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Water: One Resource – Shared Effort – Common Future

CALIFORNIA STATE UNIVERSITY EAST BAY

Investigating the Source of Nitrate in a Salinas Valley Drinking Water Supply Well with Isotopic Tracers

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Today's Presentation:

- Introduction
- Study Goals
- Approach and Results
- Conclusions

INTRODUCTION

Location of Study Site

Salinas, CA

Gabilan Range

http://maps.nationalgeographic.com/

STUDY GOALS

Questions to answer:

- *Source of elevated nitrate?*
- *Cause of rapidly changing nitrate concentrations?*
- *Denitrification occurring?*

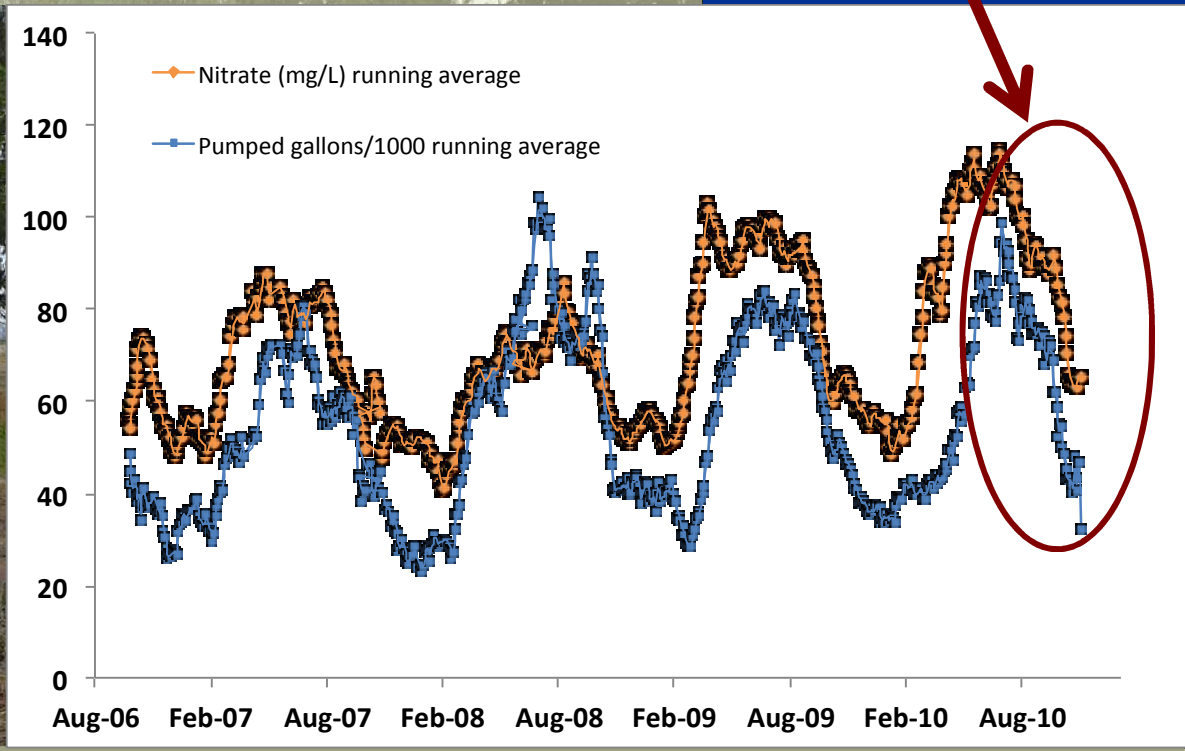
Wastewater Ponds or Fertilizer?

