

Lower Snake River Passage Summary for Snake River spring Chinook salmon, 2019

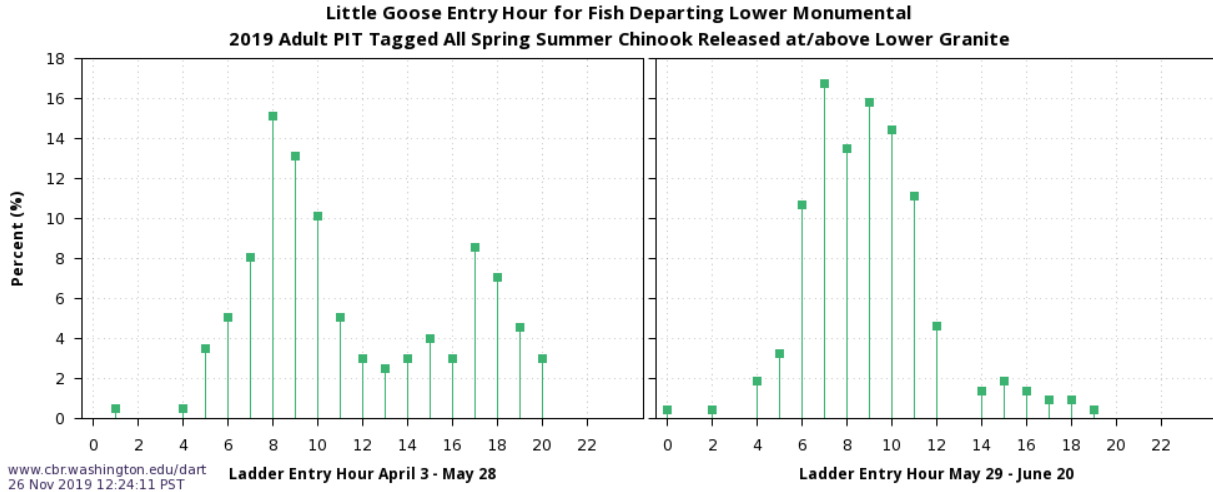
Updated 12/5/2019, C McGrath (NOAA Fisheries)

Timing of 2019 LGS Operations

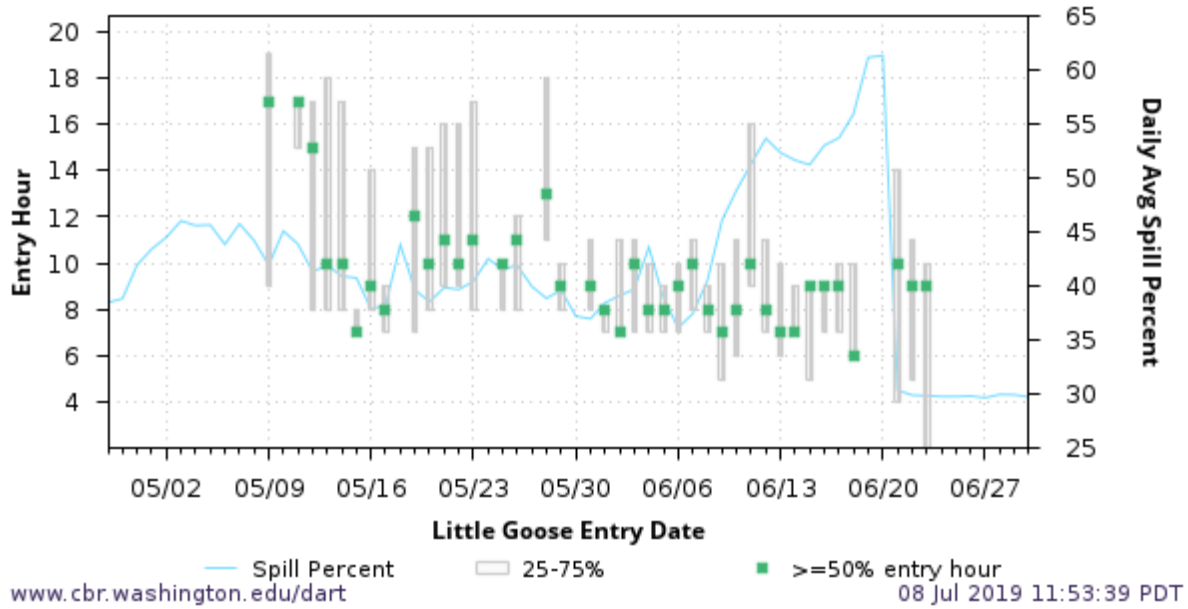
1. April 3 through May 24 (4:4 or 5:3 operation)
2. May 25 through May 28 (6:2 operation)
3. May 29 through June 5 (8:0 operation)
4. June 6 through June 12 (8:0 with ASW high crest partial hrs)
5. June 13 through June 20 (8:0 with ASW high crest 24 hrs)

Daily Time of Ladder Entry at Little Goose

- Percent distribution of arrival hour of total unique fish reflected the split flex spill pattern by producing a bimodal passage pattern for spring Chinook salmon at Little Goose Dam through May 28.
- After May 28, when performance spill occurred for an 8-hour block in the morning, the count pattern were unimodal with most passage occurring in the morning.



**Daily Distribution of Entry Hour, Little Goose
2019 Adult PIT Tagged All Spring Summer Chinook
Released at/above Lower Granite
Minimum 5 Entries/Day**



