THE ROLE OF THE WATER COLUMN IN THE NUTRIENT BUDGET OF SPIRIT LAKE, WA

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Advised by Dr. Jim Gawel
# Spirit Lake – Then and Now

<table>
<thead>
<tr>
<th>Pre – eruption</th>
<th>Post – eruption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep</td>
<td>Shallower</td>
</tr>
<tr>
<td>Oligotrophic</td>
<td>Raised elevation</td>
</tr>
<tr>
<td></td>
<td>Increased surface area</td>
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</tbody>
</table>

Taken from Larson and Glass (1987), based on previous research.
Streams

Groundwater

Tunnel Outflow

Phytoplankton

Insects

Amphibians

Atm Deposition

Water Column

Zooplankton

Fish

Logs

Sediments

Plants
Sampling sites

West arm

East arm
Methods

• Samples collected at depths of 5, 15 and 25 meters
• Water quality parameters measured every 2 meters
• Nutrient analysis conducted on Westco Smart Chem 200 Discrete Analyzer
Temperature

2011 Spirit Lake Temperature

[Graph showing temperature distribution with depth and dates June 26, July 26, August 25, September 24]
### 2011 Spirit Lake pH

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>JUN 26</th>
<th>JUL 26</th>
<th>AUG 25</th>
<th>SEP 24</th>
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</thead>
<tbody>
<tr>
<td>-29</td>
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<td>-25</td>
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<td>-17</td>
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<td>-13</td>
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<td>-9</td>
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<td>-5</td>
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<td>-1</td>
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</tbody>
</table>

*Color scale:*

- **Blue**: 7.75
- **Teal**: 7.7
- **Green**: 7.65
- **Yellow-Green**: 7.6
- **Black**: 7.55
- **Orange**: 7.5
- **Red**: 7.45
- **Light Red**: 7.4
- **Pink**: 7.35
- **Pink Red**: 7.3
- **Dark Pink Red**: 7.25
- **Dark Pink**: 7.2
- **Dark Red**: 7.15
- **Dark Red**: 7.1
- **Ivory**: 7.05
- **Ivory**: 7
- **Ivory**: 6.95
- **Ivory**: 6.9
- **Ivory**: 6.85
- **Ivory**: 6.8
- **Ivory**: 6.75
- **Ivory**: 6.7
- **Ivory**: 6.65
- **Ivory**: 6.6
- **Ivory**: 6.55
- **Ivory**: 6.5
- **Ivory**: 6.45
Dissolved Oxygen

2011 Spirit Lake DO (mg/L)

Depth (m)

JUN 26  JUL 26  AUG 25  SEP 24
Chlorophyll

![Chlorophyll graph]

- **Depth (m):** 5, 15, 25
- **Chlorophyll (ug/L):** 0.000 to 5.000
- **Dates:**
  - 7/8/2010
  - 7/20/2010
  - 8/17/2010
  - 9/14/2010
  - 10/2/2010
Secchi Depth

18 May 1980 Eruption
2010 kg N/yr

- Streams: 6,517 kg
- Amphibians: Insects 1,607 kg, Atm Deposition
- Groundwater: 35,484 kg
- Phytoplankton
  - Epilimnion: 8,691 kg
  - Hypolimnion: 19,809 kg
- Zooplankton: 581 kg
- Fish
- Sediments: 24,502 kg
- Tunnel: 17,656 kg
Spirit Lake Trophic State

Taken from Larson and Glass (1987), based on previous research

<table>
<thead>
<tr>
<th>Trophic State Index 2010</th>
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</thead>
<tbody>
<tr>
<td>Spirit Lake</td>
<td>TSI Range</td>
</tr>
<tr>
<td>Total Phosphorus (mg/m³)</td>
<td>27 - 56</td>
</tr>
<tr>
<td>Chlorophyll (mg/m³)</td>
<td>17 - 45</td>
</tr>
<tr>
<td>Secchi Depth (m)</td>
<td>21 - 27</td>
</tr>
</tbody>
</table>
Questions?