Potential for Statewide Saline Encroachment of Florida Spring Water

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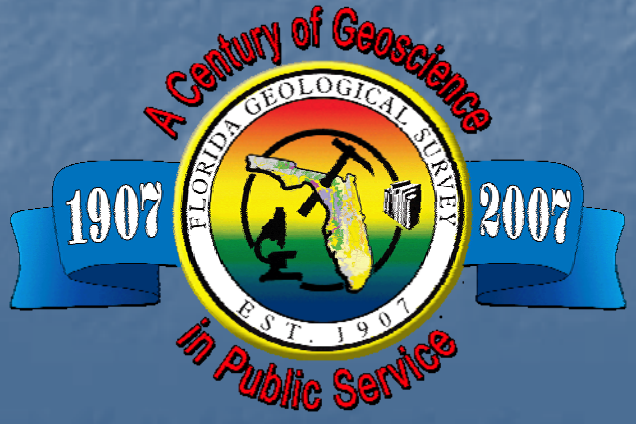
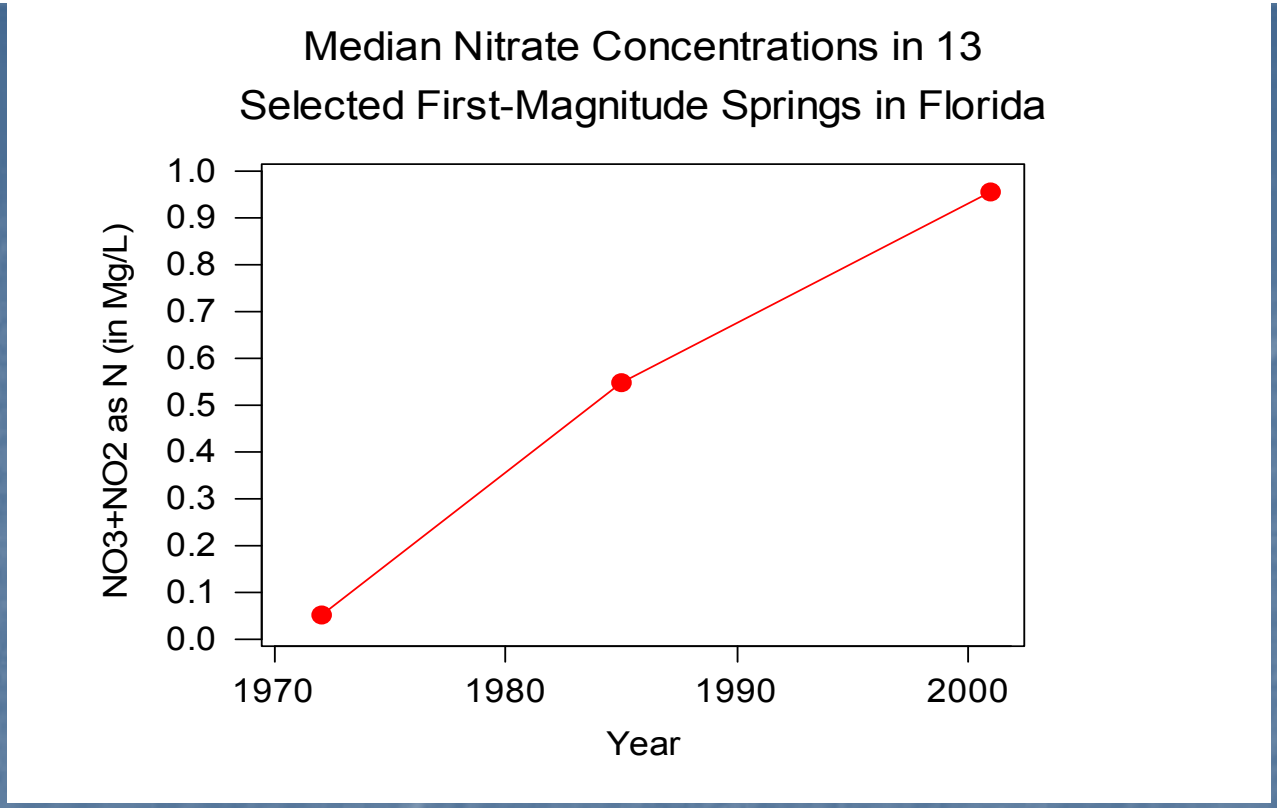




