Nutrient Rich "Hot Spots" Across the Sierran Front to the Cascades

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- Introduction
  - Biogeochemical “hot spots” or “hot moments”
    - Transport of Nutrients (Nitrogen (N) and Phosphorus (P)
    - Calcium (Ca^{2+}), Magnesium (Mg^{2+}), Potassium (K^{+})
- Past /Current Research
  - Biologically available N and P traveling from the O horizon along preferential flow paths (Miller et al., 2005)
  - Identified the periodic presence of nutrient rich “hot spots/moments” within the soil matrix; albeit the spatio-temporal scale was uncertain (Johnson et al., 2011).

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- Goal of this Research
  - To develop a better understanding of water flow and nutrient infiltration patterns across the Sierra Nevada Mountain Range.
  - Potential Cause of Excess Nutrients
  - Management Strategies
- Primary Objectives
  - Biogeochemical “Hot Spots”
    - Presence or absence
    - Chemical composition
    - Geographic distribution

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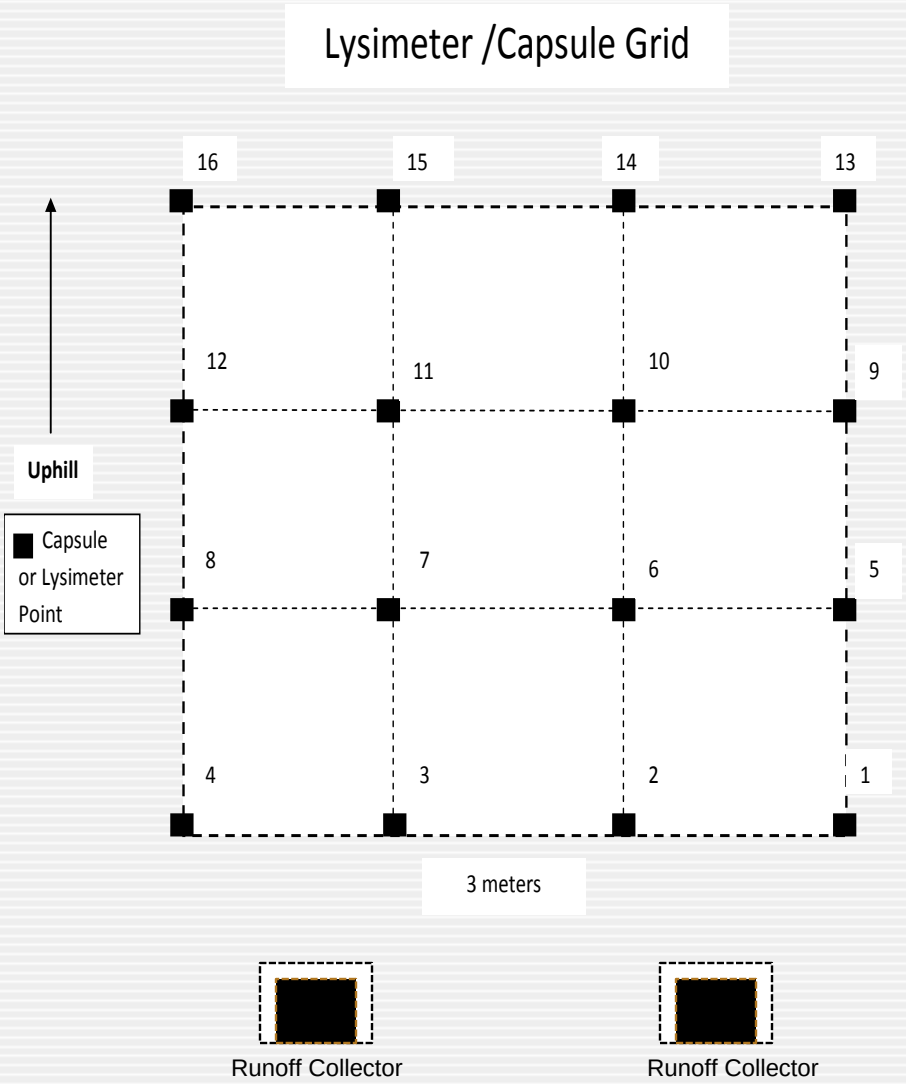
- Project Design
  - 5 Study Locations:
    - Castle Lake, CA
    - Sagehen, CA
    - Truckee, CA
    - Little Valley, NV
    - Kings River, CA

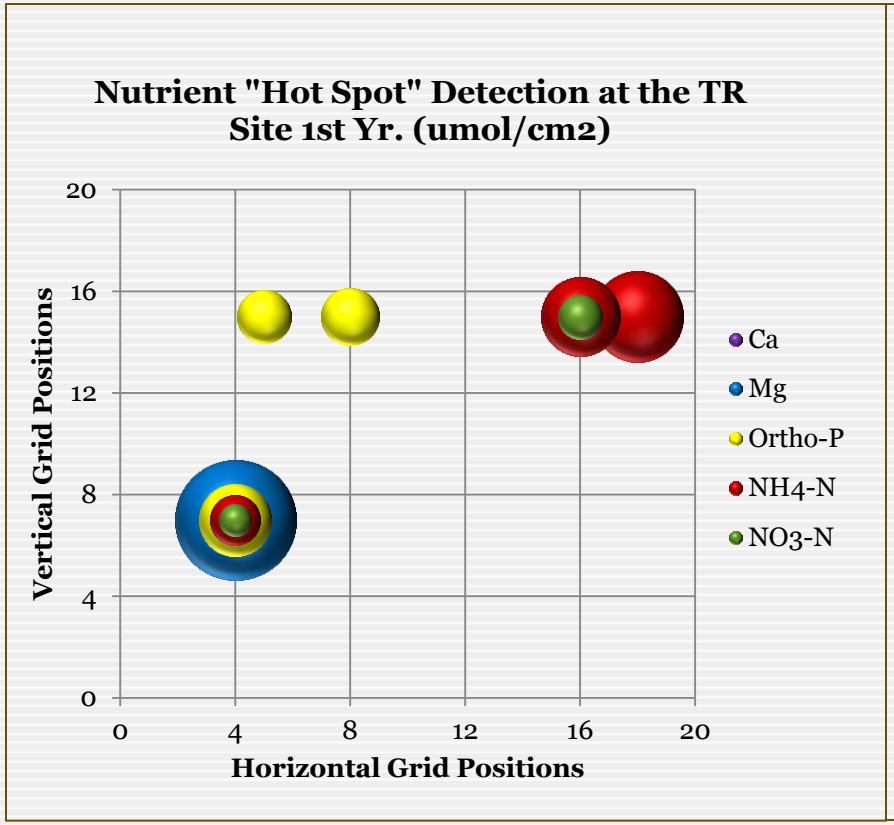
Project Design: Controlled Grid Analysis

