder with files that contain pH, Phosphorus, and/or CEC values of Counties**

Select Folder

->When selecting a valid folder, the program will post the average, standard deviation and sample size for each parameter of each county.

->In summary, the post values in each file will be recorded in this workbook on the "Summary Page".

```
.ReadingOrder = xlContext  
.MergeCells = False  
End With  
With Selection  
.HorizontalAlignment = xlCenter  
.VerticalAlignment = xlCenter  
.WrapText = False  
.Orientation = 0  
.AddIndent = False  
.IndentLevel = 0
```

The program Soil Test Analysis allows the user to select a folder that include data soil test files.

These types of files are comprised of pH, Phosphorus, and CEC values from 20 different counties.

Soil Test Analysis post averages, standard deviations, and sample sizes of each year in one county.

```
Range("O2").Select  
ActiveCell.FormulaR1C1 = "CEC Mean"  
Range("P2").Select  
ActiveCell.FormulaR1C1 = "CEC Stndrd. Dev."  
Columns("G:P").Select  
With Selection  
.HorizontalAlignment = xlGeneral  
.VerticalAlignment = xlCenter  
.WrapText = False  
.Orientation = 0
```

# Software Application

# PKFQWin

Using the peakfq watstore files downloaded from the USGS database, PKFQWin uses the peak flow values to create plots.

PKFQWin

File Help

Use File menu to Open PeakFQ data or PKFQWin spec file.  
Update Station and Output specifications as desired.  
Click Run PeakFQ button to generate results.

**PEAKFQ Data File:**

**PKFQWin Spec File:**

Station Specifications						Output Options						Results				
Station ID	Include in Analysis?	Beginning Year	Ending Year	Historic Period	Skew Option	Generalized Skew	Gen Skew Std Error	Mean Sqr Err	Low Hist Peak	Lo-Outlier Threshold	High Sys Peak	Hi-Outlier Threshold	Gage Base Discharge	Urban/Reg Peaks	Latitude	Longitude

