APR Part 3

Management Framework For Summer/Fall Chinook

- Review Logic Path for the Adaptive Management Process
- Review Key Assumptions
- 2023 Outcomes and 2024 Forecasts

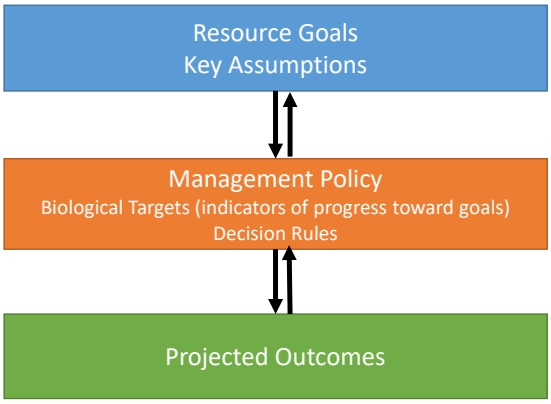
Components of Adaptive Management

I. Annual Program Review
   a. Program Goals (harvest and conservation)
   b. Key Assumptions
   c. Management Policy

Purpose of the APR: Confirm/adjust Key Assumptions and Management Policy to ensure that Program Goals are met over time

II. In-Season Management
   a. Run Forecasts
   b. Management Targets (escapement, harvest, hatchery)

Components of Adaptive Management



Program Goals

- **Conservation or Natural Production Goals:**
  - 7,500 total spawners—5,250 natural origin spawners (NOS)
  - Increase temporal and spatial diversity of spawning/rearing
  - High PNI, low pHOS so that the natural environment is driving adaptation
- **Harvest Goals:**
  - Increase harvest for all fishers
  - Harvest full tribal allocation (2024 pre-season ~3,500 summer Chk)
  - Increase % of individual tribal member harvest

Key Assumptions – Natural Production

HABITAT PARAMETERS	2016	2017	2018	2019	2020	2021	2022	2023	5-year average	Planning Assumptions
Habitat Productivity			5.8				5.2		NA	5.2
Habitat Capacity			16,296				18,027		NA	18,027
OCEAN AND PASSAGE SURVIVAL (SAR)										
Juvenile Outmigration										27.0%
Ocean Survival (BON to BON)										1.98%
Adult Migration										83.0%
Smolt-to-Adult Survival (SAR) (OK to OK)									0.43%	0.44%

- Habitat productivity and capacity assumptions based on EDT (updated in 2021)
- Juvenile outmigration and adult migration assumptions are based on the BiOp
- Ocean survival (BON to BON) assumption is based on 2021 EDT analysis. Empirical data for NORs (based on PIT tag returns) suggests much higher SARs than average for BYs 2011-2013 and much lower SARs for BY 2014-2016. SARs for BY 2017-2020 (average of 0.43%) appear to be closer to the long-term average assumption used in EDT.

Key Assumptions - Harvest

HARVEST RATES-NORs	2019	2020	2021	2022	2023	5-year average
Ocean (unmarked)	20.8%	15.1%	18.8%	24.3%	17.4%	19.3%
Lower Col. Zones 1-5 (unmarked)	0.4%	0.8%	0.8%	1.4%	1.7%	1.0%
Upper Col. Bonneville to Wells (unmarked)	18.0%	14.7%	23.0%	20.9%	23.0%	19.9%
NOR Terminal Induced Mortality Rate	3.3%	1.2%	2.9%	3.6%	3.1%	2.8%
HARVEST RATES-HORs						
Ocean (marked)	20.8%	15.1%	18.8%	24.3%	17.4%	19.3%
Lower Col. Zones 1-5 (marked)	0.4%	2.9%	5.5%	5.9%	10.1%	5.0%
Upper Col. Bonneville to Wells (marked)	30.8%	23.4%	37.4%	35.2%	40.1%	33.4%
Terminal Above Wells - Integrated	34.8%	17.8%	31.5%	41.2%		31.4%
Terminal above Wells - Segregated	56.2%	11.9%	44.4%	53.8%		37.7%

- TAC harvest rates used for ocean, Zones 1-5, and Upper Columbia to Wells fisheries
- RMIS (based on CWTs) data for terminal harvest of HORs
- NOR terminal harvest rate is estimated using CJHP program data
- Total exploitation rate is 38% for NORs and 65% for Integrated HORs
- Low NOR terminal harvest rate by MSF is critical for brood and escapement
- MSF sport fisheries in Columbia River Zones 1-6 also help NOR returns

