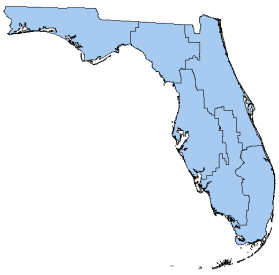
2011-2013 Status Network Statewide Results

Florida Department of Environmental Protection (FDEP)

Division of Environmental Assessment and Restoration

Water Quality Assessment Program, Watershed Monitoring Section



Goal of the Status Monitoring Network

The goal of the Status Network is to broadly characterize Florida's surface and ground water quality with a known statistical confidence. Since it is impossible to sample every waterbody in the state on an annual basis, the Network employs a statewide random-site monitoring design. The purpose of the design is to allow water sampling locations to be chosen in an unbiased manner. The water samples are analyzed in the FDEP lab and inferential statistics are used to estimate the water quality conditions of the state as a whole. Thus, the Status Network provides a cost-effective way to produce statistically valid estimates of statewide water quality. The Network addresses statewide and regional (within Florida) questions; it is not designed to evaluate specific waterbodies or wells. This report summarizes the 2011-2013 Status Monitoring Network design and results.

Monitoring Design

The Status Monitoring Network categorizes Florida's fresh waters into six resource types. Four are surface water: small lakes, large lakes, rivers, and streams. The other two resources are ground water: unconfined and confined aquifers. Based on current annual statewide sample sizes (90 samples from each surface water resource and 120 samples from each ground water resource) the design allows for reporting with a 95% confidence interval of approximately ± 12% for surface water resources and ± 9% for ground water resources. Therefore, we have 95% confidence that actual statewide surface water conditions are within 12% of the reported values, and similarly, actual statewide ground water conditions are within 9% of the reported values.

Each year, the resource coverages are updated to incorporate documented changes, deletions or additions of potential sampling locations. Not all randomly selected stations can be sampled for various reasons. Those that can be sampled are termed accessible. Those stations that cannot be sampled are considered either dry, inaccessible, or in the wrong resource. If a selected location does not represent one of the assigned resources, it is removed from the coverage and added to the proper resource for the following year's selections.

Reduced rainfall or periods of drought occur on a cyclical basis in many areas of Florida. This can cause water bodies to become dry or inaccessible. Prolonged or intense periods of drought can adversely affect water chemistry. Conversely, periods of extended rainfall can potentially dilute concentrations of certain water quality parameters; therefore, knowledge of the yearly rainfall can assist in better understanding the overall water quality of Florida.

Please see the 2013 Monitoring Design Document at the FDEP website for more information on the Status Network design.

The following paragraphs provide further details on the resource types and monitoring design.

Lakes

Lakes are defined as natural or established reservoirs that are at least 1 meter deep and contain at least 1/4 acre of open water (free of emergent vegetation and trees). These features are based on the 1:24000 (1:24K) National Hydrography Dataset (NHD) waterbody feature class. As lake geometries are updated in the 1:24K NHD, these new geometries are used to represent the possible features for sampling in a GIS. In an attempt to reduce the dataset to features that are most likely permanent, non-ephemeral/non-intermittent, or non-wetland, lakes that are less than 10 acres in area are not included in the lakes coverage.

The Watershed Monitoring Section (WMS) has divided these lakes by size into two categories: small lakes of 10 to 25 acres and large lakes over 25 acres. This division allows a better characterization of the state's lake resources, as the two resources can have different habitats and uses. Based on this definition and specific GIS coverage for this program (as identified above), the state of Florida has approximately 1,701 large and 2,000 small lakes. Lake sites are randomly selected in each of the lake resource types and they are reconnoitered in order. The first 90 lake sites which pass sampling criteria are sampled in each lake resource.

Rivers and Streams

Rivers and Streams include linear waterbodies with perennial flow that are waters of the state (Chapters 373 and 403, Florida Statutes). These features are obtained from the 1:24K NHD flowline feature class. The GIS coverage is developed by matching the 1:24K features to the 1:100000 (1:100K) NHD flowline feature class as an enhancement to include permanent, non-ephemeral, and non-intermittent segments within the coverage.

There have been issues using traditional classification, commonly referred to as Strahler order, on the flowing surface waters of the state. In order to better categorize those waters, WMS contacted several interested parties (e.g., Water Management Districts, other sections of FDEP) to submit suggestions for the river resource. Based on these recommendations, the state has 2,692 linear miles of rivers. The remaining streams and tributaries coming from the coverage identified above are designated as the stream resource, totaling about 16,573 additional linear miles. River and stream sites are randomly selected in each resource type and they are reconnoitered in order. The first 90 river and stream sites which pass sampling criteria are sampled. As with the lakes, the two resources can have different habitats and uses.

Aquifers

Aquifers are permeable layers of sand, gravel, or rock that contain water. Unconfined aquifers are near the land surface and are easily affected by human activities. Confined aquifers lie below a layer of material, such as fine-grained clay, that limits or prevents the downward flow of water. Water in confined aquifers is older and less affected by human activities. Ground water is monitored through wells in unconfined and confined aquifers. The target population of wells consists of 14,931 unconfined and 13,064 confined wells. Wells are randomly selected from each

aquifer type and they are reconnoitered in order. The first 120 wells which pass sampling criteria are sampled in each aquifer type.

