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

Dauphin Island Sea Lab
Alabama

NGI
Northern Gulf Institute

National Oceanic and Atmospheric Administration
NOAA
U.S. Department of Commerce

Things about…me.

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

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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

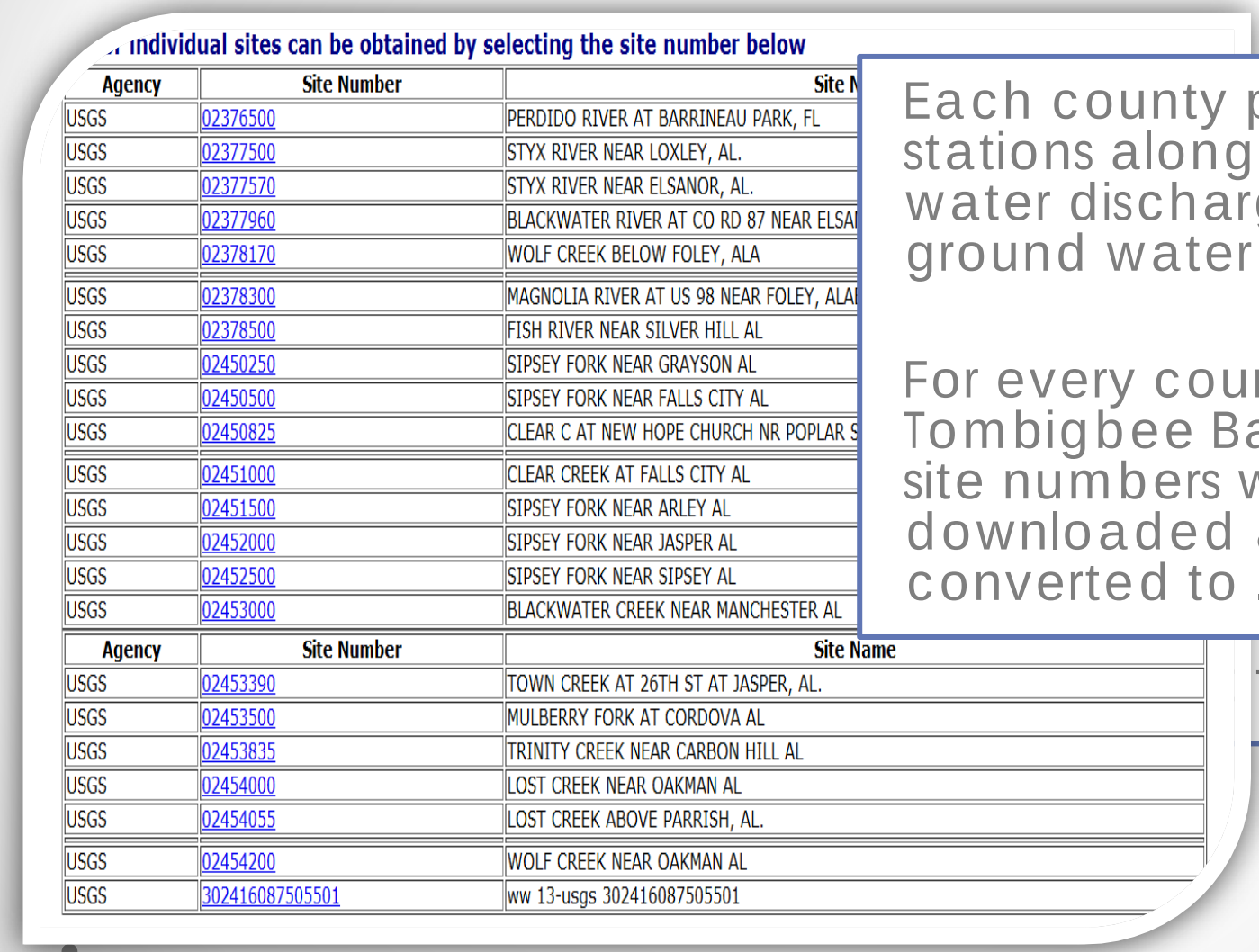
CLEAN =)

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



ndividual sites can be obtained by selecting the site number below

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

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

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 .xlsm files.

