

Comments Regarding the Florida Geological Survey's Bulletin 69:  
**REGIONAL AND STATEWIDE TRENDS IN FLORIDA'S SPRING AND WELL GROUNDWATER QUALITY  
(1991-2003)**

Based on a review of Bulletin 69 in 2010, the Secretary of the Florida Department of Environmental Protection requested a timely update of the Bulletin that would incorporate the most current statewide information possible. Therefore, a revised publication of Bulletin 69 is scheduled for Spring, 2011 and will cover an extended time span of 1991 through 2008.

In addition, the authors regret that Bulletin 69 contained a number of minor errors, mostly in the tables. The errors do not affect the overall interpretations presented in Bulletin 69. A listing of the corrections is available upon request. Just click "Ask the Librarian" on the web page at <http://WWW.dep.state.fl.us/geology/publications/library.htm>.

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## Errata

Florida Geological Survey Bulletin No. 69  
REGIONAL AND STATEWIDE TRENDS IN FLORIDA'S SPRING  
AND WELL GROUNDWATER QUALITY (1991-2003)

Page	
xix	Third full paragraph last sentence, change "...potentially be e used..." to "...potentially be used to..."
10	Third paragraph last sentence, change "Unfortunately, some pollutants not always..." to "Unfortunately, some pollutants <b>are</b> not always..."
16	First full paragraph last sentence, change Appendix D to Appendix C.
21	Second paragraph, fourth line from bottom, change "...is statistically..." to "... <b>it</b> is statistically..."
22	First full paragraph after last sentence, eliminate "Other analytes had"
29	Fourth paragraph last sentence, change "...agency has their ..." to "...agency has its..."
35	Third full paragraph first sentence, change "... <b>and</b> an upward trend..." to "...an upward trend..."
41	Second paragraph first sentence, change "Alkalinity, calcium, magnesium, sodium and specific conductance...increased" to "Calcium, magnesium, and sodium increased..."
41	Third paragraph second sentence, change "...springs that exhibited <b>and</b> increase..." to "...springs that exhibit an increase..."
41	Fourth paragraph third sentence, change "...all rock-matrix..." to "many rock-matrix..."
46	Third full paragraph first sentence, change "...10 of 14..." to "...11 of 15..."
51	First paragraph first sentence, change "Nutrients in the SRWMD..." to "During Sequence A, nutrients in the SRWMD..."
51	Second paragraph third sentence, change "...not a standard..." to "...not a numeric standard..."
55	Second paragraph third sentence, change "...strontium increased in 10 springs and decreased in one." to "...strontium increased in 10 springs and strontium decreased in one."
59	Fifth paragraph last sentence, change "...Sequence A..." to "...Sequence B..."
62	First full paragraph second sentence, change "...most frequent..." to "...a frequent..."
67	Second paragraph second sentence, change "...pH increased in one spring and decreased in 10..." to "...pH decreased in 10 springs."
71	First paragraph last sentence, change "Sodium and sulfate" to "Sodium, sulfate and temperature..."
74	First paragraph third sentence, change "Temperature rose...(six increased..." to "Temperature Rose...(seven increased..."
75	Figure 44, change "Both wells are confined..." to "Both wells are unconfined..."
77	First partial paragraph fifth sentence, change "...Sequence B...five decreased...Sequence C (two increased..." to "...Sequence B...four increased...Sequence C (one increased..."
77	First partial paragraph seventh sentence, change "...A (seven increased...C (five increased" to "... A (six increased...C(four increased..."
79	last paragraph, change "...six of 10..." to "...six of 11..."
81	Fourth full paragraph first sentence, change "...discussion has been..." to "...discussion was often..."

- 100 Second paragraph, first sentence, change "...specific conductance, sulfate,..." to "...specific conductance, sodium, sulfate..."
- 100 Second paragraph, third sentence, change "...the sign tests revealed that nitrate had an upward trend while phosphorus, and phosphate showed decreasing trends." to "...the sign tests revealed that phosphorus showed decreasing trends, while fluoride had an upward trend."
- 100 Third paragraph first sentence, change "...potassium, specific conductance..." to "potassium, sodium, specific conductance..."
- 101 first paragraph seventh sentence, change "...magnesium, sodium and strontium..." to "magnesium and sodium..."
- 104 First paragraph third sentence, change "...trending in the other direction by greater than 50 Percent..." to "...trending in the other direction..."
- 104 First paragraph sixth sentence, change "...decreasing trends (minor) direction..." to "...increasing trends (minor) direction..."
- 104 Change the entire second paragraph to:

Data from eight wells (six unconfined and two confined) in the NFWMD were used. For unconfined groundwater for Sequence A, sodium, sulfate, and temperature showed potential evidence for upward trends, while pH, and water levels demonstrated potential evidence for downward trends (Table 34). With only two wells tapping confined groundwater, potential evidence for districtwide trends did not exist. For the combined (all) category (Table 35), temperature had potential evidence for an upward trend, while water level had evidence for a downward trend.