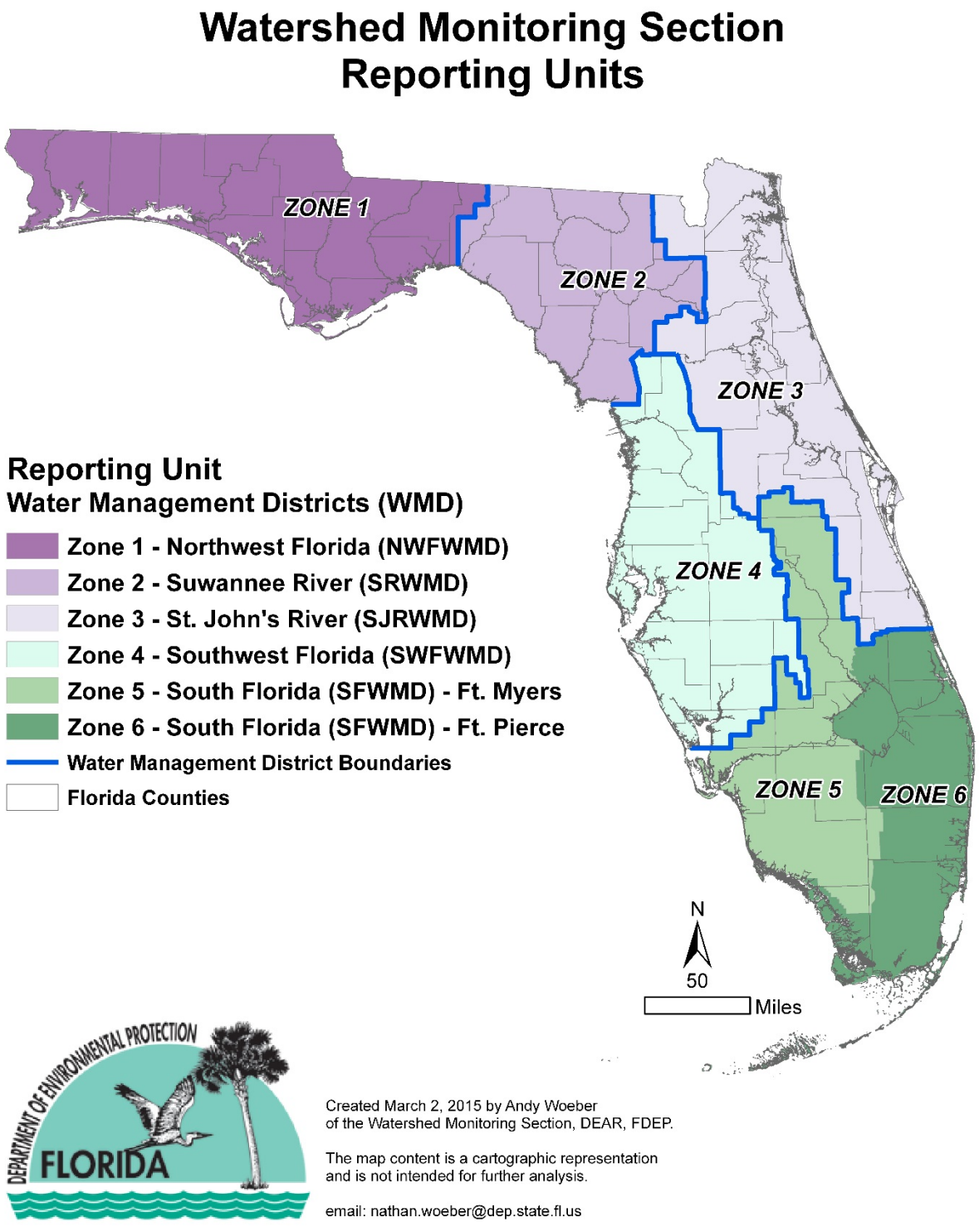
Combining Yearly Data for Analysis

An increased sample size is desirable as it is related to confidence of reported values. All else remaining the same, increasing sample size has a positive effect on the confidence levels for the reported data, increasing the confidence for statewide reporting. One way to increase the sample size is to combine data collected in different years. For this report, three years of annually collected data for the status monitoring network have been combined. This increases the sample size in each Zone sufficiently to allow reporting by Zone with 95% confidence levels at $\pm$ < 20% for regional assessments. Additionally the increase in sample size allows statewide reporting with 95% confidence levels at $\pm$ < 10%

Sampling and Analysis

In total, 60 samples in 2011 and 90 samples in 2012 and 2013 from each surface water resource type and 120 samples each year from both ground water resource types, were collected throughout the state in order to assess the conditions of each resource listed above. In addition to an overall statewide assessment, the water conditions in each of six regions (referred to from here on in as Florida's Zones, Fig. 1) were evaluated.

Figure 1. Watershed Monitoring Section Reporting Units



Summary of Resources Assessed

The table below shows the statewide extent of each of the six water resources assessed as determined by the methods listed above, and the number of samples collected in each water resource used to infer the water quality results. According to data published by the Florida State University, Florida Climate Center Precipitation website, the average annual precipitation for the 2011-2013 period was 54.8 inches, a rainfall amount that is comparable with the 30-year annual average of 55.0 inches.

Table 1. Summary of Water Resources Assessed by the Status Monitoring Network

This is a three-column table. Columns 1 and 2 list the resource type and resource size. Column 3 lists the number of samples analyzed 2011-2013.

Water Resource	*Resource Size (number/area/length)*	*Number of Samples*
Large Lake (≥ 25 acres)	1,701 lakes (1,576 square miles)	239
Small Lake (10-25 acres)	2,000 lakes (47 square miles)	208
River	2,692 miles	240
Stream	16,573 miles	228
Confined Aquifer	13,064 wells	335
Unconfined Aquifer	14,931 wells	348

Results

The sample locations for each resource are shown in **Figures 2, 4,** and **6**. Bar charts showing the percentages of waterbodies attaining water quality standards are provided below in **Figures 3, 5,** and **7**. **Appendix A** lists the definitions and numeric standards for water quality indicators. Tables providing the results are given in **Appendix B**. The data reported are the results of inferential statistics used to estimate statewide or zonewide water quality conditions based on the data collected at sampled locations.

For example, the data collected from 239 large lake sampling locations throughout the state were used to calculate inferential statistics. Indicating that 99.0±1.0% of the state's large lake area has fecal coliform levels that meet the criteria described in Appendix A. For a given resource type, typically at least 27 samples are needed to obtain a margin of error within ± 20%. Therefore if a sample size consisted of < 27 samples, then insufficient data (ISD) was reported. The regional and statewide 95% confidence intervals varied to a maximum of ± 12.6% for ground water indicators and a maximum of ± 27.8% for surface water indicators.

Surface Water

Attainment of dissolved oxygen, un-ionized ammonia, and fecal coliform criteria was 90 percent or better statewide for both large and small lakes. Lower frequencies of statewide attainment for the LVI, total phosphorus and chlorophyll-a criteria were noted for large lakes versus small lakes. Due to the reduced sample size for small lakes in Zone 6, no comparison could be made with other Zones in the study. Large lakes in Zone 6 had attainment for total phosphorus criteria of 35.1%. Whereas, small lakes in Zone 2 had attainment for total phosphorus criteria of, 74.5%.

Large lakes in Zones 3 and 4 show lower frequencies of chlorophyll-a criteria attainment than small lakes. Within Zone 2, the frequency of chlorophyll-a criteria attainment was greater for large lakes than small lakes. A lower frequency of attainment of total nitrogen criteria was noted for large lakes in Zones 3 and 4 compared to small lakes in the same Zones.

A lower frequency of statewide attainment for total phosphorus criteria was noted for streams versus rivers. Only 25 percent of the streams in Zone 6 met the criteria for total phosphorus. A lower frequency of chlorophyll-a criteria attainment was noted for rivers compared to streams in Zone 3. Only about 54.5 percent of streams in Zone 2 or rivers in Zone 1 attained total nitrogen criteria. Statewide dissolved oxygen and fecal coliform criteria attainment frequency was lower for streams versus rivers.

Ground Water

Statewide confined and unconfined aquifer attainment rates for all indicators were above 90%, with the single exception of total coliform bacteria. Statewide frequency of total coliform criteria attainment was 87.4 and 83.4% respectively for confined and unconfined aquifers. Regionally total coliform criteria attainment was lowest in Zones 3 (76.1%), 4 (69.5%) 5 (77.2%) and 6 (68.6%) in the unconfined aquifers. Regionally sodium criteria attainment rates were lowest in confined aquifers in Zones 5, 65.1%, and Zone 6, 18.8%. Regional attainment of sodium criteria in unconfined aquifers was greater than 90% with the exception of zones 4 (87.3%), and 6 (88.6%).

For more information, contact:
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2600 Blair Stone Road, Tallahassee, FL 32399
(850) 245–8433; Watershed Monitoring

