

SALINE SEEP MANAGEMENT

Dave Franzen, Ph.D.

Extension Soil Specialist

NDSU, Fargo

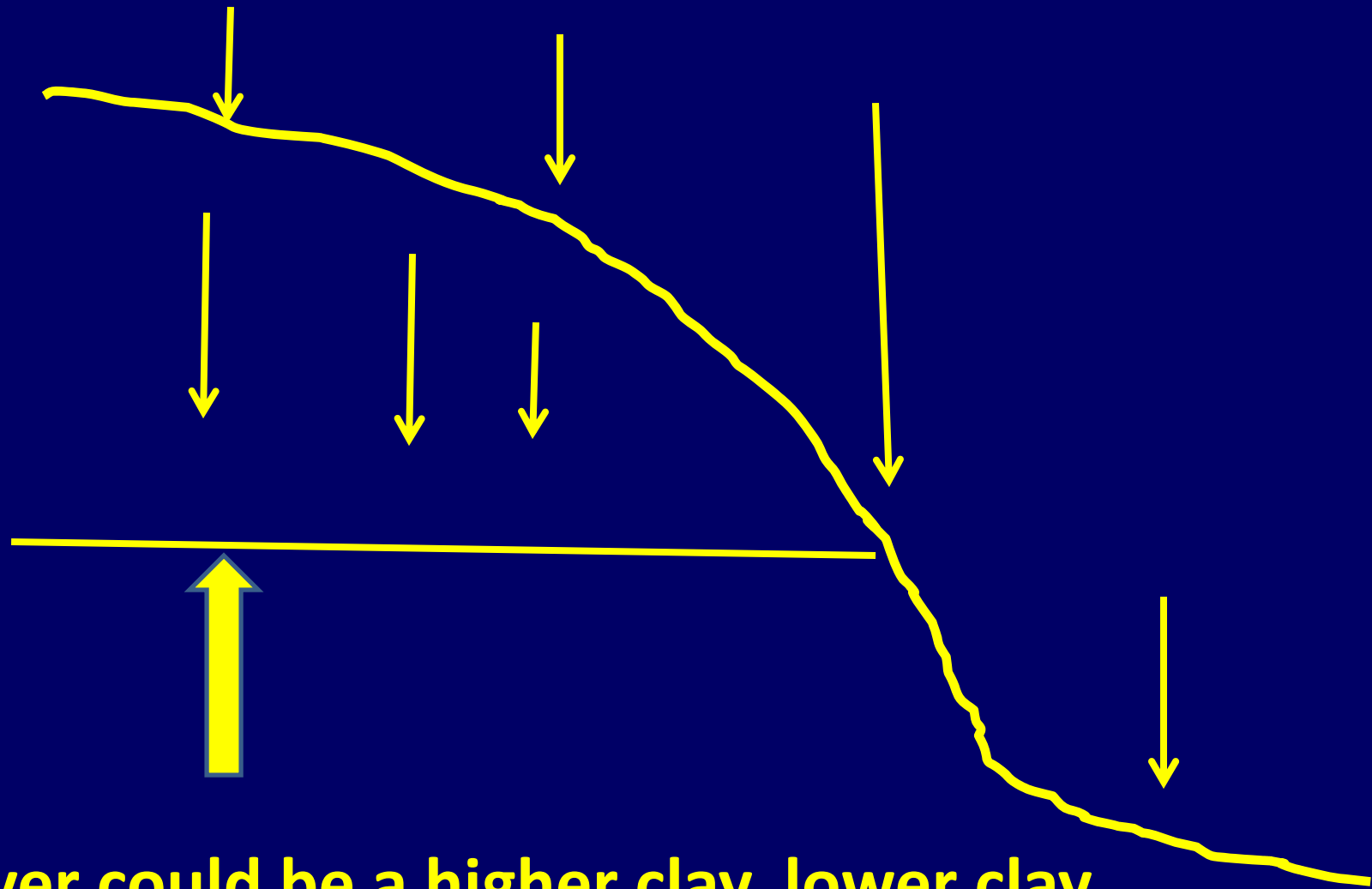
Saline Seeps-

Salty areas that appear on the side of hills.