- Florida Spring Task Force Rept (2000)
- Recommendations
  - Implement Springs Monitoring
  - Document Long-Term Trends

Trends

- Sufficient Data (1991 - 2003)
  - 58 springs and 46 wells
  - Major Analyte Groups and Examples
    - Field (Temp, discharge)
    - Rock (Ca, Mg, HCO3)
    - **Saline (Na, Cl, SO4)**
    - Nutrients (NO3, P)
- Severe Drought Occurred 1998-2002
  - Cause of Numerous Trends

Statewide Trends in Springs (1991-2003)

Analyte	↑	↓	Direct	P-Val
NO3	25	12	↑	0.047
Flow	3	14	↓	0.013
Ca	31	3	↑	<0.001
Mg	32	3	↑	<0.001
Sr	28	1	↑	<0.001
Alk	29	1	↑	<0.001
F	16	0	↑	<0.001

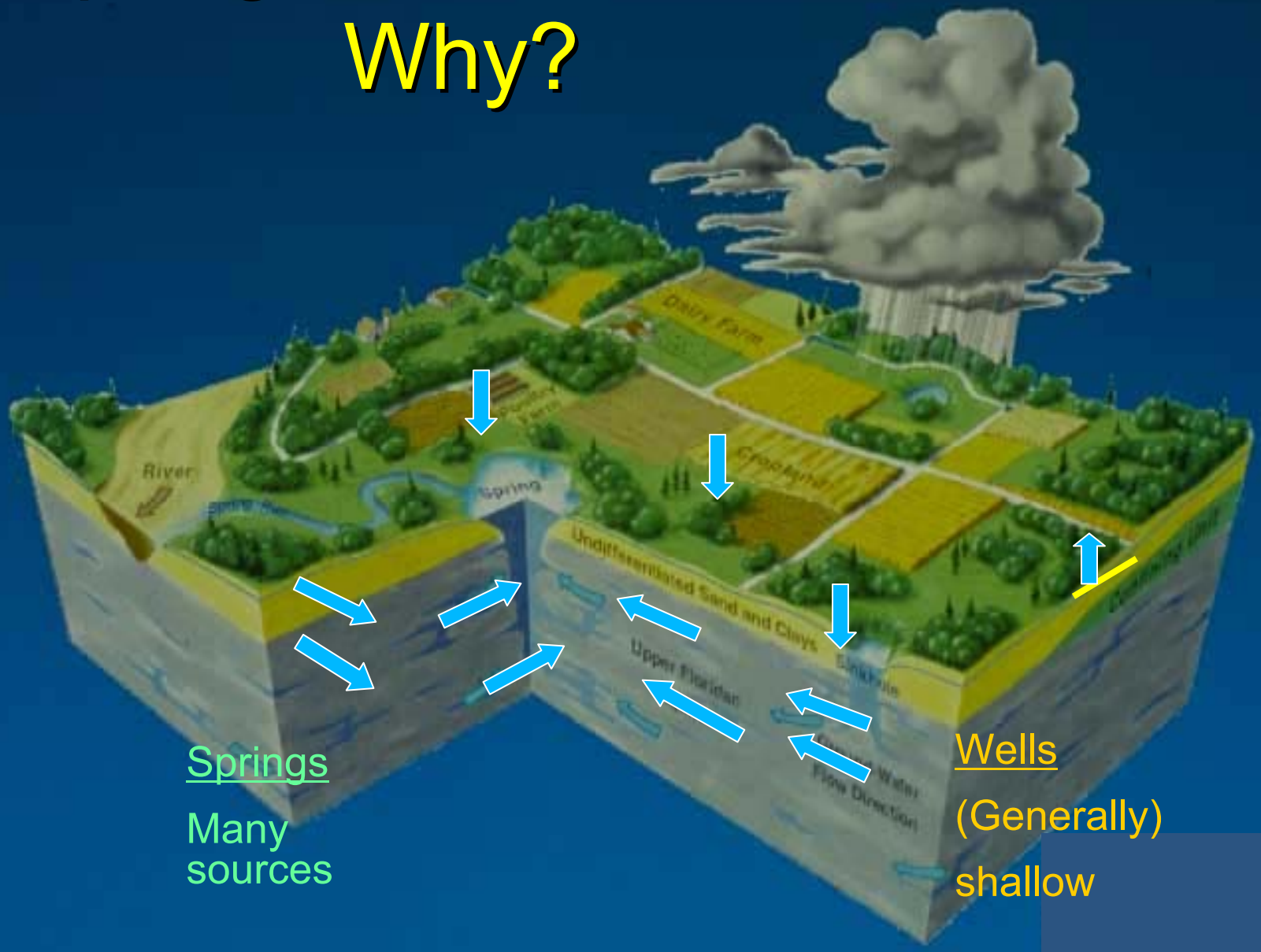
Statewide Trends in Springs (1991-2003)