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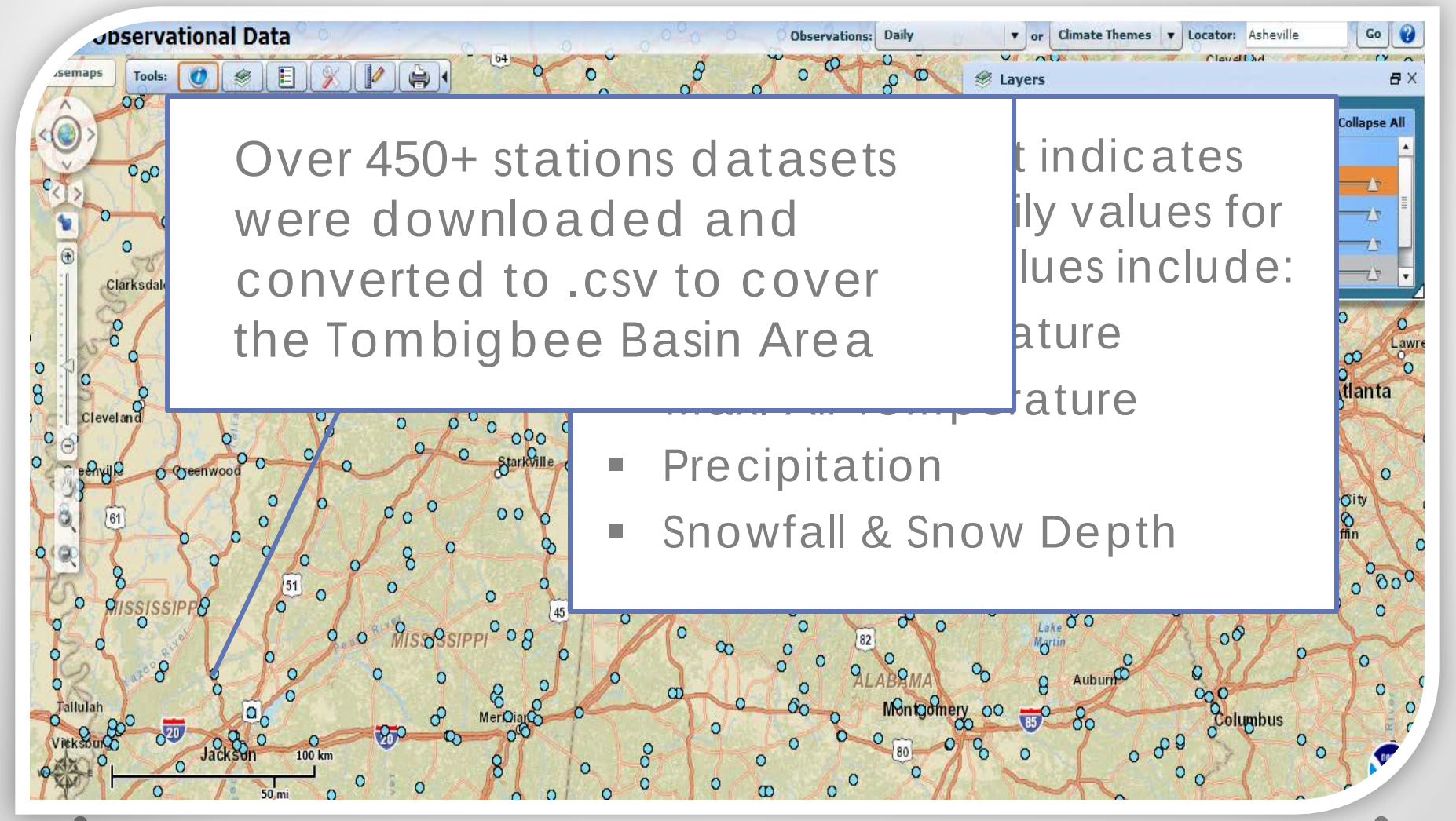
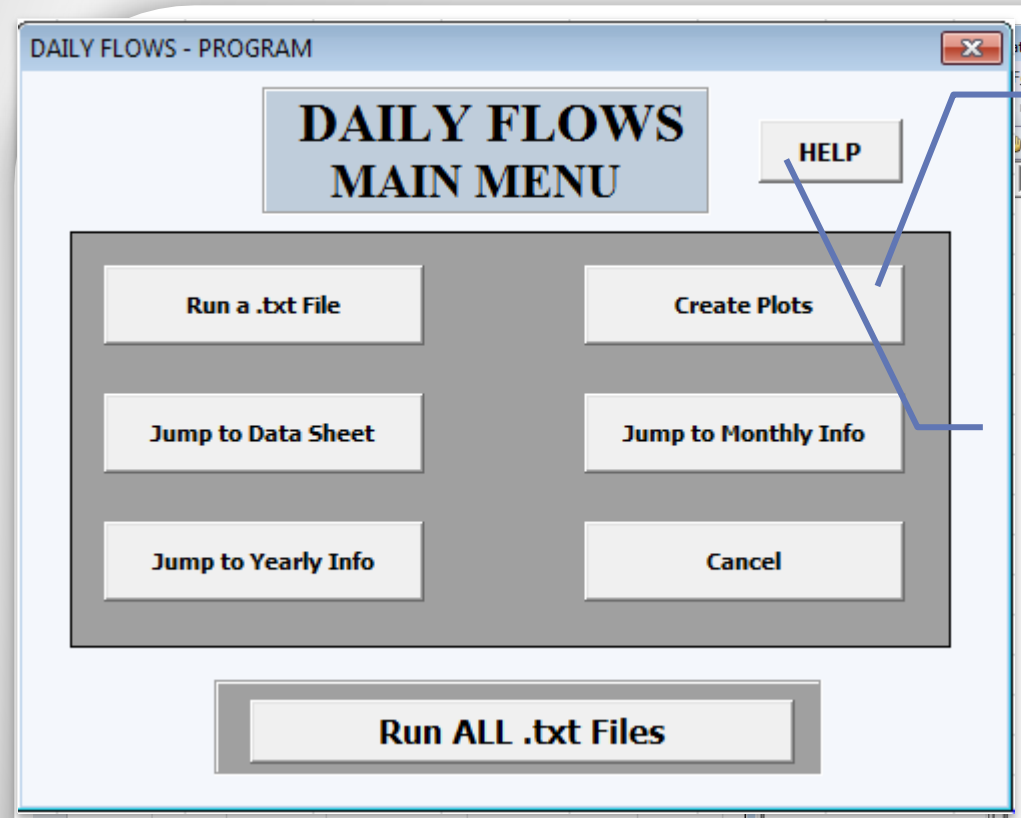
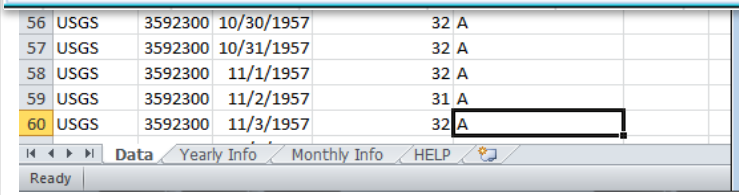
Data Collection