Water doesn't move downward to the center of the earth.

The earth has a molten iron core, and its rotation results in the earth magnetic field.

Water moves downward until it reaches an impermeable layer of 'discontinuity of texture', then moves sideways.

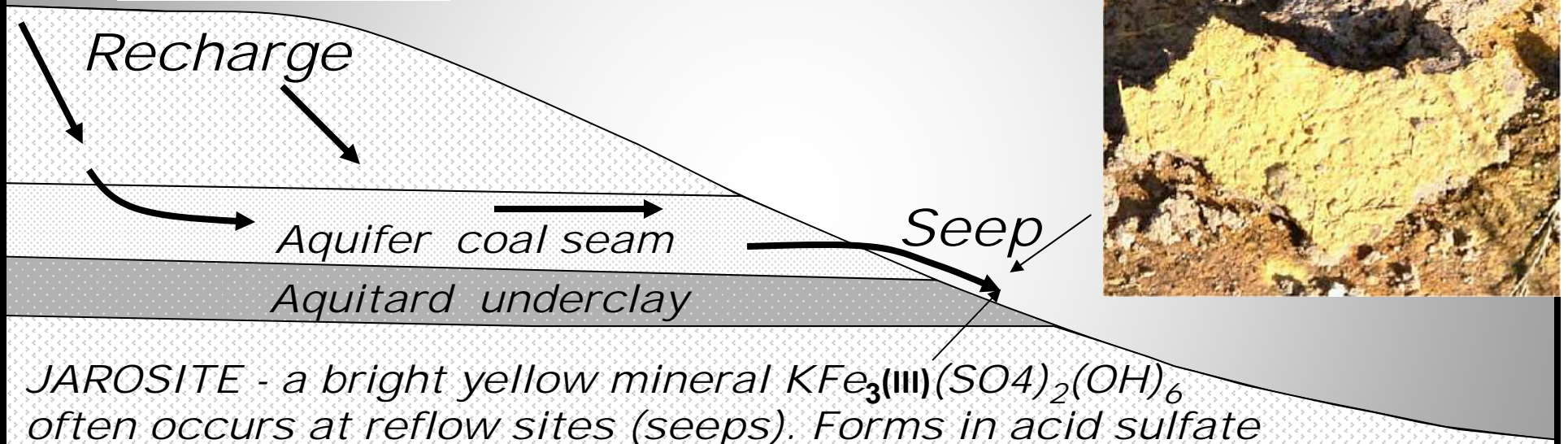


**Layer could be a higher clay, lower clay,
coal seam, different parent material,
different density, different anything!**

Taken directly from Richardson, 2010



Coal Seam Seep



JAROSITE - a bright yellow mineral $KFe_3(III)(SO_4)_2(OH)_6$ often occurs at reflow sites (seeps). Forms in acid sulfate conditions - pH levels below 4.0. Occurs in acid mine drainage in large amounts called "yellow boy".

BE ALERT FOR JAROSITE NEAR BLACK SHALES!