Analyte	↑	↓	Direct	P-Val
Na	30	5	↑	<0.001
K	20	4	↑	0.007
Cl	28	6	↑	<0.001
SO4	27	8	↑	0.002
TDS	18	3	↑	0.001
Sp. Cond.	24	9	↑	0.007

Statewide Trends in Wells (1991-2003)

Analyte	↑	↓	Direct	P-Val
Temp	20	8	↑	0.036
WL(msl)	4	18	↓	0.004
pH	3	20	↓	<0.001
Ca	3	12	↓	0.035

Spring and Well Trends Different Why?

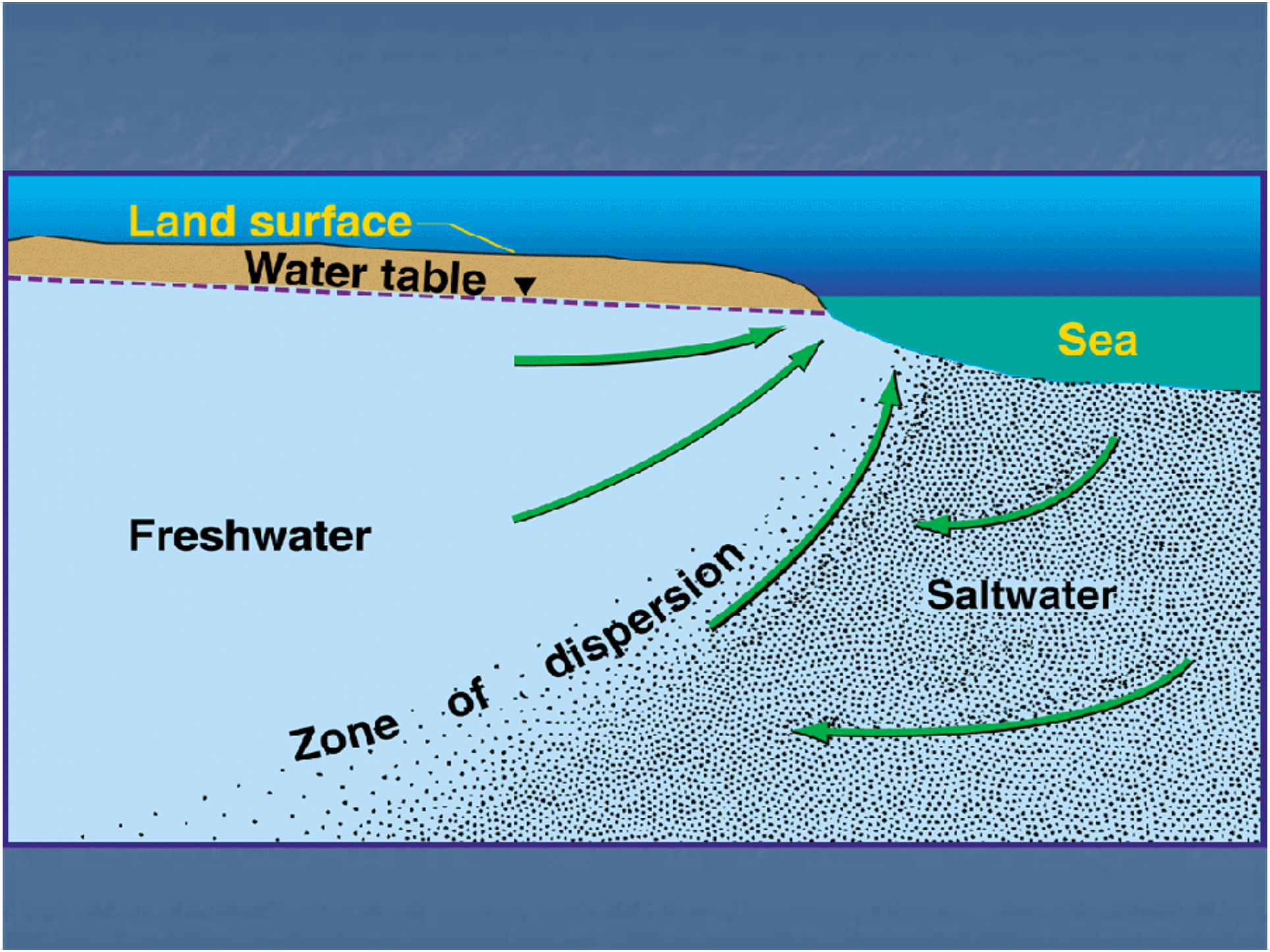


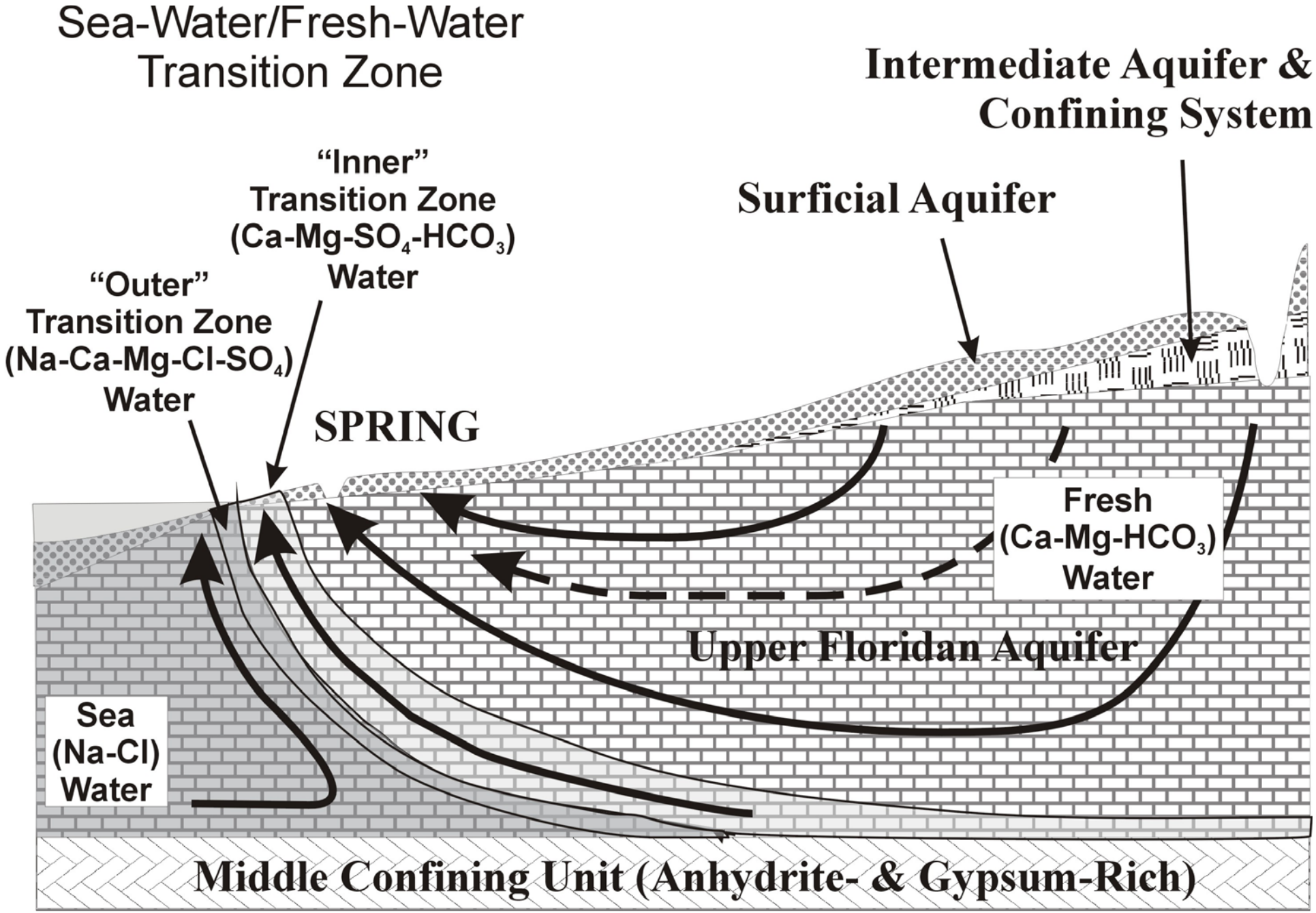
Springs

Many sources

Wells

(Generally) shallow


Land surface
Water table
Sea
Freshwater
Saltwater
Zone of dispersion


Sea-Water/Fresh-Water
Transition Zone
Intermediate Aquifer &
Confining System
"Inner"
Transition Zone
(Ca-Mg-SO4-HCO3)
Water
Surficial Aquifer
"Outer"
Transition Zone
(Na-Ca-Mg-Cl-SO4)
Water
SPRING
Fresh
(Ca-Mg-HCO3)
Water
Upper Floridan Aquifer
Sea
(Na-Cl)
Water
Middle Confining Unit (Anhydrite- & Gypsum-Rich)

Trends in Wells

Rock and Field Analytes

Well trends show decreasing Water levels

(reflected by pH, and Ca)