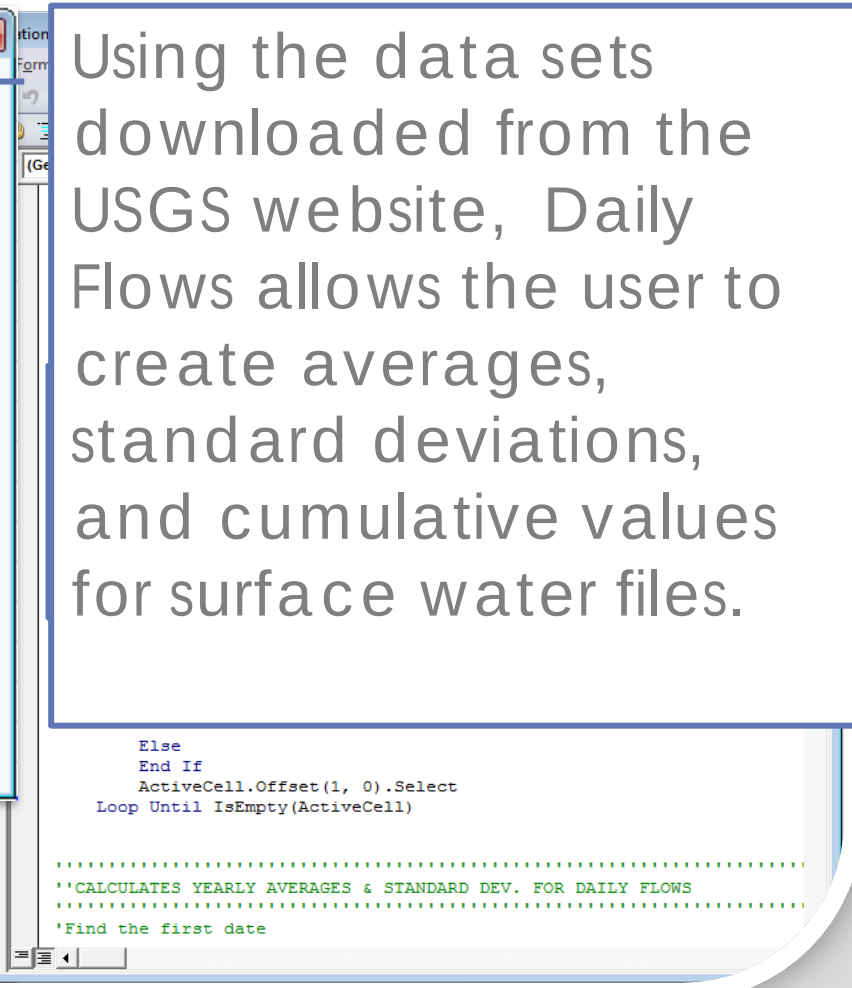
NCDC Precipitation & Air Temperature



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.