DART Passage Metrics

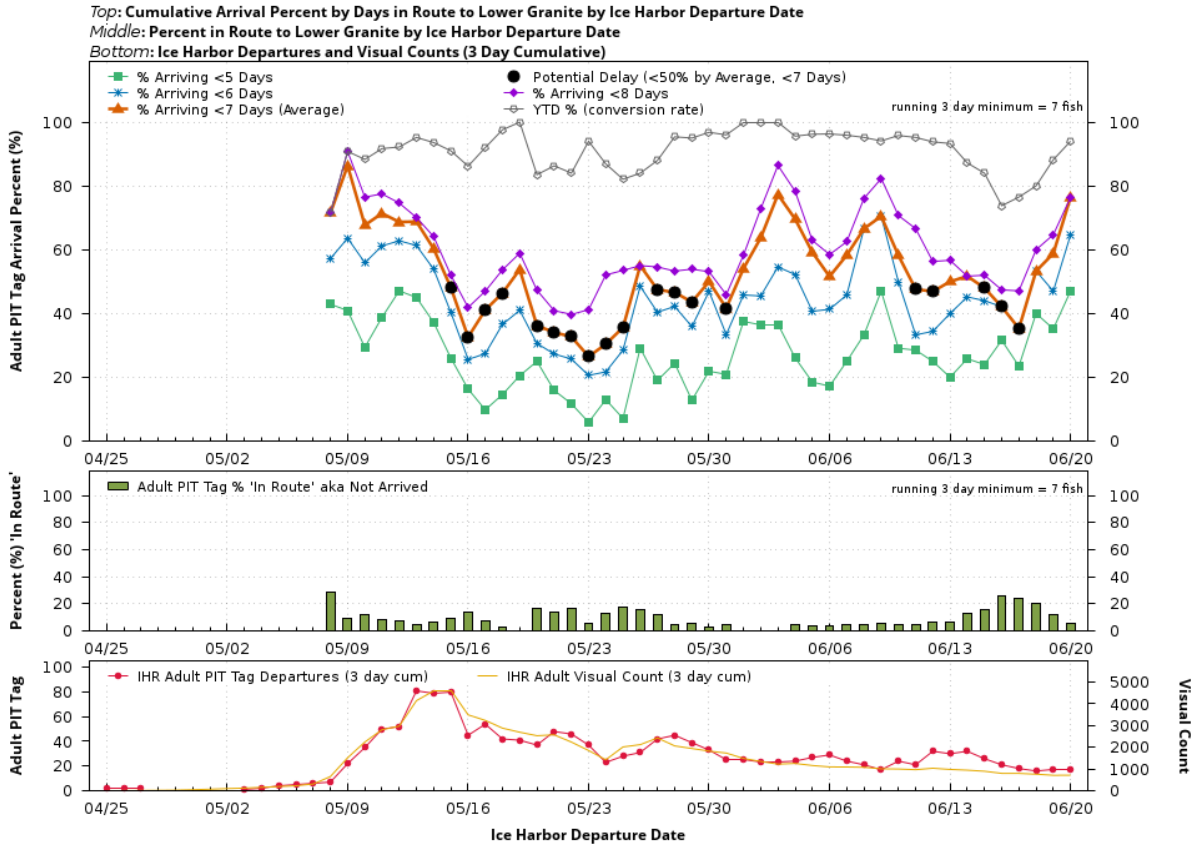
Ice Harbor to Lower Granite Conversion

- 2019 conversion YTD as of 11/25/2019 is 95.6 relative to a historical EOY conversion of 96.3 (range 93.3-98.0)
- DART's running 3-day tool indicated "potential delay" (slower than historical average travel time for 3-day cohort) on approximately half (44%) of dates between May 8 and June 20

***ICH:LGR EOY conversion (2019 is YTD as of 11/25/2019 and prior years are End-of-Year)**

Year	IHR Tag Count	LGR Tag Count	EOY Conversion
2019	474	453	95.6*
2018	666	645	96.8
2017	611	587	96.1
2016	1252	1212	96.8
2015	2327	2251	96.7
2014	1940	1899	97.9
2013	1388	1360	98.0
2012	1979	1903	96.2
2011	2819	2631	93.3
2010	4542	4364	96.1
2009	3366	3236	96.1
2008	2325	2260	97.2
2007	840	797	94.9
2006	454	435	95.8
Average	2006-2018		96.3

Running 3 Day - Ice Harbor to Lower Granite Travel Days and Run Size
2019 Adult PIT Tagged All Spring Summer Chinook Released at/above Lower Granite
Unique TagIDs Departing Ice Harbor (474) through 06/20
YTD Conversion Rate 95.6, YTD Harmonic Mean Travel Time 5.8



Lower Monumental to Little Goose Conversion

- 2019 conversion YTD as of 11/25/2019 is 97.2 relative to a historical EOY conversion of 98.3 (range 97.7-99.0)
- DART’s running 3-day tool indicated “potential delay” (slower than historical average travel time for 3-day cohort) on most (70%) dates between between May 9 and June 20
- Important to examine uncertainty around point estimates, e.g., incorporate information on how representative PIT tag data are of the population at large (Clopper-Pearson CI)
- In 2019 wild-origin (0.971) and hatchery-origin (0.973) fish had similar convergence rates

***LMN:LGS EOY conversion for wild and hatchery SR Chinook (2019 is YTD as of 11/25/2019 and prior years are End-of-Year)**

Year	LMN Tag Count	LGS Tag Count	EOY Conversion
2019*	468	455	97.2*
2018	645	631	97.7
2017	598	593	99
2016	1216	1194	98
2015	2154	2119	98.3
2014	1898	1874	98.6
Average 2014-2018			98.3

LMN:LGS Wild versus Hatchery Conversion with uncertainty estimates

From Gabe Scheer, FPC

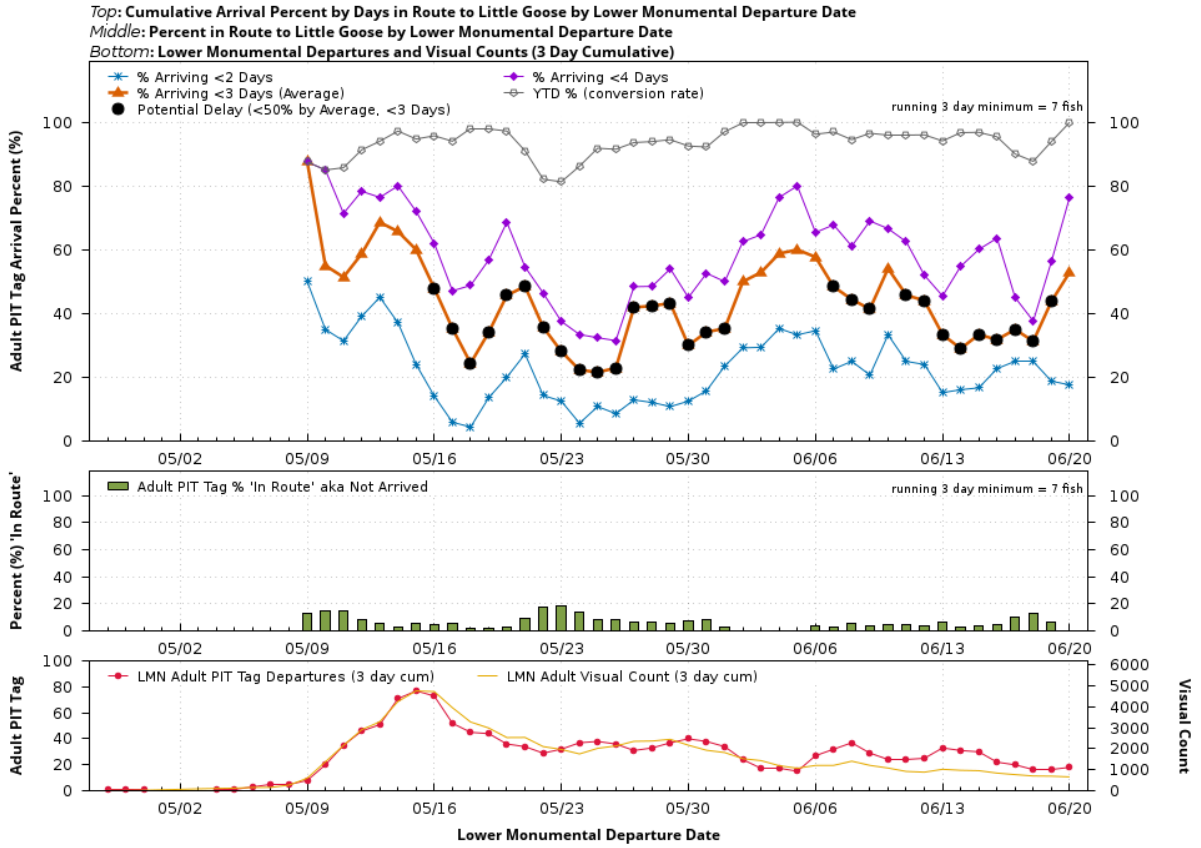
EOY spring Chinook conversion and 90% CI between LMN and LGS dams (2014-2019), wild fish only.

