Incorporating Snow Fences in the NSDSS Water Budget Model.

Any snow fence has a maximum snow retention capacity. The Volume of Snow that corresponds to this maximum capacity in the snow fence can be estimated based on Tabler 1980 (equations 6a, 6b and 7):

**Horizontal slat fence**

\[ V_{\text{snow}} = L \times (19.3H^2 + 2.6H^2) \times K \]

**Vertical slat fence**

\[ V_{\text{snow}} = L \times (14.5H^2 + 2.6H^2) \times K \]

H is snow fence height (meters)  
L is length of the snow fence in meters  
K is empirical coefficient that accounts for the fence trapping efficiency (K = 0.9)

(Note: The 19.3H^2 and 14.5H^2 terms in the above equations account for the leeward side of the fence. The 2.6H^2 terms account for the windward side)

Stuefer evaluated the Tabler equations against her field data (Sturm and Stuefer 2013 (Table 2 and Table 4)):

<table>
<thead>
<tr>
<th>Design</th>
<th>Height (m)</th>
<th>Volume per meter fence (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Calculated</td>
</tr>
<tr>
<td>Plastic Fencing (using horizontal slat formula)</td>
<td>2.4</td>
<td>114</td>
</tr>
<tr>
<td>Vertical slat</td>
<td>4</td>
<td>246</td>
</tr>
<tr>
<td>Plastic Fencing (using horizontal slat formula)</td>
<td>3</td>
<td>177</td>
</tr>
</tbody>
</table>

Thus, the Tabler equations were supported by the Sturm and Stuefer field data.

To convert volume of snow into volume of water use:

\[ V_{\text{water}} = (\text{snow density}) \times V_{\text{snow}} / (\text{water density}); \]

where snow density is assumed to be constant (450 kg/m³), a value consistent with Tabler (1980) and Sturm and Stuefer (2013). Water density is assumed to be 1,000 kg/m³.

\[ V_{\text{water}} \] can now be inserted into the Water Balance equations 6a and 6b (White Paper, See http://nsdss.ine.uaf.edu/NaturalSystemModeling/WhitePapers/WhitePaper_NSDSS_Lake_Water_Budget_Modeling.pdf).
References:
