Coquille River watershed stream flow projections

Based on variable infiltration capacity (VIC) model

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Introduction and Purpose

• Flow regime is of fundamental importance in determining the physical and ecological characteristics of a river or stream, but actual measurements are in short supply.

• This data is intended to help fill that role by:
  1. Having broad coverage
  2. Showing patterns across a watershed
  3. Accounting for historic and future hydrologic regimes
Input

• National Hydrography Dataset (NHD+) for Columbia basin and coastal drainages
• A1B emissions scenarios for 2040 and 2080
• 10 global climate models (GCMs)
• Two additional temperature models
Strengths and limitations

- Works for Coquille sub-basin scale
- Relatively conservative methodology
- Authors acknowledge limitations
- Widely used and trusted

- This version does not incorporate groundwater inputs
- Addresses Winter and Summer, but not Spring and Fall
- Deals with supply/yield, but not sedimentation or water quality
Coquille River watershed stream flow projection

Based on variable infiltration capacity (VIC) macroscale hydrologic model, as modeled by the Western U.S. Stream Flow Metric Dataset (Wenger et al., 2010).

www/ised.usGS/OCA/nER/projects/modeled_stream_flow_neotropic.html

Date of Center of Flow Mass (CFM):
Historic* to 2040

- No change
- 1 to 2 days earlier
- 3 days earlier
- 4 days earlier

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www/sited.us/nsf/besus/AWAP/projects/modeled_stream_flow/metrica.shtml

Date of Center of Flow Mass (CFM):
Historic* to 2080

- No change
- 1 to 3 days earlier
- 4 to 6 days earlier
- 7 to 9 days earlier

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Mean daily flow change:
Historic* to 2040

- -4.25 to -5.56 %
- -2.5 to -4.25 %
- -1.25 to -2.50 %
- 0 to -1.25 %
- +0.01 to +1.7%

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Mean daily flow change:
Historic* to 2080

- 5.50 to -6.78%
- 4.25 to -5.50%
- 2.50 to -4.25%
- 1.25 to -2.50%
- 0 to -1.25%

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www/zed.us/ma/belz/AWAP PROJECTS/MODELED_STREAM_FLOW_METRIC_data.html

Mean summer flow change:
Historic* to 2040

-15 to -17.07 %
-13 to -15 %
-11 to -13 %
-9 to -11 %
-5 to -9 %

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Mean summer flow change: Historic* to 2080

-21.00 to -24.39 %
-19 to -21 %
-16 to -19 %
-13 to -16 %
-7 to -13 %

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www/ded.us/n/mol/us/AWAQ/TP/laned_stream_flow_metric.htm

Probability of a 2-year flow event in Winter (0 to 100 percent)

<table>
<thead>
<tr>
<th>Historic*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 percent</td>
</tr>
<tr>
<td>1 to 20 percent</td>
</tr>
<tr>
<td>20 to 25 percent</td>
</tr>
<tr>
<td>25 to 30 percent</td>
</tr>
</tbody>
</table>

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www/sited.us/nsf/boeis/AWABA/Projects/modelled_stream_flow_metrics.htm

Probability of a 2-year flow event in Winter (0 to 100 percent)

2040 projection

- Green: 0 percent
- Yellow: 1 to 20 percent
- Orange: 20 to 25 percent
- Brown: 25 to 30 percent
- Red: 30 to 35 percent

0 5 10 Miles
N
Coquille River watershed stream flow projection

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www.sited.us/ma/bolus/AWAP/ProjectX/modflow_stream_flow_metrics.html

Probability of a 2-year flow event in Winter (0 to 100 percent)

2080 projection

- 0 percent
- 1 to 20 percent
- 20 to 25 percent
- 25 to 30 percent
- 30 to 40 percent

0  5  10  Miles

N
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Winter days in which flows are in the highest 5% for year

Historic*

- 0.00 to 0.50
- 0.51 to 3.00
- 3.01 to 6.00
- 6.01 to 12.00
- 12.01 to 17.10

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Winter days in which flows are in the highest 5% for year

2040 projection

- 0 to 0.50
- 0.51 to 3.00
- 3.01 to 6.00
- 6.01 to 12.00
- 12.01 to 17.50

0 5 10 Miles

N
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www/sited.us/ma/bolus/WFWA/projects/modelled_stream_flow_metrics.shtml

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Winter days in which flows are in the highest 5% for year

- 2080 projection
  - 0 to 0.50
  - 0.51 to 3.00
  - 3.01 to 6.00
  - 6.01 to 12.00
  - 12.01 to 17.90

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0 5 10 Miles
Potential ecological implications

- Shift to an earlier midpoint of water year, but not the magnitude seen in other watersheds within the region.
- Greater reduction in freshwater refugia and other aquatic resources in summer.
- Greatest projected change in mean daily flow is in lower watershed, an important anadromous fish rearing environment.
- Flashier conditions in Spring and late Fall?
Other metrics and capabilities

• The data set also can show changes in:
  – 7-day low flow with a 10-year return interval (cfs)
  – Channel-forming flow (cfs)
Related publications


Other resources

• Steele et al. 2011. Potential Climate-Induced Runoff Changes and Associated Uncertainty in Five Pacific Northwest Estuaries.
• GSFLOW
• SWAT
Questions or comments?

Mixed flock of Least and Western Sandpipers at Bandon Marsh NWR
Credit: David Ledig, USFWS Region 1