Run PEAKFQ Save Specs Exit

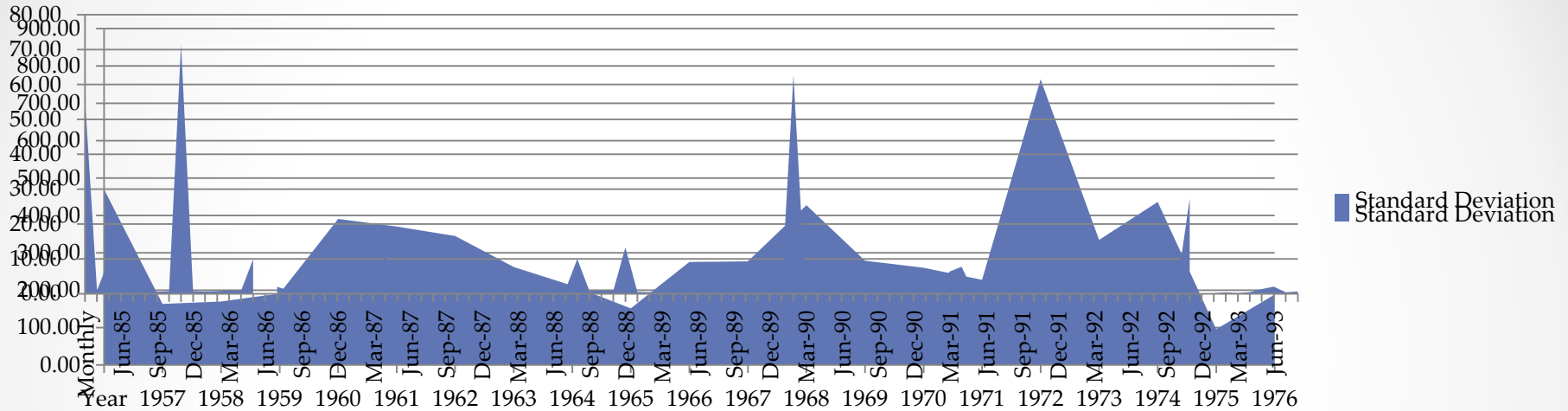
# Soil PK&EQ Analysis

## Program Results

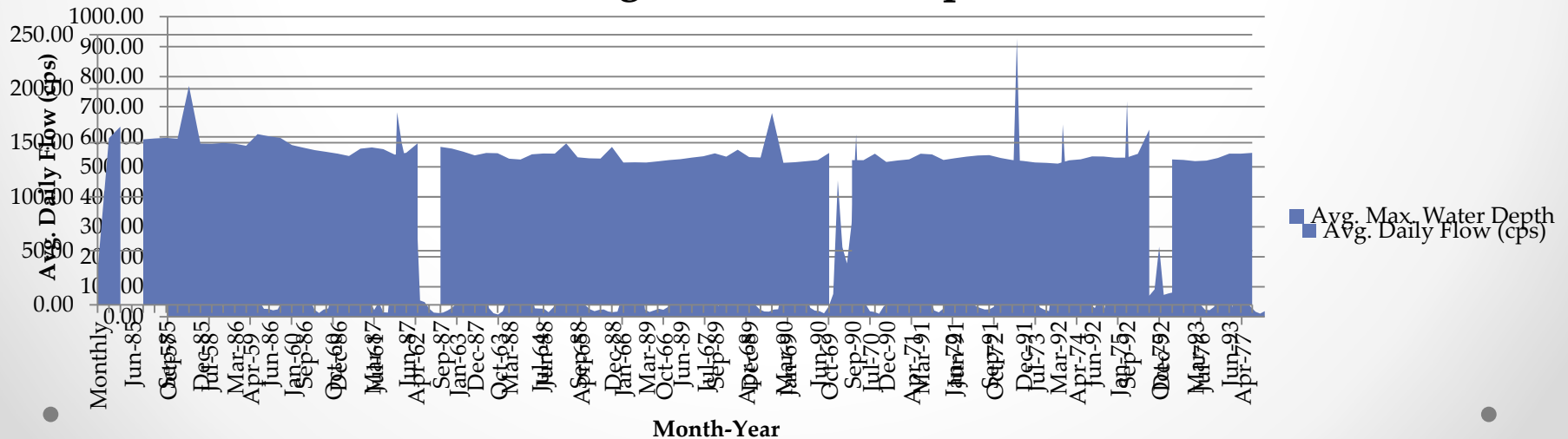
	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	
2	SUMMARY																			
3	Per County	Phosphorus	P	pH	CEC	Phosphorus	P	pH	CEC	Phosphorus	P	pH	CEC	Phosphorus	P	pH	CEC	Phosphorus	P	pH
4	County	0-18				19-36				37-72				73-144				>144		
5	Amite	#Samples	Mean	Mean	Mean	#Samples	Mean	Mean	Mean	#Samples	Mean	Mean	Mean	#Samples	Mean	Mean	Mean	#Samples	Mean	Mean
6	2002-2003	13	12.07692308	79.9	95.89	9	25.44444444	52.8	63.94	10	53.8	59.8	90.29	4	112.25	21.3	33.07	5	201.6	27.8
7	2003-2004	12	7.416666667	67.6	83.24	12	30.25	68.1	95.59	5	59.8	29.3	42.52	7	90.14285714	40.4	58.2	3	162.3333333	16.4
8	2004-2005	16	14.0625	88.3	143.1	11	26.09090909	57.4	92.36	1	39	5.5	5.28	6	98.33333333	31.5	54.92	4	211.5	18.7
9	2005-2006	28	9.5	153.3	222.65	9	27.44444444	47.5	69.66	28	49.14285714	147.8	209.13	14	104.4285714	79.7	127.08	21	233.8571429	118.3
10	2006-2007	5	15.4	25.6	37.88	22	28.45454545	118.3	171.07	20	53.95	104.9	154.14	13	103.3846154	69.6	106.45	22	236.3636364	121
11	2007-2008	2	13.5	11.3	15.43	4	29	21.7	34.33	23	53.56521739	127.6	206.23	14	101.1428571	76.7	127.31	15	270.0666667	84.4
12	2008-2009	6	14.83333333	31.5	51.68	6	28.5	34	49.39	15	51.66666667	86.5	149.13	5	95	26.2	41.95	23	195.5217391	124.8
13	2009-2010	1	9	4.9	7.48	15	28	87.2	113.97	14	53.71428571	79.6	125.13	19	95.68421053	106.9	167.63	11	293	63.7