http://maps.nationalgeographic.com/

APPROACH AND RESULTS

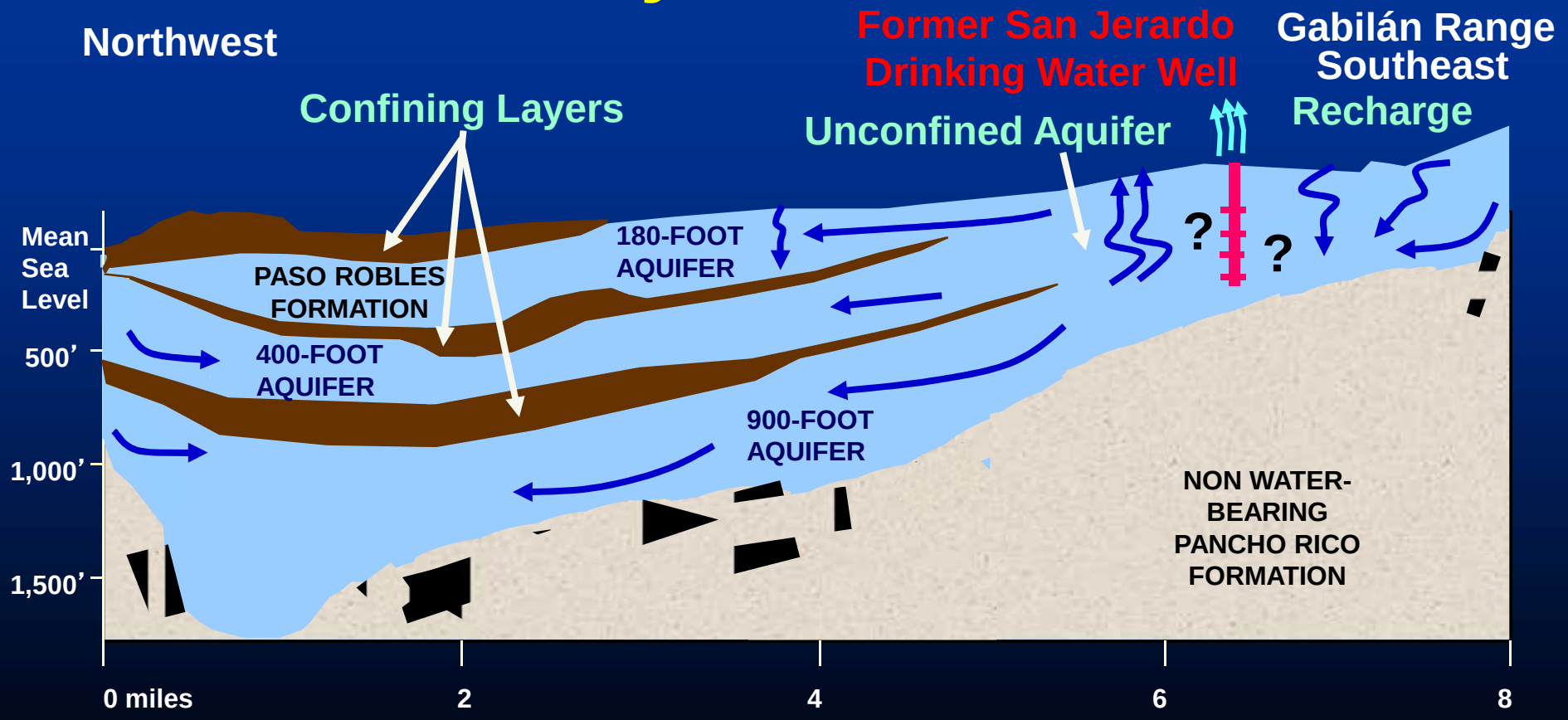

Strawberry Fields
Former San Jerardo
Drinking Water Well

Former Drinking Water Well & Treatment System



Thanks to MCSI Water Systems Management for the 3-year record of gallons pumped and nitrate concentrations.

