**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 **are** 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 “…**it** 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 “… **and** 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 **and** 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…”

Page

100 Second paragraph, first sentence, change “…specific conductance, sulfate,…” t o “…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 and 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 NWFWMD 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 “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 | NH3 and NH4 |  |
| Temp | K | SC | NO3 or NO3 + NO2 |  |
| WL(msl) orStage | Mg | SO4 | PO4 and P |  |
|  | PO4 and P | TDS | SO4 |  |
|  | pH | WL(msl) orStage | TKN |  |
|  | SC |  | TOC |  |
|  | SO4 |  |  |  |
|  | 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 |
|  **SO4** | 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 NWFWMD 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 NWFWMD 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 NWFMD 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.**

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

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

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

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

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

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

|  |  |  |  |
| --- | --- | --- | --- |
| **Analyte** | **Confined or****Unconfined** | **Direction** | **Comments** |
| **SC(field)**  | All | Up | Less rainfall, less dilute recharge water |
| **WL(msl)** | 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)

|  |
| --- |
| **Sequence A (1991 - 2003)** |
| **Analyte** | **Trend Direction** |  **P-Value** |
|  **Flow** | Down |  0.006 |
|  **Alk** | Up |  <0.001 |
|  **Ca** | Up |  <0.001 |
|  **Cl** | Up |  <0.001 |
|  **F** | Up |  <0.001 |
|  **K** | Up |  0.001 |
|  **Mg** | Up |  <0.001 |
|  **Na** | Up |  <0.001 |
|  **SC** | Up |  0.004 |
|  **Sr** | Up |  <0.001 |
|  **SO4** | Up |  0.001 |
|  **TDS** | Up |  <0.001 |
| **Sequence B (1991-1997)** |
|  **P** | Down |  <0.001 |
|  **F** | Up |  0.001 |
| **Sequence C (1998-2003)** |
|  **Flow** | Down |  <0.001 |
|  **Alk** | Up |  <0.001 |
|  **Ca** | Up |  <0.001 |
|  **Cl** | Up |  0.001 |
|  **F** | Up |  <0.001 |
|  **K** | Up |  <0.001 |
|  **Mg** | Up |  <0.001 |
|  **Na** | Up |  <0.001 |
|  **SC** | Up |  0.005 |
|  **Sr** | Up |  <0.001 |
|  **SO4** | Up |  0.003 |
|  **TDS** | Up |  0.019 |