Figure 2. Sampling Location Map for Large and Small Lakes

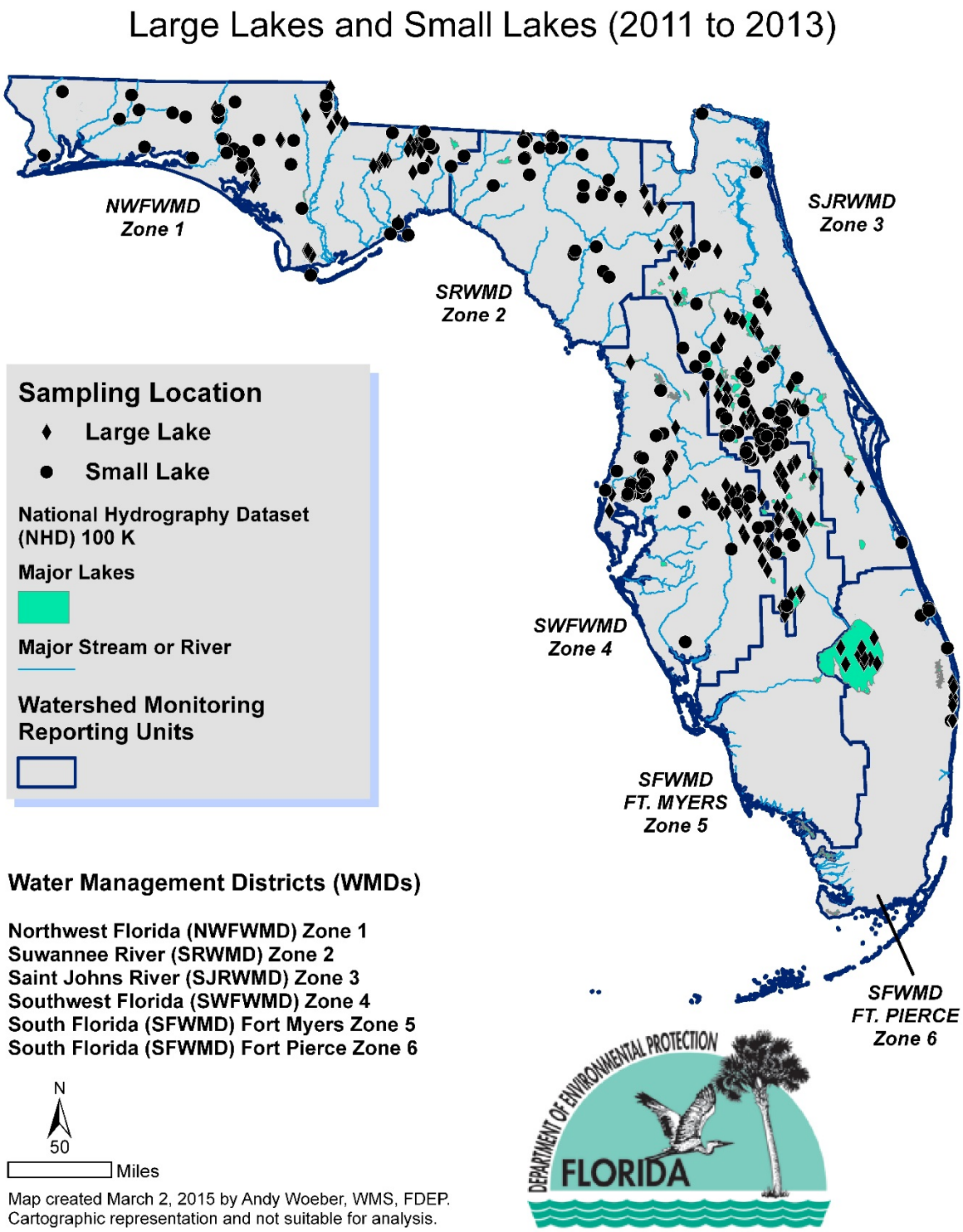
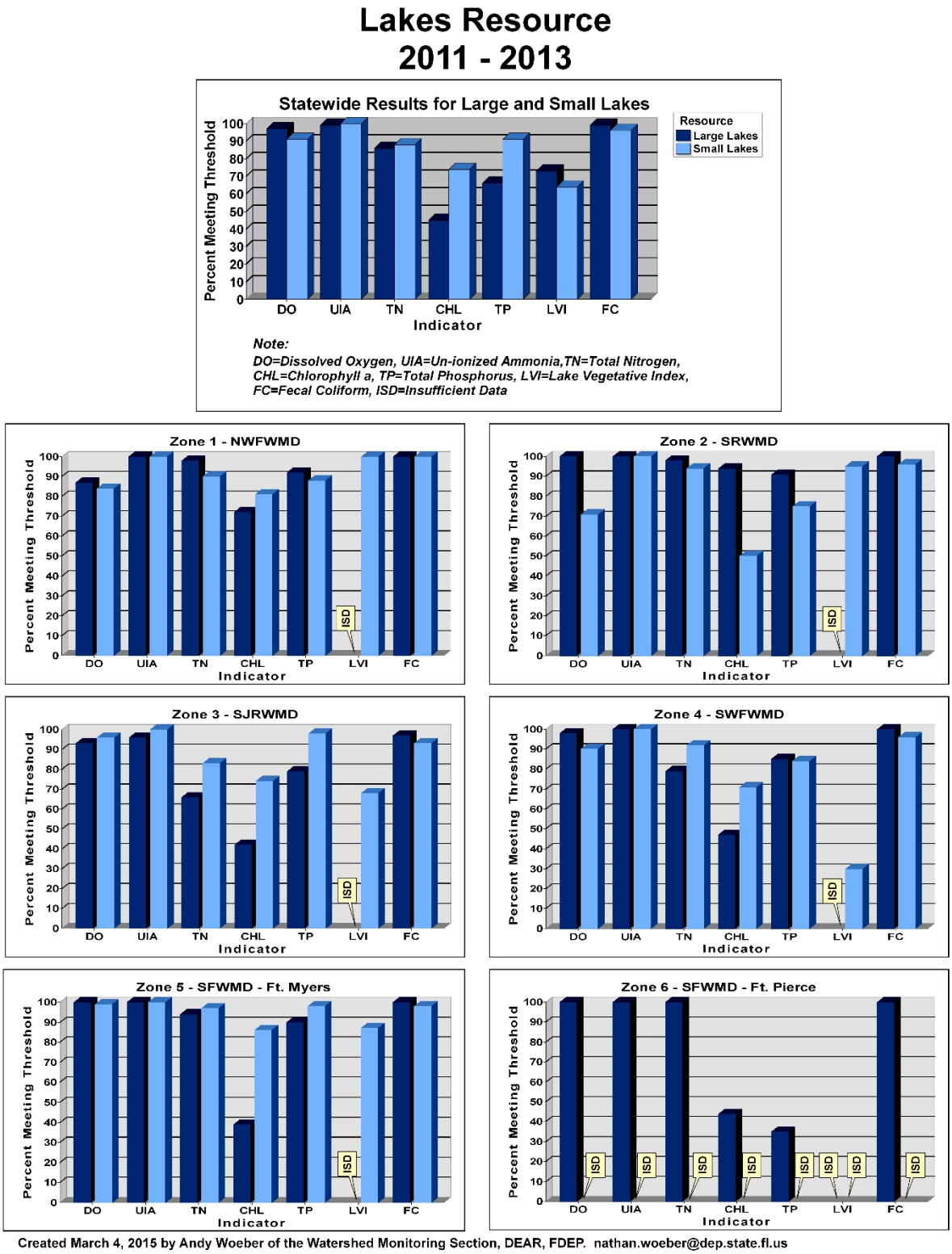


Figure 3. Percent of Large and Small Lakes Meeting Indicator Thresholds



Created March 4, 2015 by Andy Woeber of the Watershed Monitoring Section, DEAR, FDEP. nathan.woeber@dep.state.fl.us

