

Soil Management Practices for Reducing Risk: *Can Anything be Done?*

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What is Risk?

- Definition: expose someone or something of value to danger, harm, or loss. (source: Oxford Dictionary)
- Farmers deal with uncertainty on a daily basis; weather, animal/insect damage, weeds, pathogens, etc.
- “Risk can be defined as the possibility of adverse outcomes due to uncertainty and imperfect knowledge in decision making.” (source: S.A. Drollette, 2009)

Sources of Risk from a Soils Point of View

| Risk Source | Impact | Potential Cause |
|--------------------------|--|--|
| Inadequate fertilization | <ul style="list-style-type: none">- Poor yields- Susceptibility to pests | <ul style="list-style-type: none">- Management |
| Lack of soil moisture | <ul style="list-style-type: none">- Poor emergence- Reduced yields | <ul style="list-style-type: none">- Weather- Management |
| Soil erosion/runoff | <ul style="list-style-type: none">- Reduced soil profile depth- Nutrient losses- Reduced yields | <ul style="list-style-type: none">- Management- Weather |
| Excess water | <ul style="list-style-type: none">- Poor crop performance- Nutrient losses- Increased erosion risk | <ul style="list-style-type: none">- Soil type- Weather- Management |

Weather is a MAJOR factor, but management is too...

DAYS OF ICE COVER ON LAKE MENDOTA (1850–2000)

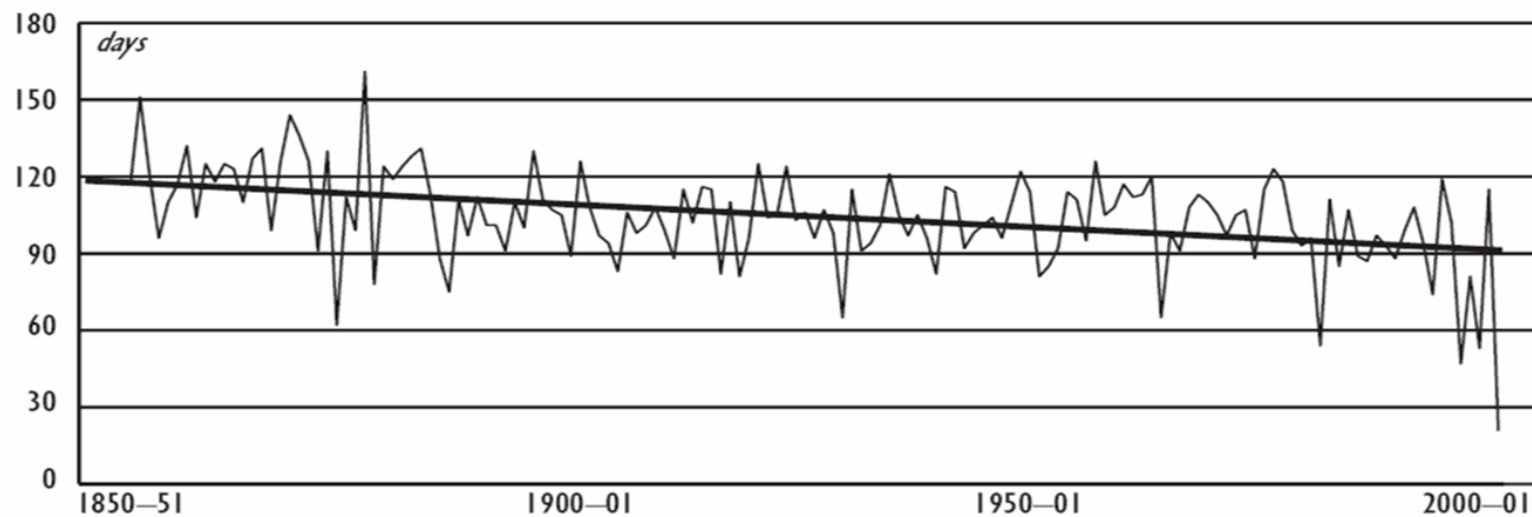
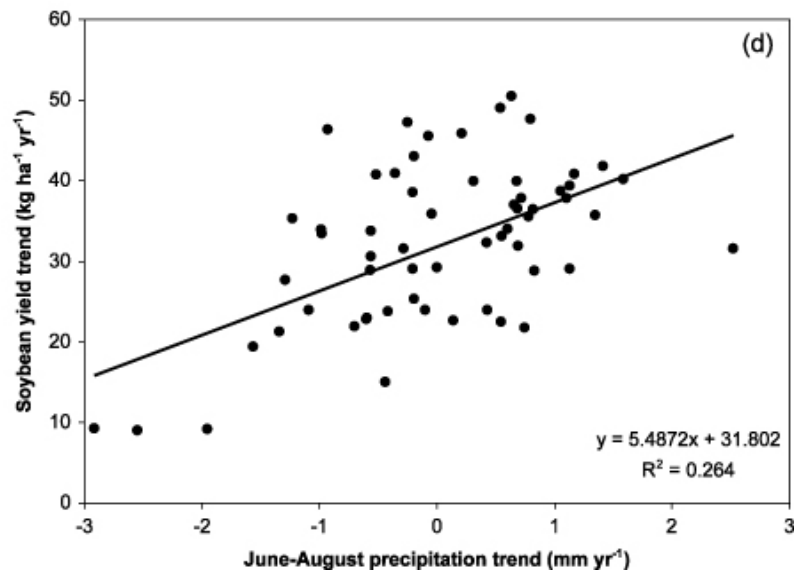
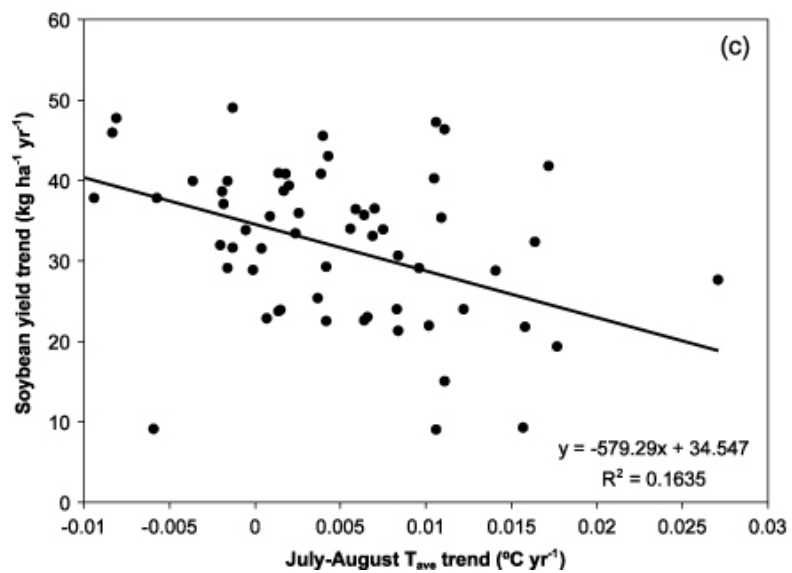
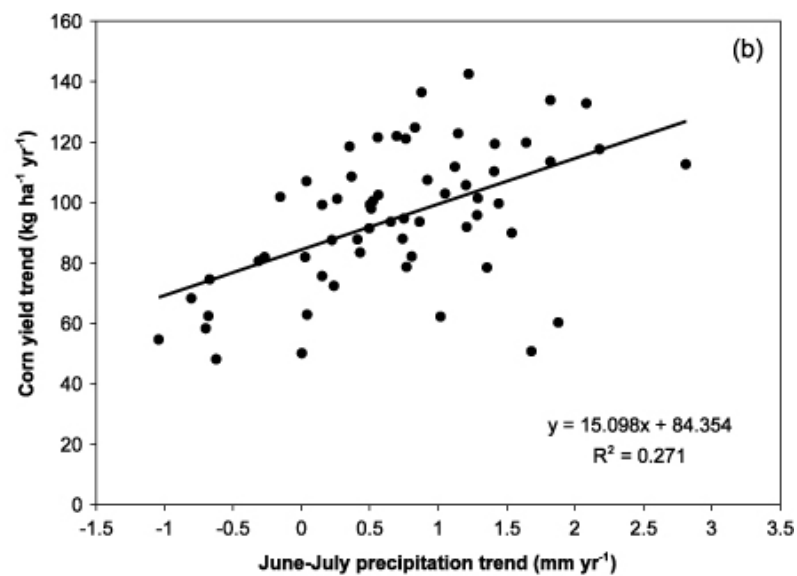
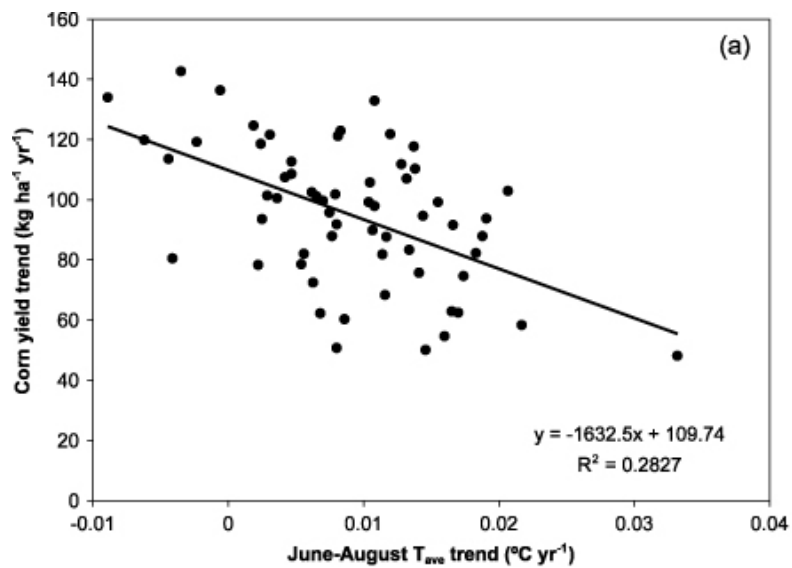


