The Influence of Hillside Springs on Subalpine Streamwater
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Overview
In high-elevation watersheds, more than 90% of snowmelt water passes through near-surface flowpaths before entering the stream channel. Groundwater discharges from isolated and clustered springs generating ephemeral, intermittent and permanent flow in headwater stream channels. At the Fraser Experimental Forest, 157 hillside springs are distributed throughout the 290-hectare Fool Creek watershed. This preliminary report describes results from synoptic sampling of 39 randomly selected springs in alpine and subalpine portions of the catchment.

Plant Associations & Soil Conditions

<table>
<thead>
<tr>
<th>Elevational Zone</th>
<th>Wetland Plant Association1</th>
<th>Species Name / Occurrence (n = 17)</th>
<th>Mean Cover (%)</th>
<th>Cover-Range (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treeline Zone (3270 – 3500 m)</td>
<td>Willow shrubland</td>
<td>Salix planifolia (13)</td>
<td>21</td>
<td>1 – 65</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Calthia leptosepala (3)</td>
<td>30</td>
<td>15 – 90</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Saxifraga odorifera (3)</td>
<td>5</td>
<td>0 – 25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moss spp. (3)</td>
<td>5</td>
<td>0 – 30</td>
</tr>
<tr>
<td>Subalpine Forest (2000 – 2370 m)</td>
<td>Herb dominated</td>
<td>Senecio triangularis (12)</td>
<td>3</td>
<td>0 – 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cardamine cordifolia (10)</td>
<td>5</td>
<td>0 – 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Luzula parviflora (10)</td>
<td>10</td>
<td>0 – 30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Carex aquatilis (7)</td>
<td>15</td>
<td>0 – 65</td>
</tr>
</tbody>
</table>


Springwater versus Streamwater

Concentrations of dominant cationic & anionic constituents of springwater exceed Fool Creek streamwater (Fig. 7).

Springwater nitrate was higher, but organic N did not differ from streams (Fig. 8).

The average mid-day temperature of water emerging at springs was equal to the daily minimum streamwater temperature at the upper Fool Creek gauge (Fig. 9).

Historic Context of Current Research

Historic Characterization of Fool Creek Springs
In 1950 and 1953, several years prior to harvesting of the Fool Creek watershed, RMRS soil scientist John Retzer surveyed and characterized wetland communities throughout the basin. Retzer’s groundwater and preliminary recommendations have not been revisited for a half-century.

Retzer’s Objectives
To locate and plot all seeps and springs in the watershed.
To classify the water-yielding ability at the surface of each spring.
To relate the emergence of springs to geologic structures or other features that may have influence on their surface emergence.
To collect water samples from the more vigorously flowing springs for analysis of salts present.
To evaluate the forest harvest treatment program on the occurrence and water yield of springs.

Historic Recommendations / Current Objectives

Historic Recommendations / Current Objectives
To define seasonal patterns & linkages among springs and between springs & streamwater

50 years after harvesting, dissolved inorganic & organic N concentrations are lower in springs emerging within recovering stands than in uncut forest.
Spring water temperature is no different between forest conditions.

Future Directions
Identify seasonal patterns & linkages among springs and between springs & streamwater.
Assess long-term effect of harvesting on edaphic, vegetation, snowpack & hydrochemical conditions of spring network.