Key Assumptions - Hatchery

Integrated Program In-Hatchery Assumptions	5-year average	Planning Assumptions
In-Hatchery Pre-spawning survival - NORs	80.3%	(+) 80.3%
Eggs/Female - NORs	4,026	(-) 4,600
Egg to smolt survival-yearlings	64.2%	(-) 86.0%
Egg to smolt survival-subyearlings	77.8%	(-) 84.0%
Segregated Program In-Hatchery Assumptions	**5-year average**	**Planning Assumptions**
In-Hatchery Pre-spawning survival - HORs	78.4%	(+) 78.4%
Eggs/Female - HORs	3,864	(-) 4,600
Egg to smolt survival-yearlings	75.2%	(-) 86.0%
Egg to smolt survival-subyearlings	82.4%	(-) 84.0%

- 6 of 8 metrics are not meeting expectations (pre-spawning survival assumption was 90%, now based on 5-year average)
- Options: 1) Collect more brood (not without more space or cooler water)
  2) Change management practices (CJH has been doing this, but not the big stuff (i.e. water and space))
  3) Accept the lower biological targets and reduce the program goals for smolts released

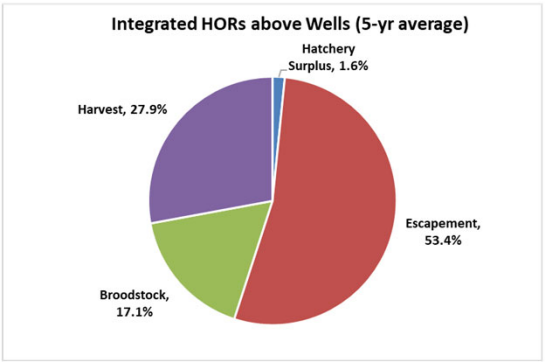
Key Assumptions - Hatchery

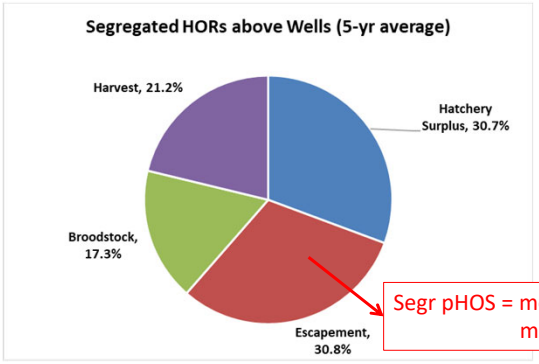
HATCHERY	5-year average	Planning Assumptions
SAR- integrated yearlings - BY	1.03%	0.90%
SAR- integrated subyearlings - BY	0.29%	0.30%
SAR- segregated yearlings - BY	0.92%	0.90%
SAR- segregated subyearlings - BY	0.08%	0.30%

- Yearling SARs have consistently exceeded original program assumption of 0.8-0.9%.
- Integrated subyearling SAR similar to planning assumptions; lower for segr. subyearlings
- Stray rate of CJ HORs (Int and Seg) to other streams and hatcheries is very low.

Key Assumptions – Hatchery

Destination of HORs after passing Wells Dam





- Segregated HOR escapement to the Okanogan River (strays) has been higher than expected, the goal is for the majority of seg HORs to be harvested or return to the hatchery ladder.
- In 2023, we operated the ladder more than usual and collected a large number of segregated HORs for broodstock for the CJHP program in anticipation of having a shortage of integrated HORs for brood.

Many segr. summer Chinook are left in the river:

-early on, it's to provide fish for the fishery

-later, it's to avoid steelhead 'take' and rendering at the dump

October 6, 2020

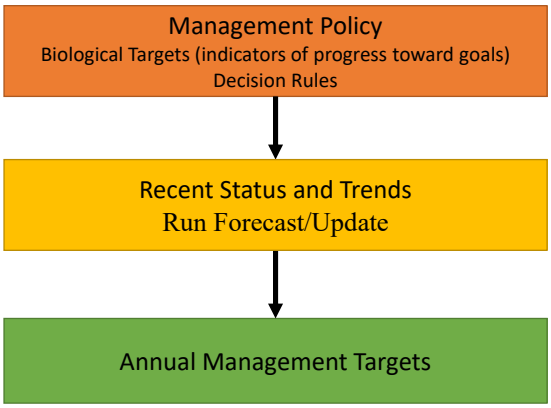
Components of Adaptive Management

I. Annual Program Review

II. In-Season Management Decision Making

II. In-Season Management Decisions

What is the "right thing to do" the coming season to meet Biological Objectives



Biological Targets are indicators of annual progress toward meeting program goals.