Figure 5

Magnuson et al. in press

Source: WDNR, Waters of Wisconsin Report



Source: Kucharik & Serbin, 2008

Can We do Anything About the Weather?

- Yes and No.
- NO : can't control weather patterns
- YES: certain management practices can help reduce some of the risk/uncertainty...

Management



Soil Management Strategies

- Maintain adequate soil fertility
- Increase water retention by soil
- Prevent and reduce soil erosion/runoff potential
- Control of excess water (flooding) in poorly drained soils

Management Strategies Soil Fertility

Nitrogen



Zinc



Phosphorus



Manganese

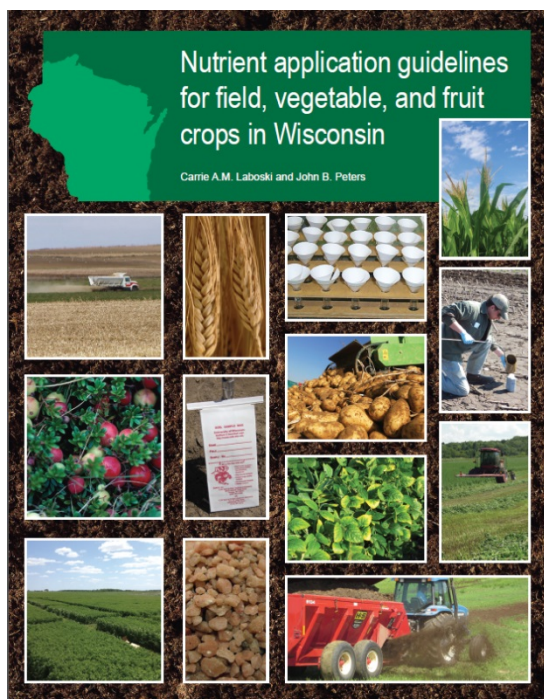


Management Strategies Soil Fertility

| | sandy loam | | | | silty clay | | |
|---|------------|------|------|--|------------|------|------|
| | 2009 | 2010 | Mean | | 2009 | 2010 | Mean |
| Corn stover, ton/ac | 2.28 | 1.57 | 1.93 | | 2.45 | 2.13 | 2.29 |