14	2010-2011	2	16	12.7	14.54	3	31.33333333	17	21.37	4	57.5	22.7	31.27	3	109.6666667	19.3	25.94	20	286.25	121.8
15	2011-2012	3	13	16.6	21.38	7	26.85714286	37.6	54.85	8	55.125	46.1	70.38	10	97.6	55.8	99.29	16	536.8125	95.8
16																				
17	SUMMARY																			
18	Per County	Phosphorus	P	pH	CEC	Phosphorus	P	pH	CEC	Phosphorus	P	pH	CEC	Phosphorus	P	pH	CEC	Phosphorus	P	pH
19	County	0-18				19-36				37-72				73-144				>144		
20	Copiah	#Samples	Mean	Mean	Mean	#Samples	Mean	Mean	Mean	#Samples	Mean	Mean	Mean	#Samples	Mean	Mean	Mean	#Samples	Mean	Mean
21	2002-2003	120	12.06666667	700.1	1062.43	82	26.2195122	476.4	767.87	47	52.38297872	272.6	449.91	27	100.5185185	161.4	275.5	42	490.4047619	249.2
22	2003-2004	22	10.59090909	129	174.09	17	27.70588235	97.1	154.28	9	52.55555556	51.4	80.01	11	104.2727273	59.4	103.32	18	371.8888889	102.4
23	2004-2005	19	10.15789474	100.7	167.2	6	25.66666667	32.6	52.53	2	67	11.5	17.76	5	113.6	29.5	64.09	7	355.8571429	40.9
24	2005-2006	7	13	39.5	60.64	12	27.25	68.9	119.72	26	49.03846154	147	251.58	10	97.5	54.1	89.28	8	258.375	48.4
25	2006-2007	5	13.2	26.5	48.52	18	29	99.9	176.75	28	52.21428571	153.8	283.36	19	105.2105263	106.8	220.07	19	225.8421053	104
26	2007-2008	9	7.666666667	51.2	82.24	9	23.77777778	47.7	85.58	24	55.20833333	141	284.54	27	102.9259259	151.7	306.11	21	378.952381	
27	2008-2009	2	15.5	12.7	17.8	6	26.66666667	36.8	73.03	17	52	96.3	171.3	12	100.75	69.4	130.79	13	357.0769231	