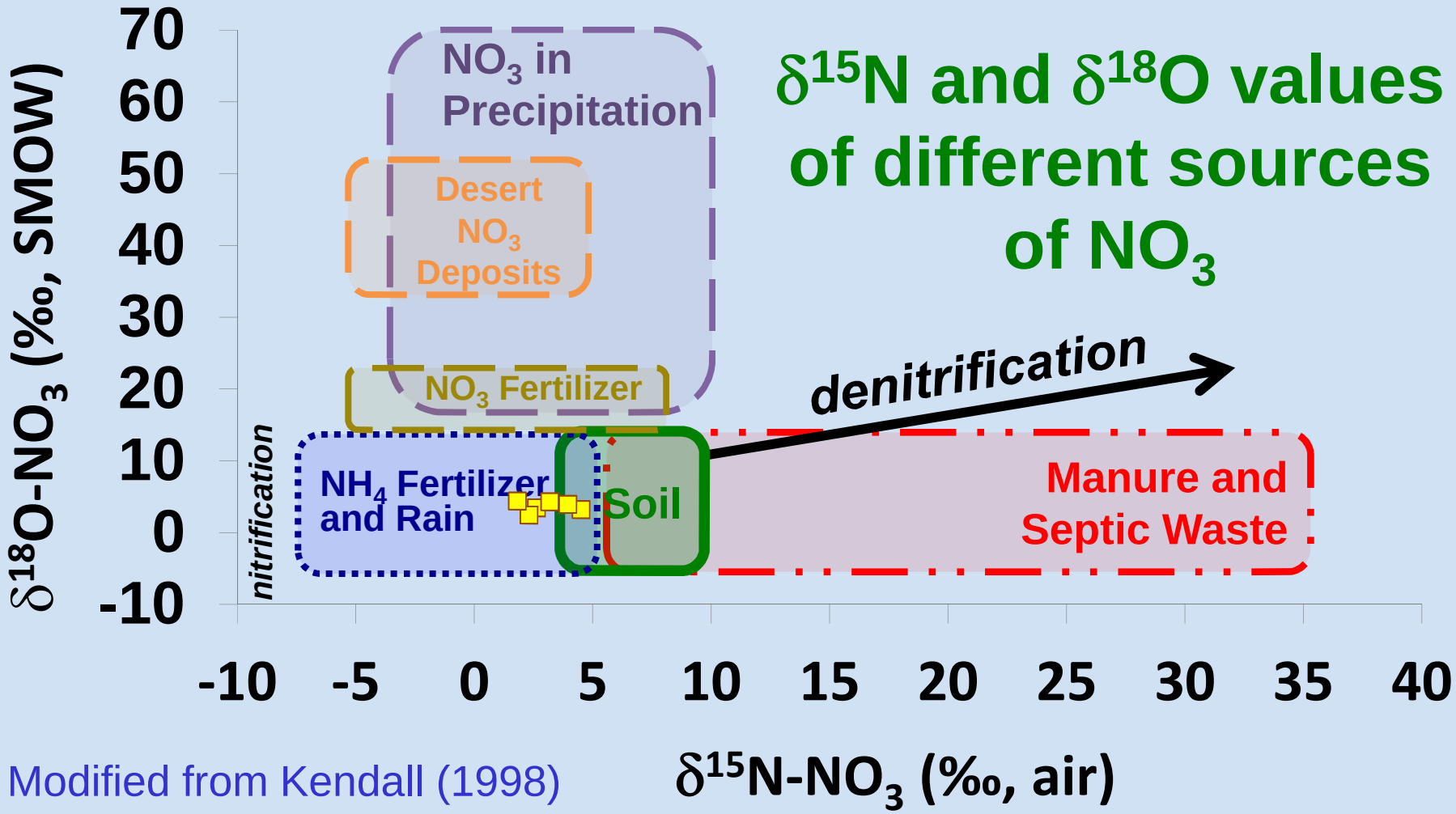
Salinas Valley Groundwater Basin



