Geomorphic Processes and Salmonid Habitat in Sulphur and Carneros Creeks, Napa River Watershed, Napa County California

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Stewardship Support and Watershed Assessment in the Napa River Watershed

- CALFED funded project led by the Napa County Resource Conservation District (RCD)

- Two tributaries to the Napa River: Sulphur Creek and Carneros Creek

- Channel Geomorphology, Hillslope/tributary sediment budget, Fish and macro-invertebrate assessment, Historical ecology, Flora and fauna assessment, Water budget
Project Goals

- Use a multidisciplinary science approach to create a watershed management plan for each watershed
- Meet the stewardship group’s needs: Basic understanding of watershed form and function, specific management recommendations
Setting

Napa River Watershed

Sulphur Creek

Carneros Creek

San Pablo Bay
Surface and subsurface sediment grain size
Surface and subsurface sediment grain size

<table>
<thead>
<tr>
<th></th>
<th>Sulphur Creek</th>
<th>Carneros Creek</th>
<th>Published Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsurface % &lt; 1mm</td>
<td>11%</td>
<td>8%</td>
<td>&lt; 20%</td>
</tr>
<tr>
<td>Subsurface D50 (mm)</td>
<td>13</td>
<td>25</td>
<td>18-76</td>
</tr>
<tr>
<td>Subsurface D84 (mm)</td>
<td>33</td>
<td>64</td>
<td>100</td>
</tr>
</tbody>
</table>
Large Woody Debris (LWD)

Sulphur Creek

Carneros Creek

Sample Reach

Number of Pools

LWD formed
LWD associated
Not associated or formed by LWD
Large Woody Debris (LWD)

Sulphur Creek

Carneros Creek
Pools

Sulphur Creek

Carneros Creek

**Pool Residual Depth (meters)**

<table>
<thead>
<tr>
<th>Pool Type</th>
<th>Sulphur Creek</th>
<th>Carneros Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step pool</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>Dammed pool</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Lateral scour pool</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Plunge pool</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Main channel/bedrock pool</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

**Graphs**

- **Sulphur Creek**: The graph shows the distribution of pool residual depths for Sulphur Creek. The majority of pools fall within the 0.2 - 0.4 m and 0.4 - 0.6 m depth ranges.
- **Carneros Creek**: The graph shows the distribution of pool residual depths for Carneros Creek. The majority of pools fall within the 0.2 - 0.4 m and 0.4 - 0.6 m depth ranges.
Sediment deposits

Sulphur Creek

Carneros Creek

Unit volume (m$^3$) / Unit area (m$^2$)

Pool deposits

Bars

Active channel
Bank erosion

Sulphur Creek

Carneros Creek

Average Erosion per Unit Channel Length (m³)
Bank erosion

Sulphur Creek

Carneros Creek
Riparian Vegetation
Management implications

• Sulphur Creek: A high natural sediment load related to hillslope processes (landslides), pool habitat (formation and cover) that would improve with more in-channel LWD, and lower reaches that are affected by St. Helena.

Best salmonid spawning and rearing habitat in the canyon and upland reaches

• Carneros Creek: Middle reaches with the highest bank erosion and fine pool deposits, pool formation and cover linked with in-channel LWD, low summertime discharge.

Best salmonid spawning and rearing habitat in the middle reaches
• Sulphur and Carneros Creek Stewardship Group Needs: Identify the quality and quantity of salmonid habitat, characterize important watershed processes, collect data on channel form and function, make recommendations for management and restoration of the watershed.

• CALFED Objectives: Facilitate coordination and collaboration between stewardship groups, government agencies and other organizations. Use a defensible scientific approach to define watershed needs and priorities for restoration that are socio-economically acceptable. Improve the understanding of the connection between watershed processes and land management.