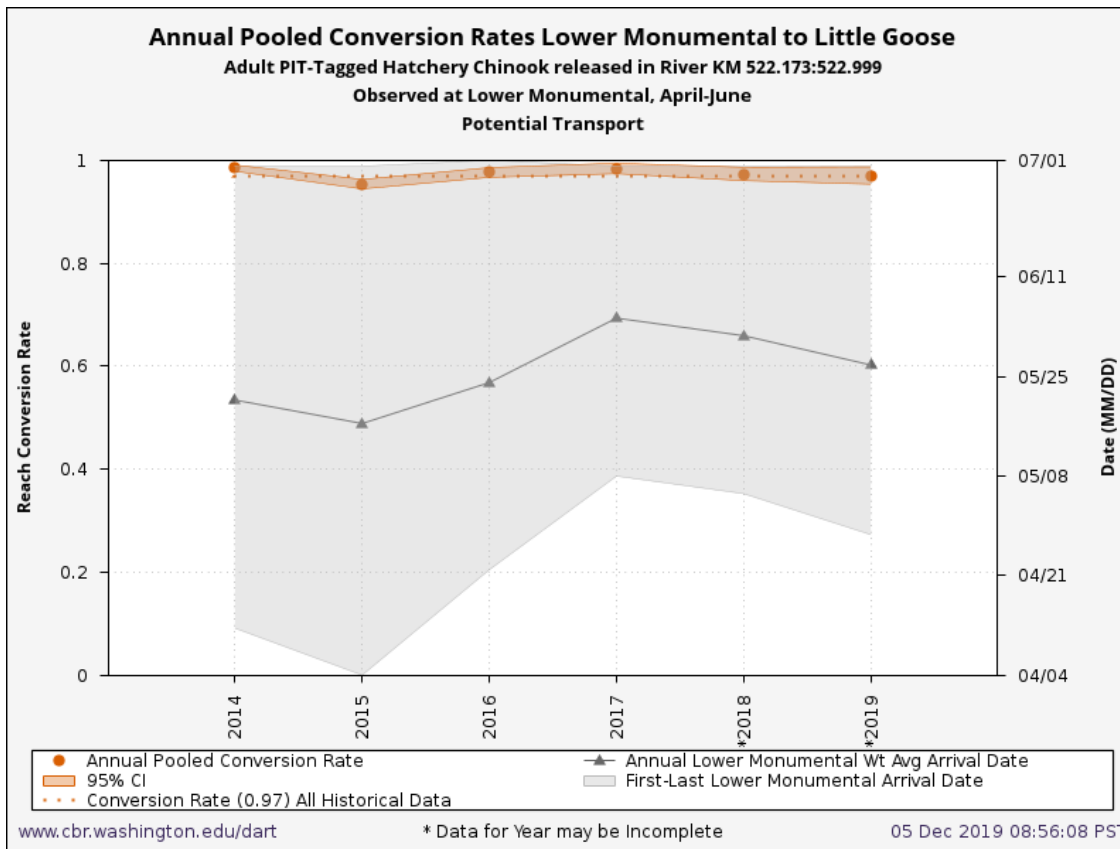
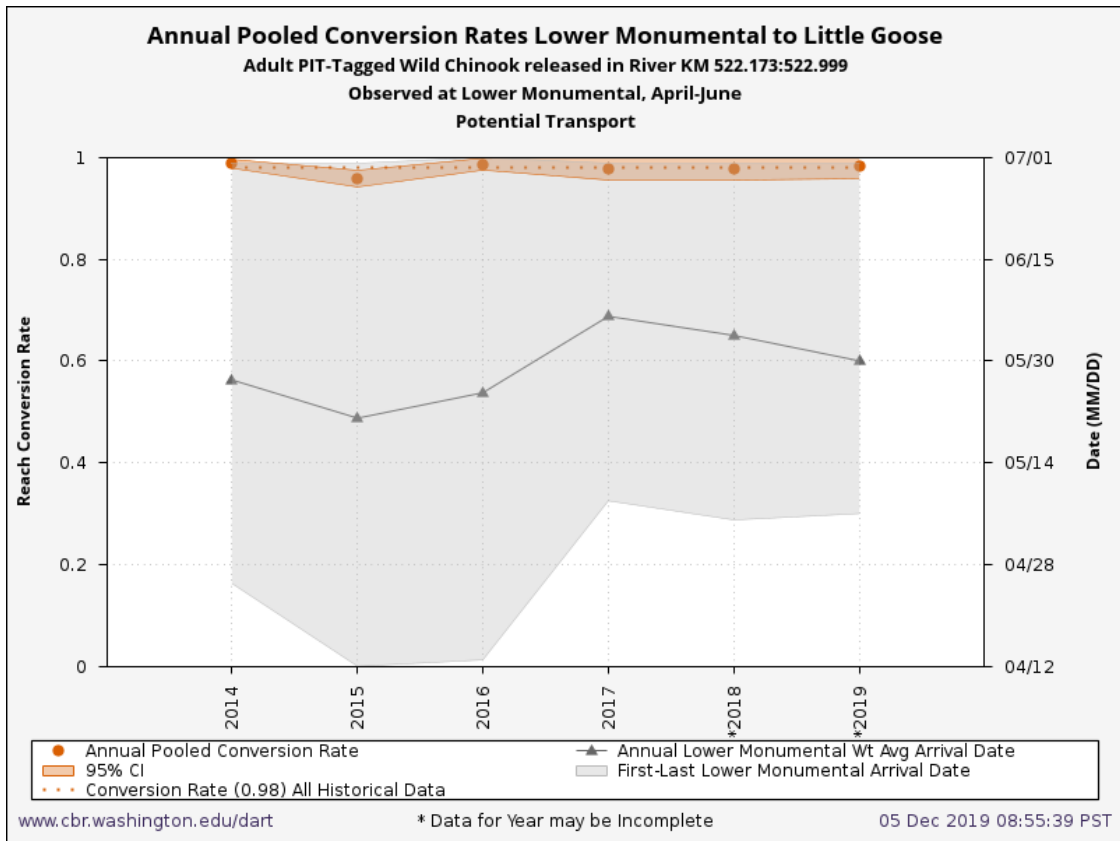
Year	Conversion	LL	UL
2014	0.951	0.928	0.969
2015	0.945	0.918	0.965
2016	0.974	0.947	0.989
2017	0.932	0.871	0.970
2018	0.955	0.889	0.988
2019	0.971	0.926	0.992

EOY spring Chinook conversion and 90% CI between LMN and LGS dams (2014-2019), hatchery fish.

