When the bottom drops out tools to handle the unexpected
Features of a solid foundation

• Clearly defined need
  – Consequences of doing nothing
  – Is intervention worth the costs and risks?

• Clearly stated goals

• Strong team
  – Multidisciplinary, experienced
  – Creative, flexible
Watershed

- Geologically new
  - (Holocene glaciers)
- High bedload
- Concerns
  - Metals (mine drainage)
  - Sediment/instability
    - Riparian impacts
    - In-stream gravel mining
    - Channelization
Reach
• Lacustrine valley
• C stream
• Peanut Lake
<table>
<thead>
<tr>
<th>Reach</th>
<th>Recent impacts</th>
<th>Historic impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lacustrine valley</td>
<td>1970s - In-stream mining</td>
<td>1800s</td>
</tr>
<tr>
<td>C stream</td>
<td>Channelization</td>
<td>Mine drainage</td>
</tr>
<tr>
<td>Peanut Lake</td>
<td>Levees</td>
<td>Coal/railroad</td>
</tr>
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<td></td>
<td>Channel realignment</td>
</tr>
</tbody>
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Restoration priority
Geomorphic assessment
• Sediment load
• Avulsion risk
Restoration priority
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Restoration priority

Geomorphic assessment
• Sediment load
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Cultural Values
• Peanut lake!
• Wildlife habitat
Restoration priority

Geomorphic assessment
- Sediment load
- Avulsion risk

Cultural Values
- Peanut lake!
- Wildlife habitat

Watershed Plan
- Metals contamination
  (Lake sediment)
Restoration priority

Geomorphic assessment
- Sediment load
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Cultural Values
- Peanut lake!
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Watershed Plan
- Metals contamination (Lake sediment)

Wetland preserve
- CBLT conservation
- Stream function
  - floodplain connect.
- Wetland function
  - water source
  - vegetation
Considering the ‘do nothing’ option
Goals
1. Reduce risk of Peanut Lake avulsion
2. Improve stream functional condition (1500 feet)
3. Restore converted wetland (1.8 acres)
4. Improve wetland functional condition (5.3 acres)
Berm cut to floodplain elevation, restored as wetland

Enhanced floodplain wetland (improved water source)

Bank toe protection

Floodplain wetland (relocated from prior channel and berm area)

New channel alignment

Nordic trail (rerouted)
The Bottomless Pit

Where is the gravel?!

Since we have already established the need (‘do nothing’ option is not viable), what are the newly discovered constraints and what can we accomplish within them to meet the stated goals?
The lack of gravel deposits meant two important things
1. The machines were very limited to where they can go
2. No existing gravel layer for the bed surface of the river
Plan B compromises

- less acreage as a buffer
- transplanted vegetation mats as bank structure
- relocated gravel
- revised planting plan
- portions of the berm remain
Project manager who was engaged at all phases

Stream and wetland specialists on site

McCullum’s Excavating - capable and flexible contractors!
1. Clearly defined need
2. Clearly stated goals
3. Diverse and flexible team