SOIL HEALTH & LAND MANAGEMENT

NDSU EXTENSION SERVICE

SPRING WHEAT RESPONSE TO SALINITY

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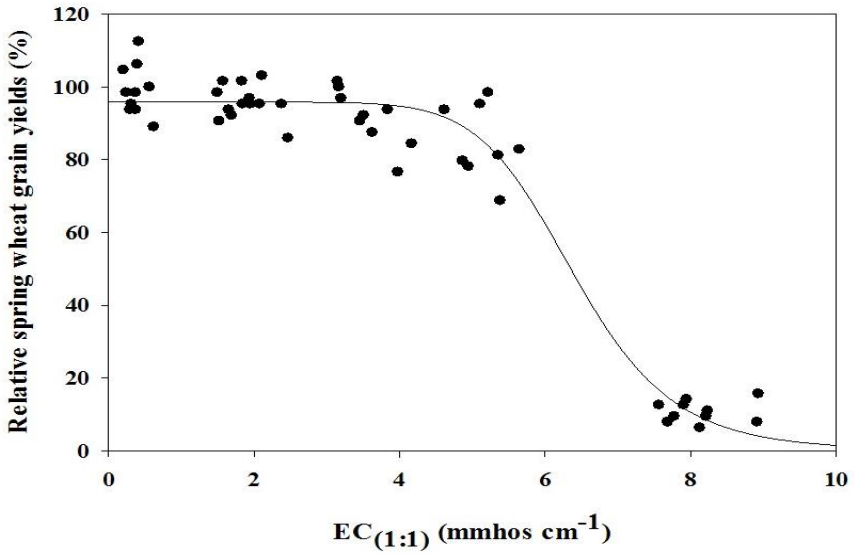
Salinity can affect yields of many of the crops grown in North Dakota; however, some crops can be slightly more tolerant than others making them a better choice for salt-affected ground. Having regionally specific information on crop response to salinity is important for growers in their decision making process.

To evaluate spring wheat response to salts specific to North Dakota (sulfate-dominated), greenhouse and field studies were conducted at NDSU. In the greenhouse, spring wheat yields start to decline at a soluble salt threshold of 4.5 mmhos/cm with a 23% yield decline per unit increase in soluble salts (see figure below). Wheat tolerance thresholds were not observed in the field because the high water holding capacity of the clay loam soils may have diluted salts in the rooting zone of the spring wheat.



Having a higher salinity tolerance threshold for wheat (relative to corn or soybean) provides an opportunity to manage salt-affected fields in the range of 4 – 5 mmhos/cm. First, having a crop growing is important for water use and controlling evaporation pulling salts into the rooting zone. Second, wheat provides a window of opportunity to get a cash crop growing early and to follow with a cover crop to extend the time something is growing. Crop failure on saline ground causes those areas to grow in size.

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"This ground needs a small grain"

Diversifying rotations by adding a small grain into a corn-soybean rotation is a slam dunk for building soil health and managing the whole system in general.

In addition to salinity management (where small grains are essential), here are other benefits:

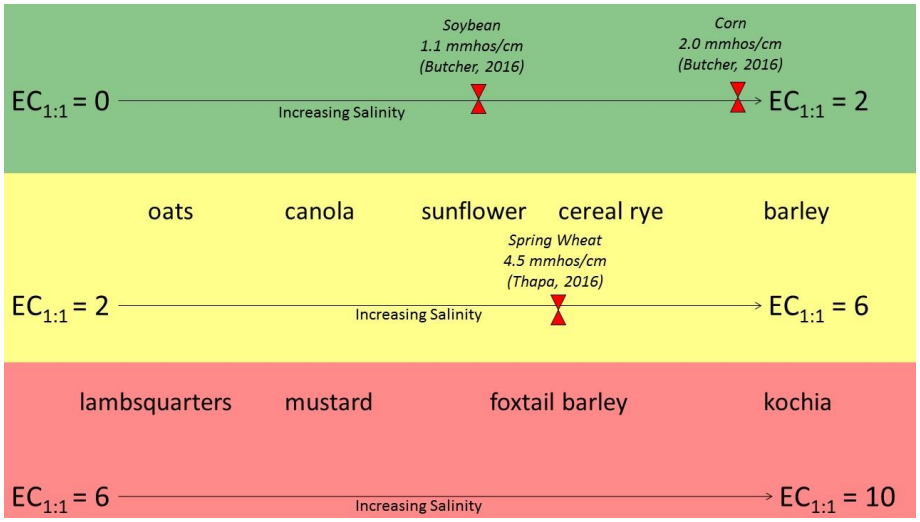
- the fiberous roots of a small grain help build soil aggregation, which in turn improves water movement through soils, provides space for microbes to live and protects organic matter

- there is enough time to get a cover crop growing post harvest. Cover crops can diversify the "food" put into the soil for microbes, making them more abundant and efficient

- earlier seeding and harvest of a small grain relative to corn or soybean can help with resistant weed management

Need some guidelines?

Here are a few ideas for crop tolerances based on research conducted at NDSU and also observations from NDSU demonstration sites (see figure below). Studies by Butcher (2016) re-defined soybean thresholds (1.1 mmhos/cm) and corn thresholds (2.0 mmhos/cm) for sandy loam soils. In this study, the spring wheat threshold was established at 4.5 mmhos/cm. Salinity tolerance for other crops shown on the chart is based solely on field observations. Saline areas are often dominated by weeds at soluble salt levels ($EC_{1:1}$) of 6 to 10. Even weeds have a tolerance gradient and can give you some information on salt levels you are managing.



Establishing cover crops after wheat harvest

is an essential step to successful management of salinity. Cover crops reduce evaporation, use excess water, build root channels and break up compaction layers for water movement. Here are a couple ideas of what cover crops will grow for different salinity levels- again, based on observations only.