

Benchmark Soils: Status and Questions

R. David Hammer
National Leader, Soil Survey Investigations

Bob McLeese
State Soil Scientist, Illinois

Thomas Reinsch
Supervisory Soil Scientist
NSSC

Definition of a Benchmark Soil

NSSH 360

- A soil of large aerial extent.
(100,000 acres in LRR or 10,000 + acres in MLRA)
- Holds a key position in the soil taxonomic system.
- There is a large amount of data, or this soil has special significance for important land use.



Purpose of the Benchmark Soil Concept

NSSH 360

To acquire significant information for a soil of regional importance, and extrapolate that information to related or neighboring soils.



Reasons to Acquire Benchmark Soil Data

- It is in our strategic plan.
- Mike told us to do it!
- It is the logical way to focus on important land uses and maximize the impact of our finite field and laboratory resources.



Administration of Benchmark Soils

Responsibilities lie among:

MLRA project leaders
State Soil Scientists

MO leaders are conspicuously absent

NSSC
NGDS



What are the administrative issues with benchmark soils?

- Which soils are benchmarks?
 - *SSS need to tell us*
- What data do we now have?
 - *It depends*
 - *Fewer than half of listed BM's have data*
 - *Those data are sporadic/incomplete*
- What data do we need?



What constitutes a complete data set?

All of the data necessary to understand how the Drummer functions in the landscape with its associated, neighboring soils.

The patterns and processes of the Drummer in its landscape setting.



What constitutes a complete data set?

*The "Reinsch Data Completeness Index"
(Ratio of complete to total)*

- *clay*
- *organic carbon*
- *extractable Na*
- *CEC NH₄OAC pH7*
- *pH water*
- *Db 1/3 bar*
- *15 bar gravimetric water*
- *volume <2 mm soil/volume whole soil @ 1/3 bar*
- *mineralogy*



What data do we need, and why/what is a complete data set?

We don't know all future needs, so let's understand the functions of this soil in the landscape.

Complete, precise soil profile descriptions in the appropriate places to allow extrapolation across the landscape.

Complete soil morphology, chemistry, and mineralogy of selected profiles.

Temporal and spatial distributions of water. Understand recharge, throughflow, discharge.





In this context, a complete data set includes infiltration, bulk densities, K_{sat} and, perhaps, some monitoring of seasonal water table locations and depths.

What are Illinois' Benchmark Soils?

- McLeese said "a whole bunch."
- NCSS data base said six on Wednesday and three on Thursday.
- MO office had deleted most.
- McLeese now has list of 54.
- RDCI ranges between 5 and 7 for most.