Sulfate
Low pH

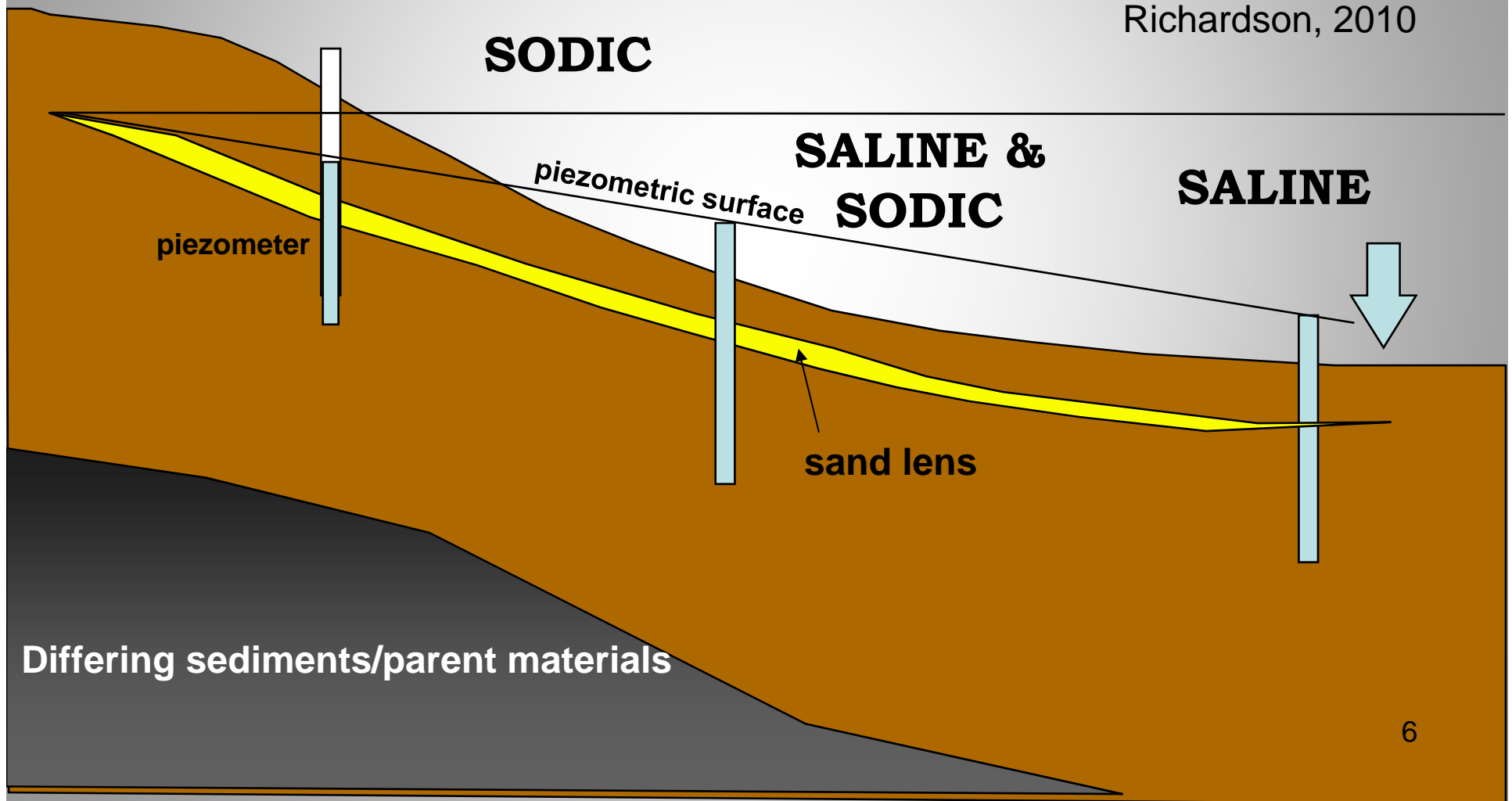


Sulfide
High pH

OCCURS IN WETLANDS WITH
WET AND DRY CONDITIONS 5

Hydrostatic Pressure Seep