Figure 4. Sampling Location Map for Rivers and Streams

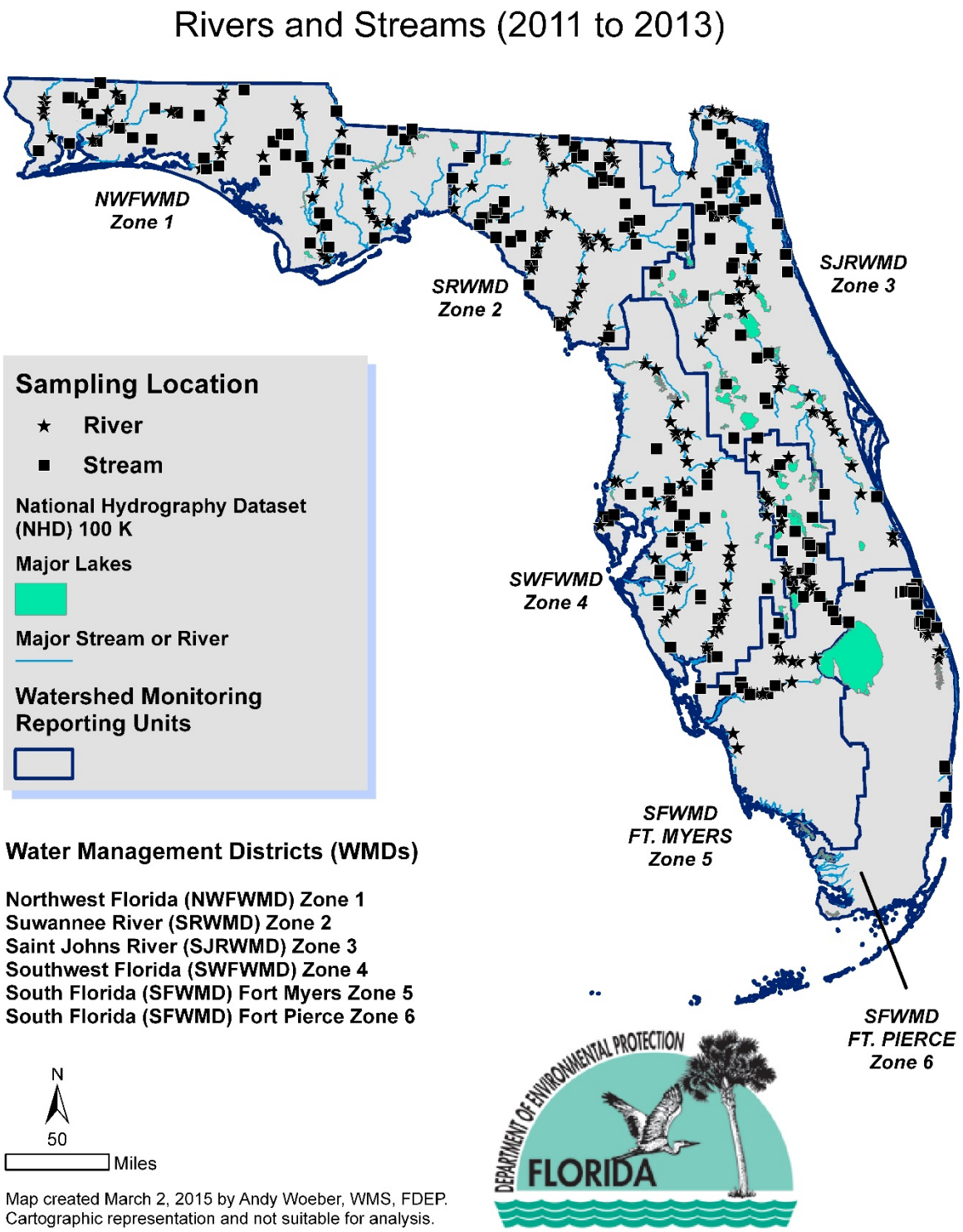


Figure 5. Percent of Rivers and Streams Meeting Indicator Thresholds

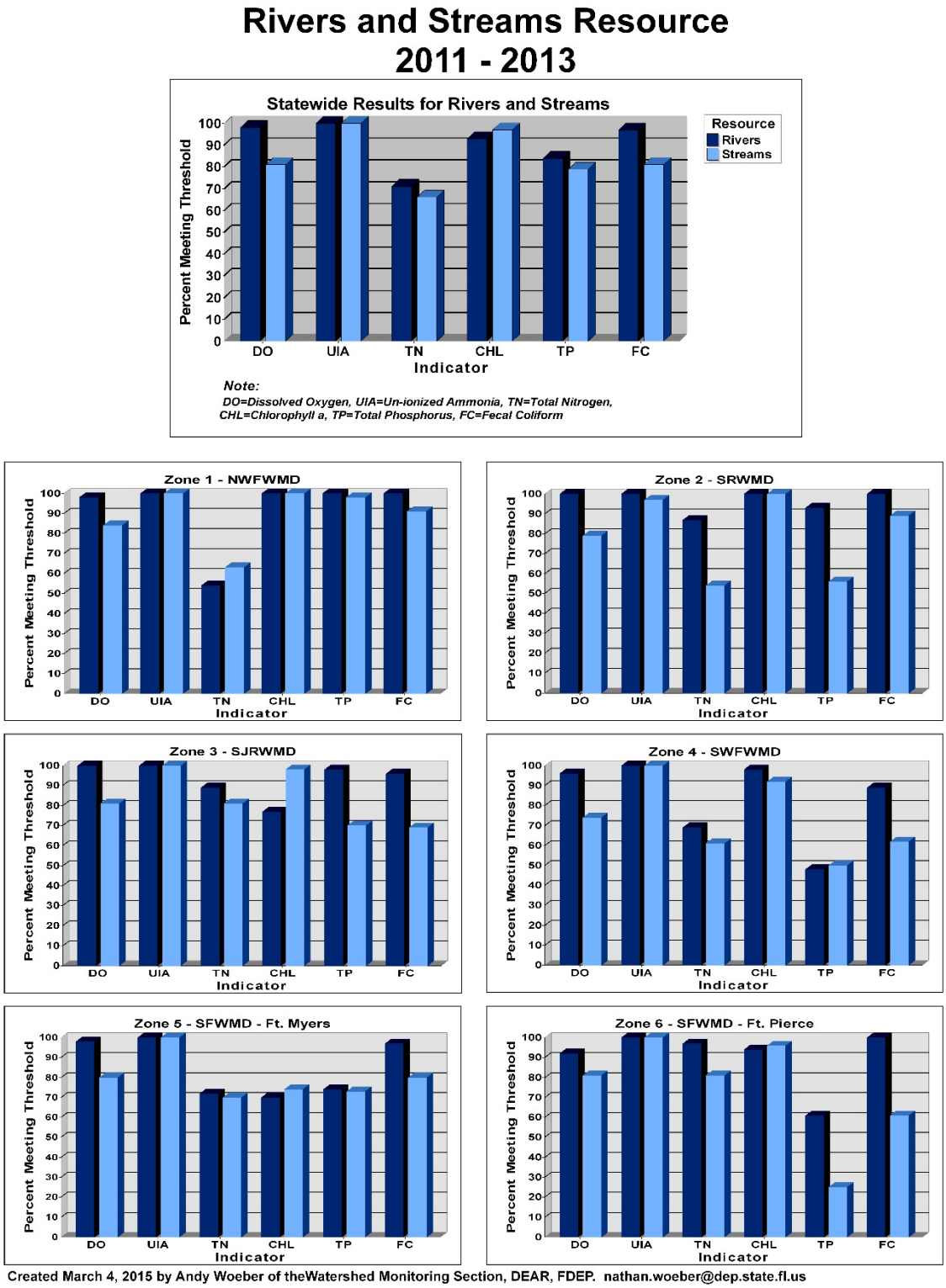


Figure 6. Sampling Location Map for Confined and Unconfined Aquifers

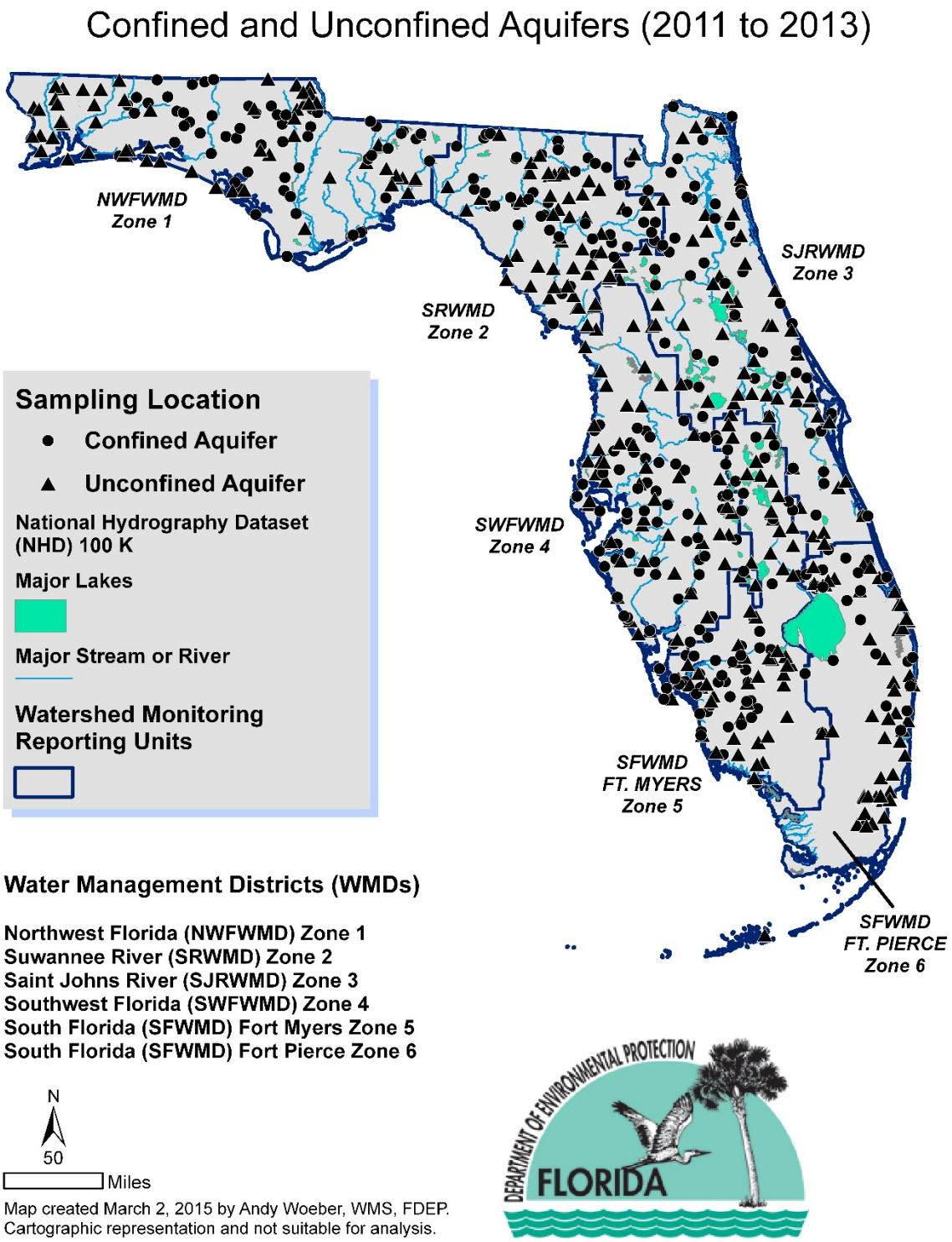
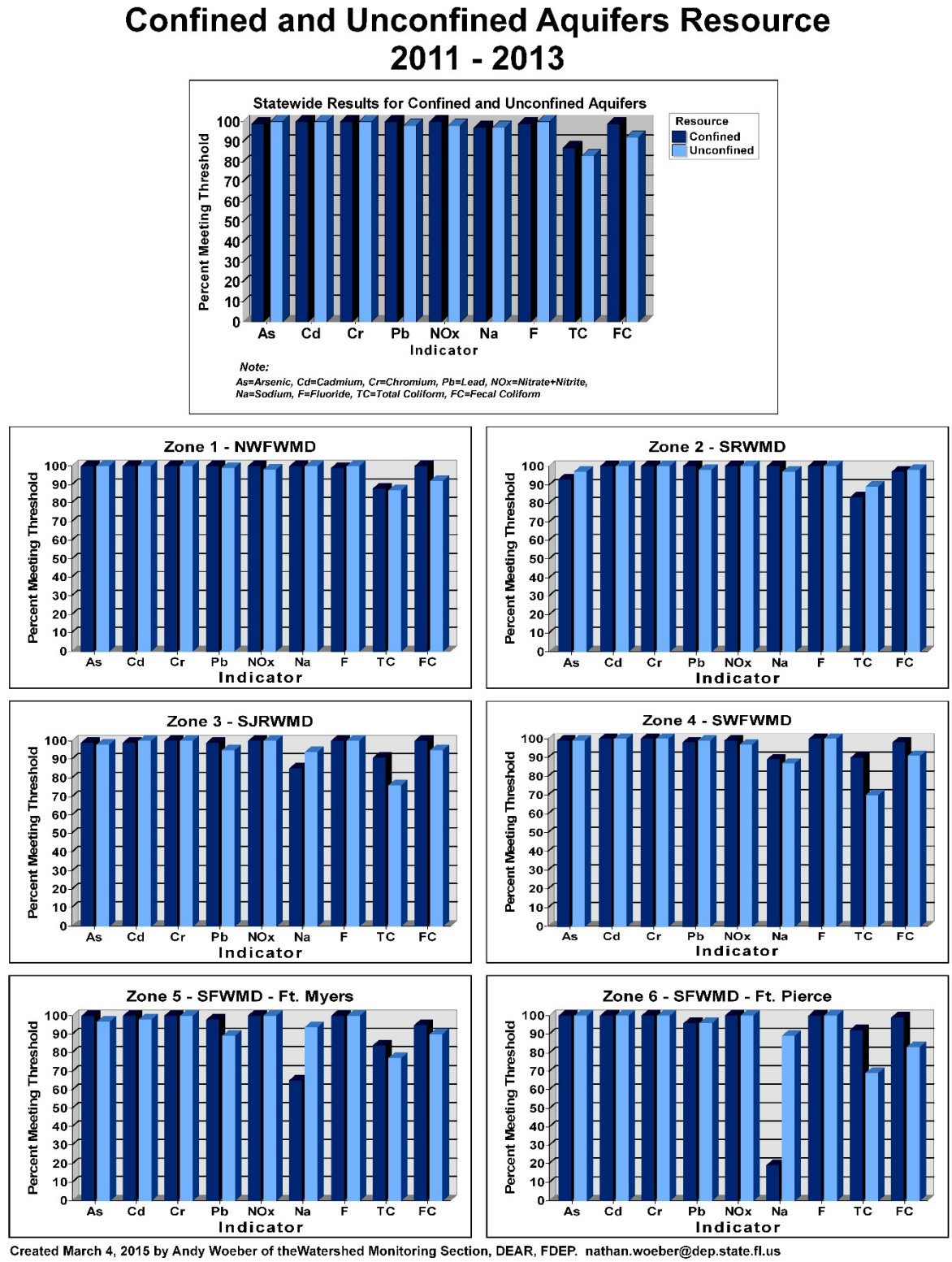


Figure 7. Percent of Confined and Unconfined Aquifers Meeting Indicator Thresholds



Appendix A. Water Quality Indicators and Associated Criteria

Surface Water

Table A1. Nutrient Indicators Used To Assess Lake Resources.

The nutrient (nitrogen and phosphorus) criteria for lakes depend on the lake color, alkalinity, and whether the lake meets the applicable chlorophyll *a* criterion.

This is a five-column table. Column 1 lists the lake color and alkalinity, Column 2 lists the chlorophyll a *criterion, Column 3 lists the total phosphorus criterion, Column 4 lists the total nitrogen criterion, and Column 5 lists the designated use of the water.*

PCU – platinum cobalt units; $CaCO_3$ – calcium carbonate; µg/L – micrograms per liter; mg/L – milligrams per liter