| | | | | | | | |
| P, lb/ton | 1.7 | 1.5 | 1.6 | | 1.4 | 2.6 | 2.0 |
| P, lb P ₂ O ₅ /ac | 9.0 | 5.5 | 7.3 | | 7.8 | 12.5 | 10.2 |
| | | | | | | | |
| K, lb/ton | 14.5 | 14.6 | 14.5 | | 12.5 | 23.0 | 17.8 |
| K, lb K ₂ O/ac | 39.9 | 27.6 | 33.8 | | 36.8 | 59.0 | 47.9 |
| | | | | | | | |
| Ca, lb/ton | 3.2 | 3.2 | 3.2 | | 2.90 | 4.4 | 3.6 |
| Ca, lb/ac | 7.3 | 5.0 | 6.2 | | 7.1 | 9.3 | 8.2 |

Management Strategies Soil Fertility

- Soil test on a regular basis and follow nutrient management recommendations (A2809)



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Nutrient application guidelines for field, vegetable, and fruit crops in Wisconsin (A2809)

Extension
Cooperative Extension

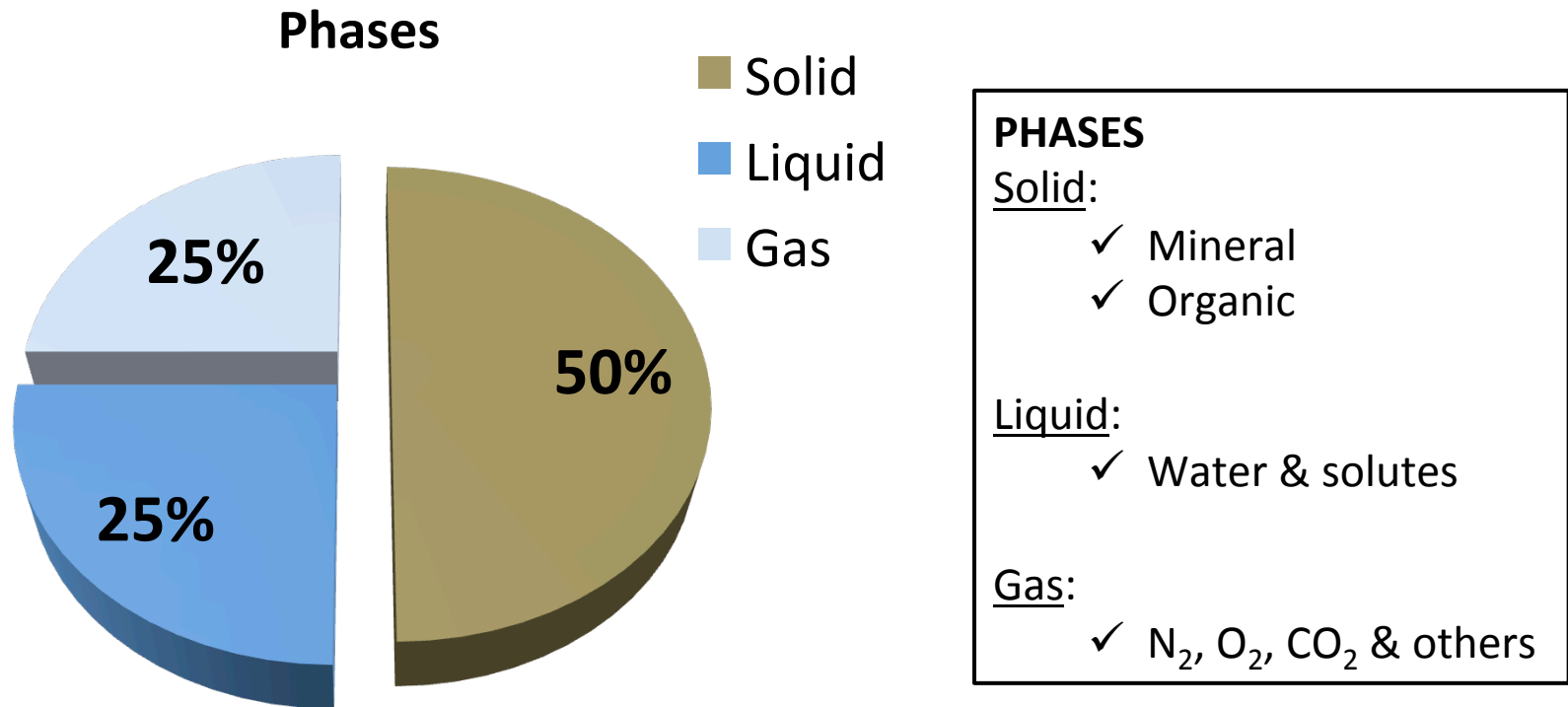
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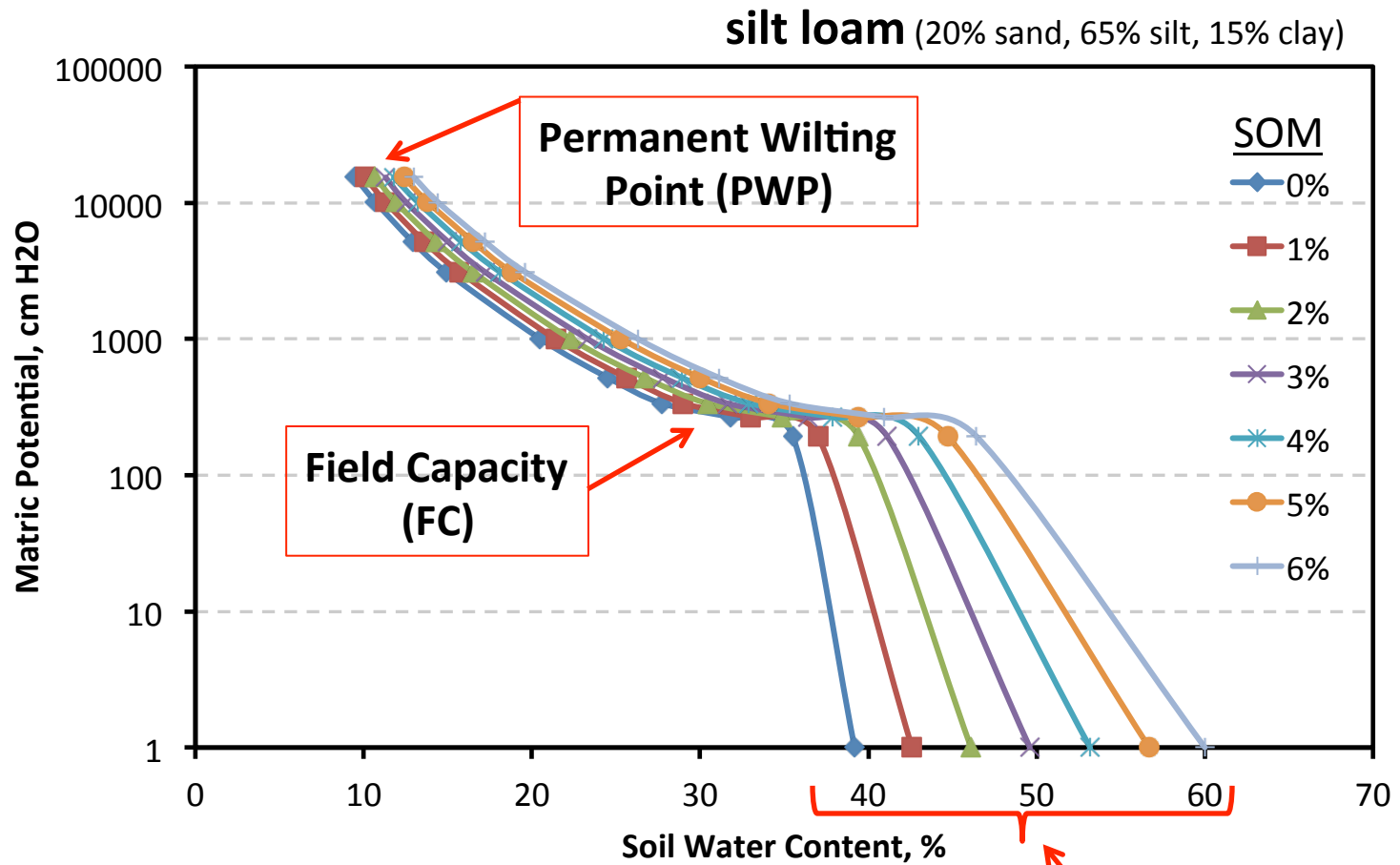