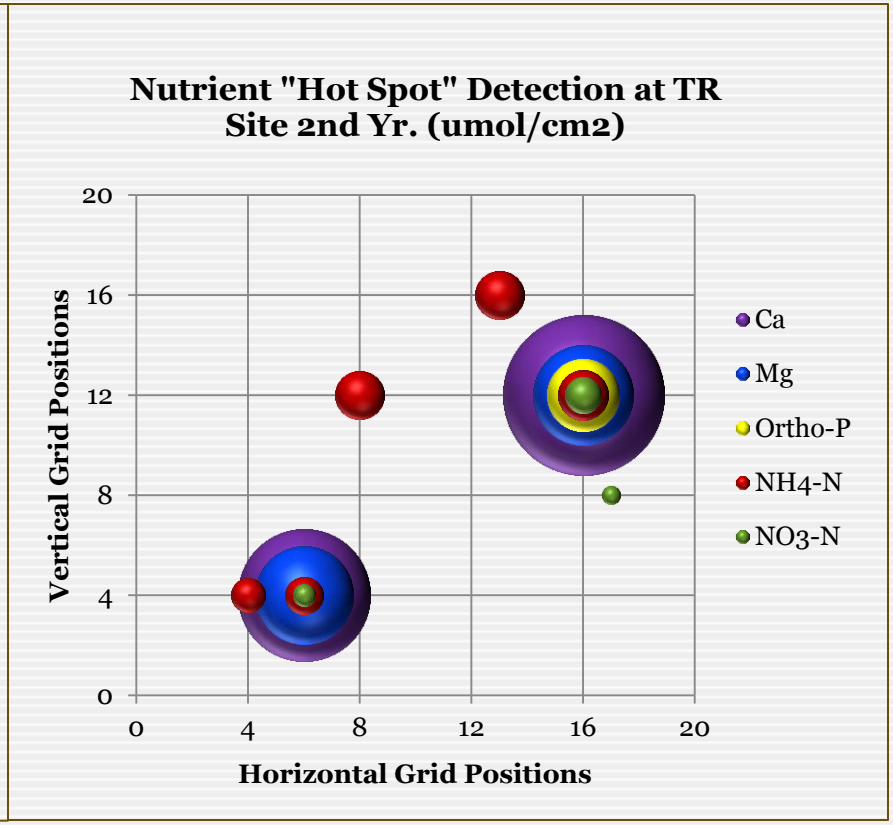
- Controlled Grid Plots
  - 2-9m² , 16 points
    - Resin Lysimeters
    - Resin Capsules
  - 2 Settings:
    - Upland Forested Ecotone
    - Transition/Variable Down-Gradient Ecotone



1st and 2nd Year Capsule Results
Moderate and Extreme Outliers

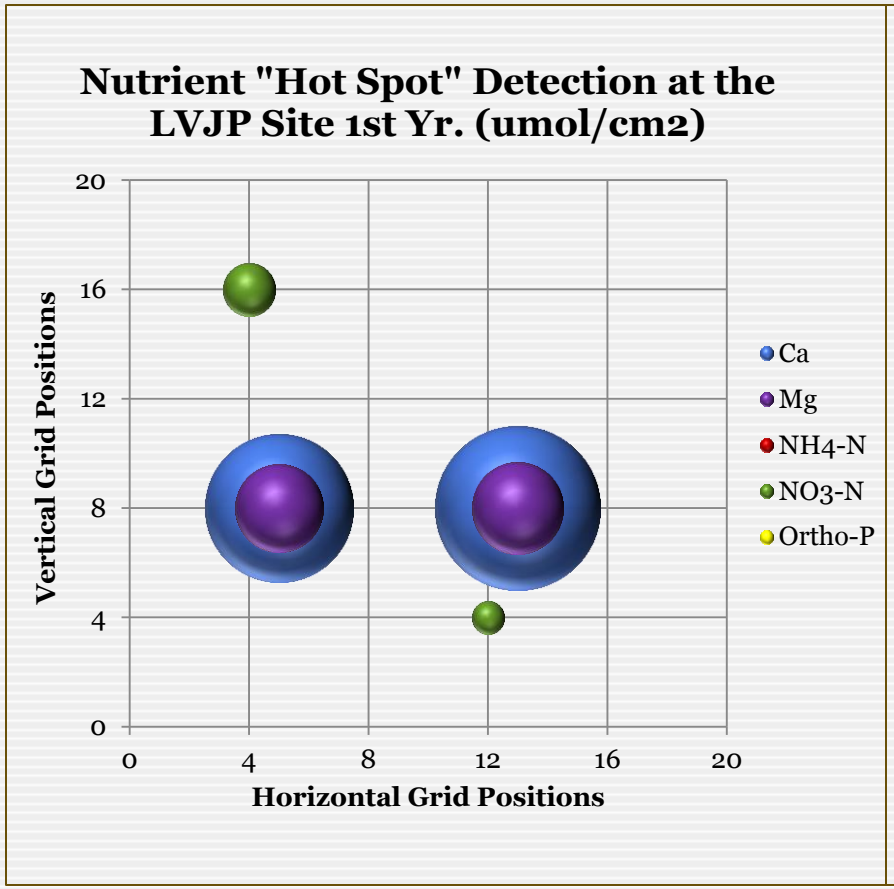
~ 9 m^2 Most Nutrients Would Correlate at a Grid Point

