Fish IN
Fish OUT

SBSRTC
May 1, 2018
Colin Wahl
Tulalip Tribes
- Trends
- Trap numbers
- Productivity
- Ocean conditions/factors affecting trends
- 2018 forecast
- FRAM and 2018
- harvest management plan
Snohomish Chinook

- TOTAL (Snohomish)
- Skykomish
- Snoqualmie

Sky_2004-2016 trend
Snoq_2004-2016 trend

Chinook Natural Escapement (# fish)

Forecast 3,460

6,119
Snoqualmie

Chinook Natural Escapement (# fish)

TOTAL (Snohomish)  Skykomish  Snoqualmie  Snoq_2004-2016 trend

R² = 0.505

1745
Snoqualmie Chinook


Natural Chinook Escapement (# fish)

TOTAL (Snohomish)  Skykomish  Snoqualmie  Snoq_2009-2016 trend


1745
Coho (26 yr record)

- Escapement
- Normal Management Status
- Critical Management Status

2017 forecast (91,000)

18,362
Coho in critical status

- 2017 forecast (91,000)
- 18,362
Chum

Snohomish Chum Escapement

NOR Escapement

even-goal (28,000)

odd-goal (10,200)
4th highest peak flow on record

Snohomish Chum Escapement

2006
Screw Trap
2017 Anecdotes were GOOD

Chinook 0+ estimated migration

Potential 5yr high

Coho 1+ estimated migration

Potential 5yr high
2017 Chinook (CPUE)

Skykomish Chinook 0+ CPUE

2017 Record catch
2017 Coho (CPUE)

- 2017 Record catch
- 2018 is looking similar
2017 Coho (CPUE)

Pre trap relocation -- below woods creek

Post trap relocation - - Above woods creek
2009 - 2017 Coho

Skykomish Coho 1+ CPUE

Not a 5 year record
Productivity
Salmon are a naturally productive species.
What is Productivity?

Number of spawners

\[
\frac{2}{2} = 1
\]

Number of progeny to reach adulthood
Productivity = 1 (replacement)

Number of spawners:

\[
\frac{2}{2} = 1
\]

Number of progeny to reach adulthood
Productivity = 2
Productivity = 3 (high productivity)
Productivity = 0.5 (Low productivity)
Productivity defines our recovery goals
Productivity goals

Chinook Natural Escapement (# fish)

- 1986: 1987
- 1990: 1991
- 1992: 1993
- 1994: 1995
- 1996: 1997
- 1998: 1999
- 2000: 2001
- 2002: 2003
- 2004: 2005
- 2006: 2007
- 2008: 2009
- 2010: 2011
- 2012: 2013
- 2014: 2015
- 2016: 2017

Graph shows fluctuations in Chinook Natural Escapement from 1986 to 2016.
Recovery Goals

High productivity target

Chinook Natural Escapement (# fish)

- 0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000
- 6119
Recovery Goals

Low productivity target (64,000)

High productivity target (14,000)

Chinook Natural Escapement (# fish)


6119
What determines productivity?
If we have the right habitat conditions, we don’t need 64,000 returning to produce a sustainable and healthy fishery.
Chinook Productivity - Skykomish

Recruits/Spawner

Recruits and Spawners per spawner

NOE/NS

NOR/NS

Chinook Productivity - Snoqualmie

Graph showing the trend of recruits and spawners per spawner from 1995 to 2012. The x-axis represents the brood year, while the y-axis represents the number of recruits and spawners per spawner. The graph compares the trends for NOE/NS and NOR/NS.
PS Chinook Salmon are Widely Distributed
Ocean Conditions - PDO

Figure PDO-01. Time series of shifts in sign of the Pacific Decadal Oscillation (PDO), 1925 to present. Values are summed over the months of May through September. Red bars indicate positive (warm) years; blue bars negative (cool) years. Note that 2008 and 2012 were the most negative values recorded since 1956.