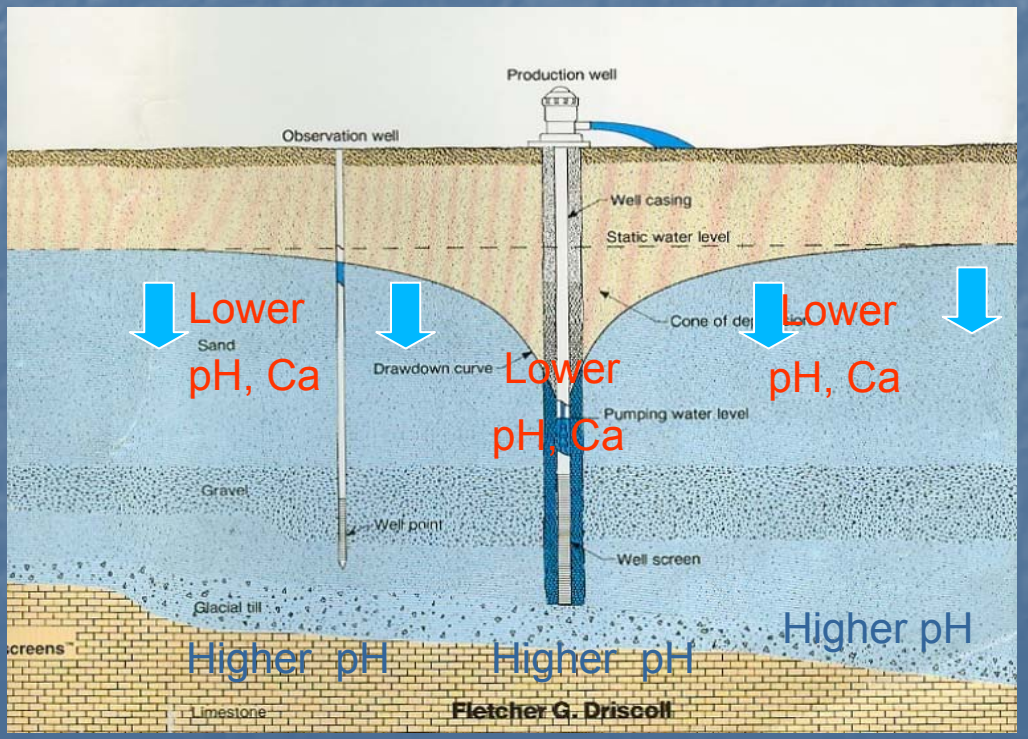
GW

Temp↑

WL ↓

pH ↓

Ca ↓



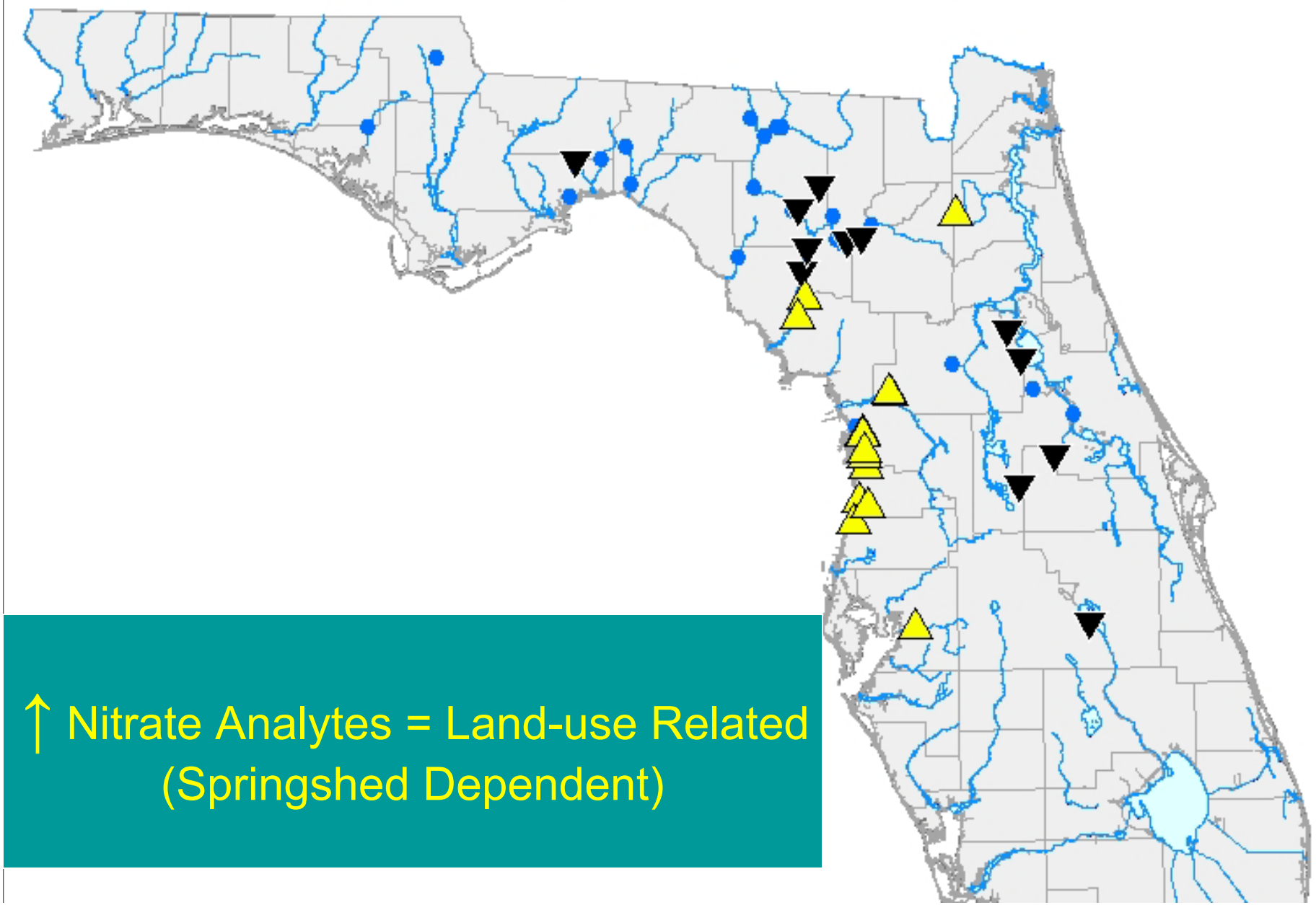
Causes of Spring Trends for Rock and Saline Indicators

- This Discussion
- Encroachment – Natural
- Intrusion - Man induced

- ↑ Rock Analytes = Older Mineralized Water from Storage → *Precursor of Encroachment & Possibly Intrusion (yellow flag)*

- ↑Saline Analytes = ***Encroachment/Intrusion Gen. lag behind Rock Analytes*** *(red flag)*

Nutrients – Local to Regional



↑ Nitrate Analytes = Land-use Related
(Springshed Dependent)

Springs

- ↑ Nutrients – springshed scale
- Drought, ↑ GW use, → chemical degradation (encroachment and possibly intrusion)
- Also, ↑ Population Growth causes ↑demand for GW (more during drought)

Springs and Wells

- **Encroachment/intrusion** – potentially more serious than ↑ nutrients

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Recommendations

Phone 850-488-9380

- Incorporate springs into an encroachment/
- intrusion monitoring network

- Combine with well networks into a statewide spring/well network

- Incorporate water use and pumpage data into monitoring

- Produce annual reports with “Health” indices