- 108 First paragraph second sentence, change "...combined category had potential..." to "...combined category and pH for unconfined had potential..."
- 108 First paragraph fourth sentence, change "...pH..." to "...pH and SC-f..."
- 108 First paragraph fifth sentence, change "unconfined groundwater" to "...combined groundwater"
- 120 Second paragraph third sentence, change "For combined groundwater, calcium, temperature, turbidity..." to "For combined groundwater, calcium, turbidity..."
- 120 Second paragraph fourth sentence, change "...less than 0.02, pH..." to "...less than 0.02, pH, turbidity..."
- 120 Third paragraph first sentence, change "... trends in calcium and several..." to "...trends in several..."
- 120 Third paragraph third sentence, change entire sentence to, "Phosphorous displayed a strong downward trend while fluoride had a strong upward trend during Sequence B."
- 120 Third paragraph fourth and fifth sentences, delete both sentences.
- 122 First full paragraph fourth sentence, change "...calcium, magnesium, sodium, and strontium..." to "...calcium, magnesium, and sodium..."
- 123 Table 65 last line, delete "Sr ↑"
- 161 First partial paragraph, last phrase, change the word "dependant" to "dependent."
- 162 Second paragraph, fourth sentence, change "...SRJWMD..." to "...SJRWMD..."
- 163 First full paragraph third sentence, change "...coastal spring" to "...coastal springs..."

**Table 1. Analyte Groups**

Field	Rock-Matrix (Rock)*	Saline or saltwater	Nutrient	Other
Discharge	Alk	Ca	Ca and Mg	TSS
DO	Ca	Cl	K	Turb
pH	F	K	N	TOC
SC	Fe	Na	NH <sub>3</sub> and NH <sub>4</sub>	
Temp	K	SC	NO <sub>3</sub> or NO <sub>3</sub> + NO <sub>2</sub>	
WL(msl) or Stage	Mg	SO <sub>4</sub>	PO <sub>4</sub> and P	
	PO <sub>4</sub> and P	TDS	SO <sub>4</sub>	
	pH	WL(msl) or Stage	TKN	
	SC		TOC	
	SO <sub>4</sub>			
	Sr			

\*Light gray indicates rock and saline-related indicators while dark gray shows common nutrient analytes.

**Table 19. SJRWMD Districtwide Trends Based on Sign Tests, Sequence C.**

Analyte	+	-	Trend Direction	P-Value
Flow	0	8	Down	0.008
pH	10	0	Up	0.001
F	7	0	Up	0.008

**Table 29. Statewide Trends Based on Sign Tests for 57 Springs, Sequence B (1991-1997).**

Analyte	+	-	Trend Direction	P-Value
P	0	16	Down	<0.001
F	12	0	Up	0.001

**Table 30. Statewide Trends Based on Sign Tests for 57 Springs, Sequence C (1998-2003).**

Analyte	+	-	Trend Direction	P-Value
Alk	27	2	Up	<0.001
Ca	23	1	Up	<0.001
Cl	24	6	Up	0.001
F	16	0	UP	<0.001
Flow	0	20	Down	<0.001
K	23	1	Up	<0.001
Mg	28	1	Up	<0.001
Na	28	1	Up	<0.001
SC*	20	5	Up	0.004
SO <sub>4</sub>	21	6	Up	0.003
Sr	22	1	Up	<0.001
TDS	10	2	Up	0.019
TKN	10	2	Up	0.020
TOC	2	15	Down	0.001

\* Specific conductance - SWFWMD and SJRWMD measured specific conductance (field); SRWMD measured specific conductivity (lab).

**Table 31. Statewide Trends in at Least Two WMDs, Sequence A (1991-2003).**  
(Districtwide in at least two WMDs and significant in at least two spring in three WMDs.)

Analyte	+	-	Sig in WMD	Trend Direction	P-Value
Ca	31	2	SR, SJ, SW	Up	<0.001
Mg	32	2	SR, SW	Up	<0.001
Na	30	4	SR, SW	Up	<0.001
Sr	27	1	SJ, SW	UP	<0.001

SR = SRWMD, SJ = SJRWMD, SW = SWFWMD

**Table 32. Statewide Trends in at Least Two WMDs, Sequence C (1998-2003).**  
(Districtwide in at least two WMDs and significant in at least two springs in three WMDs.)