Year	Conversion	LL	UL
2014	0.987	0.981	0.991
2015	0.952	0.943	0.960
2016	0.978	0.969	0.986
2017	0.992	0.982	0.997
2018	0.976	0.962	0.986
2019	0.973	0.955	0.985

Running 3 Day - Lower Monumental to Little Goose Travel Days and Run Size
2019 Adult PIT Tagged All Spring Summer Chinook Released at/above Lower Granite
Unique TagIDs Departing Lower Monumental (468) through 06/20
YTD Conversion Rate 97.2, YTD Harmonic Mean Travel Time 2.3

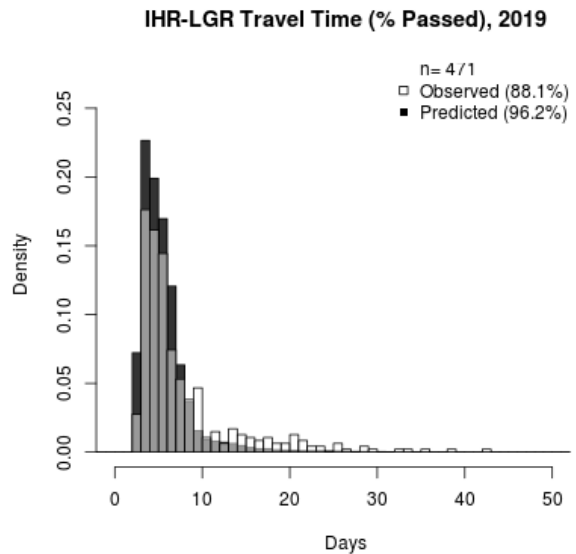
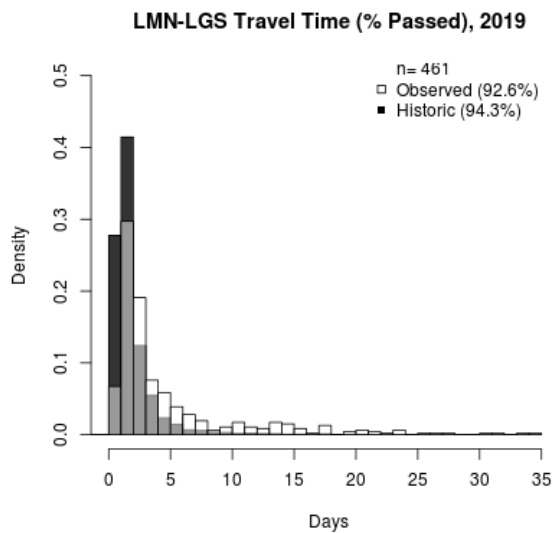
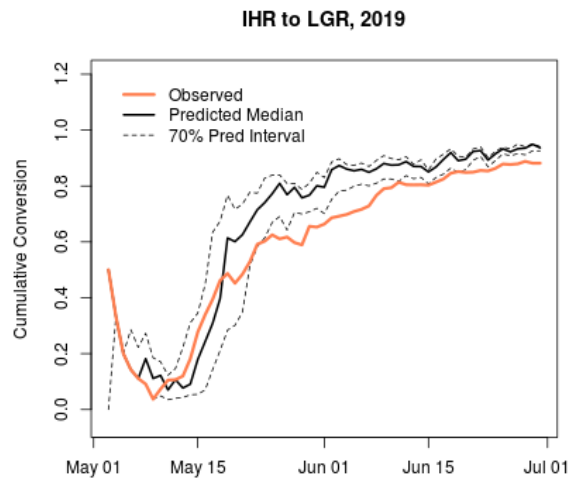
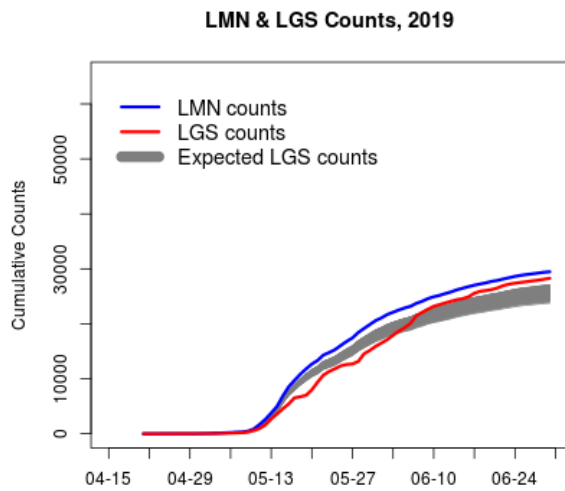




FPC Passage Indicator, 5/3/19 - 6/30/19

Data from: http://www.fpc.org/passageindicator_homepage.php

- Accounts for flow conditions to determine expected convergence based on historical datasets
- Indicated lower convergence and longer-than-expected travel times between LMN and LGS for much of 2019 spring spill season
- Fallback likely accounts for most of the discrepancies between ladder counts (top left plot) and PIT tag convergence (top right)



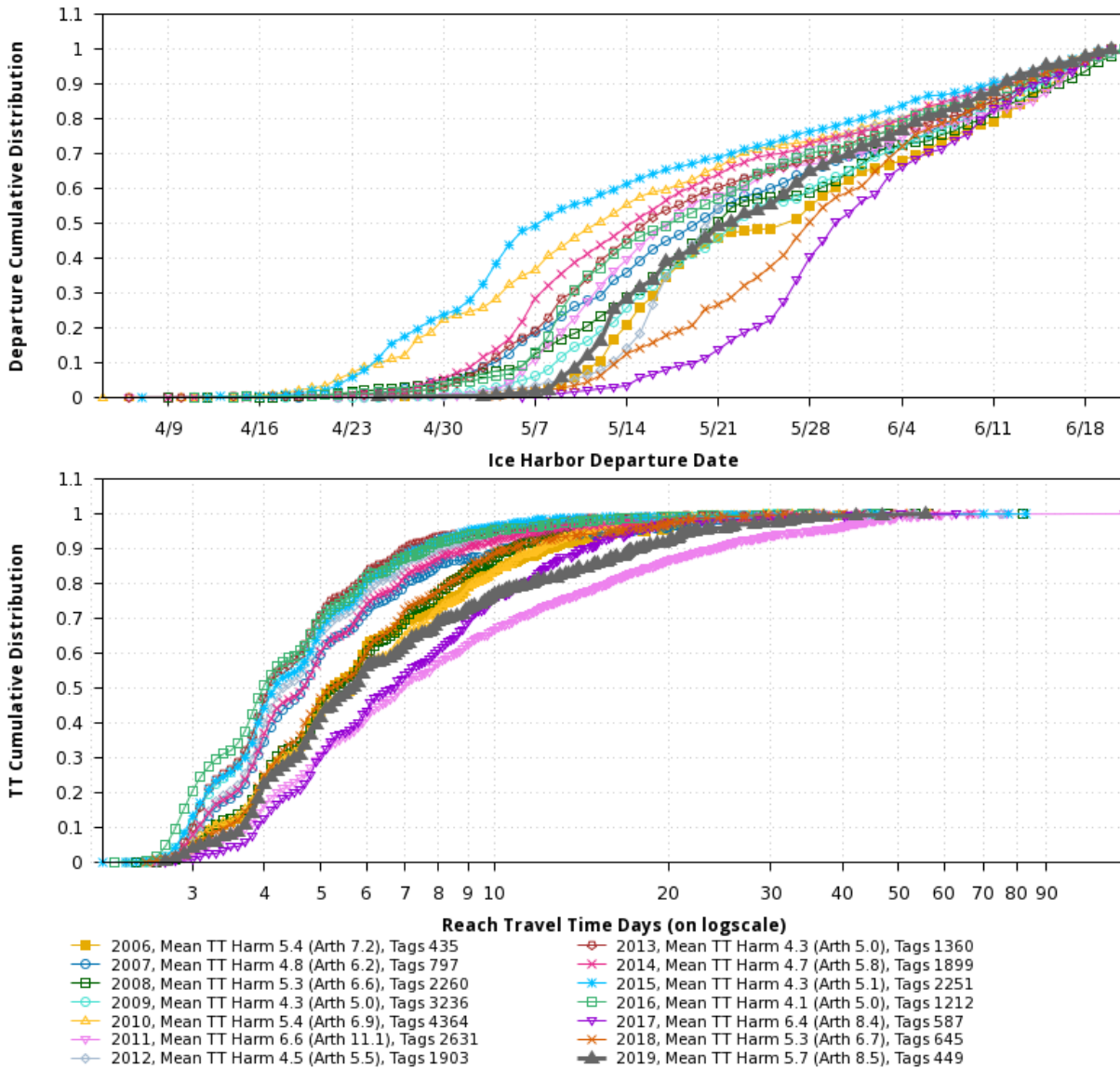
Run Timing, Reach Travel Times, and River Conditions