[1] For lakes with color > 40 PCU in the West Central Nutrient Region (Figure A1), the Total Phosphorus criterion is 0.49 mg/L, regardless of the chlorophyll concentration.

Lake Color and Alkalinity	*Chlorophyll a Criterion (µg/L)*	*Total Phosphorus Criterion (mg/L)*	*Total Nitrogen Criterion (mg/L)*	*Designated Use*
Color > 40 PCU	≤ 20	≤ 0.16[1] if meets Chlorophyll criterion; ≤ 0.05[1] if it does not meet the criterion	≤ 2.23 if meets Chlorophyll criterion; ≤ 1.27 if it does not meet the criterion	Aquatic Life
Color ≤ 40 PCU and Alkalinity > 20 mg/L $CaCO_3$	≤ 20	≤ 0.09 if meets Chlorophyll criterion; ≤ 0.03 if it does not meet the criterion	≤ 1.91 if meets Chlorophyll criterion; ≤ 1.05 if it does not meet the criterion	Aquatic Life
Color ≤ 40 PCU and Alkalinity ≤ 20 mg/L $CaCO_3$	≤ 6	≤ 0.03 if meets Chlorophyll criterion; ≤ 0.01 if it does not meet the criterion	≤ 0.93 if meets Chlorophyll criterion; ≤ 0.51 if it does not meet the criterion	Aquatic Life

Table A2. Nutrient Indicators Used To Assess River and Stream Resources.