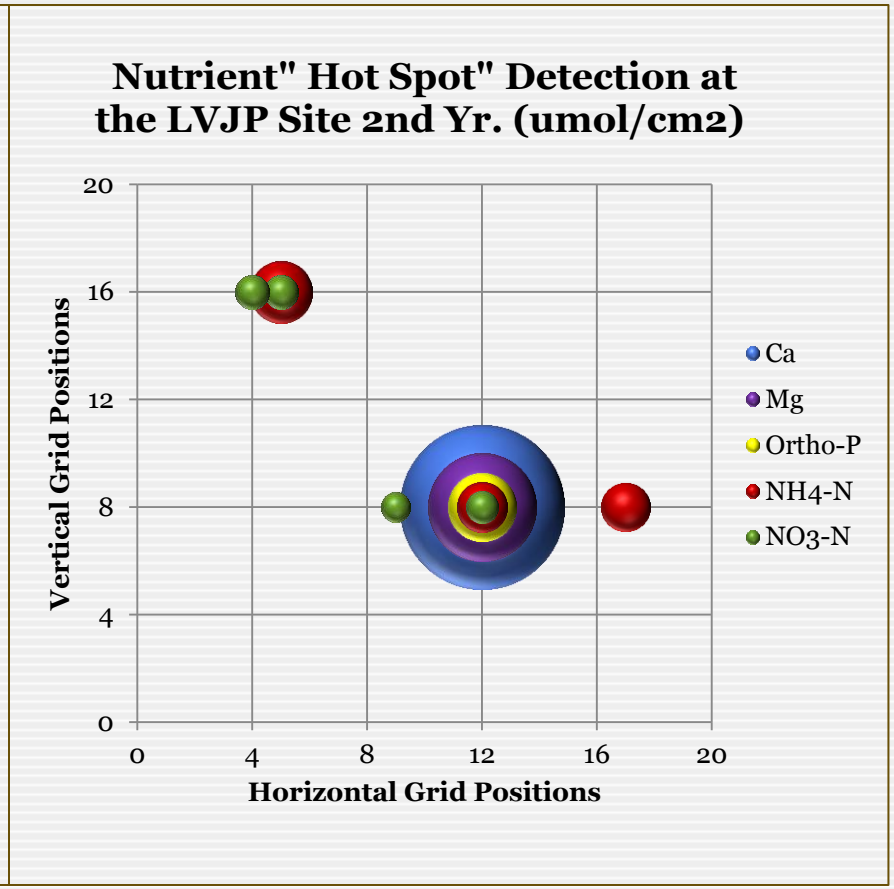




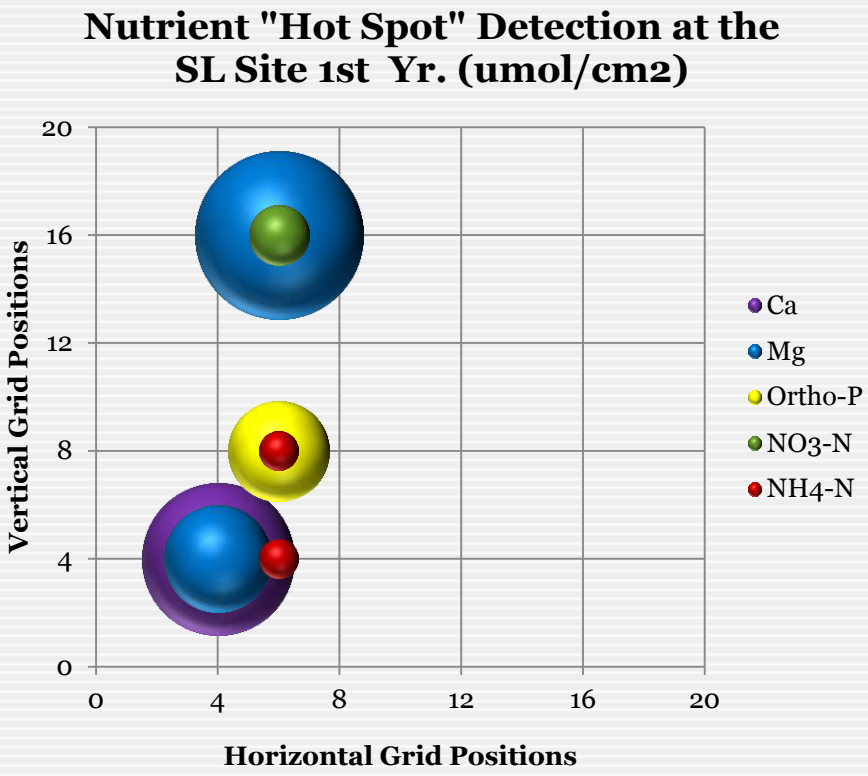
Capsule Grid Results
Moderate and Extreme Outliers

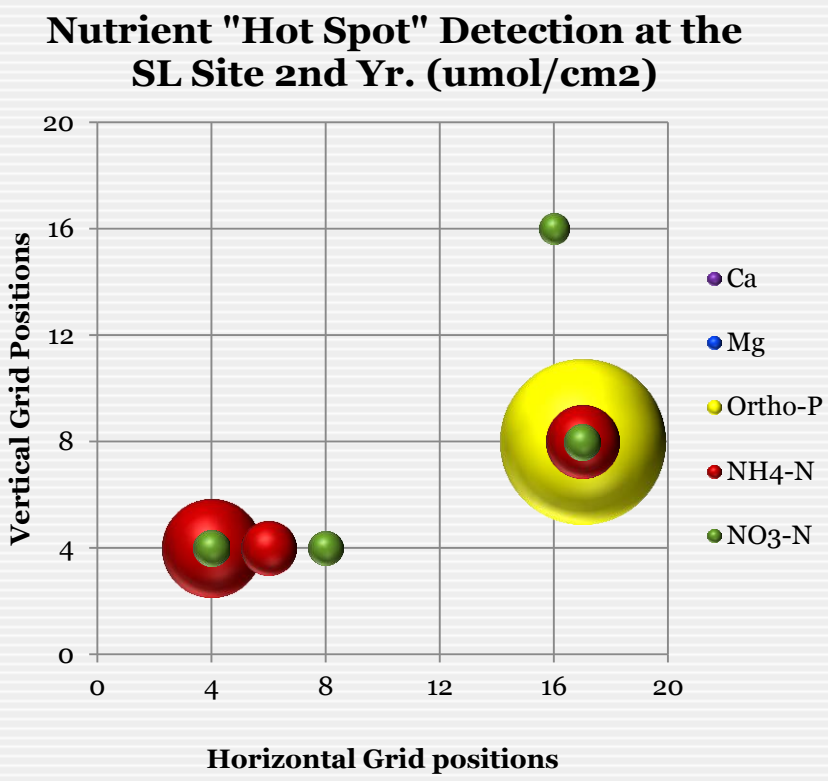
~ 256 Grid Points only 4 Points Detected Similar High Nutrient Fluxes (1.5%)



