

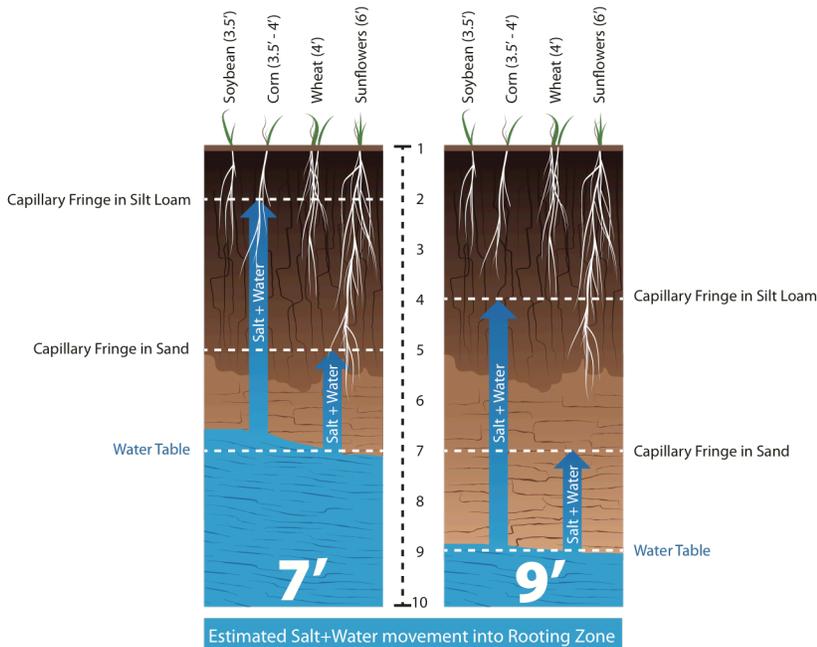


Why do we have salts?

Salts are part of the geology of North Dakota. The weathering of parent material has released salts into soils over thousands of years. Salts are something that we will have to manage for years to come.

Does my soil have to be white to be saline?

The answer to this is no. Salts in the rooting zone are just as harmful to plants as are the white patches on the surface. Capillary rise (water moving towards the surface because of tension between soil particles) brings water + salts into the rooting zone. See diagram below.



Why is my salt problem spreading?

Saline areas typically have poor plant growth leading to increased evaporation at the surface. Here's how the process works:

- As the surface soils dries with evaporation, water is brought up through the soil profile by a process called capillary action to replace water that has evaporated.
- Unfortunately, the water rising towards the surface is picking up soluble salts from deeper in the soil and carrying them into the rooting zone and up to the surface.
- Once the water reaches the surface, the water will evaporate and the salts will remain (leaving a white patch) or in some cases, you have an excess of salts lingering in the rooting zone with no visible white patch on the surface.
- As more salts are brought toward the surface because of poor plant growth, salts get into the rooting zone of what were healthy plants along the edge of the saline patch – so those plants are now effected by salts and thus the problem spreads.

GENERAL SALINITY QUESTIONS AND ANSWERS

10-24-13

Contributors:

Dr. Abbey Wick

State Soil Health Specialist

Abbey.wick@ndsu.edu

Chris Augustin

Area Soil Health Specialist

chris.augustin@ndsu.edu

Naeem Kalwar

Area Soil Health Specialist

naeem.kalwar@ndsu.edu

Jason Goltz

Richland Co. Agent

jason.goltz@ndsu.edu

Lionel Olson

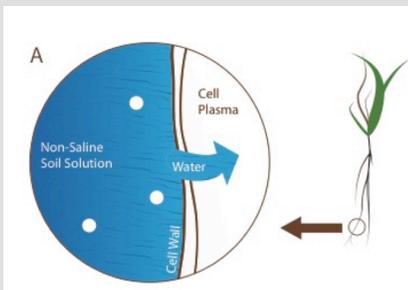
Grand Forks Co. Agent

lionel.olson@ndsu.edu

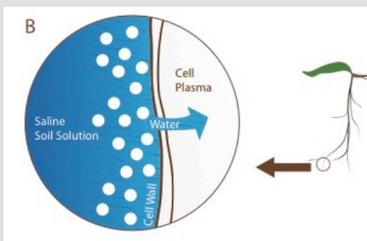
Plant Response to Salts:

Salts put the plants into drought stress – so look for drought symptoms when you are looking for salts.

Below is a non-saline soil solution, the plant is fine. It can pull water from the soil.



When you have salts, it makes it more difficult for the plant to pull water from the soil into the root. This is just like a reverse osmosis system in a house. A lot of energy has to be expended to pull the water across a membrane to clean the salts out of it. Think the same thing for a plant pulling water across a root cell.



Once a plant root hits that saline water in the rooting zone, it will look drought stressed.

How do I keep the salt patch from spreading?

This is a tough one to answer and will depend on the type of saline area developing. Here are a few basic concepts that can be applied:

- **Intercept the water:** use deep-rooted, salt tolerant crops in areas that show signs of salinity. These crops will use the water before it reaches the surface and rooting zone of shallower crops. By having plant establishment, you will cover the soil and reduce evaporation. You can also use deep-rooted plants like alfalfa along a ditch to keep salts from rising up in the field by a ditch.
- **Use the water:** if the saline patch is at the base of a hill, you need to use up the water before it gets to the base of the hill. That means, looking at the landscape, identifying the tops of surrounding hills and planting those areas into a high water use, deep-rooted crop. Here's how it works, the tops of the hills are called "recharge" zones. Water enters here and if in excess, it will move through the soil until it hits a layer that it can't move through. Then it moves laterally and exits at the base of the slope or "discharge" area. If you use the excess water where it enters (recharge zone), that keeps it from moving through the soil and picking up salts, and depositing those salts at the discharge area.
- **Plant salt-tolerant crops:** the best thing you can do is get something growing to use water and to shade the surface to reduce evaporation. Use something like wheat, barley or sunflower. If you want to try a perennial species, use grasses or alfalfa. If kochia is growing – let it, but don't let it go to seed!

Sometimes near a ditch the salts are worse than in the field and the crops next to the ditch look good and 50-100' inside the field, the crops look terrible, why?

This is typical ditch effect salinity – the best way to show this is using a diagram (below). Two things to do: (1) keep the water moving in the ditch so it doesn't rise into the field and (2) plant a 30' strip of alfalfa or something that is deep-rooted to use water before it picks up salts as it moves through the soil and upwells into the field.

