A Decision-Support Tool for Water Resources Management under Future Extreme Events

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Background and Objectives
Climate change is altering the water cycle and water resources. In Puget Sound the most disruptive effects are linked to extreme events. This project leverages existing climate datasets to develop a web-based decision-support tool for water resource planning in the Skagit and Dungeness sub-basins in Puget Sound, under future extreme events.

Stakeholder Workshops
Two stakeholder workshops provide input/information on impacts of extreme events on water use, management needs and what model data is needed to meet the management concerns.

Analysis of Water Resource under Future Climate Conditions

Web-based Decision-Support Tool

The web-based decision-support tool is available at:
https://public.tableau.com/profile/whitijf/vizhome/CompetingWaterInTheFaceofClimateChange/ModelResults

Competing Water Use in the Face of Climate Change
This interactive website shows the results of an integrated analysis of the impacts of climate change on available freshwater in the Skagit and Dungeness basins and presents scenarios of water use under future climate conditions.

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Figure 1. Dungeness and Skagit watersheds (highlighted in red) – two sub-basins in Puget Sound with distinctly different attributes, as shown in the table below.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Dungeness</th>
<th>Skagit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basin type</td>
<td>Small, mountainous, limited lowland area.</td>
<td>Large, mountainous, large floodplain and river delta</td>
</tr>
<tr>
<td>Discharge</td>
<td>Small discharge</td>
<td>Largest discharge</td>
</tr>
<tr>
<td></td>
<td>Effect of rain shadow</td>
<td>Effect of snowpack</td>
</tr>
<tr>
<td>Stakeholder groups</td>
<td>Agricultural community</td>
<td>Agricultural community</td>
</tr>
<tr>
<td></td>
<td>Tribes</td>
<td>Tribes</td>
</tr>
<tr>
<td></td>
<td>Municipal management</td>
<td>Multiple municipalities</td>
</tr>
<tr>
<td></td>
<td>City of Sequim</td>
<td>Power producers</td>
</tr>
<tr>
<td>Fishery</td>
<td>Salmon runs in Dungeness River</td>
<td>Multiple salmon runs, greatest contribution to salmon in Puget Sound</td>
</tr>
</tbody>
</table>

Approach

The project approach consists of three key elements:
- Conduct extensive stakeholder engagement, including online surveys and workshops, to develop critical water resource metrics and measures of fish habitat and human use.
- Leverage existing climate model simulations in Pacific Northwest region, conduct model analysis for different water resource use.
- Develop an interactive web-based tool using Tableau to visualize river discharge for different sectoral applications throughout the stream networks in the Dungeness and Skagit watersheds.

Figure 2. Stakeholders participating in the workshops (upper-panel) and workshop outcomes (lower-panel).

Figure 3. Distribution of weekly river discharge under historical (1990s) and future climate scenarios (RCP4.5 and RCP8.5, 2080s) near the estuarine mouth for the Dungeness River (left) and the Skagit River (right).

Figure 4. Comparison of stream flows at Day Creek and Sauk River in Skagit basin for the historical (1990s) (left) and future climate (2080s) (right) conditions. Day Creek is less influenced by snowpack while Sauk River is heavily influenced by snowpack.

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