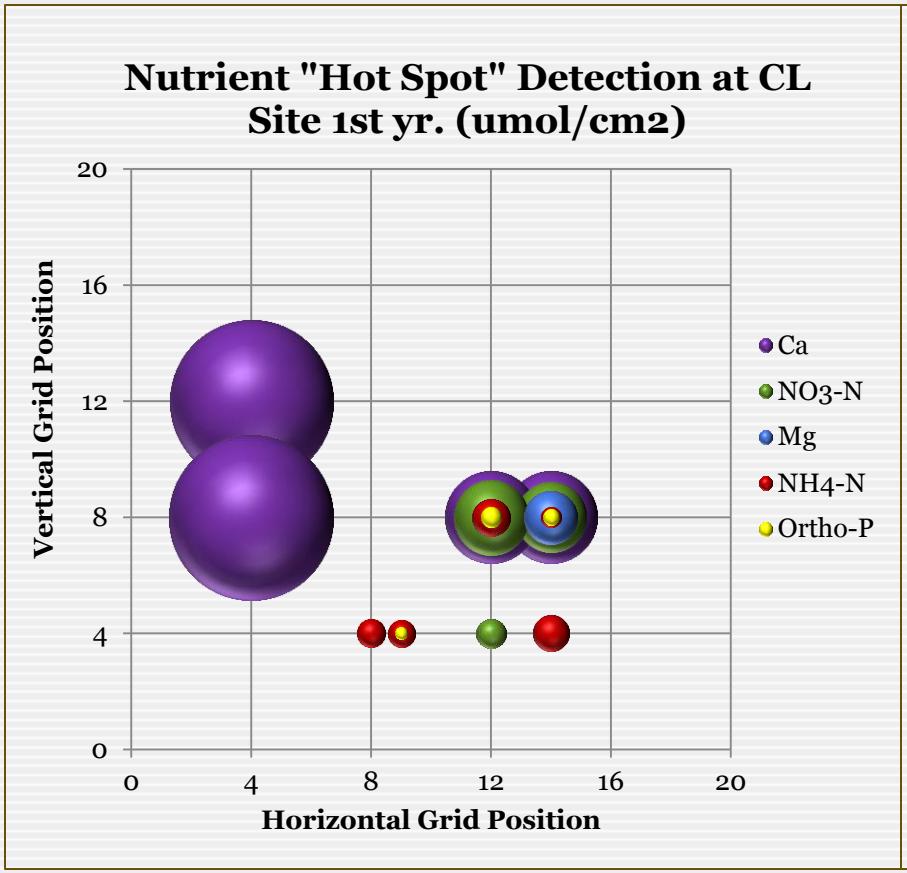


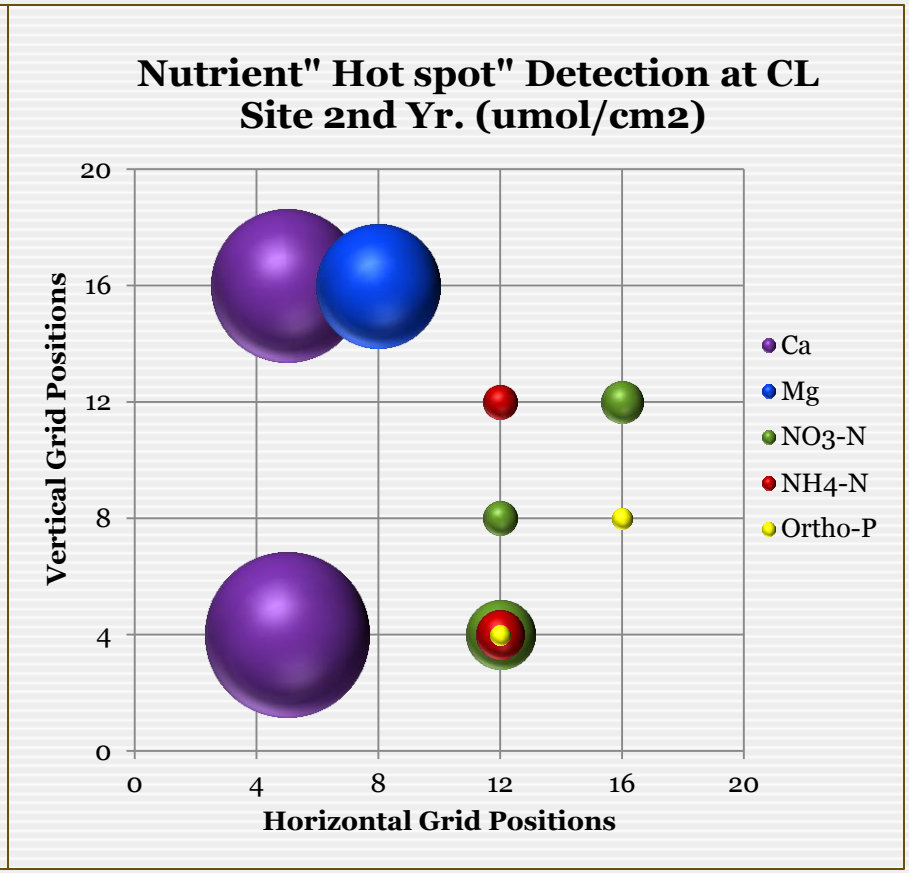
Capsule Grid Results
Moderate and Extreme Outliers



