Life cycle model evaluation of Snake River spring/summer chinook under alternative spill and breach scenarios
Objective

- Evaluate relative survival and recovery benefits of different Spill and Breach scenarios
  - Predict life stage survivals
  - Predict long term abundances
Life stage Predictions

0 - Spawn
1 - Smolt
2 - Transport
3 - Passage
4 - Ocean
5 - Age 3
6 - Age 4
7 - Age 5
8 - Adult passage

Tributaries
LGR

Hydrosystem

Zones 1-6 Harvest
Life stage Predictions

100K Smolts

100 smolts/spawner

0% pre-spawn mortality

1000 Spawners

LGR-LGR SAR = 1%

100K Smolts

Tributaries

Hydrosystem

Estuary

Ocean

LGR

BON

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Anthropogenic and Environmental Effects

Hydro system
- Water transit time WTT
- Powerhouse PITPH

Tributaries

LGR

Estuary

BON

Ocean

- Temperature PDO
- Upwelling UPW
- Powerhouse PITPH
Mainstem environment

- PIT tag derived index of cumulative powerhouse passage (across 8 or 4 dams)
- Water transit time (all reservoirs)
  - Volume/discharge calculation at flow
Powerhouse passage

Hydrosystem development

1981 - spill programs

93-04 BiOp

Court / ’08 BiOp
Statistical reconstruction

- Predict all life cycle stage abundances
  - Smolts
  - Age class returns (+30 years)
  - Survival rates, SARs
- Estimate uncertainty in predictions
Contrasts

- Spill contrast
  - BiOp, 115/120, 120, 125% TDG

- Flow contrast
  - High 2011
  - Average 2009
  - Low 2010
## Current configuration

<table>
<thead>
<tr>
<th>BiOp</th>
<th>High</th>
<th>Average</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>115/120 %</td>
<td>- Predicted Water Travel Time (WTT)</td>
<td>- Predicted powerhouse (PITPH)</td>
<td></td>
</tr>
<tr>
<td>120%</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>125%</td>
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</tbody>
</table>

8 dams
## Breach configuration

<table>
<thead>
<tr>
<th>BiOp</th>
<th>High</th>
<th>Average</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>115/120 %</td>
<td>- Removed lower 4 Snake dams</td>
<td>- Spill on lower 4 Columbia dams only</td>
<td></td>
</tr>
<tr>
<td>120%</td>
<td></td>
<td>- Lower WTT and PITPH</td>
<td></td>
</tr>
<tr>
<td>125%</td>
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</tr>
</tbody>
</table>

*4 dams*
Scenarios & PITPH

- Recent

- Current

- Breach

Less flow

PITPH

BiOp Spill

115/120%

120%

125%
Scenarios & WTT

![Graph showing WTT across different flow scenarios: Low, Ave, High. The graph indicates a decrease in WTT with increasing flow, with 'Current' and 'Breach' lines.]
In-river survival

Alternatives

Current configuration

Recent

Breach

More flow and/or breaching

More spill

PITPH
Simulation assumptions

- Harvest rate increasing to 20% at 5000
  - Zone 6 < 17% currently
- Fixed transportation (20% vs 0%)
- Simulated ocean and migration variability
Current configuration

\( R_{2036-2045} \text{ in 1000's} \)

Catherine Creek

- High flow
- Ave flow
- Low flow

BiOp
115/120%
120%
125%

Imnaha

- BiOp
115/120%
120%
125%

Minam

- BiOp
115/120%
120%
125%

Grande Ronde

- BiOp
115/120%
120%
125%

Lostine

- BiOp
115/120%
120%
125%

Wenaha

- BiOp
115/120%
120%
125%
Return abundance

Catherine Creek

- High Flow
- Average Flow
- Low Flow

Breach
No breach

Relative to BiOp/Ave without breach

Imnaha

Grande Ronde

Lostine

Minam

Wenaha
Key findings

- More spill always predicts higher survival and abundance, regardless of flow.
- Breach/BiOp $\geq$ Current/125%
- Potential for 4X abundance with 125% and Breach
- Approximately 2-3X improvements in SARs