**Fine-silty, mixed,
superactive, mesic Typic
Endoaquolls**

The Drummer Soil

Very deep, poorly drained

Loess or other silty material

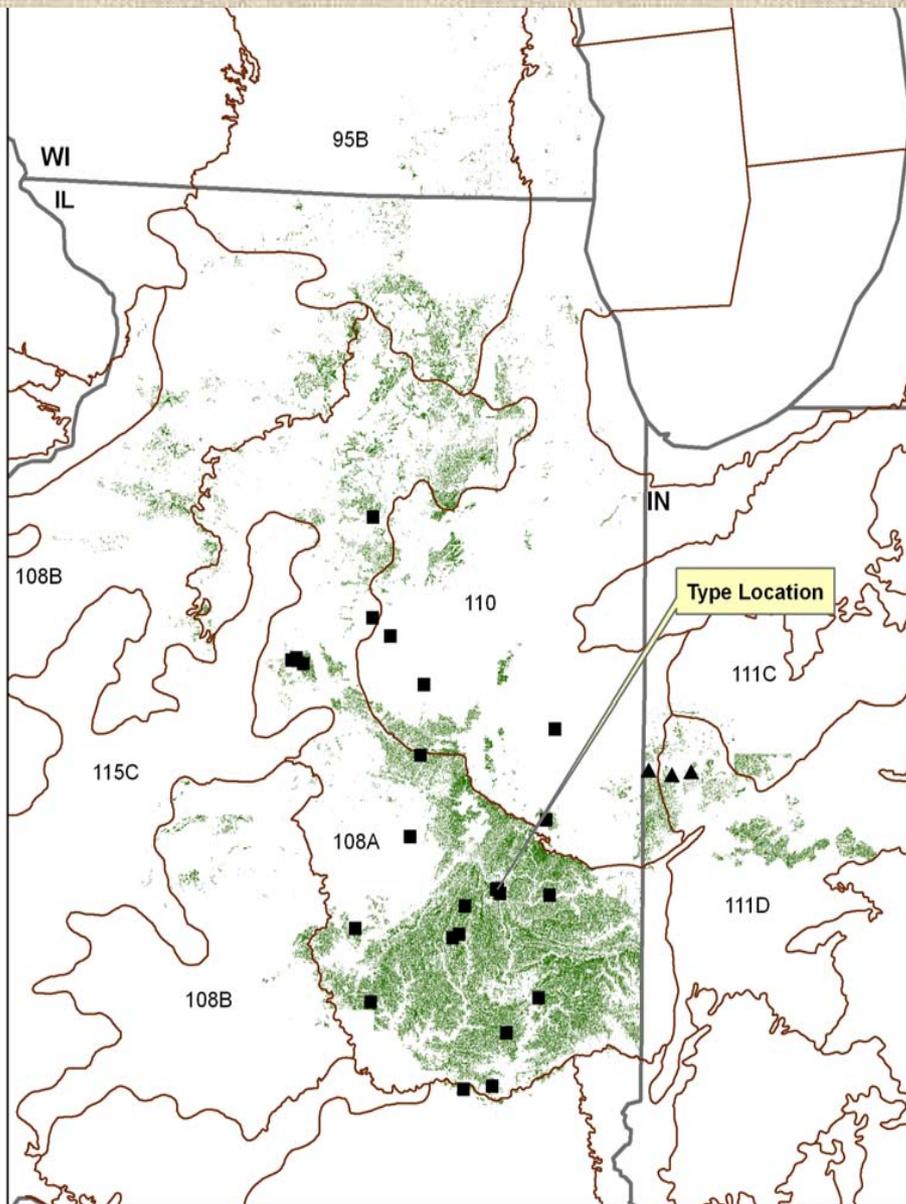
Nearly level or depressional
parts of outwash plains,
stream terraces, and till
plains

Slope --0 to 2 percent

MAP about 37 inches

MAT about 52 F





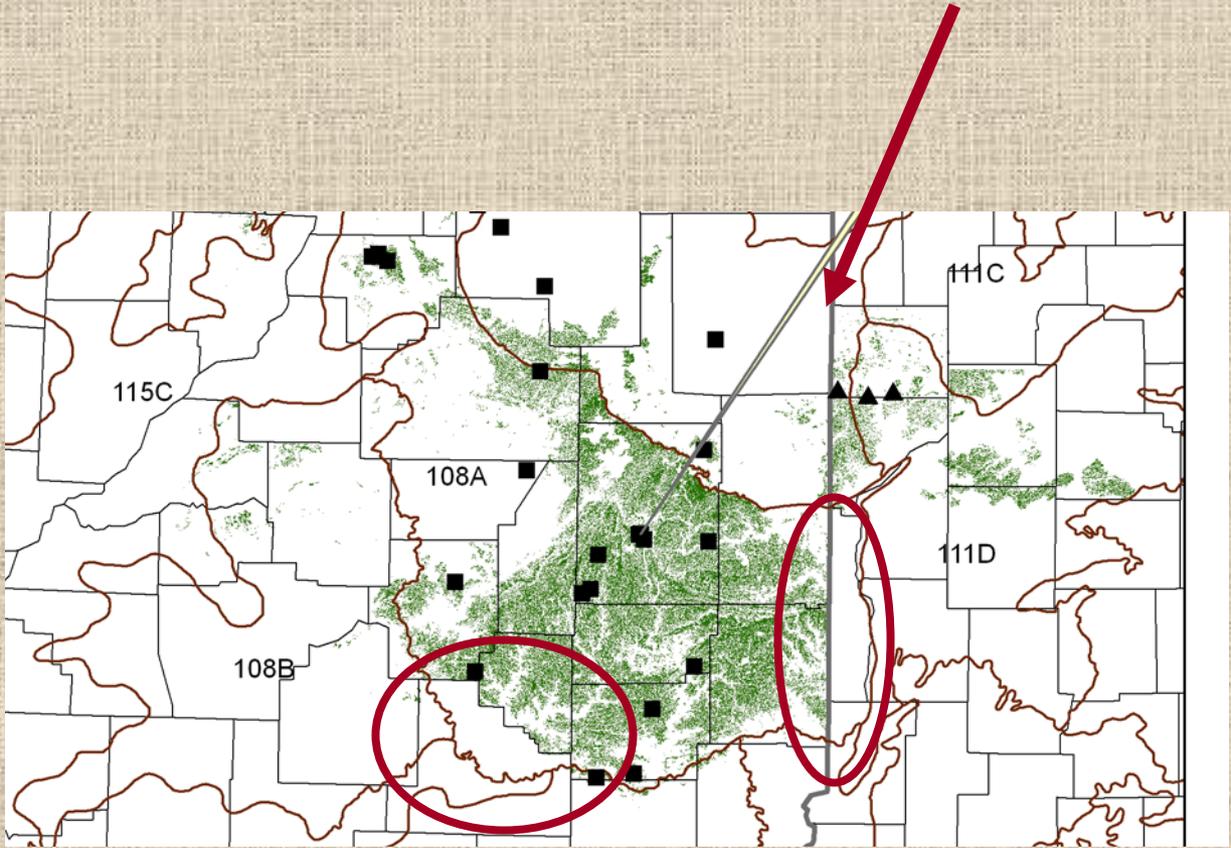
First step – look at the aerial distribution of the soil.