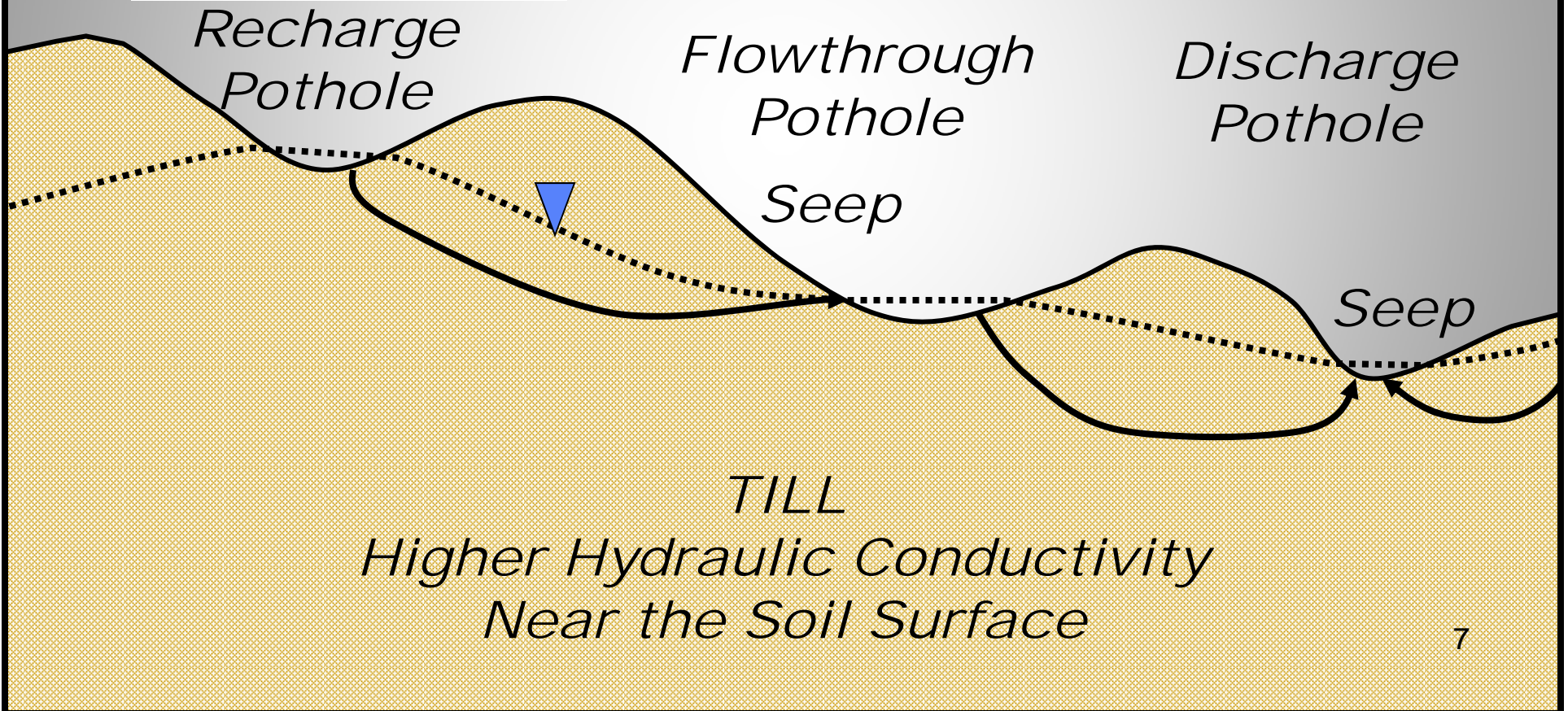
Adapted from
Richardson, 2010





Glacial Depression Seeps in Sub-humid & Semi-arid Climates

From Richardson, 2010