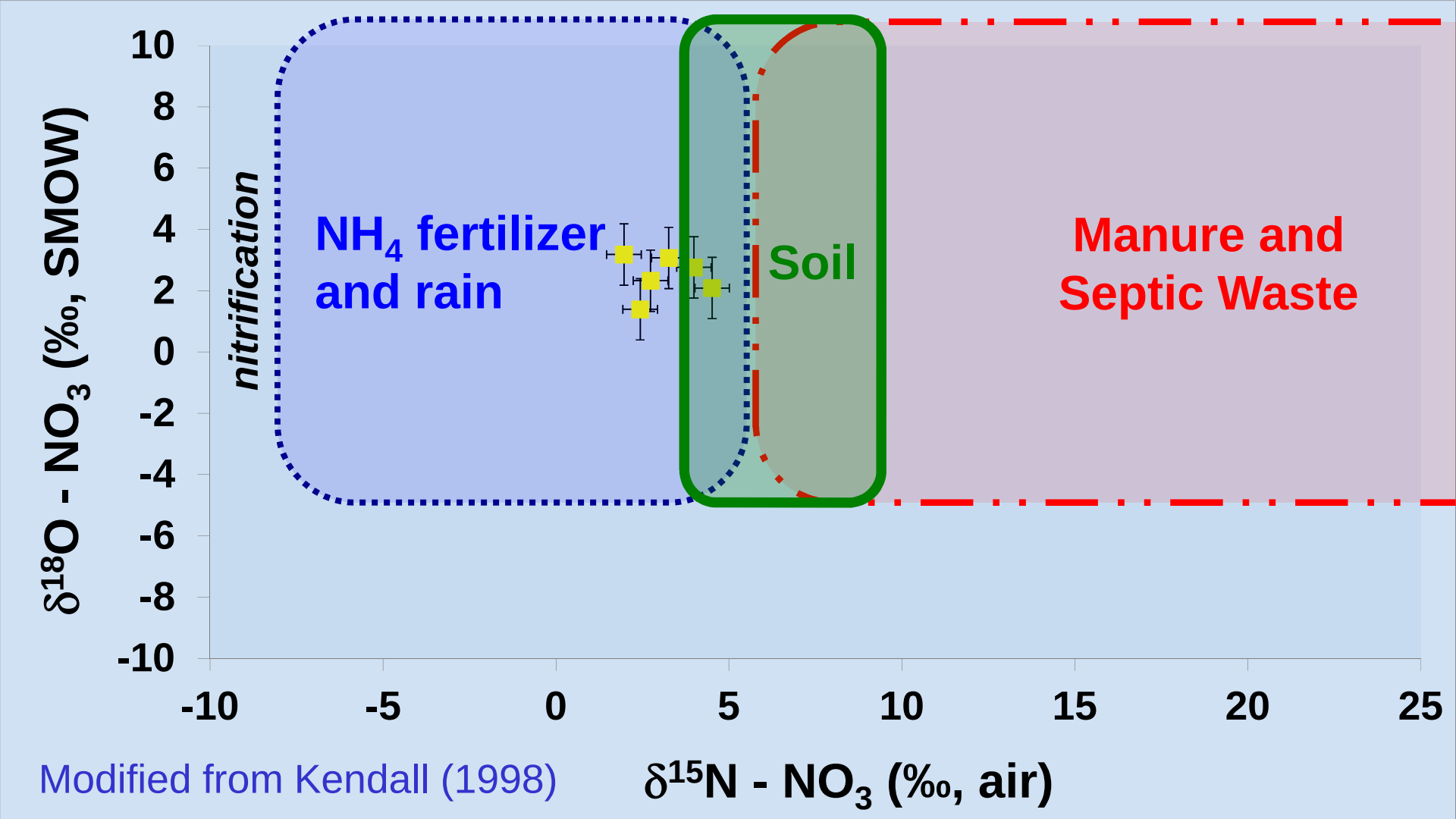
(Modified from Montgomery Watson 1994)