Second step – gather and georeference existing data.

Lab Data locations

- ▲ nssl
- ui_lab



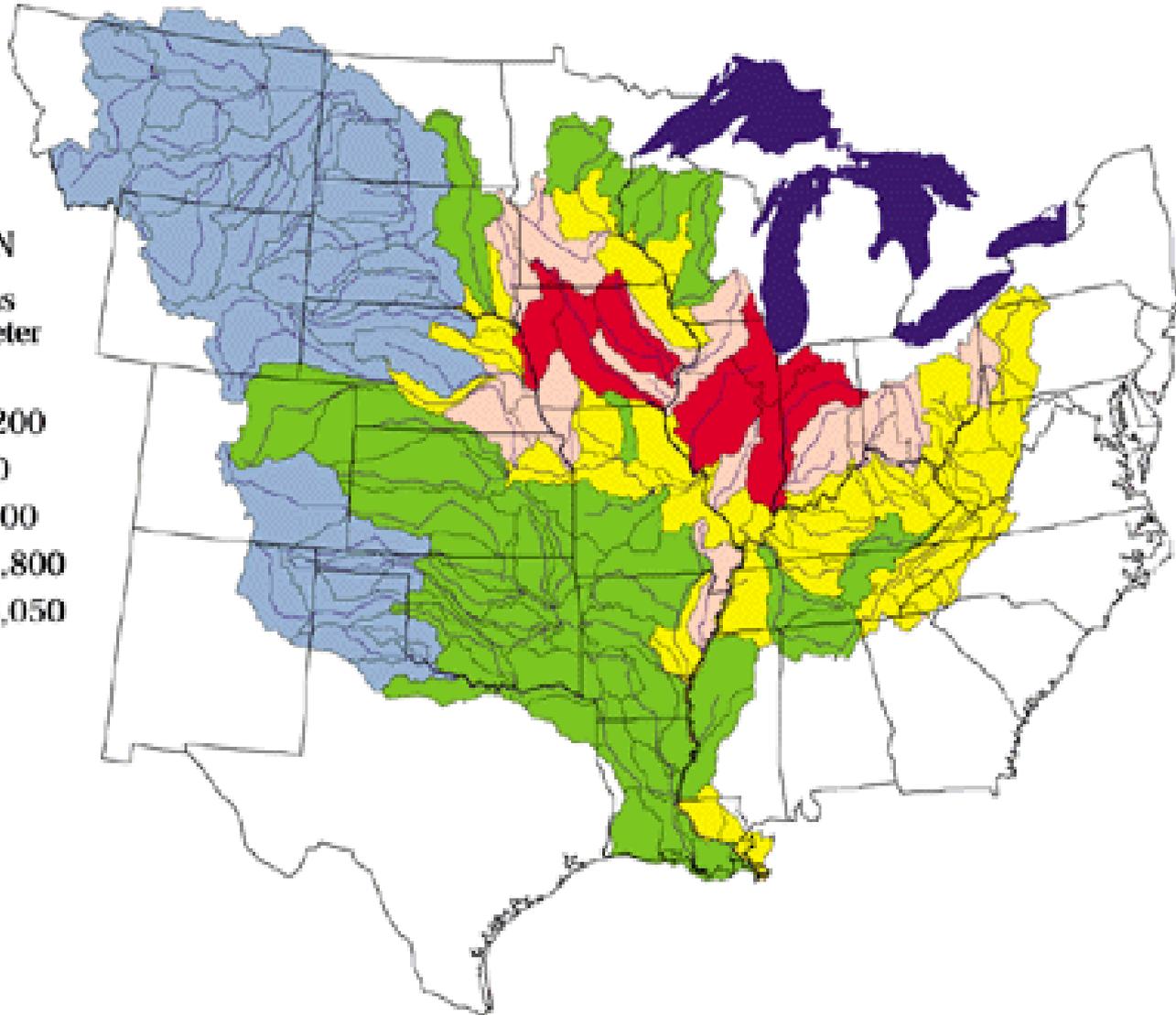
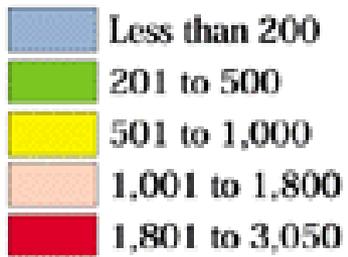