www.nwfscl.noaa.gov/research/divisions/fe/estuarine/oeip/ca-pdo.cfm
Ocean Conditions - PDO

https://www.nwfsc.noaa.gov/research/divisions/fe/estuarine/oeip/ca-pdo.cfm

Figure PDO-02. Upper panel shows summer PDO (sum of May-Sept), 1965—present; middle panels show anomalies in counts of adult spring and fall Chinook salmon passing Bonneville Dam from 1965—present; lower panel shows survival of hatchery coho salmon from 1965—present. Vertical lines indicate climate—shift points in 1977 and 1988.
## Ocean conditions: indicators

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<td>46050 SST (°C; May-Sept)</td>
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<td>Upper 20 m T (°C; Nov-Mar)</td>
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<td>Upper 20 m T (°C; May-Sept)</td>
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<td>N. copepod biomass anom. (mg C m⁻³; May-Sept)</td>
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<td>S. copepod biomass anom. (mg C m⁻³; May-Sept)</td>
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<td>Ichthyoplankton biomass (log (mg C 1000 m⁻³); Jan-Mar)</td>
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<td>Chinook salmon juveniles (no. km⁻³; June)</td>
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<td>Coho salmon juveniles (no. km⁻³; June)</td>
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| Mean of ranks | 17.1 | 7.0 | 5.8 | 6.9 | 5.8 | 12.4 | 15.1 | 16.2 | 10.9 | 8.9 | 2.7 | 8.3 | 12.2 | 8.2 | 6.5 | 7.6 | 12.3 | 15.9 | 16.4 | 13.9 |
| Rank of the mean rank | 20   | 6   | 2   | 5   | 2   | 14   | 16   | 18   | 11   | 10   | 1   | 9   | 12   | 8   | 4   | 7   | 13   | 17   | 19   | 15   |
# Outlook for Coho and Chinook

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<th>Indicator</th>
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<th>2016</th>
<th>2017</th>
<th>Coho 2018</th>
<th>Chinook 2018</th>
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<td><strong>Large-scale ocean and atmospheric indicators</strong></td>
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<td>PDO (May - Sept)</td>
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<td>ONI (Jan - Jun)</td>
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<td><strong>Local and regional physical indicators</strong></td>
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<td>Sea surface temperature</td>
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<td>Deep water temperature</td>
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<td><strong>Local biological indicators</strong></td>
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<td>Copepod biodiversity</td>
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<td>Northern copepod anomalies</td>
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<td>Biological spring transition</td>
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<td>Juvenile Chinook salmon catch – June</td>
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<td>Juvenile coho salmon catch – June</td>
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**Key**
- ■: good conditions for salmon
- ◼: intermediate conditions for salmon
- ■: poor conditions for salmon
- ◼: good returns expected
- ■: intermediate returns expected
- ■: poor returns expected
Freshwater habitat
2018 Chinook Forecast

Escapement Goals

- LAT = 3,375 spawners (up from 2,800)

Chinook Natural Escapement (# fish)
2017 Coho Forecast

- 65,925 (Ocean Age 3)
- 44,000 terminal escapement
2017 Coho Forecast

- Estimated run size (no harvest): 65,920
- Ocean Age 3 low/normal: 125,000
- Ocean Age 3 critical: 51,667
- Spawning low/normal: 50,000
- Spawning critical: 31,000

Coho Natural Escapement (1000s)

- Escapement
- Normal Management Status
- Critical Management Status

Forecast: 44,000
Chum forecast

• Chum = 13,957
  – Escapement goal: 28,000
Fishery Regulation Assessment Model (FRAM)

**INPUT**
- Abundance (forecast)
- Stock comp. (CWTs)

**OUTPUT**
- Individual stock impacts

**Fishing plan**
Snohomish Chinook exploitation rate trend

[Graph showing exploitation rate for different years and categories: Ak-CA, SUS, and Term]
Are we fishing selectively?
Wild Chinook exploitation

![Graph showing wild Chinook exploitation rates for Sno W with categories for Ak/Can, Non-Treaty, Treaty, and Esc.]
Forecast accuracy (Predicted – Actual)

- Underforecast (Good)
- Overforecast (bad)
Questions?