Program
Water Level

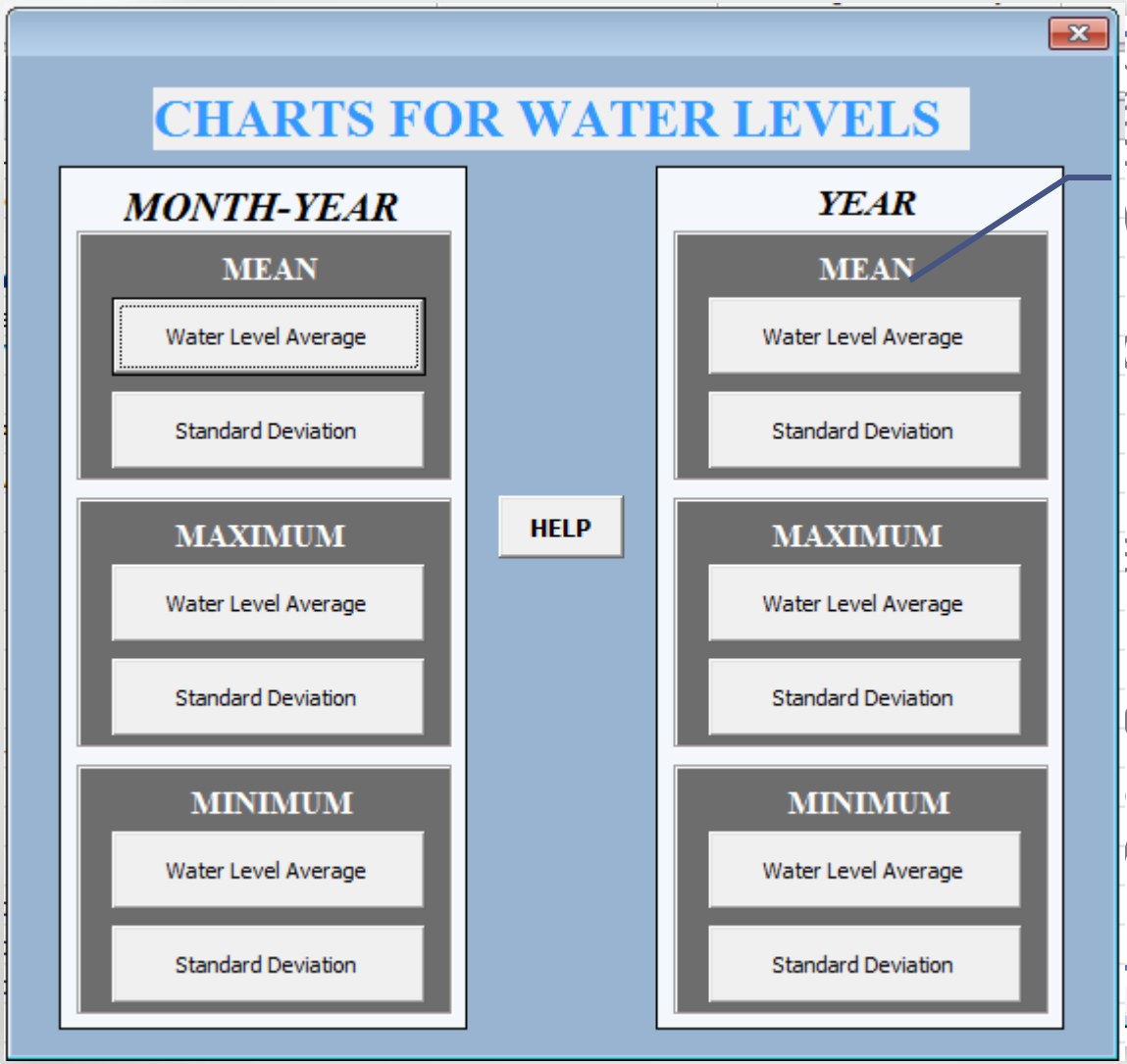
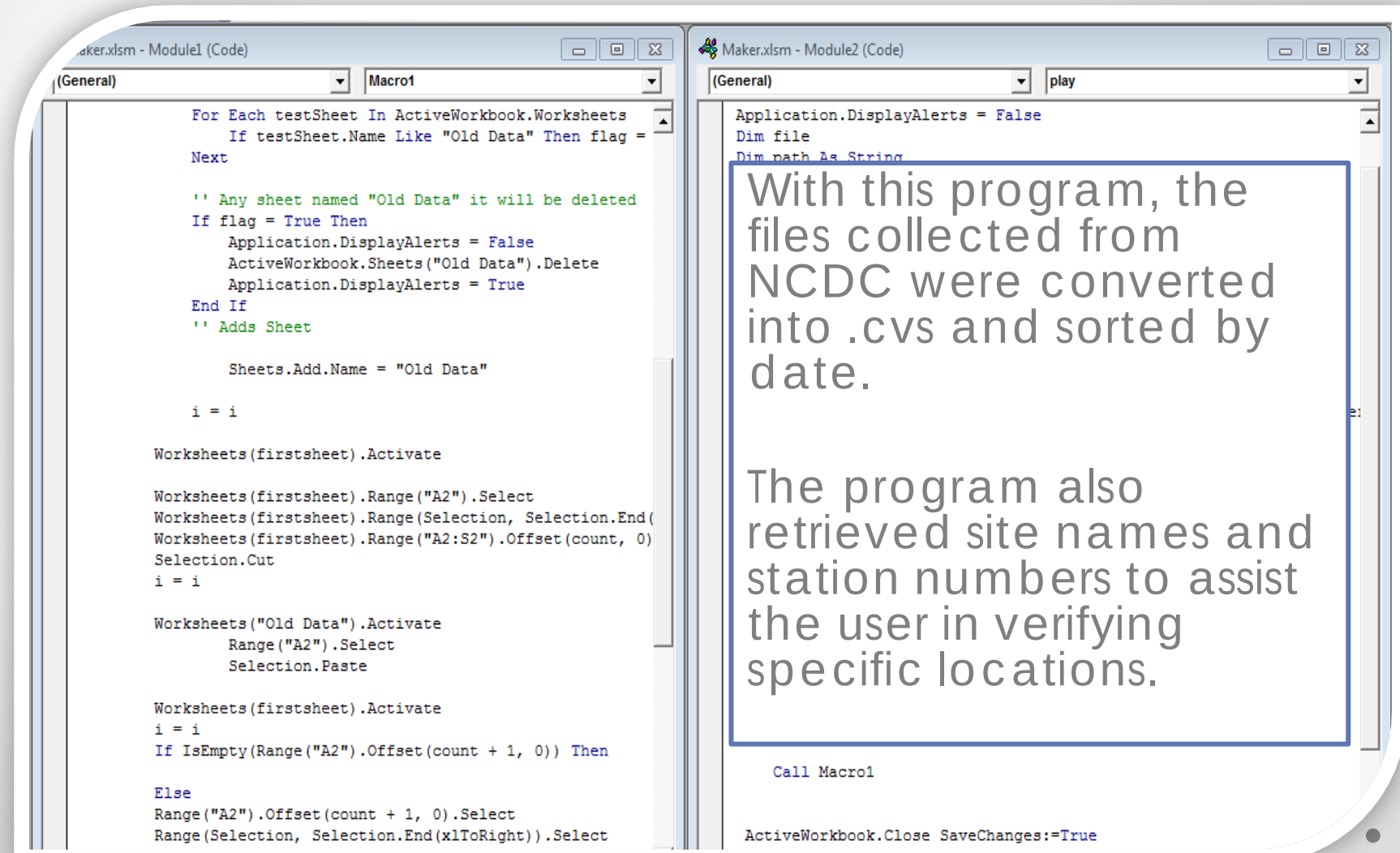