Now we can move beyond taxonomy and geography and do the fun work of being soil scientists.

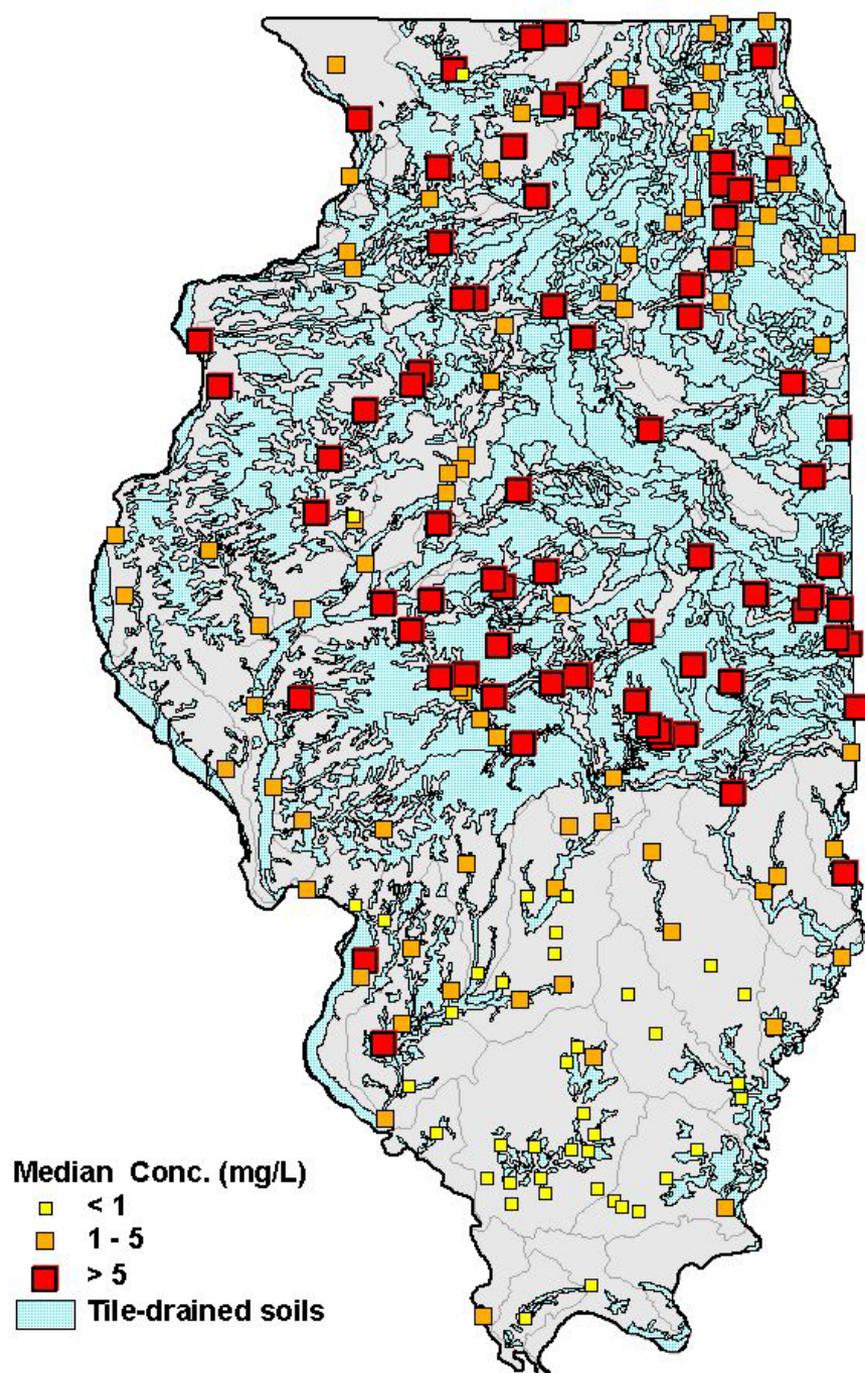
(B)

