Subsurface Drainage and Salinity

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Excess water has limited crop production in areas of South Dakota.
The field water balance affects salinity
Allowing for more timely field operations
Reducing crop stress due to excess water and high water tables
Reducing build up of salts
Pattern drainage for fields or large areas

Graphic courtesy of Dr. Gary Sands
Salinity reduction doesn’t happen overnight

Source: AGVISE Laboratories
Tile Drainage - Soluble Salts Demonstration Project
Topsoil (0-6”) Salinity (2002-2014)

(Tiled summer 2002)

Topsoil Salt Level

50% yield many crops

100% yield

Soil samples collected from 10 GPS sites

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Saline seeps

Mankin and Koelliker (2000)
Interceptor drains

Figure 16. Drawing A shows an interceptor drain installed at the upstream boundary of the seepage area. Drawing B is a side view showing how an interceptor drain lowers the water table above an impervious area and usually eliminates the seepage area.
Outlet

- Ditch, tile main, natural stream, other?
- Location (right of way issues)
- Capacity (flow and timing issues)
- Quality
- Rules & regulations
- Elevation (physical structure & water surface)

NEIGHBORS
Lift station
Considerations for sodic and saline/sodic soils
Considerations for sodic and saline/sodic soils

- Sodium can cause dispersion in soils greatly limiting water movement
- Salinity can suppress the effects of sodium
- Drainage may make a sodium problem worse if Ca and Mg salts are leached and Na salts are left behind
Recommendations for drainage on sodic soils

<table>
<thead>
<tr>
<th>SAR</th>
<th>Drainage Suitability Rating</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 6</td>
<td>&lt; 0.15</td>
<td>No Limitation</td>
</tr>
<tr>
<td>6 to 10</td>
<td>0.15 to 0.80</td>
<td>Somewhat Limited</td>
</tr>
<tr>
<td>&gt; 10</td>
<td>&gt; 0.80</td>
<td>Very Limited</td>
</tr>
</tbody>
</table>

Table from Cihacek et al, https://www.ndsu.edu/fileadmin/soils/pdfs/sf1617.pdf
Data from Springer (1997) and Web Soil Survey
Drainage water management (controlled drainage) — using water to bring Ca back up into the upper soil
Winter conservation mode

Illustration courtesy of Jane Frankenberger, Purdue Extension
Conventional drainage mode

Illustration courtesy of Jane Frankenberger, Purdue Extension
Summer conservation mode

Illustration courtesy of Jane Frankenberger, Purdue Extension
In summary, tiling may be a solution for some situations in saline areas

Need to understand the causes and sources of wetness

Weigh benefits and costs of tiling versus non-structural approaches

Extra care is needed in sodic or saline/sodic soils