Chart creation

g the data from
S, this Water Level
ys
te averages,
dard deviations,
cumulative values
round surface
er files.

o features many of
ame options as
Flows Program.

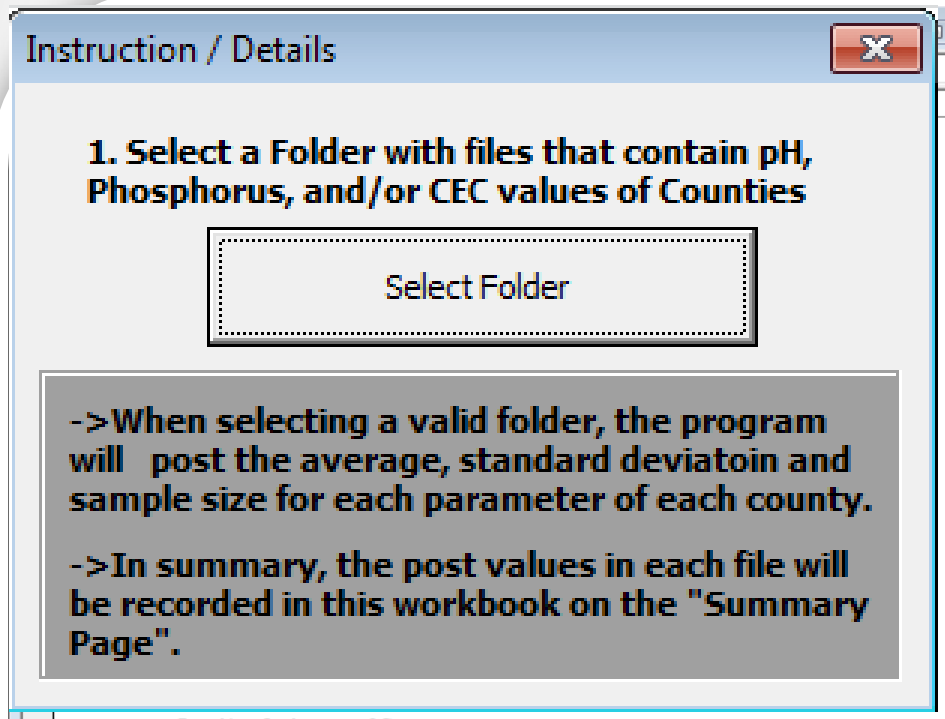
Program
Move & Make

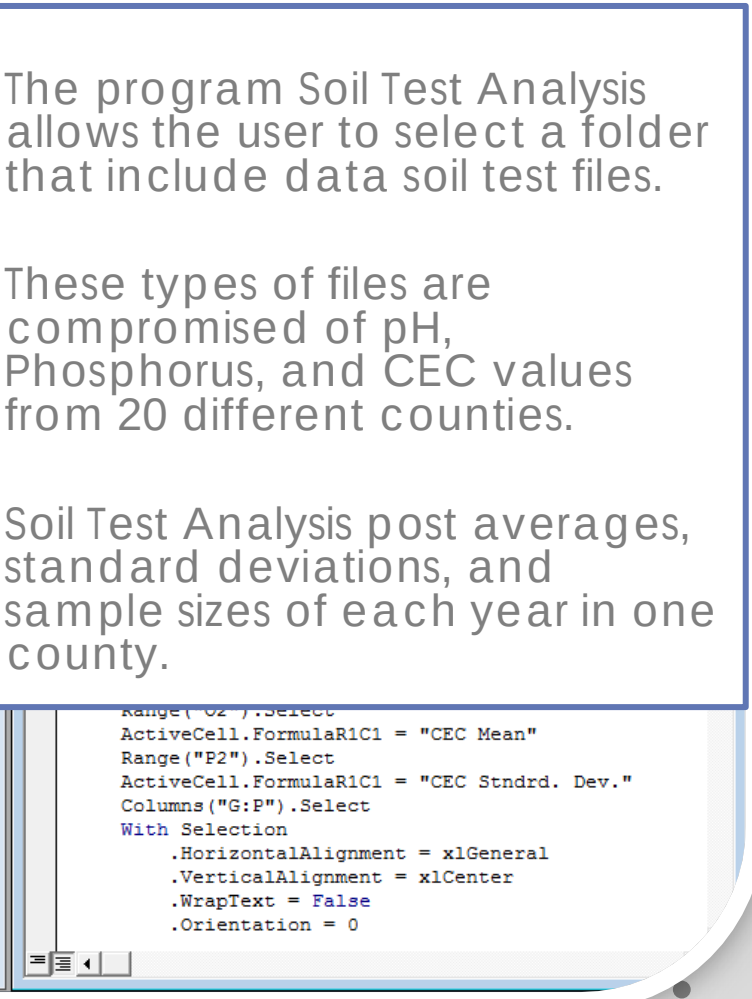