EXPLANATION
Yield, in kilograms
per square kilometer
per year

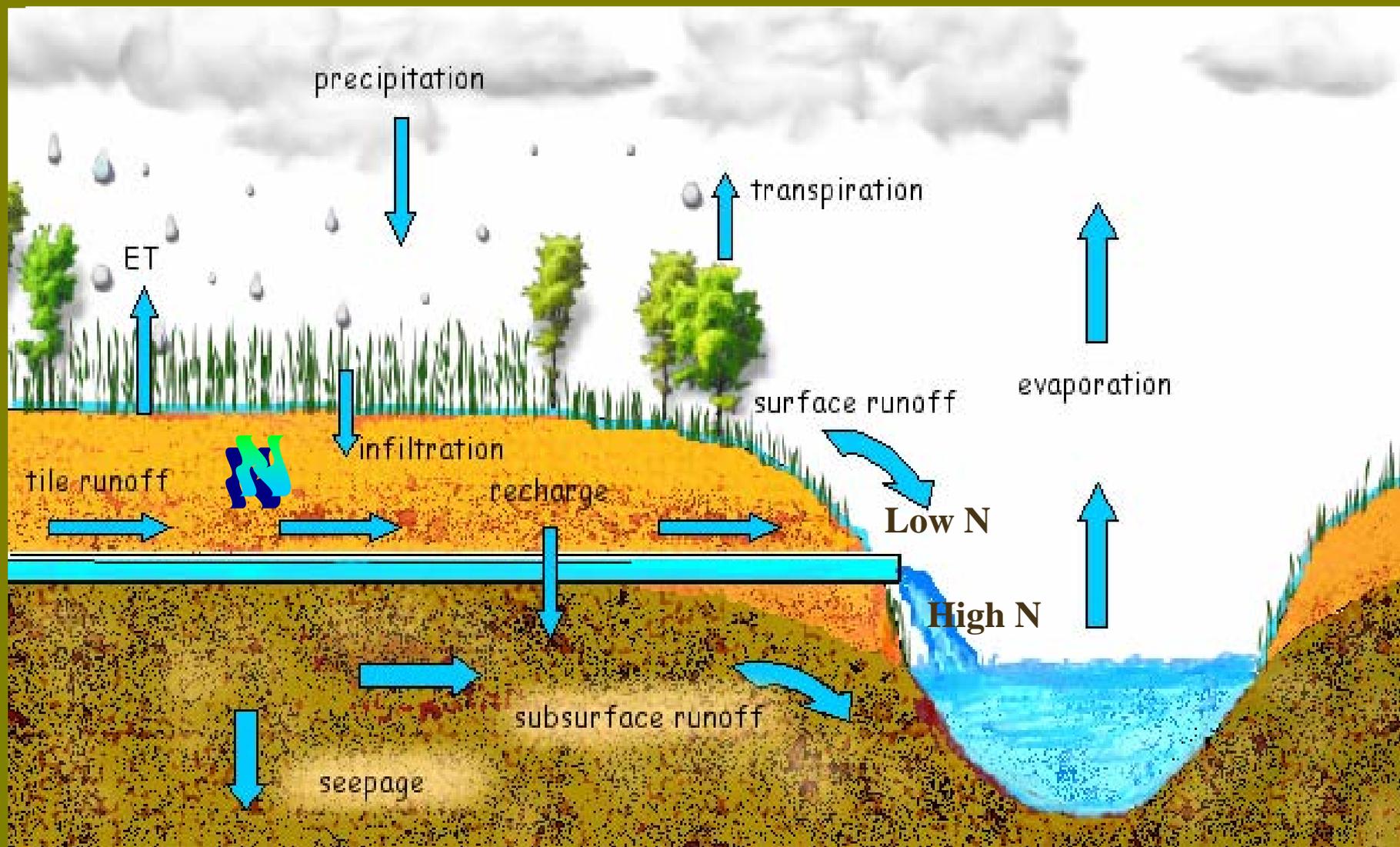


Average annual nitrogen yield of streams for 1980-1996