The nutrient criteria for rivers and streams depend on the Nutrient Region (Figure A1).

This is a four-column table. Column 1 lists the Nutrient Region, Column 2 lists the total phosphorus criterion, Column 3 lists the total nitrogen criterion, and Column 4 lists the designated use of the water.

mg/L – milligrams per liter
[1]No numeric criterion. The narrative criterion in paragraph 62-302.530(47) (b), F.A.C., applies.

Nutrient Region	*Total Phosphorus Criterion (mg/L)*	*Total Nitrogen Criterion (mg/L)*	*Designated Use*
Panhandle West	≤ 0.06	≤ 0.67	Aquatic Life
Panhandle East	≤ 0.18	≤ 1.03	Aquatic Life
North Central	≤ 0.30	≤ 1.87	Aquatic Life
Peninsula	≤ 0.12	≤ 1.54	Aquatic Life
West Central	≤ 0.49	≤ 1.65	Aquatic Life
South Florida	N/A[1]	N/A[1]	Aquatic Life

Figure A1. Nutrient Regions for River and Stream Resources.

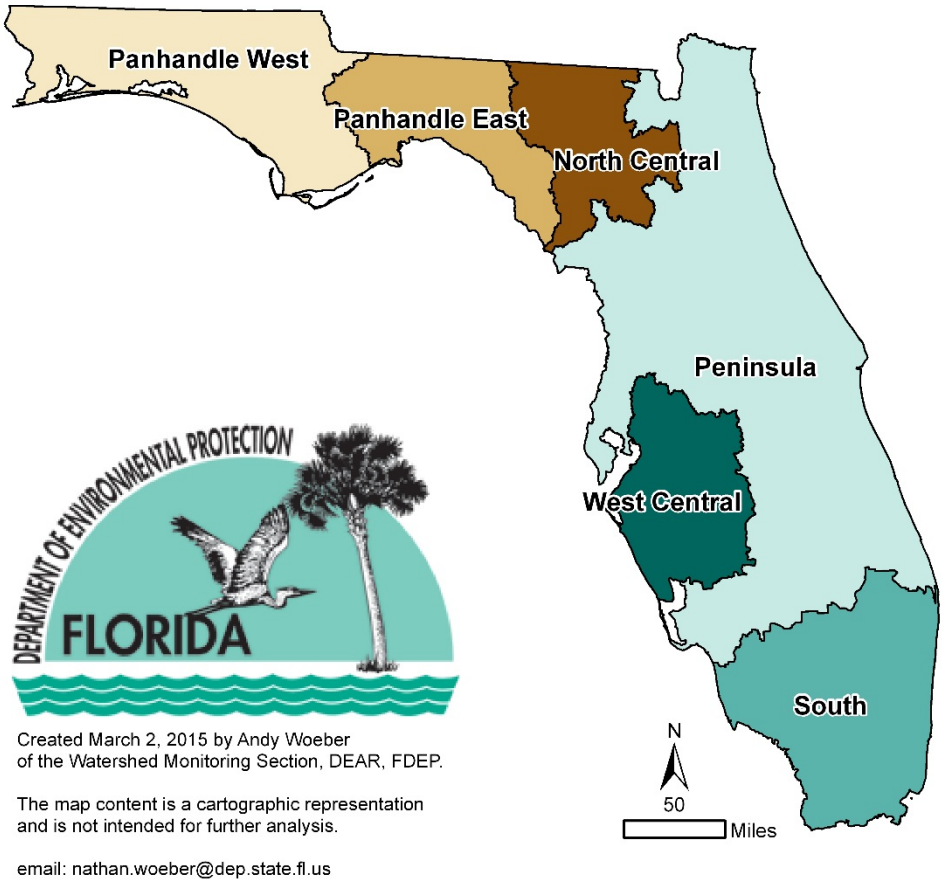


Table A3. Dissolved Oxygen (DO) Criteria Used To Assess Surface Water Resources.
The DO criteria for lakes, rivers, and streams depend on the Bioregion (Figure A2). Additionally, Site Specific Alternative Criteria (SSAC) exist in several areas of the state; however, these SSAC were not used in this report because of the reporting scale (statewide). Refer to the website link here - Alternate Surface Water Quality Standards Site Specific Alternative Criteria for more information on SSAC and the locations of sites with these variances.

This is a three-column table. Column 1 lists the Bioregion, Column 2 lists the dissolved oxygen criterion, and Column 3 lists the designated use of the water.

Bioregion	***Dissolved Oxygen Criterion (% saturation)***	***Designated Use***
Panhandle	≥ 67	Aquatic Life
Big Bend	≥ 34	Aquatic Life
Northeast	≥ 34	Aquatic Life
Peninsula	≥ 38	Aquatic Life
Everglades	≥ 38	Aquatic Life

Figure A2. Bioregions for Lake, River, and Stream Resources.

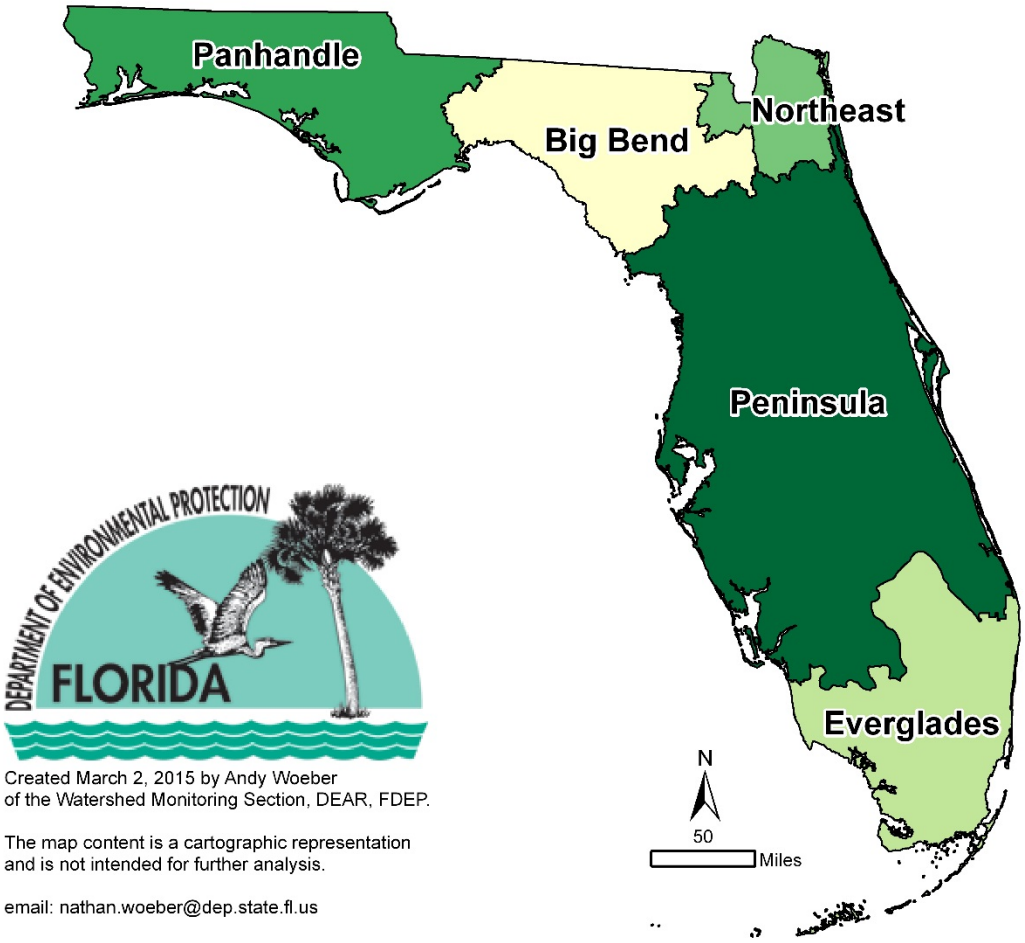


Table A4. Other Indicators Used To Assess Surface Water Resources.
Each indicator listed below was chosen because it has an applicable state criterion, found in *Criteria for Surface Water Quality Classifications, Rules 62-302 and 62-303, F.A.C.* The same criteria apply everywhere in Florida and for all surface waters, unless otherwise noted.

