

Understanding Salinity in the South Plate River Valley

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Introduction to the Topic:

Salinity has many times been thought of something that happens only in the desert regions of the world. Not so, this silent warrior/demon attacks even as we sit here today. What is salinity? How does it affect any one of us? Who cares? And why are we needing to know anything about salinity?

Salinity in soils refers to the presence of excess levels of dissolved or readily dissolved solutes in the soil solution and on soil exchange sites of the clay particles. Soil salinity has been customarily defined and assessed in terms of laboratory measurements of electrical conductivity of an extract derived from an saturated paste of collected soil samples (ECe). This has been the norm expression of salinity because electrical conductivity is a practical index of the total concentration of ionized solutes in an aqueous sample. Nearly all soil testing labs in the United States use this standard procedure to measure salts in soils. Soil specialists, consultants, agronomists, researchers and others all know what is spoke of when EC values are expressed when discussing soil salinity or water salinity.

How does it affect us?

That is a good portion of the presentation and information I will share with you. I will say right off the bat, this time together we will see that saline affected soils have harsh effects on all who eat agricultural products that is grown, fed or raised in the Western United States presently under irrigation. That may answer the question about "Who cares?".

Why do we need to know anything about salinity? A question to ask yourself now, half way through this time together and after we're done if you are involved or rely upon agriculture.

To zoom in on the issue at hand, what understanding about salinity in the South Platte region do we need to have? Why, is it a problem? An how did it come to be anyhow?

Objectives of this Presentation:

- 1] Provide you with some pathways on how salinity has come into the Valley
- 2] Describe what are the concerns to and for producers of agricultural products
- 3] Lay out the important concepts of the levels of salinity that exist presently, and
- 4] Offer what can we jointly do now to maintain or improve the lands salinized

Probable and Possible Pathways Salinity has infected the South Platte Valley and surrounding areas

1]

2]

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Figure 1. Map depicting areas (zones) of saline affected soils in the South Platte region from Brighton to Nebraska-Colorado Stateline.

Figure 2. Map depicting geologic formations that are ancient seabeds that have soluble salts contributing to the saline concerns.

What are those concerns to the Agriculture producers?

There are quite a few, let me lay out about 13 of them to start with.

1. Reduced profits due to reduced yields
2. Irrigating is much more difficult to be truly effective
3. Crop selection is diminished in what the producer can grow
4. Fields do become water logged
5. Saline seeps spoil good land and nothing may grow
6. Trouble with weed control
7. Quality of crops is diminished
8. Delayed germination and poor stands as the result
9. Delays in harvesting the crop
10. Timing of tillage can be delayed, especially in the spring before planting
11. pH concerns, generally higher but influences herbicides efficacy
12. Input costs are higher
13. Drainage is a must in many cases

How is it that Natural Resources Conservation Service, Cooperative Extension Service and others have become involved in assessments of salinity of fields in this region of Northeastern Colorado and the issues we are speaking of today? Several reasons:

- USDA programs that have incentive payments in Conservation of Natural Resources such as EQIP, WHIP, PL-566, CRP and WRP demand that we look at all resource concerns.
 - EQIP - Environmental Quality Incentive Program
 - WHIP - Wildlife Habitat Incentive Program
 - PL-566 - Watershed Protection, Enhancement and Conservation Program
 - CRP - Conservation Reserve Program
 - WRP - Wetland Reserve Program

Through the direct assistance efforts of the NRCS and CES to the ag producers, these people together are discussing

- The local growers have come into these agencies offices, starting to recognize their soil-crop-water problems and asking the questions of why, how come, what is it and so on.
- Germination rates are lower, stands are poorer, seedlings have a horrible time of getting established, crops lodge, irrigate and two days later the crop looks as though it needs watering

- After the winter winds, a white powdery crust develops on the ground surface
- Soils seem to work a lot different during tillage passes
- Soils puddle and the water from rain or irrigation will not penetrate
- Soils can and do become hard as a rock when it dries and terrible to work with
- And it goes on from there

The concepts of what are the levels that exist now.

First, we must discuss what are the salts affecting the soils of the South Platte region, then secondly, what do those salts do to the soil and to the plants, and thirdly, where is the salt problem good, bad or terrible?

Salts that affect soils and crops negatively in high concentrations ----

What do these salts do in the soil ---

Physically...

Chemically ...

Biologically...

What do these salts do to the growing crop ---

Table 1. Specific Crops and their Tolerance to salt effects (EC in dS/m)
 Figures 3-8 Field Assessments of Salinity. Isobar maps depicting levels of saline soils.

What is important about increased levels of salinity in the soil or irrigation waters?

A] Interaction of salts in soils

B] How salts-water-roots interact

C] The effects on a crops physiology

D] Water usage

E] Long term effects on soils

What can we as government agencies and ag producers do now to sustain or improve the soil resources in the South Platte Valley?

Several things come to mind, none are inexpensive and there must be action. For no action will perpetuate if not exacerbate the condition of the deteriorating field and soils resource.

1. First, to have a sound assessment made of the field(s) believed to be affected by salinity/sodicity
2. Secondly, determine the level of salinity, high, moderate or slightly effected
3. Thirdly, determine the types of salt causing the problems: sodium chloride, sodium bicarbonate, sodium sulfate, calcium sulfate, magnesium sulfate, calcium chloride, calcium bicarbonate, magnesium bicarbonate or combinations of any one of these salts
4. Determine if water tables are within 7 feet of the soil surface during the growing season
5. Water quality being added via irrigation
6. Determine if internal drainage is required of subsurface conditions
7. Source potential of salinity..... Contributing waters, shale close to surface, silty or shaly members in sandstone parent materials
8. Reuse of waters we irrigate with - Is this possible?
9. Determine leaching quantities of irrigation water if soils are just saline; SAR < 10, pH < 8.5, ESP < 15
10. Determine leaching quantities and type of amendments to be added to system if soils are sodic; SAR > 10, pH > 8.5, ESP > 15
11. Discuss strategies for crop selection, tillage practices, timing, row/bed construction, fertilizer selection and timing and amounts, organic matter use, manure use and entire water management scheme.

Summary:

We have offered some vantage points for you to realize where some of the sources of salinity inputs are into the South Platte. You have more of an idea the concerns ag producers have with salinity up and down the South Platte, especially for the grower and how he/she manages their specific operation. We have touched on the levels of salinity, what happens in the soil and in the plants trying to be grown in these limited environments. This is reflected in yields, quality of crops, increased management inputs with no improvement in outcome on a general basis. There is somewhat a trend of salinity from Denver to Julesburg on a west to east drive so to speak that you are more aware of. You have some more knowledge of the magnitude of this growing problem. And we have dabbled in the future regards to maintaining where we are or trying to improve.

Just knowing these things leads us to where? Do we need to conduct studies, evaluations, try different additives/solutions or amendments to the water sources or soil? Do we run around in circles crying that the sky is falling, the sky is falling? Do you, we, need to procure monies to help address this issue?

Our outlook is somewhat cloudy if we do nothing. Or, we can become more proactive and work together as government scientists/technicians, private citizens, ag producers, consultants and university scientists to sustain a viable agricultural base in the South Platte region. It is your choice.