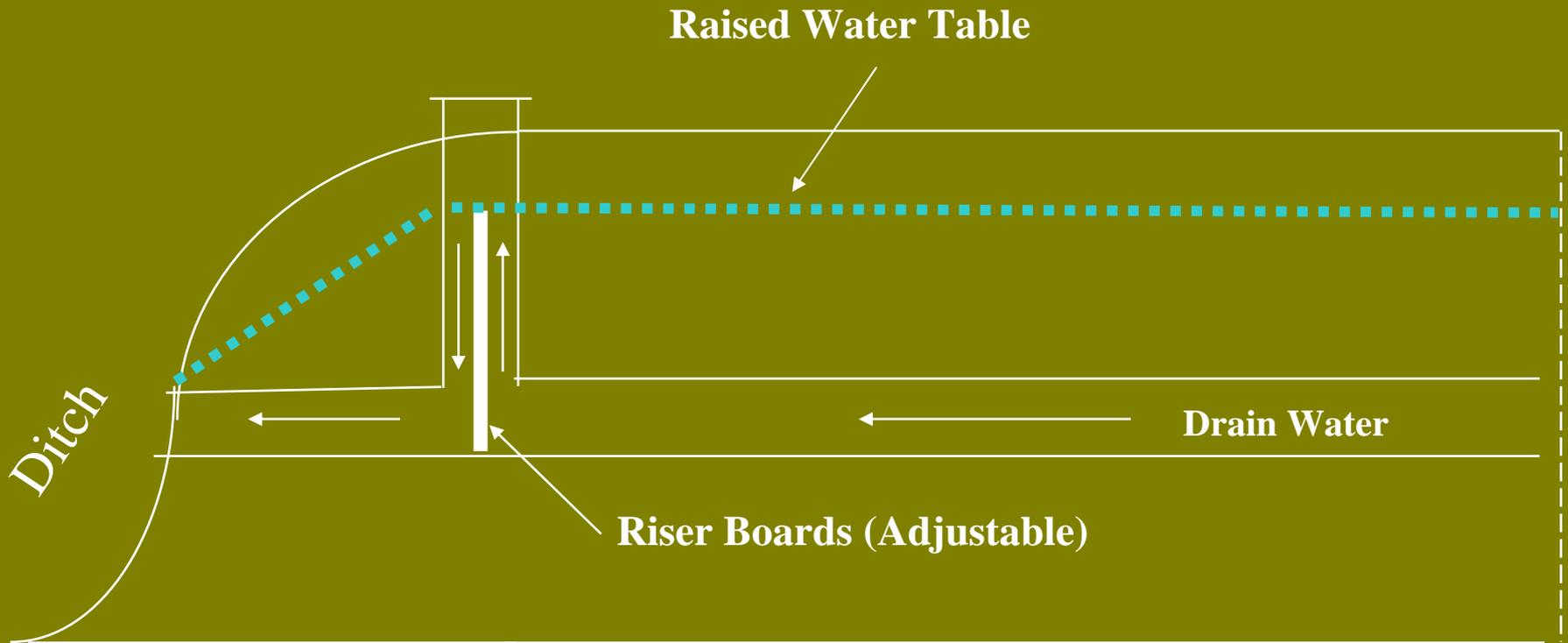
Locations of elevated nitrate levels in surface water and the distribution of tile-drained soils in Illinois



Hydrologic Cycle (with tiles)