Data from DART (S. Iltis)

- These graphics provide visualization of run timing, travel times in various reaches, and river conditions for 2019 and prior years.
- Plotting cumulative distributions for travel time on a log scale was done simply to improve visualization of differences between years across the full range of travel times
- Harmonic and arithmetic means are provided for each year in the legend

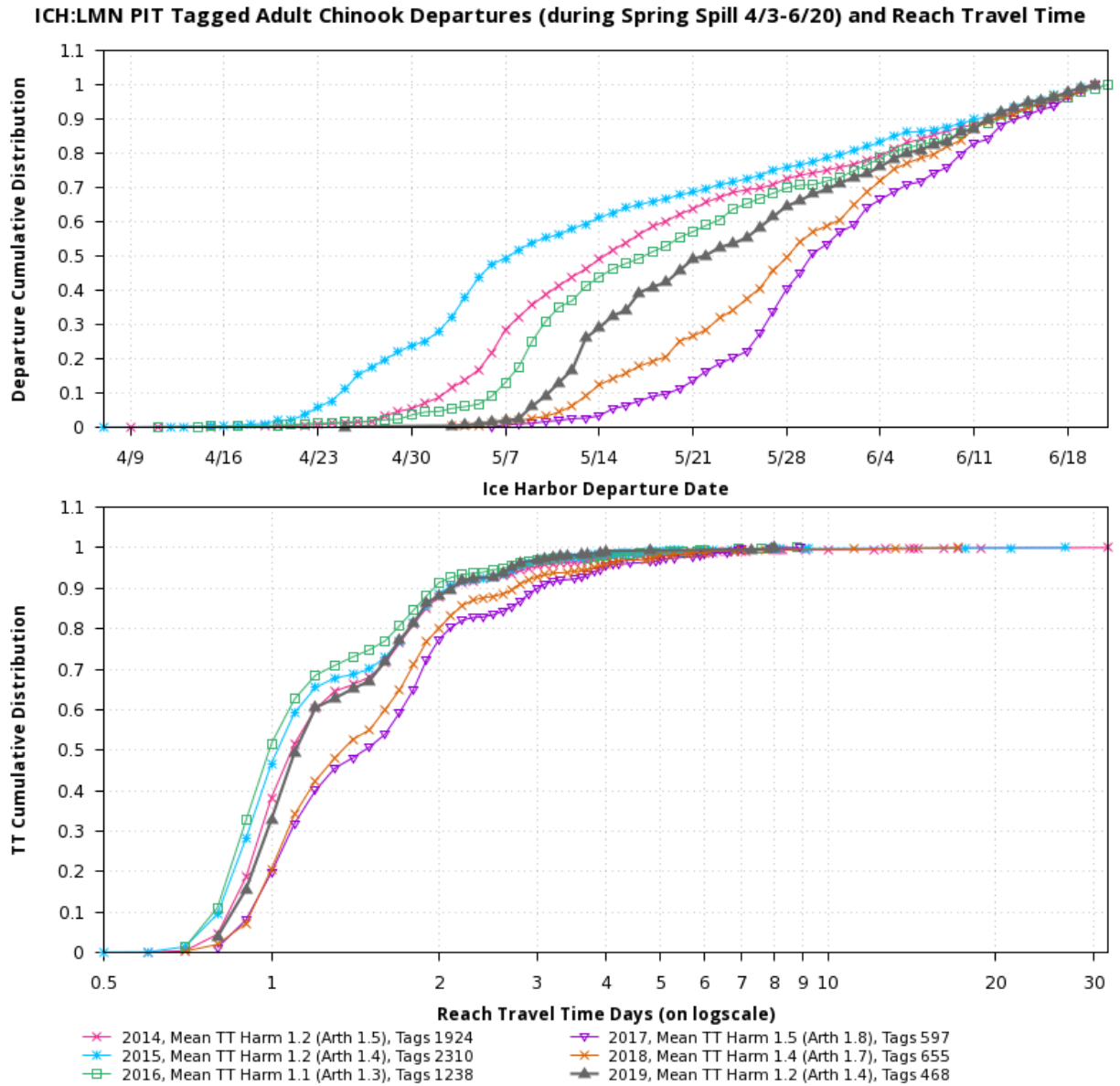
Ice Harbor to Lower Granite, through 11/24/2019

ICH:LWG PIT Tagged Adult Chinook Departures (during Spring Spill 4/3-6/20) and Reach Travel Time



Ice Harbor to Lower Monumental

- 2019 data fell within the range observed in previous years for run timing, reach travel times, and river conditions.