Management Strategies Soil Moisture

Soil as Three-Phase System



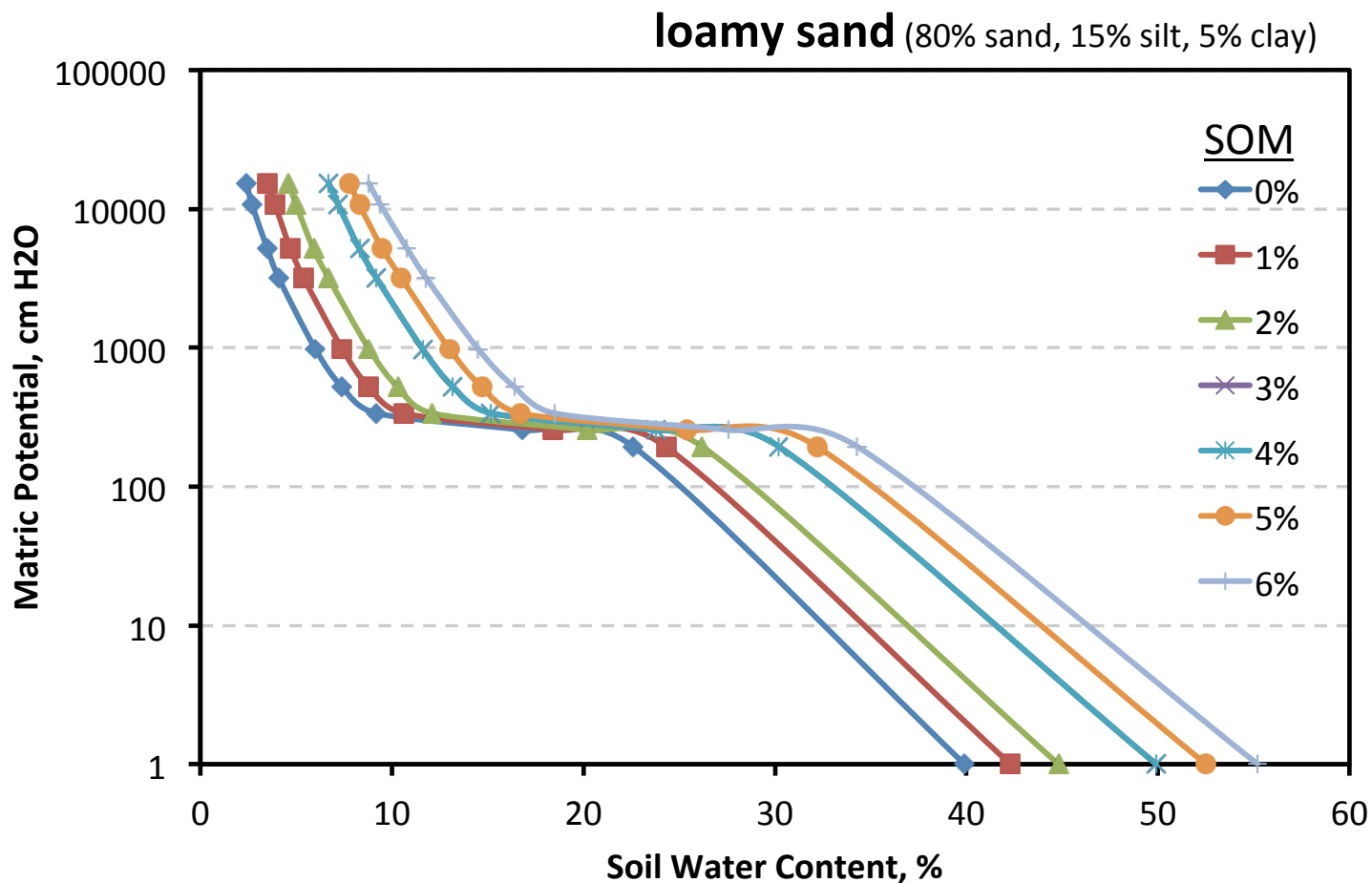
Management Strategies Soil Moisture



$$PAW = FC - PWP$$

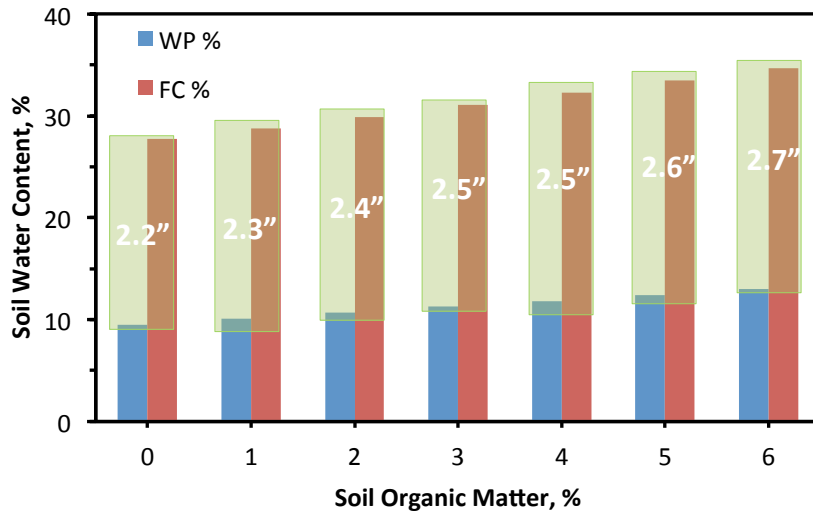
Saturation

Management Strategies Soil Moisture

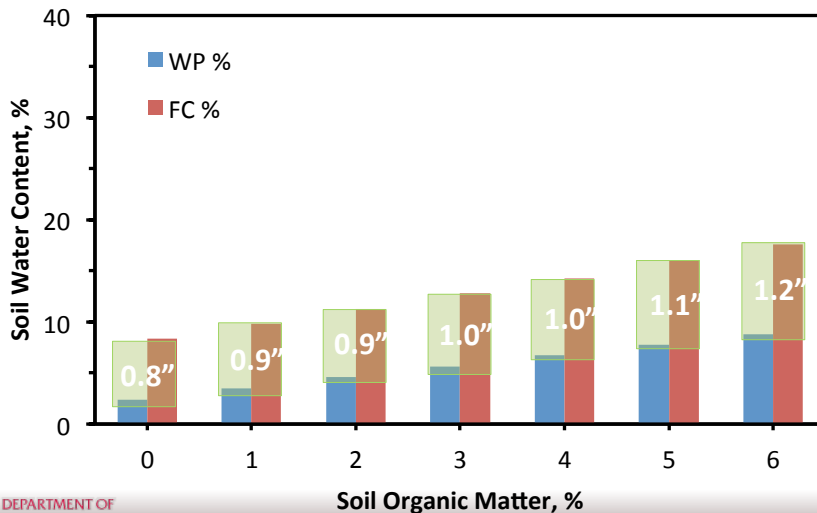


Management Strategies Soil Moisture

Plant Available Water ($PAW = FC - PWP$)