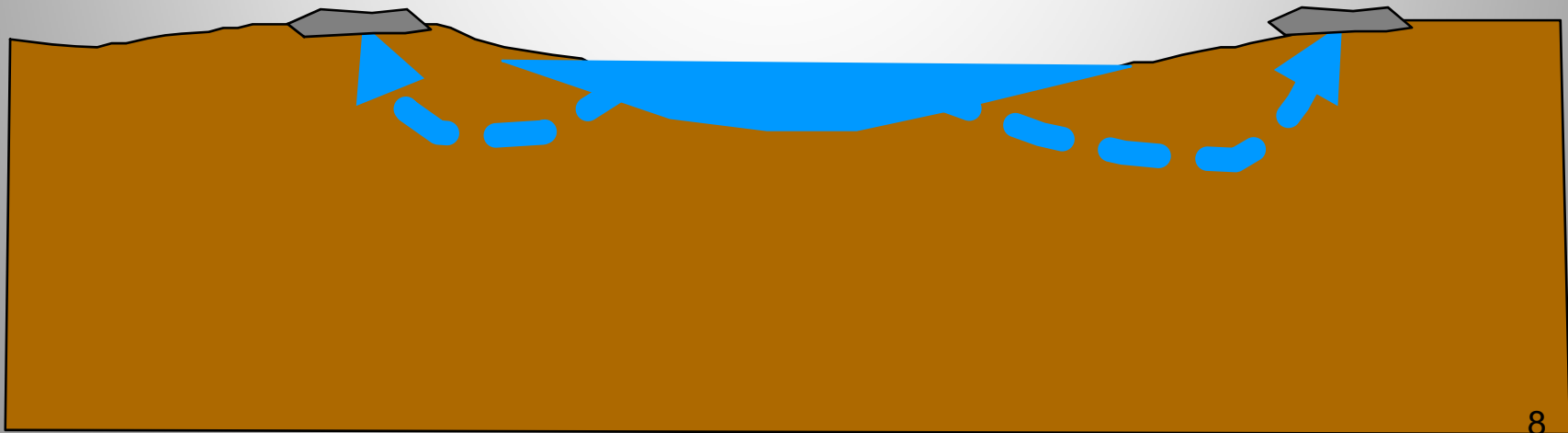


LANDSCAPE SALINITY

PONDS AND CAPILLARY Or MATRIC FLOW

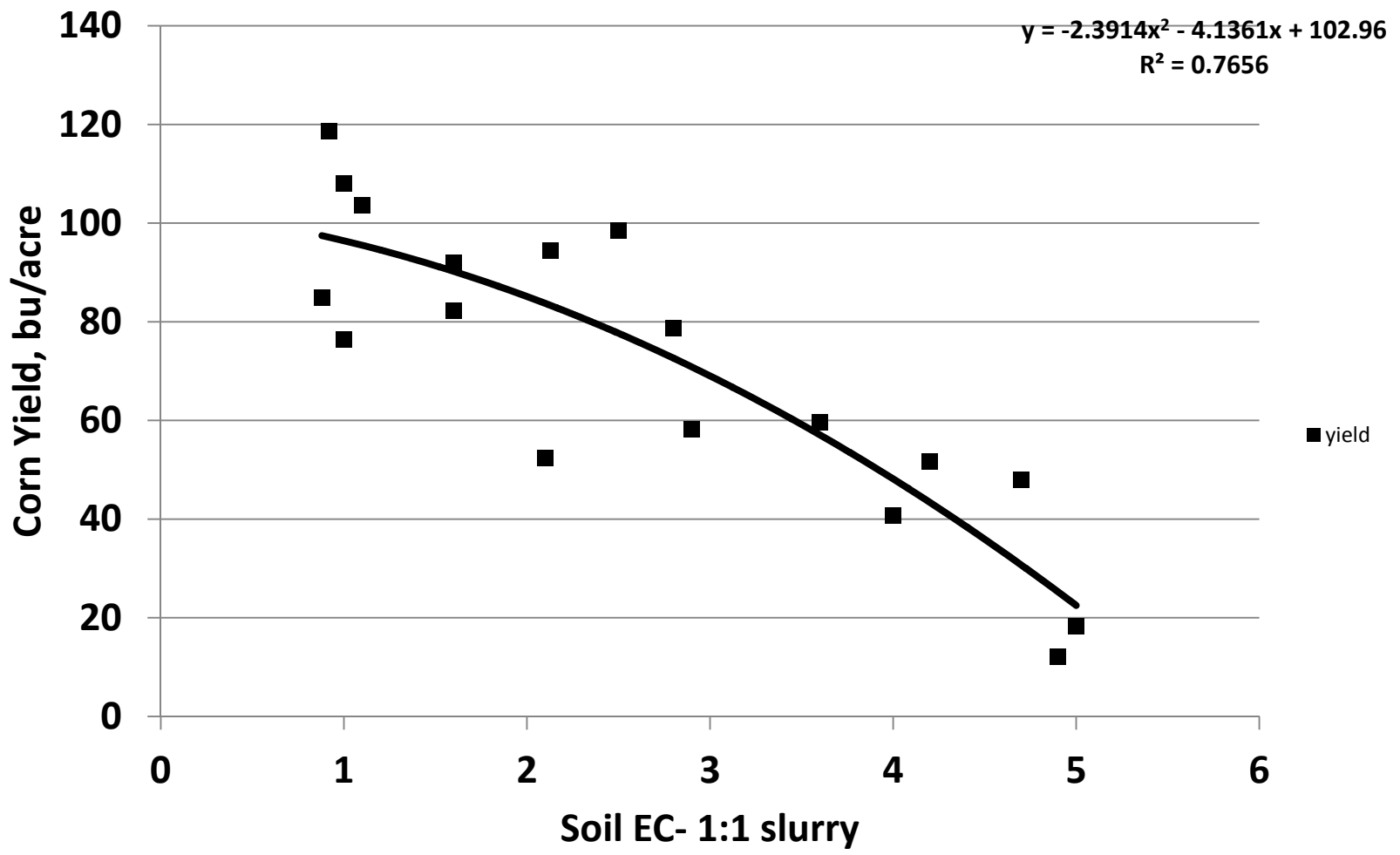
SALTS (precipitates)