This is a three-column table. Column 1 lists the indicator, Column 2 lists the criterion, and Column 3 lists the designated use of the water.

mL – milliliters; mg/L – milligrams per liter; SU – standard units; µg/L – micrograms per liter
[1]Applies to rivers, streams, and canals. See Table A1 for the chlorophyll criteria for lakes.

Indicator	*Criterion*	*Designated Use*
Fecal Coliform Bacteria	< 400 counts/100 mL	Recreation
Un-ionized Ammonia	≤ 0.02 mg/L	Aquatic Life
Chlorophyll *a*[1]	≤ 20 µg/L	Aquatic Life
Lake Vegetation Index (LVI)	LVI Score < 43	Aquatic Life

Fecal coliform bacteria: The single-sample criterion for fecal coliform is less than 400 counts per 100 milliliters of water. These bacteria can enter water through the discharge of waste from mammals and birds, agricultural and storm water runoff, and untreated human sewage. The

presence of fecal coliform bacteria may indicate that the water is contaminated by other disease-causing organisms.

Dissolved oxygen (DO): See Table A3 for the DO criteria. Algae and plants produce oxygen through photosynthesis. Oxygen is dissolved in water by wind and wave action. Discharges of wastewater, storm-water runoff from urban streets or farmland, and failing septic tanks consume oxygen. Natural conditions—such as respiration by aquatic animals, ground water from springs, water from swamps/wetlands, higher water temperatures, and calm and cloudy weather can lead to reduced DO levels in waterbodies.

Un-ionized ammonia: The criterion for un-ionized ammonia is a maximum of 0.02 milligrams per liter (mg/L). This is calculated from total ammonia and is adjusted for temperature, salinity, and pH, defined as the acidity or alkalinity of the solution. Aquatic systems can contain ammonia in different forms depending on these conditions and it can be toxic to fish and invertebrates.

Chlorophyll *a*: The criterion for chlorophyll-*a* in rivers, streams, and canals is a maximum of 20 micrograms per liter (ug/L). See Table A1 for the chlorophyll criteria in lakes. Chlorophyll is the pigment that allows algae and plants to convert sunlight into energy during photosynthesis. High concentrations of chlorophyll may indicate an overabundance of algae, which can reduce water clarity and limit the light available to shallow-water ecosystems.

Lake Vegetation Index (LVI): The Lake Vegetation Index (LVI) is a multi-metric tool which assesses lake health based on plant community structure. Data generated on the presence of plant species is used to calculate four biological metrics - each of which has been shown to respond to human disturbance (DEP SOP LT 7500). The threshold associated with the index is given as 43 in the Development of Aquatic Life Use Support Attainment Thresholds for Florida's Steam Condition Index and Lake Vegetative Index, DEP-SAS-003-11 p. 37. Values less than 43 are considered failing the threshold.

Total nitrogen and total phosphorus: See Tables A1 and A2 for the total nitrogen and phosphorus criteria. These elements are essential nutrients for living organisms, and are found in fertilizers. However, an overabundance of nutrients in water can cause adverse health and ecological effects, including excessive plant and algae growth. These organisms use up oxygen as they decompose, and can block light to deeper waters. This can lead to reductions in animal and plant diversity.

Ground Water

Table A5. Indicators Used to Assess Ground Water Resources.

This is a three-column table. Column 1 lists the indicator, Column 2 lists the criterion, and Column 3 lists the designated use of the water.

µg/L – micrograms per liter; mg/L – milligrams per liter; mL – milliliters

Indicator	*Criterion*	*Designated Use*
Arsenic	≤ 10 µg/L	Potable Water
Cadmium	≤ 5 µg/L	Potable Water
Chromium	≤ 100 µg/L	Potable Water
Lead	≤ 15 µg/L	Potable Water
Nitrate–Nitrite	≤ 10 mg/L	Potable Water
Sodium	≤ 160 mg/L	Potable Water
Fluoride	≤ 4 mg/L	Potable Water
Total Coliform Bacteria	≤ 4 counts/100 mL	Potable Water
Fecal Coliform Bacteria	Presence/Detected	Potable Water

Arsenic, cadmium, chromium, and lead are all naturally occurring metals in the earth's crust. These and other metals are used in manufacturing and can be found in pesticides, preservatives, and industrial operations. They may enter water as a pollutant. Florida has primary standards (criteria) for these metals to protect human health. Excess levels in drinking water can cause adverse health effects.

Nitrate–nitrite is used in fertilizer and is found in human and animal waste. Florida's drinking water criterion for nitrate is a maximum of 10 mg/L and a maximum of 1 mg/L for nitrite. Toxicity of nitrate and nitrite is additive, therefore the sum of nitrate and nitrite concentrations must be less than or equal to 10 mg/L. In the long term, nitrates and nitrites have the potential to cause serious adverse effects in humans.

Sodium (salt) has a drinking water standard to protect individuals who are susceptible to sodium-sensitive hypertension or diseases that cause difficulty in regulating body fluid volume. Sodium is monitored so that individuals on sodium-restricted diets may take into account the sodium in their water. Drinking water contributes less than 10% of an individual's overall sodium intake.

Fluoride, a natural element, is added to drinking water systems to reduce dental cavities. Prolonged exposure to levels above 4 mg/L may result in skeletal fluorosis, a serious bone disorder. At lower levels, children may develop dental fluorosis. In its moderate and severe forms, dental fluorosis is a brown staining and/or pitting of the permanent teeth.

Total coliform bacteria are common in the environment and generally are not harmful. The presence of these bacteria in drinking water, however, indicates that disease-causing organisms may be present. To reduce the risk of adverse health effects, the U.S. EPA and the State of Florida have set a single-sample maximum of 4 coliform counts per 100 milliliters of fluid. Drinking water that meets this standard is usually not associated with a health risk from disease-causing bacteria and is considered safe.

Fecal coliform bacteria: These bacteria can enter water through the discharge of waste from mammals and birds, agricultural and storm water runoff, and untreated human sewage. The presence of fecal coliform bacteria may indicate that the water is contaminated by other disease-causing organisms. Currently the state of Florida currently has no specific ground water standard for fecal coliform bacteria, however for this report we are using a detection of fecal coliforms as the threshold.

This survey does not represent a comprehensive analysis of any individual waterbody. FDEP also analyzes for other indicators that do not have numeric criteria. For a list of all analytes see the 2013 Monitoring Design Document.

Appendix B. Tables of Results from 2011-2013

Table B1. Percent Attainment in Large Lakes.

This is a ten-column table. Column 1 lists the Zone; Columns 2-9 list the percent ± confidence interval of large lakes that attains target levels of DO - dissolved oxygen, UIA - un-ionized ammonia, TN – Total Nitrogen, CHL – Chlorophyll a, TP – Total Phosphorus, LVI – Lake Vegetative Index, FC - fecal coliform, and pH. Column 10 lists N - the number of large lake samples analyzed from 2011-2013.