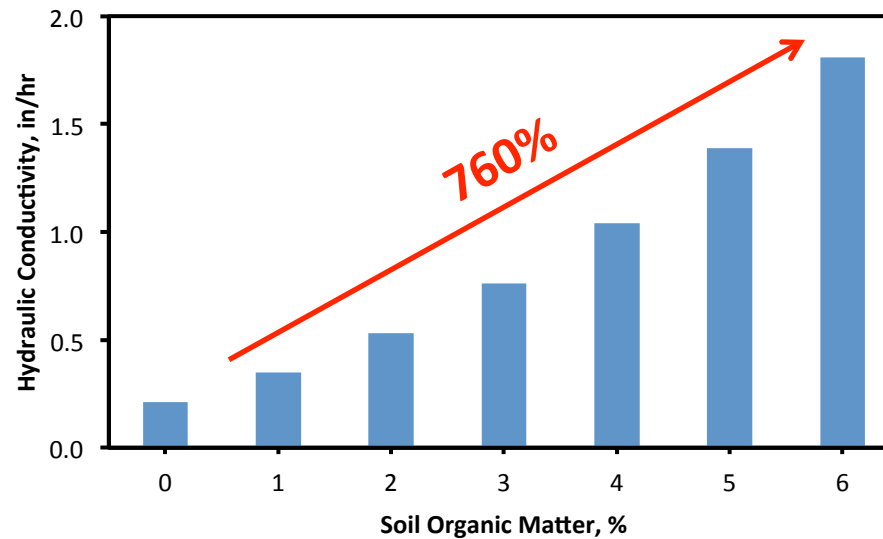


Difference in Plant Available Water = 0.5 inches/ft

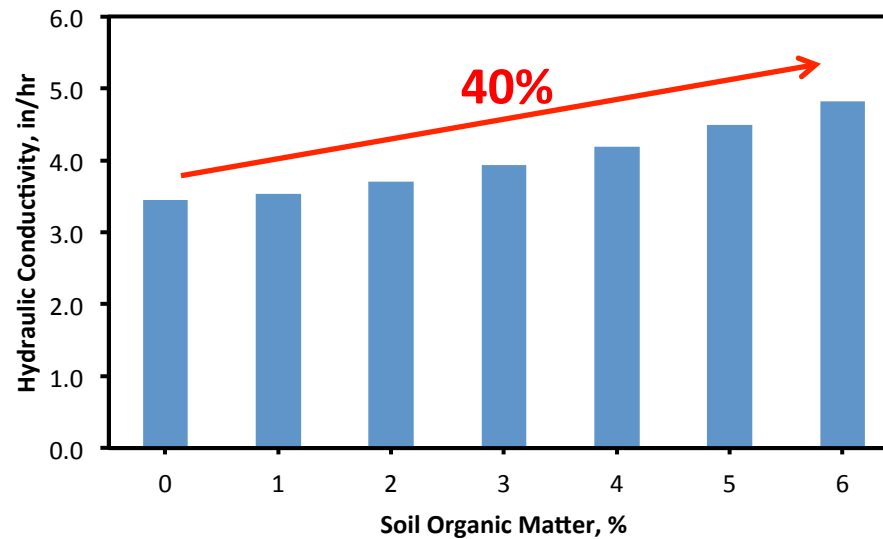


Difference in Plant Available Water = 0.3 inches/ft

Management Strategies Soil Moisture



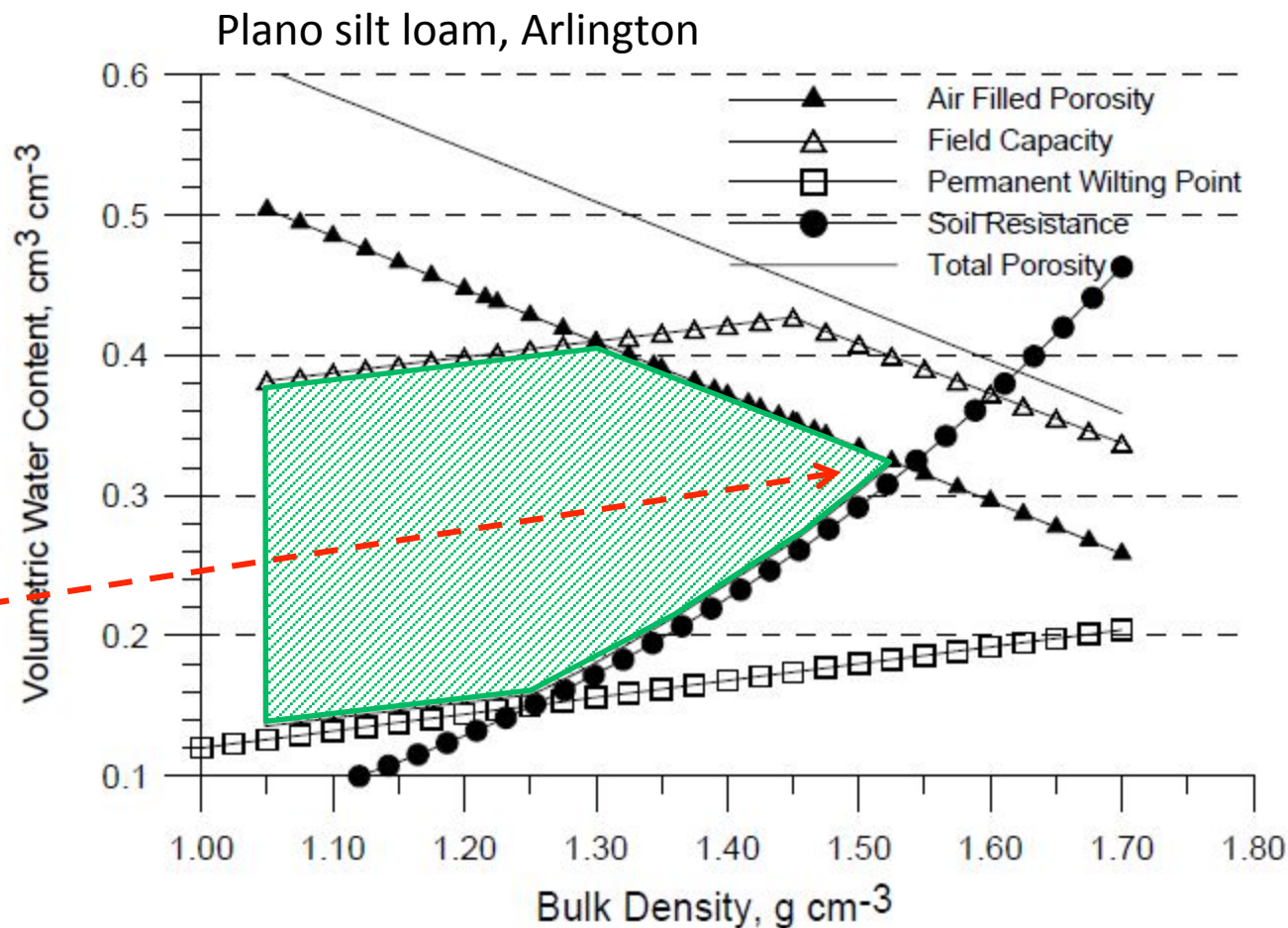
silt loam



loamy sand

Management Strategies Soil Moisture

Plant Available Water ($PAW = FC - PWP$)