From Richardson, 2010





Corn trying to grow on salty soil, Montana, from McCauley and Jones, 2005



Analysis of soil from 5 saline seeps in Hettinger Co., 1976, Doering and Sandoval

Seep	EC	Ca	Mg	Na	SAR	NO3	Cl	SO4
1	7.2	15	18	47	12	-----	1	70
2	6.5	18	40	21	4	-----	1	77
3	8.2	16	25	52	11	-----	1	86
4	9.6	14	76	59	9	6	2	139
5	7.2	15	58	36	6	5	2	100

**Depending on rainfall and management
saline seeps can grow in area over time.**

**One seep in Montana monitored from
1941 to 1971 grew from 25 acres in a
2570 acre farm in 1941
to nearly 1,000 acres in 1971**

(Daniels, 1987)

Management to reduce seep affects-

Continuous cropping (no fallow)

**Cover crops after harvest, during
early season if possible**

Longer season crops

Perennial crop (alfalfa)

Fallow increases water storage, but also increases water flow through seeps in normal to above-normal rainfall years.

A forced fallow due to prevent planting should have been followed by a cover crop or at least letting the weeds grow.

**If taking off an early crop- like
spring wheat, barley, peas, lentils,
there is a month at least where a
cover crop can use moisture. Plant the
cover crop above the seep to reduce
the hydraulic pressure in the soil.
The longer it grows, the more water
will be used.**

Consider a longer season crop-

**in the southwest, corn instead of
spring wheat**

sunflower instead of field peas

Alfalfa is king of water users-

The old recommendations (Brun, late 1970's) suggested alfalfa planted above the seep and left until it didn't come up one spring (that would be a sign that the water was gone and the seep would be gone also).

Over 5 years, Vernal alfalfa used over 30 inches of water and rooted to 19 feet in depth,

Compared with Russian wild rye, which used about 18 inches of water and rooted to 10 feet in depth.

Brown, 1976

Summary

- Saline seeps are a growing problem with huge economic and environmental consequences if not managed.
- The best management depletes the water above the seep
- Use of continuous crop, cover crop, including longer-season crops and especially alfalfa above the seep will reduce seep growth and may decrease the extent of the seep over time.