[l] Based on 104 lakes statewide
ISD – Insufficient data

Zone	DO	UIA	TN	CHL	TP	LVI [l]	FC	N
1	87.1±9.9	100	97.8±2.2	72.4±9.3	91.8±7.4	ISD	100	39
2	100	100	97.8±2.2	93.6±6.3	91.1±5.2	ISD	100	40
3	93.2±6.8	95.8±4.2	65.5±11.2	41.5±12.7	78.6±7.7	ISD	96.7±3.3	40
4	97.5±2.5	100	78.9±10.9	46.8±13.0	85.2±8.6	ISD	100	40
5	100	100	93.6±6.0	39.1±10.1	89.6±6.8	ISD	100	40
6	100	100	100	43.5±27.8	35.1±22.6	ISD	100	40
Statewide	97.1±2.1	98.8±1.2	86.1±3.7	44.9±11.0	66.3±8.6	73.1±4.1	99.0±1.0	239

Table B2. Percent Attainment in Small Lakes.

This is a ten-column table. Column 1 lists the Zone; Columns 2-9 list the percent ± confidence interval of small lakes that attains target levels of DO - dissolved oxygen, UIA - un-ionized ammonia, TN – Total Nitrogen, CHL – Chlorophyll a, TP – Total Phosphorus, LVI – Lake Vegetative Index, FC - fecal coliform, and pH. Column 10 lists N - the number of small lake samples analyzed from 2011-2013.

*Based on 37 samples
**Based on 38 samples
***Based on 41 samples
[l] Based on 174 lakes statewide, 34 for Zone 1, 31 for Zone 2, 35 for Zone 3, 39 for Zone 4, and 29 for Zone 5
ISD – Insufficient data

Zone	DO	UIA	TN	CHL	TP	LVI[l]	FC	N
1	83.7±8.6	100	90.0±7.6	80.8±12.2	88.1±9.5	100	100	40
2	70.8±12.2	100*	93.8±6.2*	50.4±16.8	74.5±14.2*	95.4±2.1	95.5±4.5	40
3	95.9±4.1	100	82.8±9.1	74.1±13.8	97.9±2.1	68.1±5.6	93.1±6.9	40
4	89.6±8.7	100	91.7±8.3	70.5±13.7	83.8±10.2	29.7±6.9	95.9±4.1**	40
5	98.6±1.4	100	96.6±3.4***	85.7±10.9	98.0±2.0***	86.9±5.5	98.0±2.0***	42
6	ISD	ISD	ISD	ISD	ISD	ISD	ISD	6
Statewide	91.4±3.6	100	88.3±4.6	74.3±7.2	91.2±3.8	64.3±3.1	95.8±4.0	208

Table B3. Percent Attainment in Rivers.

This is a nine-column table. Column 1 lists the Zone; Columns 2-8 list the percent ± confidence interval of rivers that attains target levels of DO - dissolved oxygen, UIA - un-ionized ammonia, TN – Total Nitrogen, CHL – Chlorophyll a, TP – Total Phosphorus, FC – fecal coliform, and pH. Column 9 lists N - the number of river samples analyzed from 2011-2013.

Zone	*DO*	*UIA*	*TN*	*CHL*	*TP*	*FC*	*N*
1	97.8±2.2	100	54.4±9.4	100	100	100	40
2	100	100	86.7±8.7	100	93.3±6.5	100	40
3	100	100	89.1±6.7	76.9±10.5	97.8±2.2	95.6±4.3	40
4	95.6±4.4	100	68.9±12.6	97.8±2.2	47.8±10.5	88.9±8.3	40
5	97.7±2.3	100	72.3±9.4	70.0±11.0	73.9±7.6	97.0±3.0	40
6	91.7±8.3	100	97.2±2.8	94.3±4.5	61.2±12.2	100	40
Statewide	98.0±1.8	100	71.2±4.7	93.3±2.2	84.3±2.8	96.5±2.1	240

Table B4. Percent Attainment in Streams.

This is a nine-column table. Column 1 lists the Zone; Columns 2-8 list the percent ± confidence interval of streams that attains target levels of DO - dissolved oxygen, UIA - un-ionized ammonia, TN – Total Nitrogen, CHL – Chlorophyll a, TP – Total Phosphorus, FC – fecal coliform, and pH. Column 9 lists N - the number of stream samples analyzed from 2011-2013.

*Based on 32 samples
**Based on 39 samples

Zone	*DO*	*UIA*	*TN*	*CHL*	*TP*	*FC*	*N*
1	84.4±7.3	100	63.3±10.9	100	97.8±2.2	91.1±7.5	40
2	78.9±10.9	96.7±3.3	54.5±12.7	100	55.6±11.4	88.9±9.2	40
3	81.1±10.8	100	81.1±10.4	97.8±2.2	70.0±11.0	69.3±11.2**	40
4	74.2±12.7	100	60.6±12.5	92.4±7.6	50.0±15.7	62.1±14.8	32
5	80.1±11.1	100	69.8±11.5	74.4±13.0	72.7±13.1	80.2±9.7	40
6	81.1±13.3	100	81.2±10.3*	95.8±4.2	25.0±15.6*	61.0±13.5	36
Statewide	81.3±4.8	99.7±0.3	65.7±6.3	97.1±1.7	78.7±4.0	81.2±5.0	228

Table B5. Percent Attainment in Confined Aquifers.

This is an eleven-column table. Column 1 lists the Zone; Columns 2-10 list the percent ± confidence interval of confined aquifer wells that attains target levels of arsenic, cadmium, chromium, lead, nitrate-nitrite, sodium, fluoride, total coliform, and fecal coliform, respectively; Column 11 lists "N", the number of confined aquifer samples analyzed from 2011-2013.

* Based on 58 samples
** Based on 59 samples

Zone	Arsenic	Cadmium	Chromium	Lead	Nitrate-Nitrite	Sodium	Fluoride	Total Coliform	Fecal Coliform	N
1	100	100	100	100	100	100	99.0±1.0	87.8±10.3	100	60
2	93.1±6.9	100	100	100	100	100	100	83.4±12.6*	96.7±3.3	60
3	99.0±1.0	99.0±1.0	100	99.0±1.0	100	85.3±5.2	100	91.2±6.7	100	60
4	98.8±1.2	100	100	98.2±1.8	98.8±1.2	89.5±4.7	100	89.9±5.3**	97.7±2.3	60
5	100	100	100	97.5±2.5	100	65.1±10.3	100	83.8±8.1	94.9±4.9	60
6	100	100	100	96.0±4.0	100	18.8±9.0	100	92.1±7.9	98.6±1.4	35
Statewide	98.5±1.5	99.9±0.1	100	99.7±0.3	99.9±0.1	96.7±0.7	99.4±0.6	87.4±6.8	99.1±0.9	335

Table B6. Percent Attainment in Unconfined Aquifers.

This is an eleven-column table. Column 1 lists the Zone; Columns 2-10 list the percent ± confidence interval of unconfined aquifer wells that attains target levels of arsenic, cadmium, chromium, lead, nitrate-nitrite, sodium, fluoride, total coliform, and fecal coliform, respectively; Column 11 lists "N", the number of unconfined aquifer samples analyzed from 2011-2013.

* Based on 49 samples
** Based on 58 samples

Zone	Arsenic	Cadmium	Chromium	Lead	Nitrate-Nitrite	Sodium	Fluoride	Total Coliform	Fecal Coliform	N
1	100	100	100	99.2±0.8	97.5±2.5	100	100	87.2±9.4	92.0±7.8	60
2	97.1±2.9	100	100	97.7±2.3	100	97.2±2.8	100	88.5±9.3	97.7±2.3	60
3	98.2±1.8	100	100	94.7±5.3	100	93.6±5.0	100	76.1±9.5	95.2±4.7	60
4	98.9±1.1	100	100	98.9±1.1	96.5±2.6**	87.3±11.2	100	69.5±12.9	90.8±9.2	59
5	97.0±3.0	97.6±2.4	100	89.2±8.4	100	94.2±4.0	100	77.2±10.2	89.8±7.3	59
6	100	100	100	96.3±3.7	100	88.6±7.1	100	68.6±11.3*	83.1±10.7*	50
Statewide	99.5±0.4	99.9±0.1	100	98.2±1.1	98.1±1.9	97.4±1.0	100	83.4±6.7	91.5±5.6	348