With this program, the files collected from NCDC were converted into .cvs and sorted by date.

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

Program
Soil Test Analysis





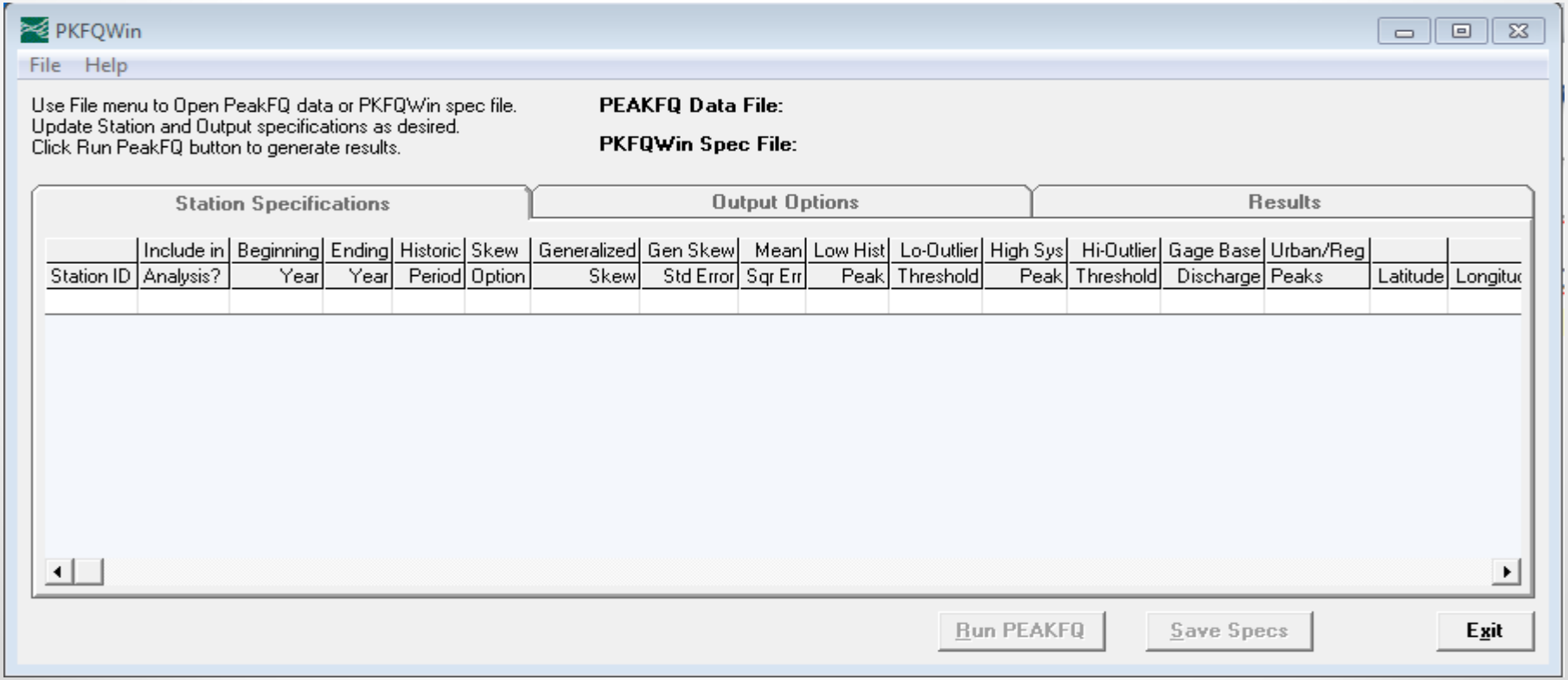
The program Soil Test Analysis allows the user to select a folder that include data soil test files.

