Evaluating the effects of agricultural drainage ditches on water levels in Wisconsin’s central sands

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Pre-Ditch Model Development
Moraines

N

2 miles
Vertical exaggeration = 170:1
Vertical exaggeration = 170:1

$K_h = 250$ or 300 ft/day
Vertical exaggeration = 170:1

R = 6.6 or 8.8 inches/year

K_h = 250 or 300 ft/day

Elevation (ft amsl)

West

East
Pre-Ditch Stream Network
T.C. Chamberlin, Geology of Wisconsin, Survey of 1873-1879, Atlas
Post-Ditch Model Development
36 % more stream
Summary of Assumptions, etc.

- Steady-state
- Models not calibrated
- Uniform K (250 or 300 ft/day)
- Uniform R (6.6 or 8.8 in/yr)
- Uniform streambed thickness (3 ft)
- Uniform streambed K (10 ft/day)
- No pumping
Steady-state pre-ditch head
-
Steady-state post-ditch head
=
Steady-state drawdown caused by ditching
Contoured Drawdown (ft)

R = 6.6 in/yr

K_h = 300 ft/day

Bass Lake

Long Lake
Contoured Drawdown (ft)

R = 8.8 in/yr  
K_h = 300 ft/day
## Results

<table>
<thead>
<tr>
<th>Scenario</th>
<th>$R$ (in/yr)</th>
<th>$K_h$ (ft/day)</th>
<th>Bass Lake Drawdown (ft)</th>
<th>Long Lake Drawdown (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6.6</td>
<td>250</td>
<td>1.9</td>
<td>2.1</td>
</tr>
<tr>
<td>2</td>
<td>8.8</td>
<td>250</td>
<td>1</td>
<td>1.6</td>
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<tr>
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<td>300</td>
<td>2</td>
<td>2.3</td>
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<tr>
<td>4</td>
<td>6.6</td>
<td>300</td>
<td>1.9</td>
<td>2.1</td>
</tr>
</tbody>
</table>
Conclusion

- Modeling suggests that installation of drainage ditches may have caused 1 or 2 feet of lake drawdown.
- Raising lake levels by 1 or 2 feet would require re-flooding the ditched fields.