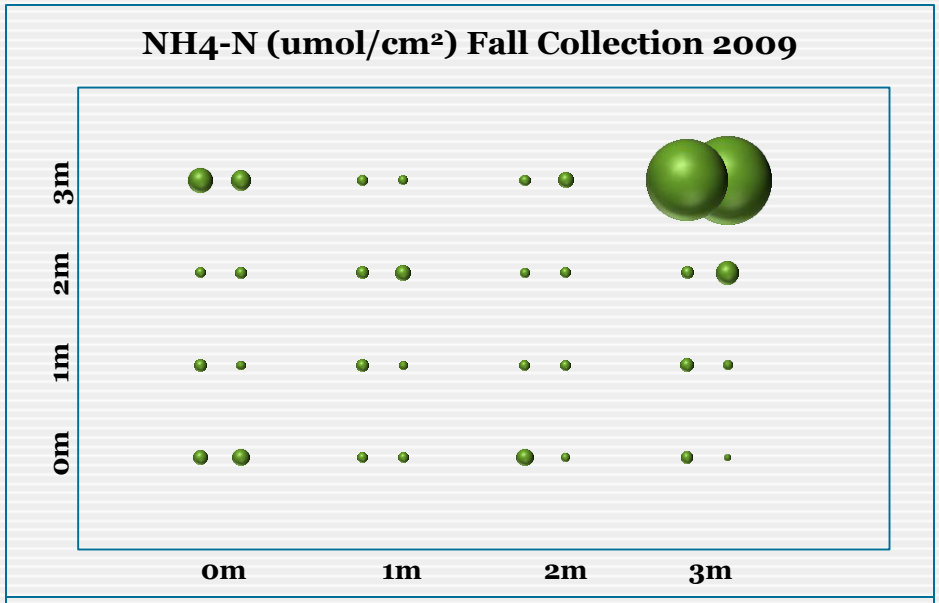


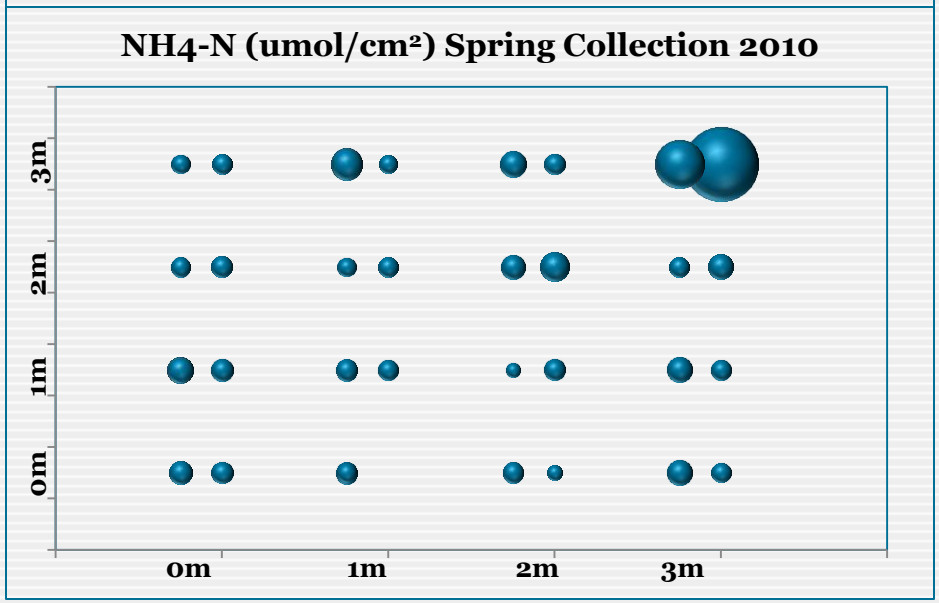
Capsule Grid Results
Moderate and Extreme Outliers

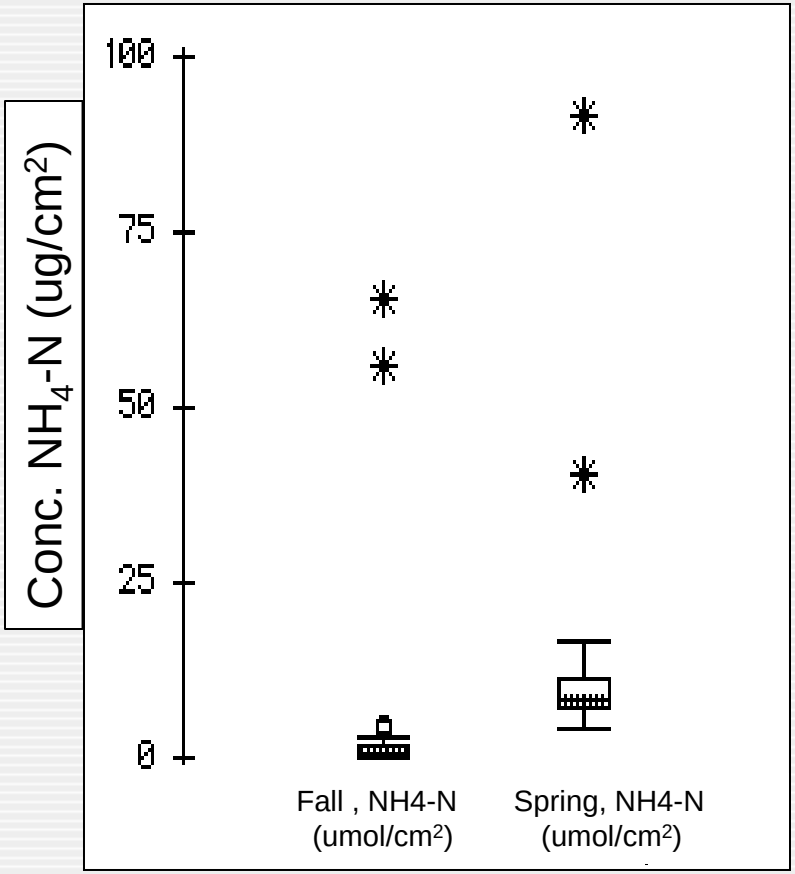




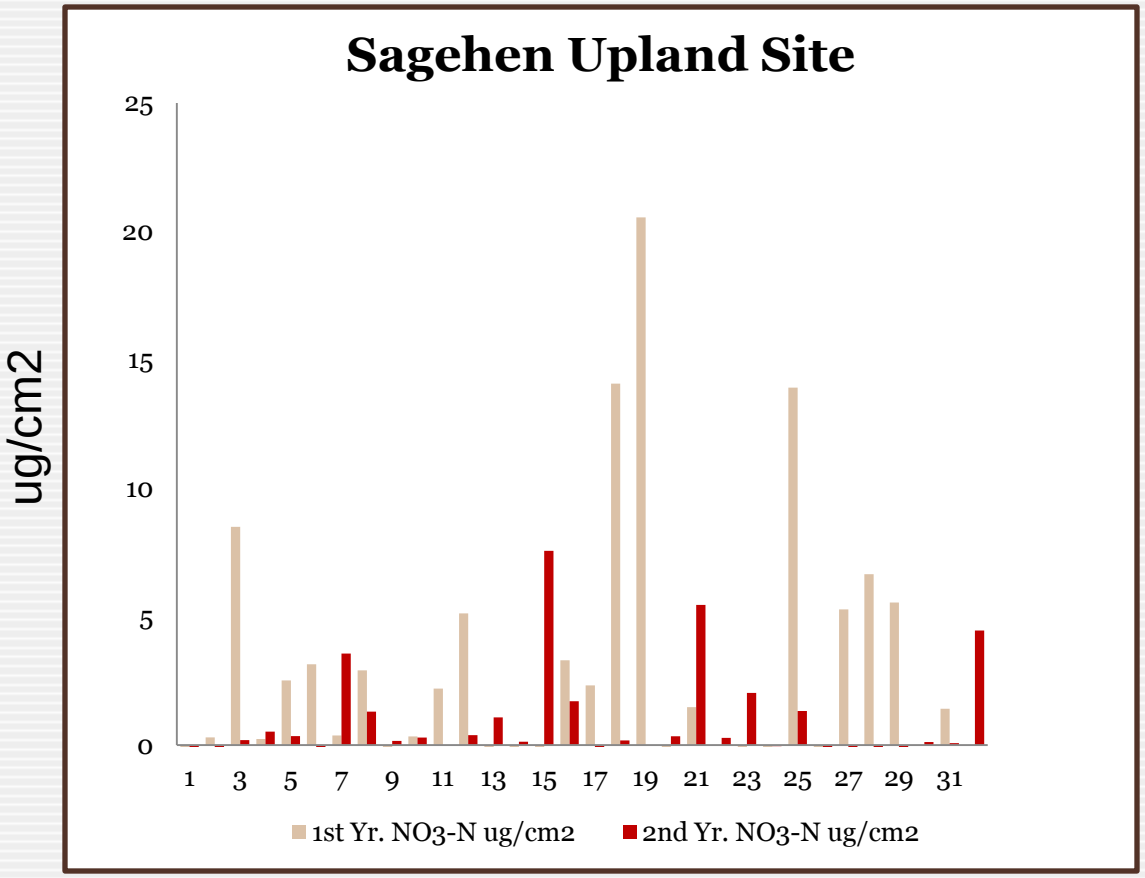
Truckee Capsule Grids



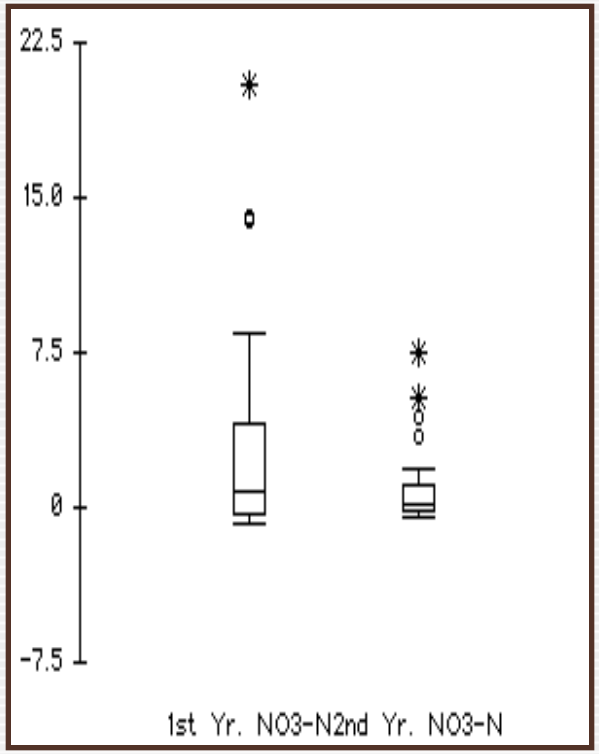




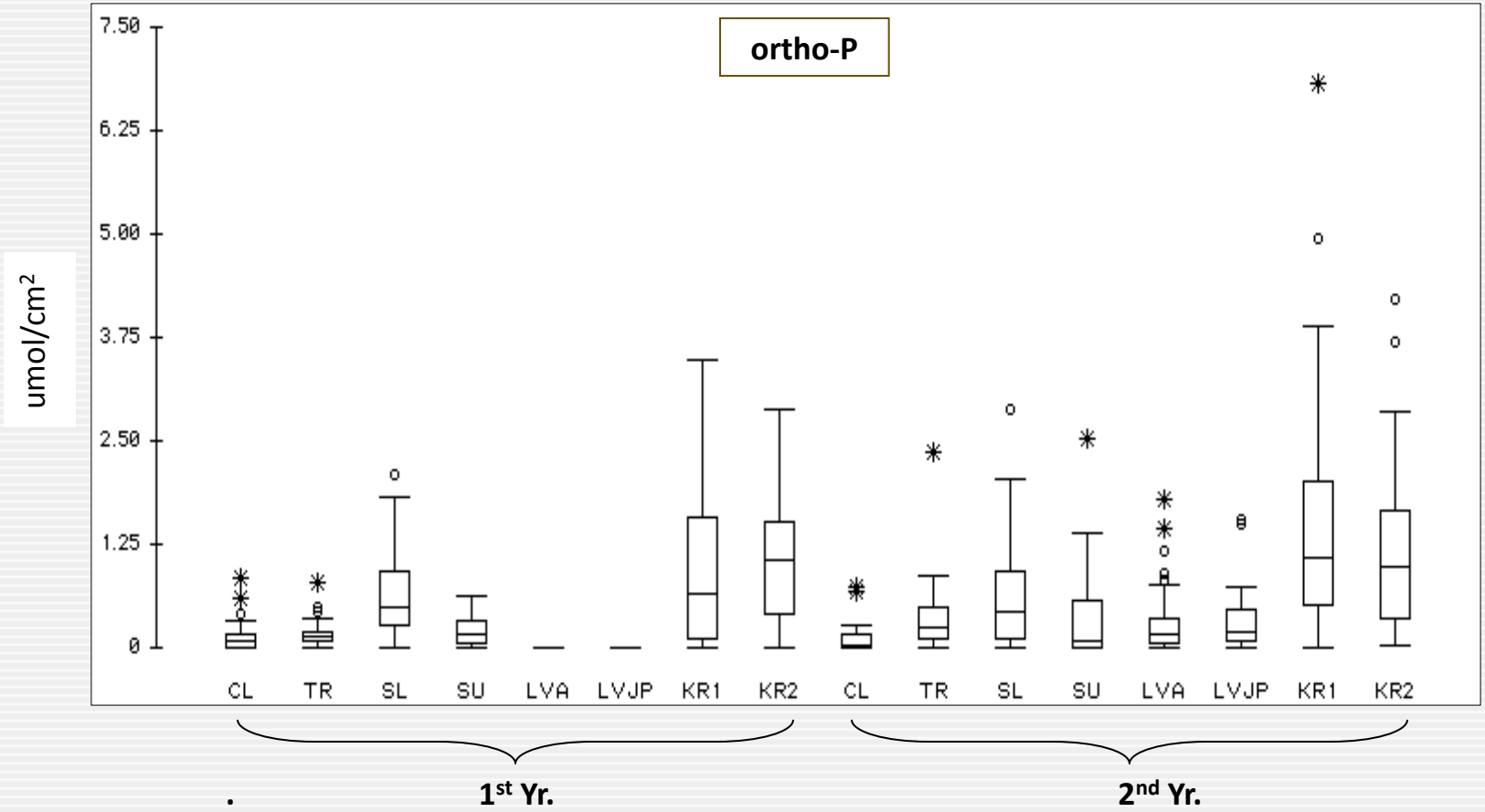
Capsule Grid Fall Analysis

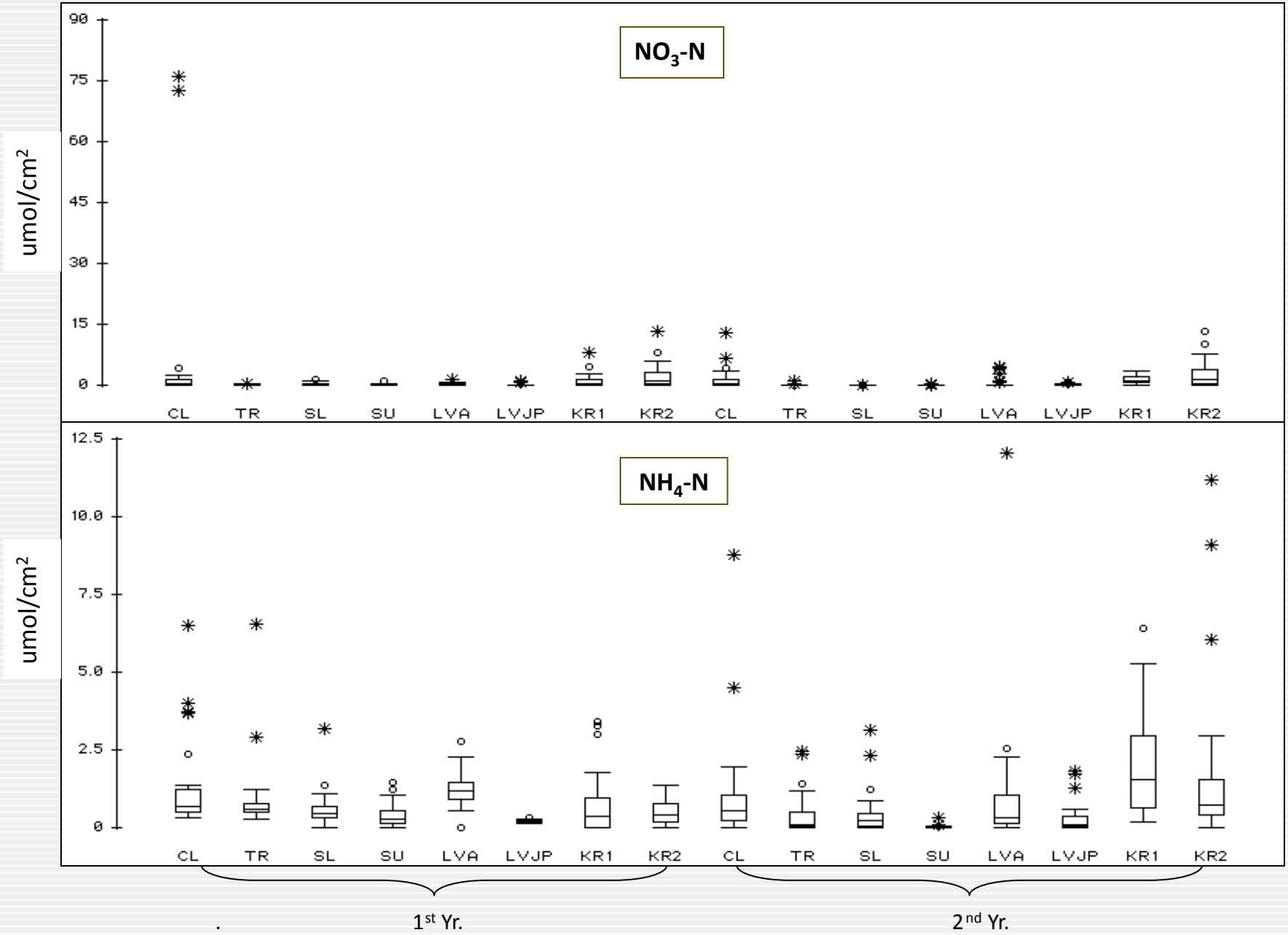


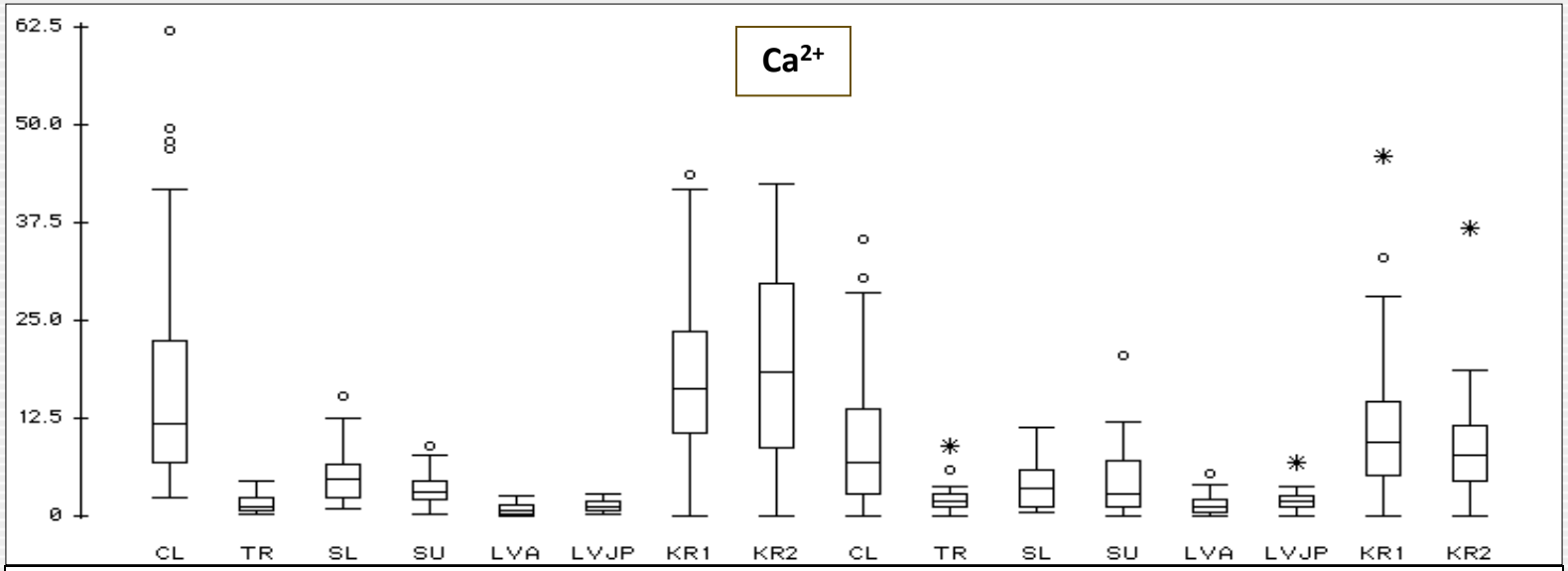
Sagehen Upland Site
Moderate and Extreme Outlier

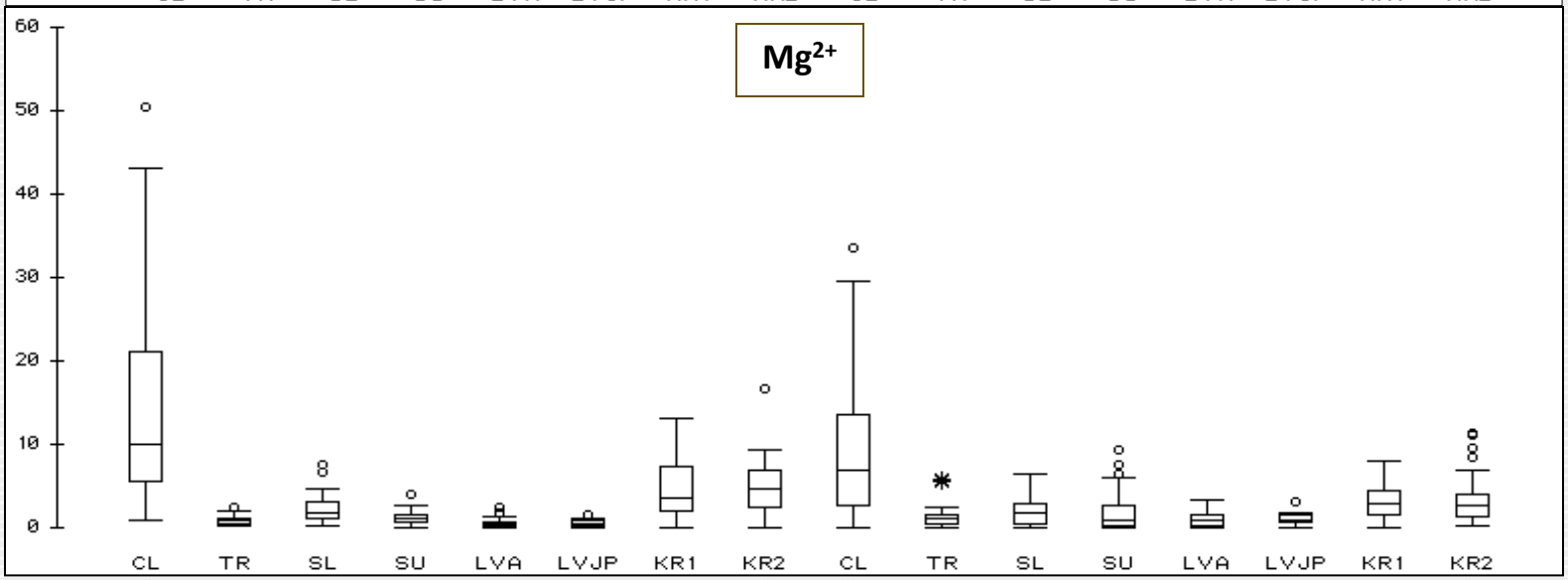


Nutrient Trends Across Sites




NO3-N
umol/cm2
90
75
60
45
30
15
0
CL TR SL SU LVA LVJP KR1 KR2 CL TR SL SU LVA LVJP KR1 KR2
NH4-N
umol/cm2
12.5
10.0
7.5
5.0
2.5
0
CL TR SL SU LVA LVJP KR1 KR2 CL TR SL SU LVA LVJP KR1 KR2
1st Yr.
2nd Yr.


Ca2+
umol/cm2
62.5
50.0
37.5
25.0
12.5
0
CL
TR
SL
SU
LVA
LVJP
KR1
KR2
CL
TR
SL
SU
LVA
LVJP
KR1
KR2


Mg2+
umol/cm2
60
50
40
30
20
10
0
CL
TR
SL
SU
LVA
LVJP
KR1
KR2
CL
TR
SL
SU
LVA
LVJP
KR1
KR2

. 1st Yr. 2nd Yr.

Conclusions

- Biogeochemical “Hot Spots/Moments” are Variable
  - Spatial Variation
  - Seasonal and Annual Variation
- 9 m^2 all Nutrients will Possibly Correlate at a Single Grid
- Water Flow and Nutrient Infiltration Patterns were Extremely Variable
  - Geographic Distribution

Questions

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