# Water Flow Results Graph.

## Standard Deviation

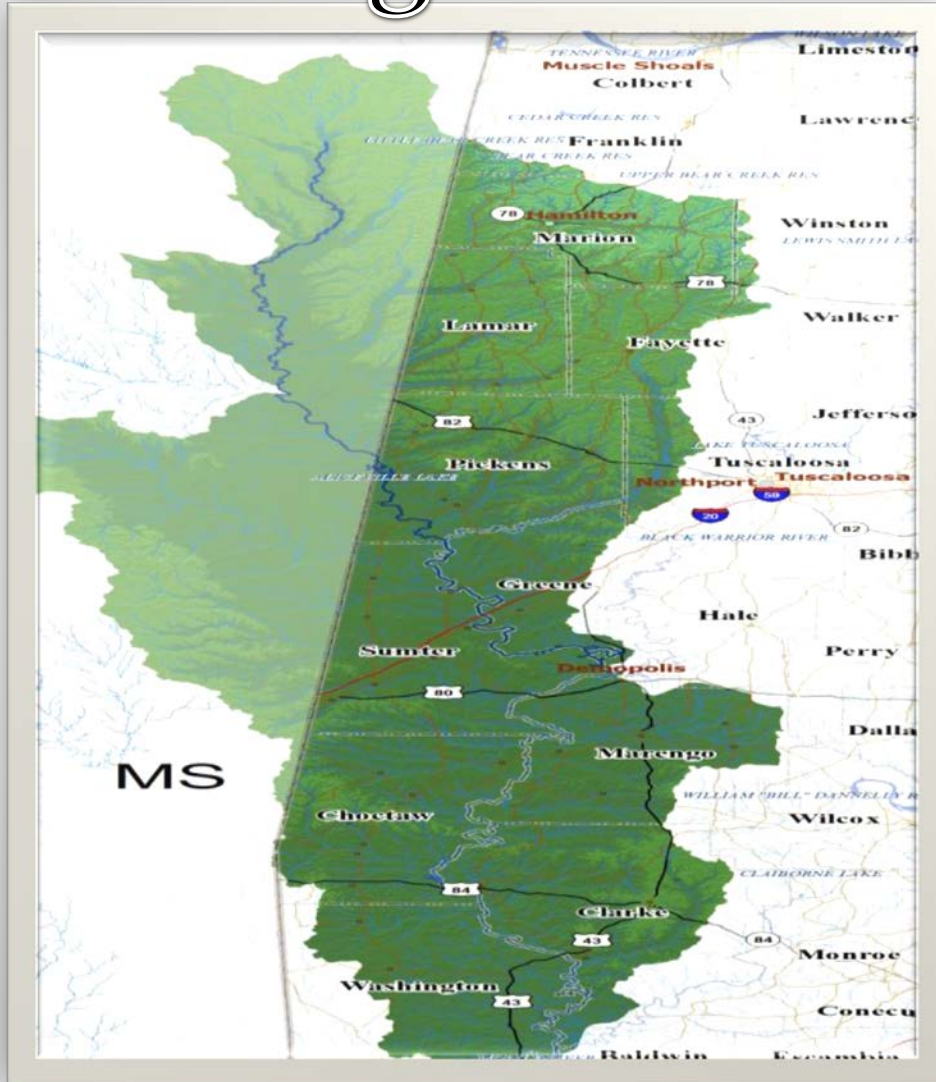


## Avg. Daily Flow (cps) Avg. Max. Water Depth



# Conclusions

## Tombigbee Basin



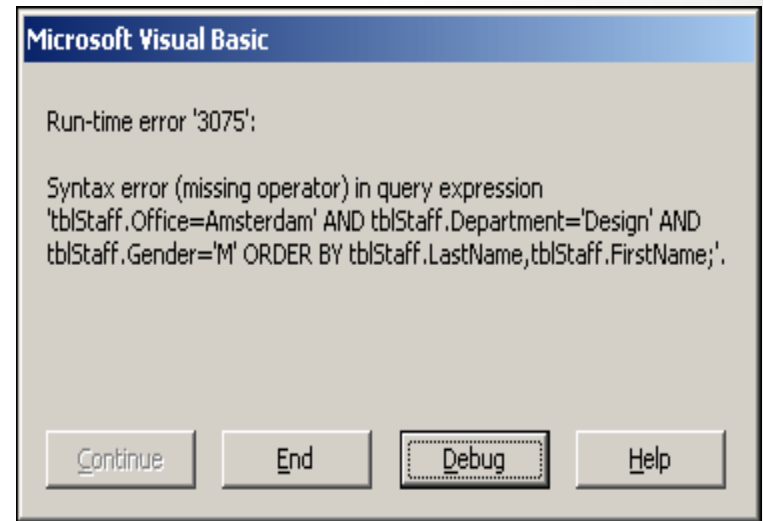
The data collected and results from the programs assisted the Tombigbee Basin area with the following:

- Developing a water balance
- Alternatives for water supply
- Essential data for future analyses



# Challenges Encountered

- Time management
- Learning Visual Basics for Application and debugging code
- Applying programming knowledge to assigned task



# Skills Attained

- Learned proper procedures to clean and sterilize laboratory equipment
- Acquired a whole new programming language under my belt – Visual Basics for Application
- Greater understanding for programming for real world application
- Improved programming techniques that provide better efficiency without loss of quality



# Thoughts

- The NOAA-NGI internship program has made me feel very fortunate to be chosen.
- The experience that I've gained through this internship truly advanced my skills and learning.
- NOAA as a career would be an ideal profession that I have come to recognize (unsure what to write for this part section)



# Acknowledgements

A special thank you to John Ramirez & Sandra Ortega for putting up with me for 9-weeks and letting me work under them as an intern.

MSU CE Department for providing me a cozy cubicle.

JoAnn Moody for ensuring the internship's success .

Everyone at Dauphin Island Sea Lab, North Gulf Institute, North Oceanic and Atmospheric Administration who helped make this internship possible.



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