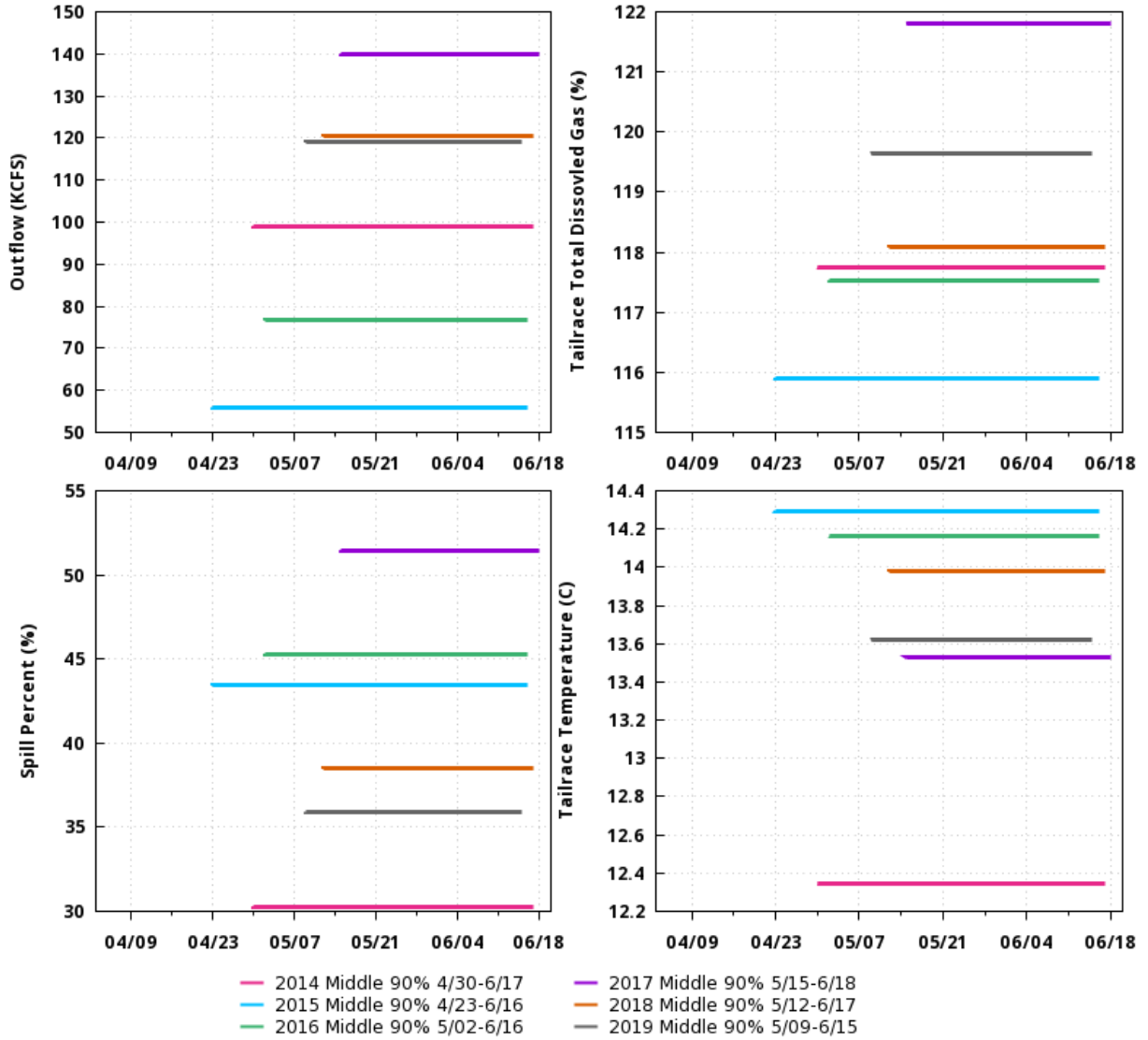


www.cbr.washington.edu/dart/

2019 data is incomplete (data through 11/24).

25 Nov 2019

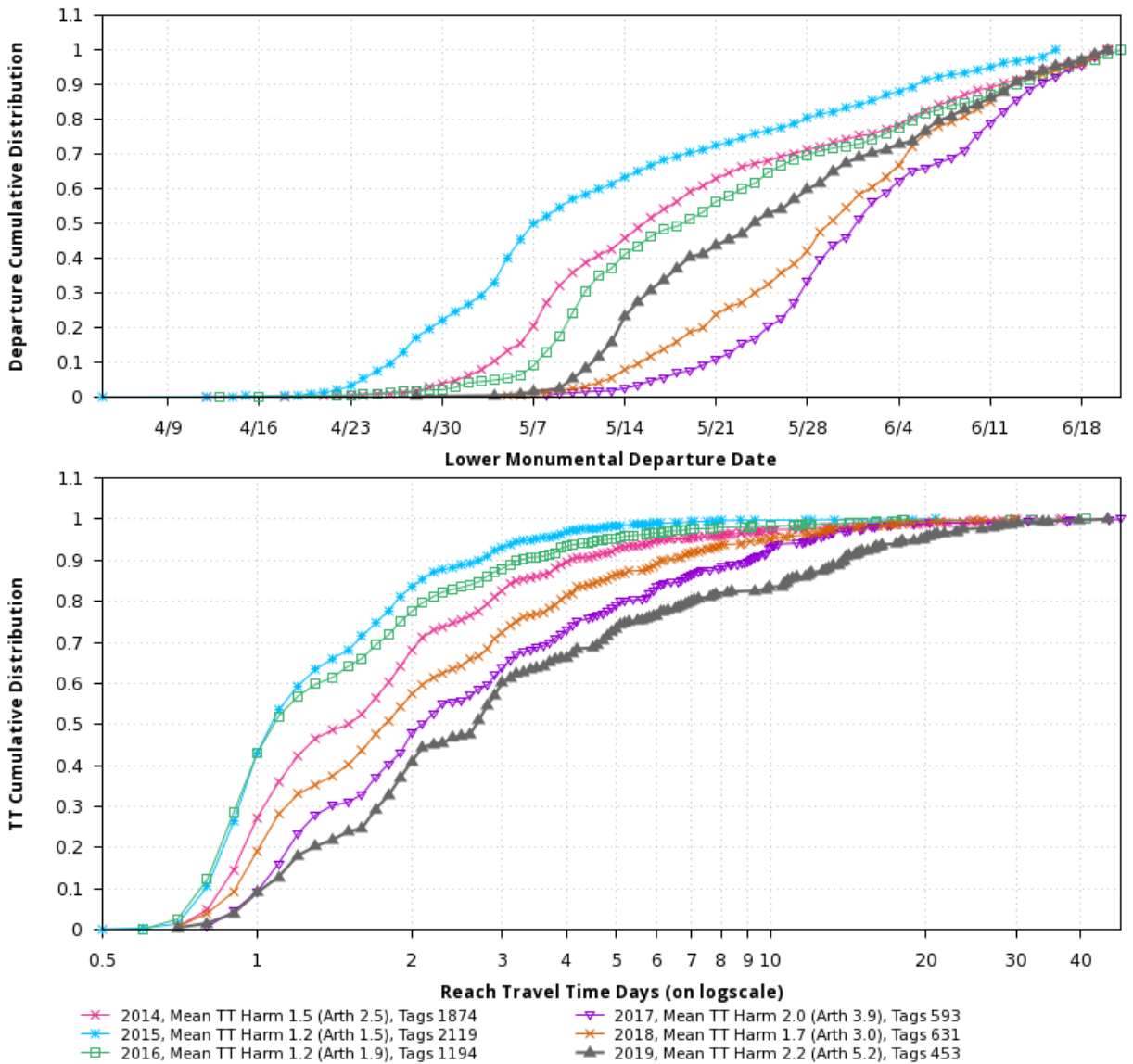
**River Conditions at Lower Monumental Averaged over Date Range
of Ice Harbor Middle 90% of Adult PIT Tagged Chinook during Spring Spill (4/3-6/20)**