Analyte	+	-	Sig in WMD	Trend Direction	P-Value
Flow	0	19	SR, SJ	Down	<0.001
Ca	23	1	SR, SW	Up	<0.001
Mg	28	1	SR, SW	Up	<0.001
Na	28	1	SR, SW	Up	<0.001

SR = SRWMD, SJ = SJRWMD, SW = SWFWMD

**Table 35. Potential NFWMD Districtwide Trends, Sequence A.** (Note small sample size.)

Analyte	Confined or Unconfined	Direction	Comments
Na	Unconfined	Up	Lowering WL may be cause of slight increase in saline analytes.
pH	Unconfined	Down	Lowering WL may be cause of decreased pH
SO4	Unconfined	Up	Lowering WL may be cause of slight increase in saline analytes.
Temp	Uncon, All	Up	Increase in air temperature
WL(msl)	Uncon, All	Down	Decrease in rainfall.

**Table 37. Potential NFWMD Districtwide Trends, Sequence B.** (Note small sample size.)

Analyte	Confined or Unconfined	Direction	Comments
Na	Unconfined	Up	Lowering WL may be cause of slight increase in saline analytes.
SC-f	Uncon, All	Up	Lowering WL may be cause of slight increase in saline analytes.
WL	Uncon, All	Down	Decrease in rainfall.

**Table 39. Potential NFWMD Districtwide Trends, Sequence C.** (Note small sample size.)

Analyte	Confined or Unconfined	Direction	Comments
pH	Uncon, All	Down	Possibly higher mixture of younger recharge water near well screen during low water level times.

**Table 41. Potential SRWMD Districtwide Trends, Sequence A.**

<b>Analyte</b>	<b>Confined or Unconfined</b>	<b>Direction</b>	<b>Comments</b>
<b>pH</b>	All	Down	High mixture of young, recharge water near well screen during drought.
<b>Turb(lab)</b>	All	Down	Not sure of reason.
<b>WL(msl)</b>	Uncon, All	Down	Less rainfall, less recharge, and more pumping of GW.

**Table 43. Potential SRWMD Districtwide Trends, Sequence B.**

<b>Analyte</b>	<b>Confined or Unconfined</b>	<b>Direction</b>	<b>Comments</b>
<b>pH</b>	All	Down	Possibly higher mixture of younger, recharge water near well screen during low water level times.
<b>SC-f</b>	All	Down	Not sure of reason.

**Table 45. Potential SRWMD Districtwide Trends, Sequence C.**

<b>Analyte</b>	<b>Confined or Unconfined</b>	<b>Direction</b>	<b>Comments</b>
<b>F</b>	All	Up	Not sure of reason.
<b>SC(field)</b>	All	Up	Less rainfall, less dilute recharge water
<b>Temp</b>	Uncon, All	Up	Air temperature in WMD increased. Water temperature may be related.
<b>WL(msl)</b>	All	Down	Less rainfall, less recharge, and more pumping of GW.

**Table 57. Potential SWFWMD Districtwide Trends, Sequence C.**

<b>Analyte</b>	<b>Confined or Unconfined</b>	<b>Direction</b>	<b>Comments</b>
<b>SC(field)</b>	All	Up	Less rainfall, less dilute recharge water
<b>WL(msl)</b>	All	Down	Less rainfall, less recharge, and more pumping of GW.

**Table 63. Statewide Spring-water Quality Summary for Rock and Saline Indicators.**  
 (Only indicators displaying strong significant trends (P-Value < 0.02))

<b>Sequence A (1991 - 2003)</b>		
<b>Analyte</b>	<b>Trend Direction</b>	<b>P-Value</b>
<b>Flow</b>	Down	0.006
<b>Alk</b>	Up	<0.001
<b>Ca</b>	Up	<0.001
<b>Cl</b>	Up	<0.001
<b>F</b>	Up	<0.001
<b>K</b>	Up	0.001
<b>Mg</b>	Up	<0.001
<b>Na</b>	Up	<0.001
<b>SC</b>	Up	0.004
<b>Sr</b>	Up	<0.001
<b>SO<sub>4</sub></b>	Up	0.001
<b>TDS</b>	Up	<0.001
<b>Sequence B (1991-1997)</b>		
<b>P</b>	Down	<0.001
<b>F</b>	Up	0.001
<b>Sequence C (1998-2003)</b>		
<b>Flow</b>	Down	<0.001
<b>Alk</b>	Up	<0.001
<b>Ca</b>	Up	<0.001
<b>Cl</b>	Up	0.001
<b>F</b>	Up	<0.001
<b>K</b>	Up	<0.001
<b>Mg</b>	Up	<0.001
<b>Na</b>	Up	<0.001
<b>SC</b>	Up	0.005
<b>Sr</b>	Up	<0.001
<b>SO<sub>4</sub></b>	Up	0.003
<b>TDS</b>	Up	0.019