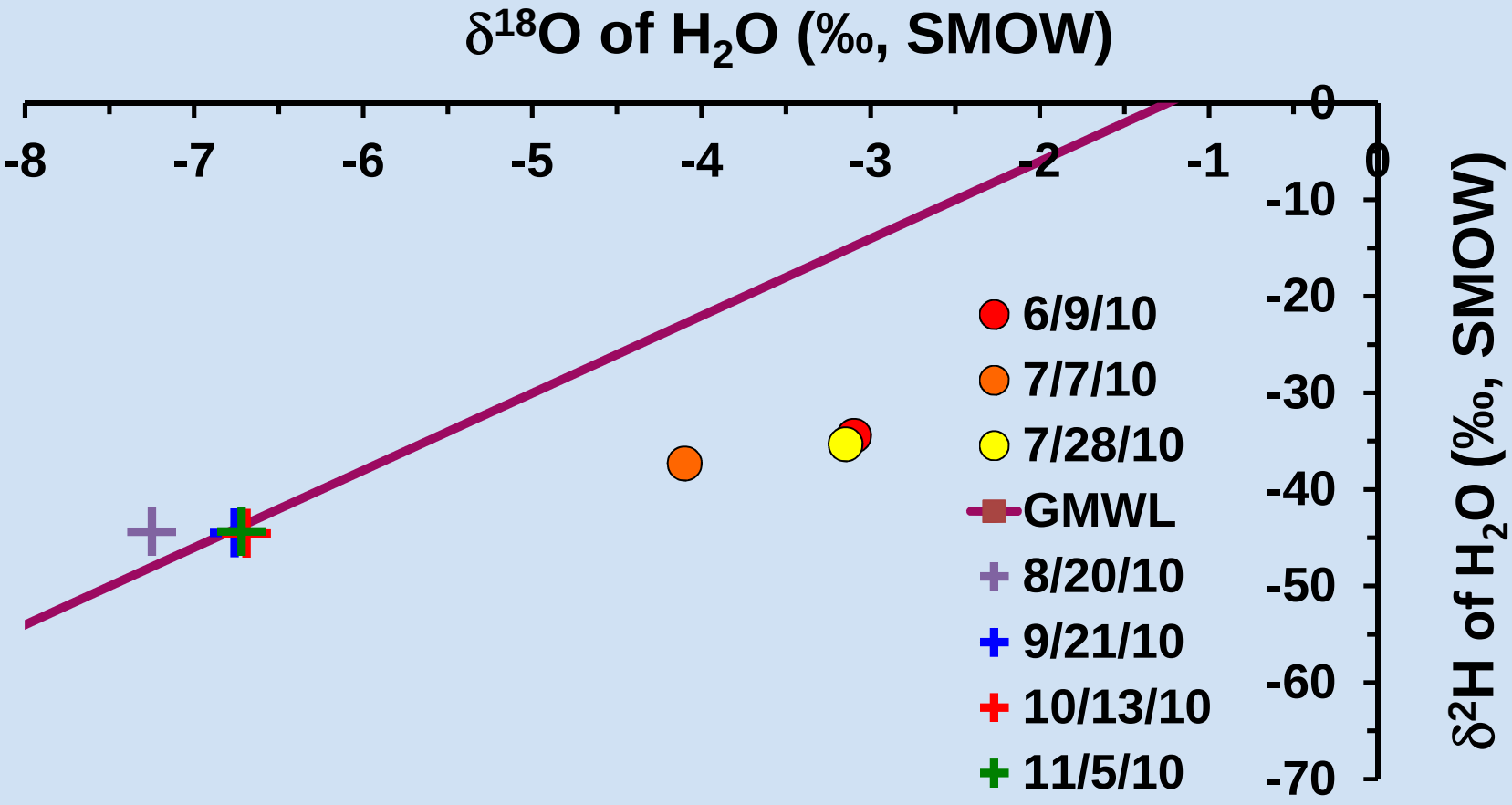
Multi-tracer Approach:

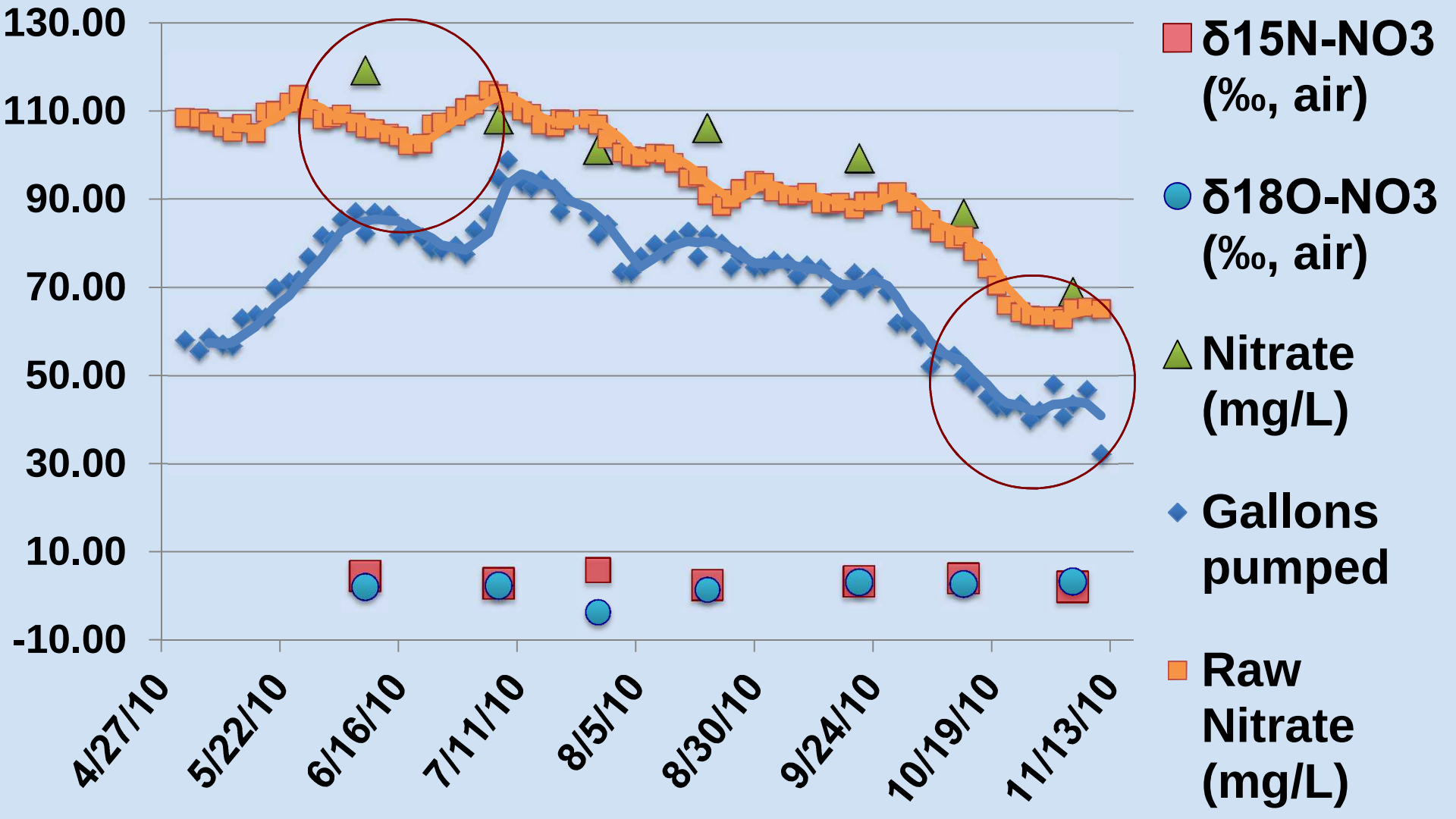
- $\delta^{18}O$ of Nitrate (‰, SMOW)
- $\delta^{15}N$ of Nitrate (‰, air)
- $\delta^{18}O$ of H_2O (‰, SMOW)
- $\delta^{2}H$ of H_2O (‰, SMOW)
- Field Parameters
- Anions and Dissolved Gases
- Tritium & Noble Gases



Modified from Kendall (1998)


10
8
6
4
2
0
-2
-4
-6
-8
-10
-10
-5
0
5
10
15
20
25
δ18O - NO3 (‰, SMOW)
δ15N - NO3 (‰, air)
nitrification
NH4 fertilizer and rain
Soil
Manure and Septic Waste
Modified from Kendall (1998)


δ18O of H2O (‰, SMOW)
-8
-7
-6
-5
-4
-3
-2
-1
0
0
-10
-20
-30
-40
-50
-60
-70
δ2H of H2O (‰, SMOW)
6/9/10
7/7/10
7/28/10
GMWL
8/20/10
9/21/10
10/13/10
11/5/10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50.00
30.00
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4/27/10
5/22/10
6/16/10
7/11/10
8/5/10
8/30/10
9/24/10
10/19/10
11/13/10
δ15N-NO3 (‰, air)
δ18O-NO3 (‰, air)
Nitrate (mg/L)
Gallons pumped
Raw Nitrate (mg/L)

CONCLUSIONS

Conclusions:

- *$N\text{-}NO_3$ Source: Inorganic fertilizer*
- *Cause of fluctuating nitrate concentrations: Dilution*
- *No denitrification, High DO*
- *Future Work: Flow dynamics*

Thank you