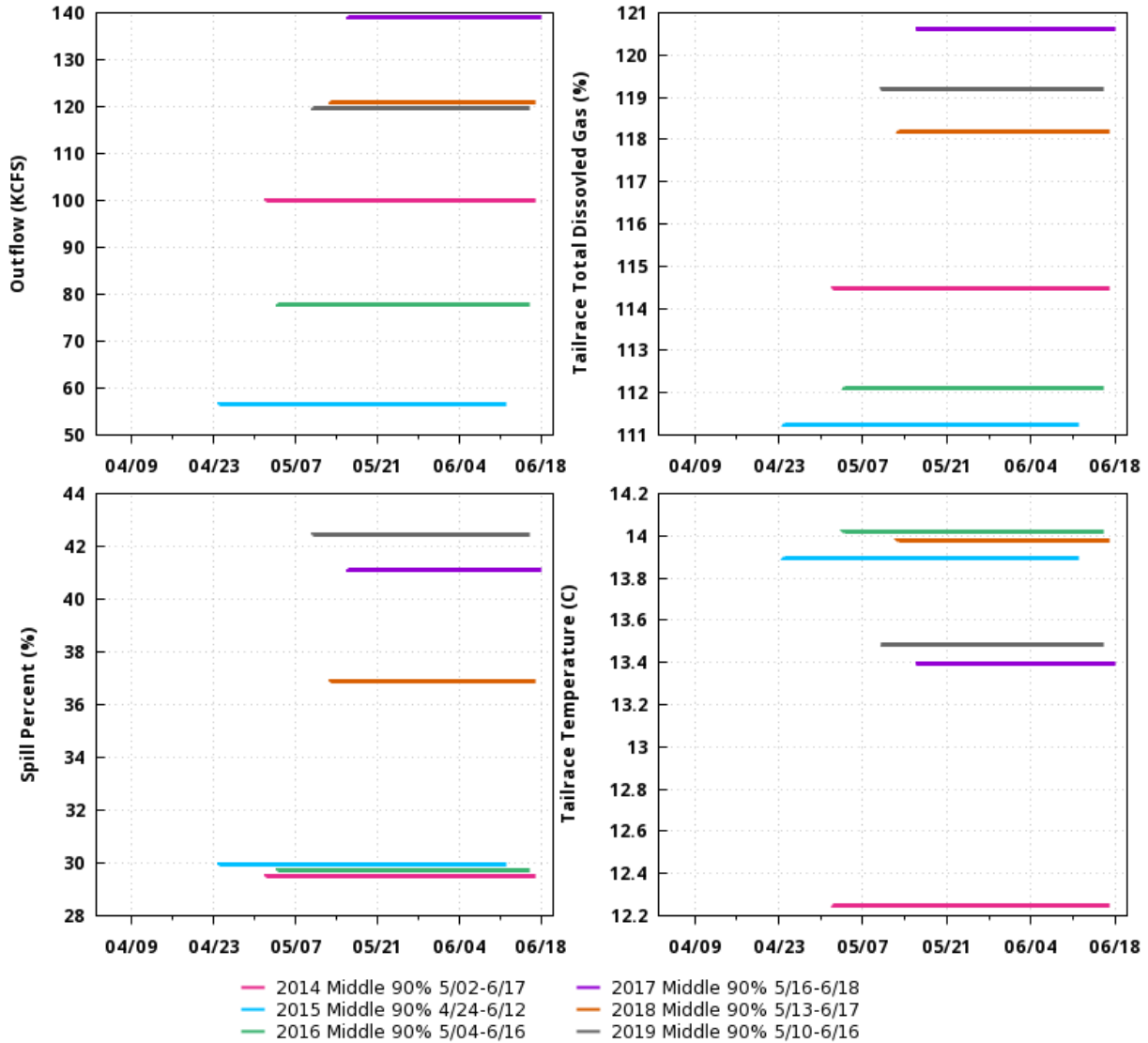
Lower Monumental to Little Goose

- 2019 data fell within the range observed in previous years for run timing and some river conditions (average outflow, tailrace TDG, and tailrace temperature)
- 2019 had slower travel times and higher average spill percent than in previous years.

LMN:LGS PIT Tagged Adult Chinook Departures (during Spring Spill 4/3-6/20) and Reach Travel Time

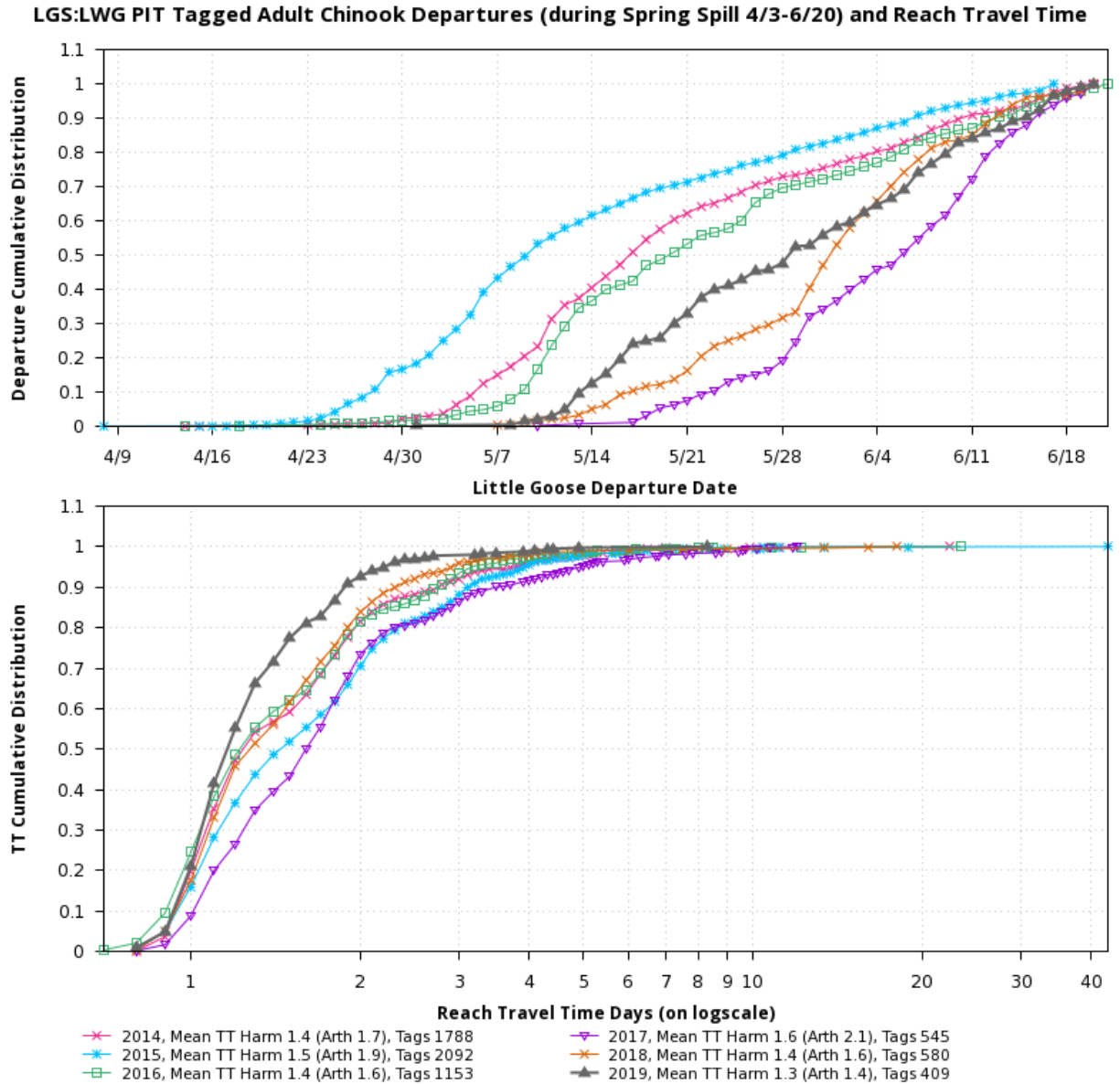


**River Conditions at Little Goose Averaged over Date Range
of Lower Monumental Middle 90% of Adult PIT Tagged Chinook during Spring Spill (4/3-6/20)**