These types of files are compromised 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.

Software Application
PKFQWin

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

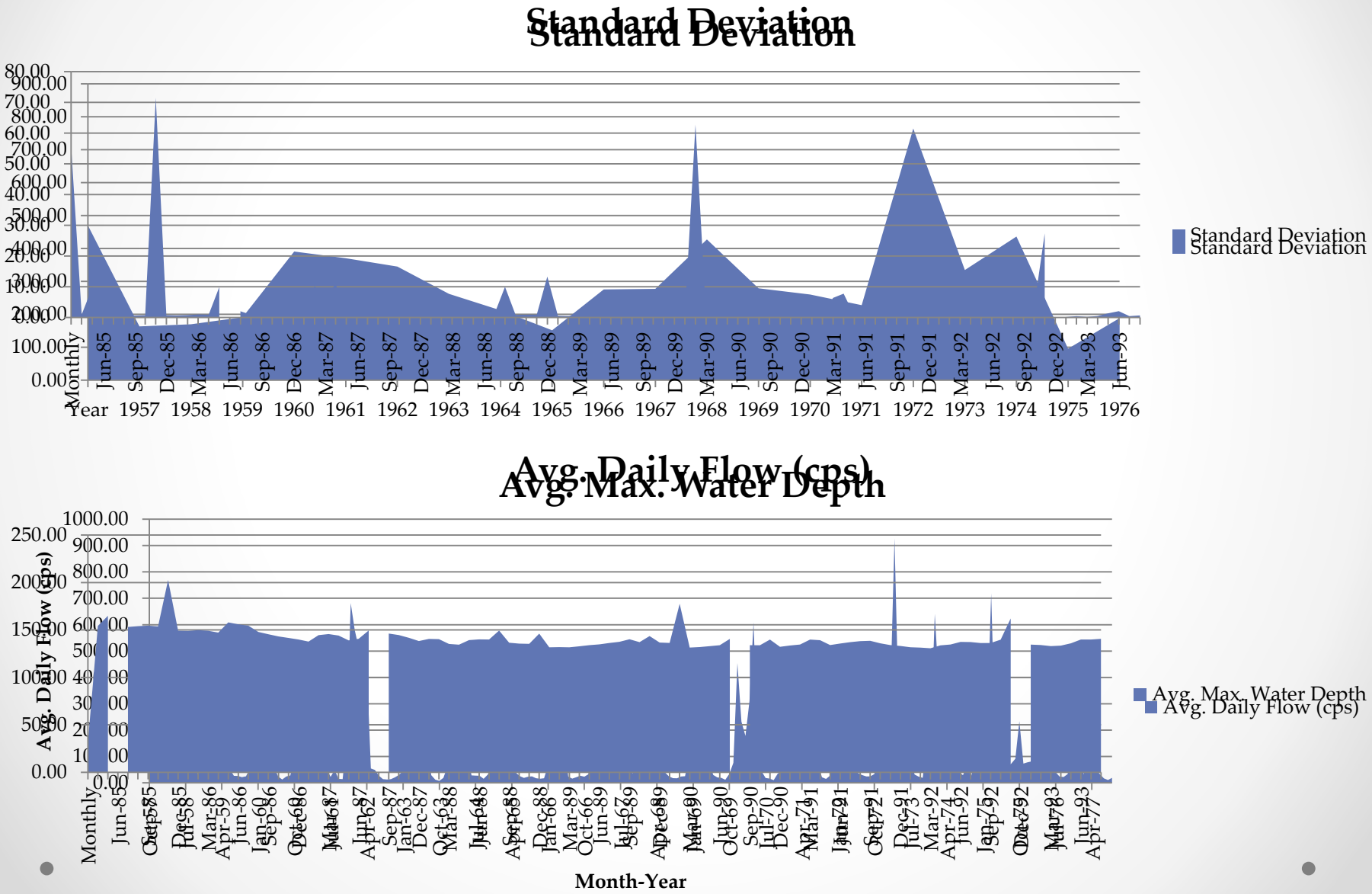


Soil PIKE QA Analysis

Program Results

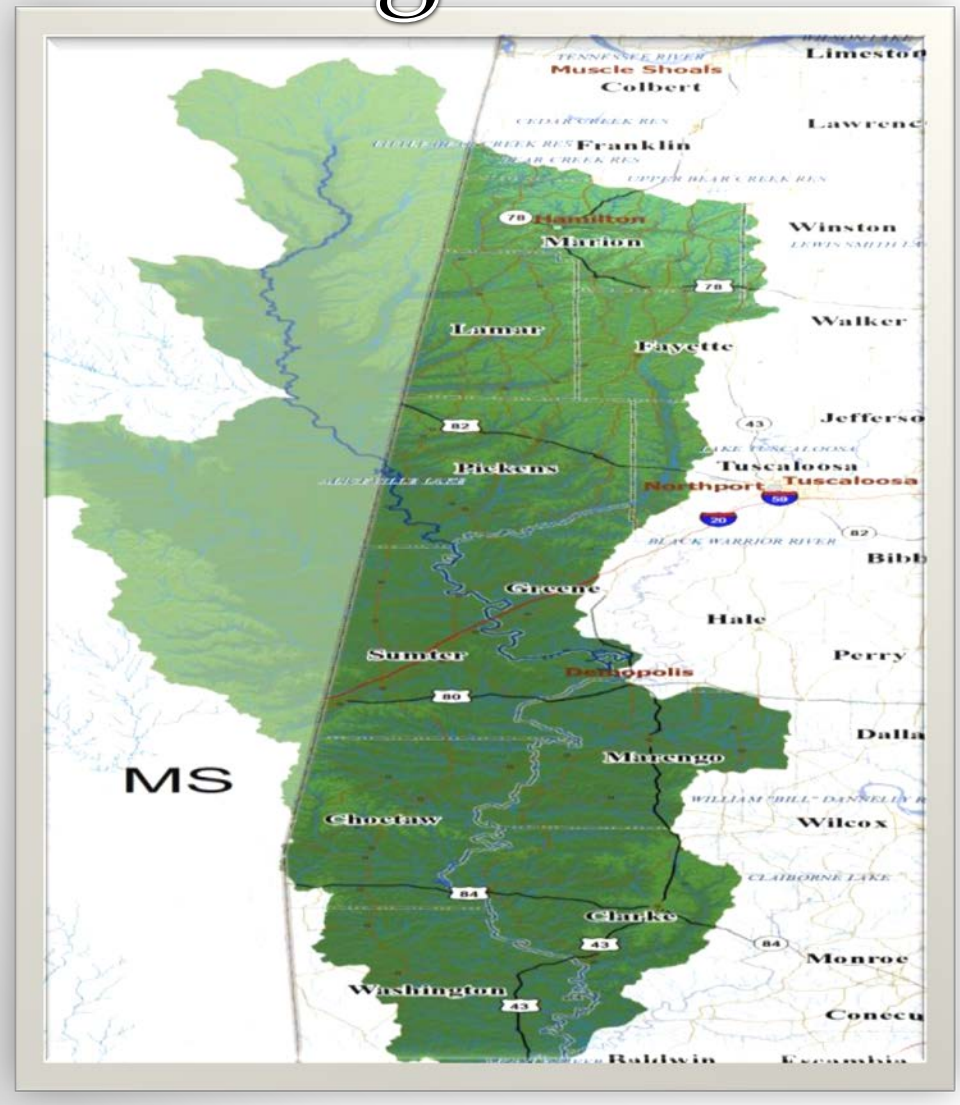
	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	SUMMARY																		
2	Per County	Phosphorus	P	pH	CEC	Phosphorus	P	pH	CEC	Phosphorus	P	pH	CEC	Phosphorus	P	pH	CEC	Phosphorus	P	pH
3	County	0-18				19-36				37-72				73-144				>144		
4	Amite	#Samples	Mean	Mean	Mean	#Samples	Mean	Mean	Mean	#Samples	Mean	Mean	Mean	#Samples	Mean	Mean	Mean	#Samples	Mean	Mean
5	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
6	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
7	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