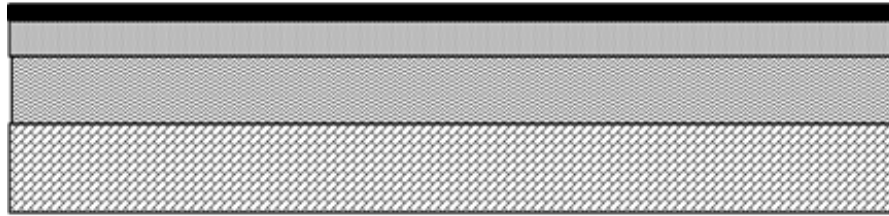


As D_b increases, plant available water is reduced dramatically

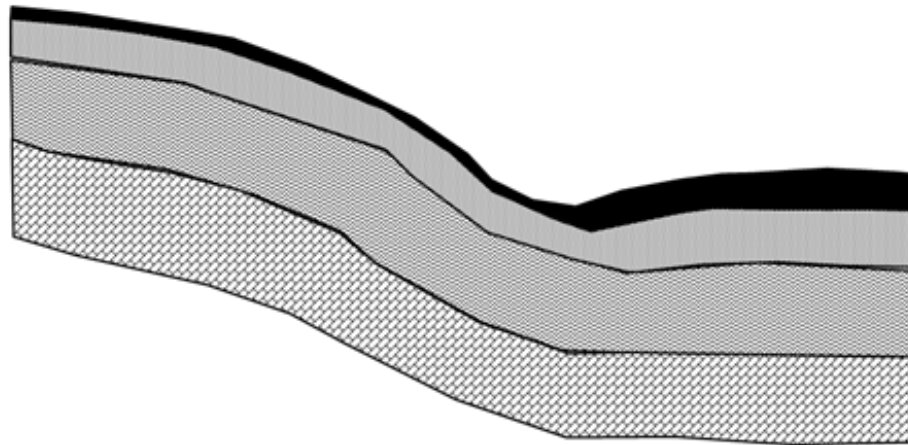
(Reinert et al., 2002)

Management Strategies Soil Erosion

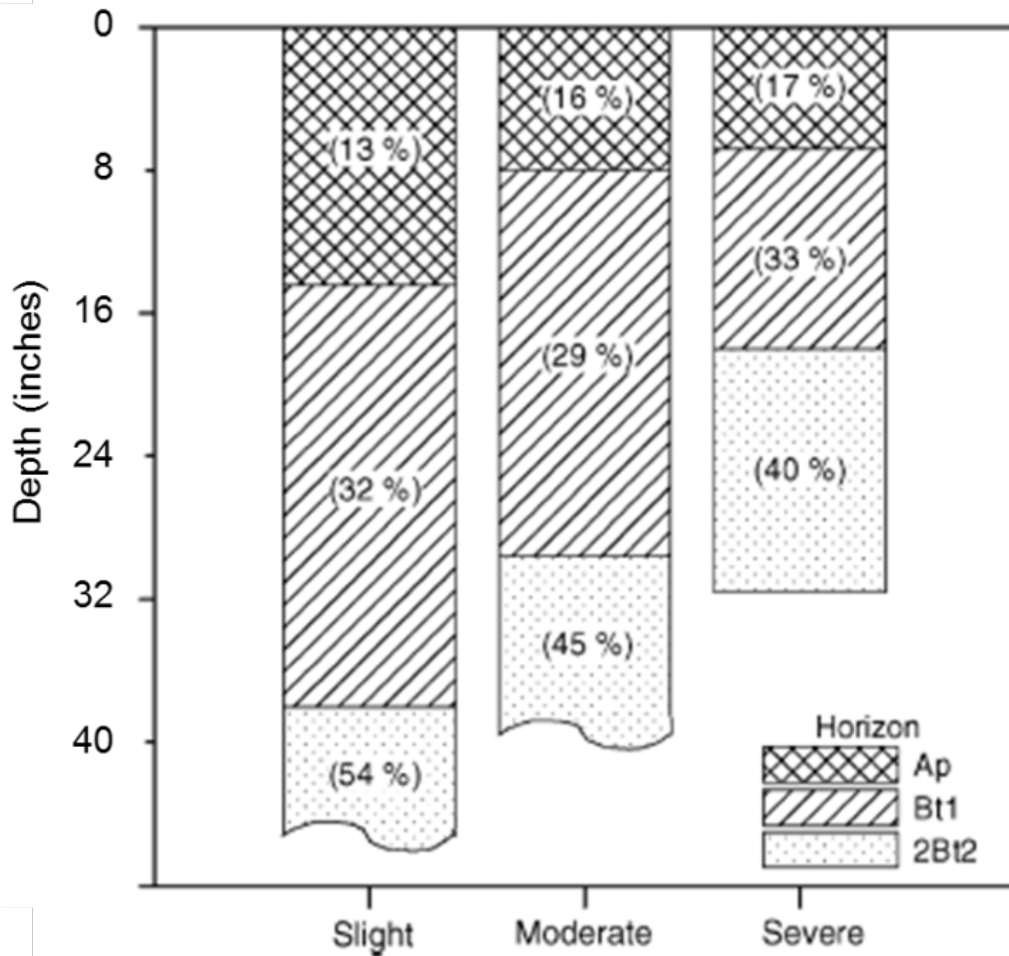
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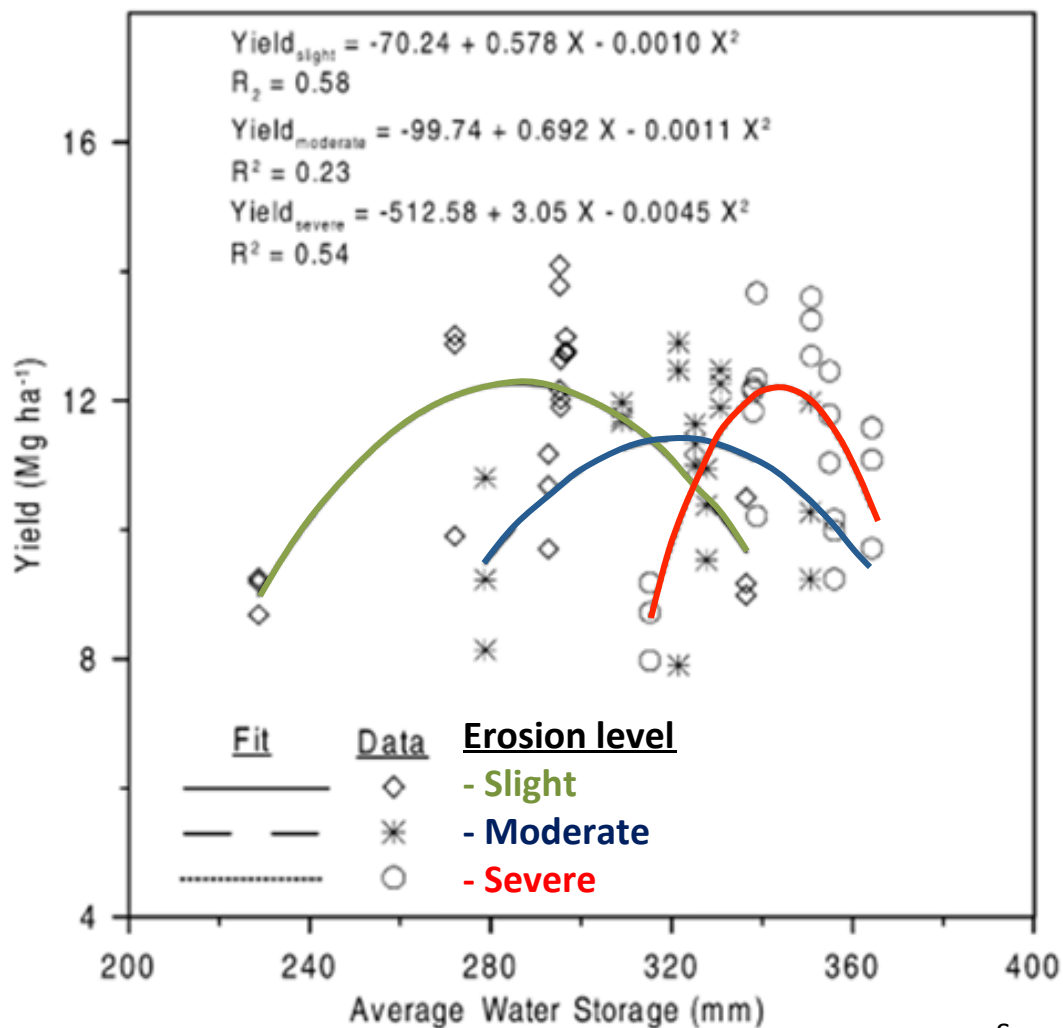