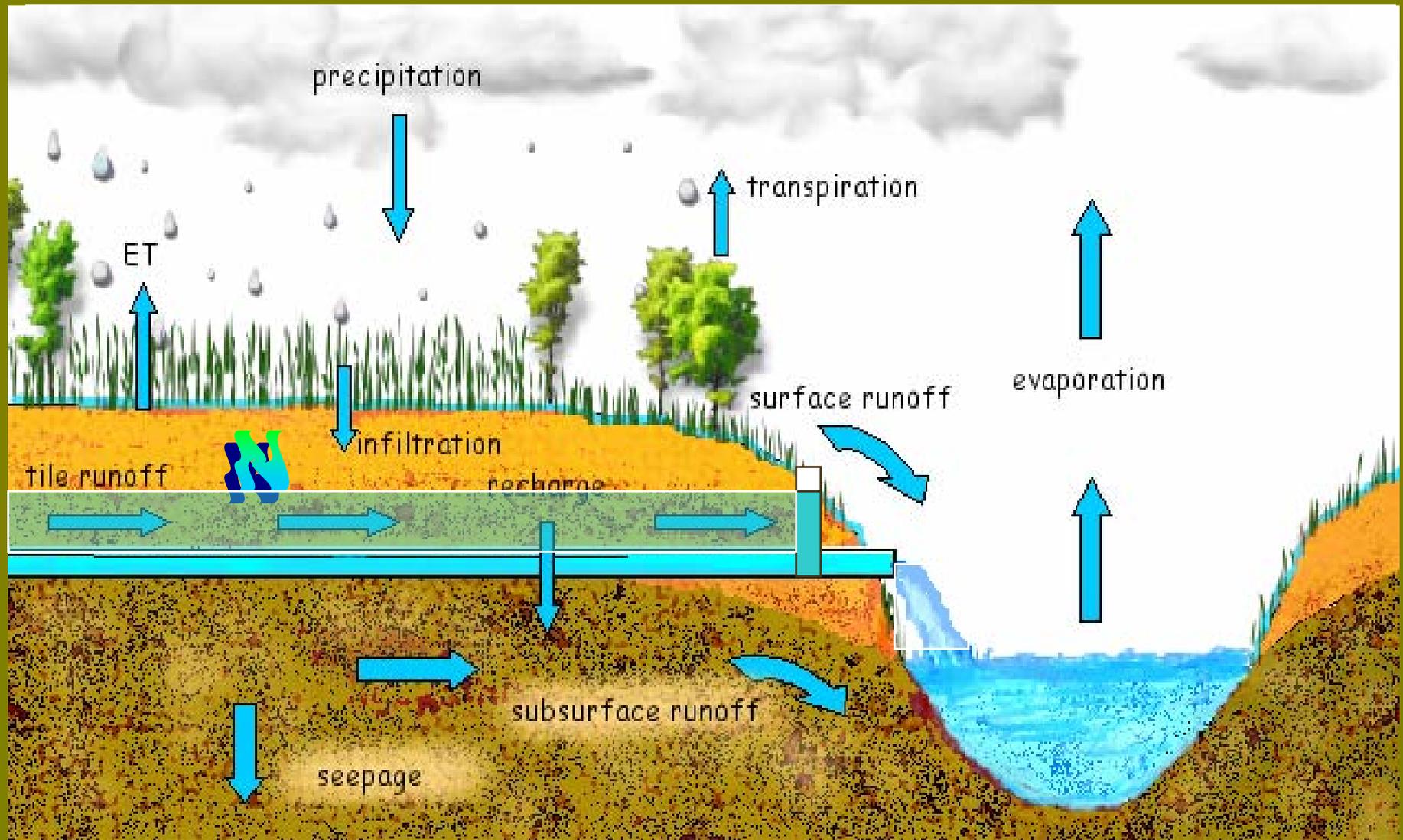


The water level control device is installed in the tile drain near the outlet and at various locations within the field depending on topography



Water level control device place in a tile line.

Hydrologic Cycle (with drainage management)



Summary

- **Need to clarify roles of SSS and MO leaders on administration of Benchmark Soils.**
- **Define and set goals for what constitutes a full data set.**
- **Take advantage of the Soil Survey Laboratory resources –**
- **Become soil scientists again – understand the functions of soils in the field under local land uses.**