8	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
9	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
10	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
11	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
12	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
13	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
14	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
15																				
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	357.076	

Water Level Graph.



Conclusions

Tombigbee Basin

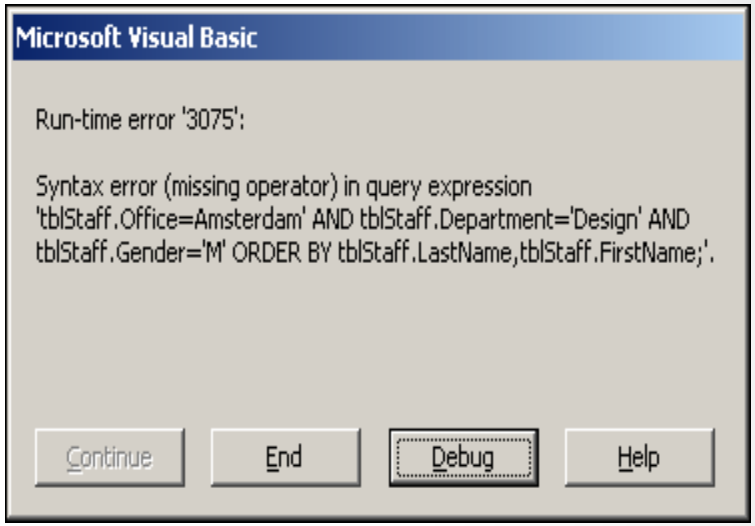


The data collected and results from the programs assisted the Tombigbee Basin area with the following:

- 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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