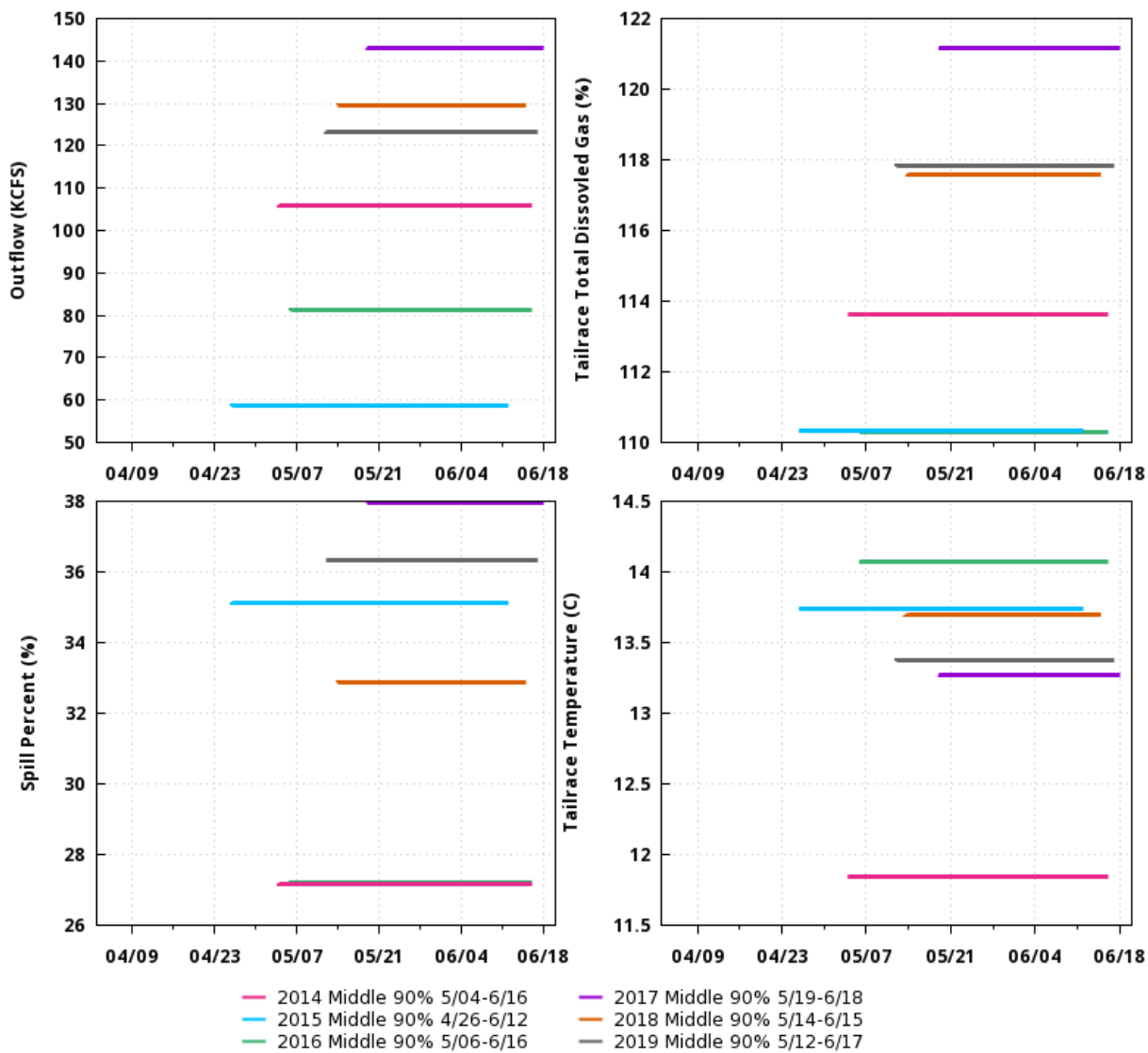


Little Goose to Lower Granite

- 2019 data fell within the range observed in previous years for run timing, reach travel times, and river conditions.
- 2019 had faster travel times than in previous years.



River Conditions at Lower Granite Averaged over Date Range
of Little Goose Middle 90% of Adult PIT Tagged Chinook during Spring Spill (4/3-6/20)



2019 Fallback Rates

Data from: http://www.cbr.washington.edu/dart/query/pitadult_fallback

- Estimated fallback was higher at LGS than at other LSR projects in 2019
- Estimated fallback was higher in May than in June for all projects except LGR
- Historical fallback rates are highly variable at Little Goose. Estimated fallback at LGS in 2019 was within the range observed for spring Chinook in previous years.

Estimated Fallback Rates, LSR, 2019

	May 1 – 28	May 29 - June 20	Average
Ice Harbor	7.3%	3.3%	5.4%
Lower Monumental	6.4%	2.8%	4.6%
Little Goose	13.3%	5.9%	9.6%
Lower Granite	6.9%	9.1%	8.1%

Estimated Fallback Rates for Spring Chinook, Snake River releases only, In-River and Transported Fish, updated 11/25/2019.

	Ice Harbor	Lower Monumental	Little Goose	Lower Granite
2019	7.4	5.6	10.8	7.8
2018	4.4	7.8	10.5	8.8
2017	7.9	7.7	14.7	15.5
2016	3.9	4.2	3.1	2.9
2015	3.4	2.9	1.3	
2014	2.6	2.7	4.8	
2013	5.1			
2012	5.1			
2011	5.6			
2010	4.6			
2009	5.0			
2008	5.8			
2007	6.1			
2006	9.9			
Average (thru 2018)	5.3	5.1	6.9	9.1

LGR Adult Trap Fish Injury Rates

- Concern was raised that jaw damage and head burn was being observed at “higher than normal” rates
- Jaw damage appears high (not much comparison data) and head burn appears within the range previously observed
- Creel surveys indicate that harvest rates were within the recreational harvest quota

Lower Granite Adult Trap, Spring Chinook (Mar 1 – Jun 17).

Year	% Jaw Damage	% Head Burn
2019	5.2	2.1
2018	1.2	2.9
2017		3.0
2016		3.5
2015		1.1
2014		1.6
2013		1.2
2012		1.6