Management Strategies Soil Erosion



Source: Arriaga and Lowery, 2005

Management Strategies Soil Erosion



Source: Arriaga and Lowery, 2003a

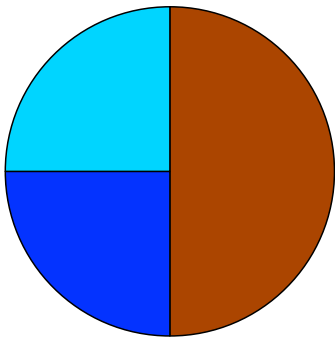
Management Strategies Soil Erosion



Management Strategies Soil Erosion

Soil Compaction

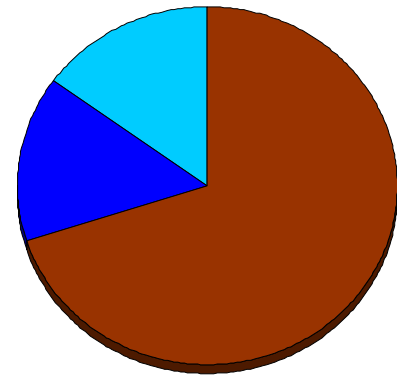
soil not compacted



■ Soil ■ Water ■ Air



compacted soil

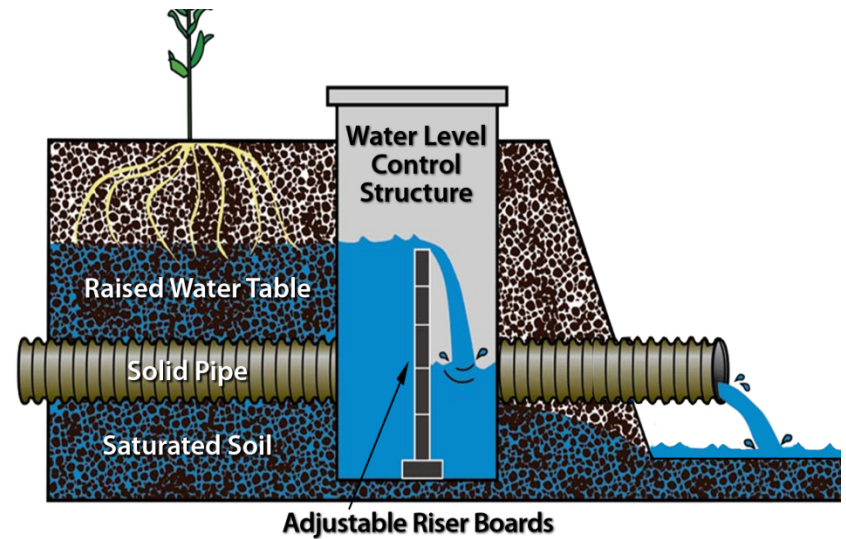


Compaction reduces the amount of pore spaces in the soil, which in turns reduces aeration, water retention, and water movement in the soil.

Management Strategies Excess Water/Flooding



source: mchenrycountyblog.com



source: NRCS

Management Strategies Excess Water/Flooding



Final Thoughts

- Uncertainty and risk are inherent factors in any farming operation.
- Management can help reduce some of the risk associated with crop production and soil in an operation;
 - Maintain fertility
 - Improve soil aggregation (improves water relations)
 - Reduce erosion potential
 - Manage frequent excess water

“Take care of the land, and the land will take care of you.”

Hugh Hammond Bennett

Thank You!

Any Questions?