- Total pHOS (all programs) < 30%
- Segregated program pHOS <5%
- PNI > 0.67
- Minimum NOS target of 800 to collect brood for the integrated program
- pNOB between 30% and 100%
- Smolt release targets (2.9m ; 6 programs)

Management Targets are annual targets for broodstock collection, harvest, weir removals, etc.

- They are driven by the Run Forecast, Biological Targets and Decision Rules.
- They ensure the best actions are taken given the current run forecast and assumptions about the population.

Run Forecast Methods

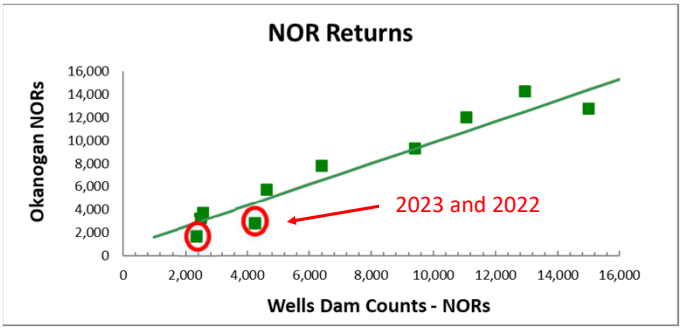
1) Preseason forecast (prior to July 15)
   1) Columbia River Preseason TAC forecast used to predict Okanogan HORs and NORs based on past relationship between counts at BON and Okanogan/CJHP returns to Wells
   2) 2023 pre-season TAC forecast was 84,000…..but downgraded to 54,100 during the season
   3) TAC will revise in-season and we will adjust
2) Life Cycle Model Forecast
   - Forecast returns of Okanogan HORs and NORs using ISIT tool: using empirical data on escapement, hatchery releases, age composition data, and key assumptions (habitat, hatchery, harvest)
3) Predicted HOR returns based on PIT tag expansions
   - In-season updates as PITs return to BON and Wells Dam
     - Uncertainty with run-timing can add a lot of variability to this one
4) In-season run forecast (July 15)
   - Wells Dam counts used to predict Okanogan HORs and NORs (regression analyses)

Wells Dam Run Forecast and Returns – 2023

2023 Forecasts	Preseason TAC Run Forecast (84,000 to BON)	Life Cycle Model Forecast	Inseason TAC Run Forecast (54,100 to BON)	Forecast Based on 7/15 Wells Dam Counts	PIT Tag Forecast as of 7/15	Final PIT tag forecast	Actual Returns to Wells
Okanogan NOR Forecast	6,905	6,038	5,066	2,919	NA	NA	1,711
Okanogan HOR Forecast	3,744	2,934	2,743	3,518	455	404	2,058
CJH HOR Forecast	1,970	1,882	1,443	1,851	1,250	643	1,439
Total Return Forecast	12,619	10,854	9,252	8,288	1,705	1,047	5,207

- 'Actual Returns' are also estimates, with unknown error (creel, redd counts, PSM, etc.)
- This was another tough year for the NOR forecast. The July 15 Wells Dam forecast for NORs was less than half of the preseason forecast. The July 15 NOR forecast has had a good track record in previous years, but in 2023 actual returns were only about 60% of the July 15 forecast.

NOR Forecast based on July 15 Wells Dam Counts



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- For Okanogan integrated HOR returns, none of the methods did a good job of predicting actual returns.
- The segregated HOR forecast was consistent (preseason and July 15), and actual returns were closest to the In-season TAC and July 15 PIT tag forecast. We ran the ladder more this year than in previous years to ensure enough brood were collected, and perhaps attracted more of these fish than in some years.

Are the forecast models useful?

Return Yr	TAC preseason	LCM pre-season	TAC update	Wells 7/15 regression	7/15 PIT
2018	(+)	(+) (-)	(-)	(+)	(+) (-)
2019	(-)	(+)	NA	(+)	(+) (-)
2020	(-)	(-)	(-)	(+)	(+) (-)
2021	(+)	(+)	(-)	(+)	(+)
2022	(-)	(-)	(-)	(-)	(+)
2023	(-)	(-)	(+)	(-)	(+) (-)
(+) indicates its within 20% of estimated end of season actual					

- **Is this track record good enough?**
- **Should we invest resources in improving it?**
- **What can be done?**
- **Do we need more information about past performance to decide how to proceed?**

Management Targets and Outcomes – 2023

Actuals are based on final Wells Dam run sizes of:
1,711 NORs
2,058 Integrated HORs
1,439 Segregated HORs

Targets are based on final run forecasts of:
2,919 NORs
3,518 Integrated HORs
1,851 Segregated HORs

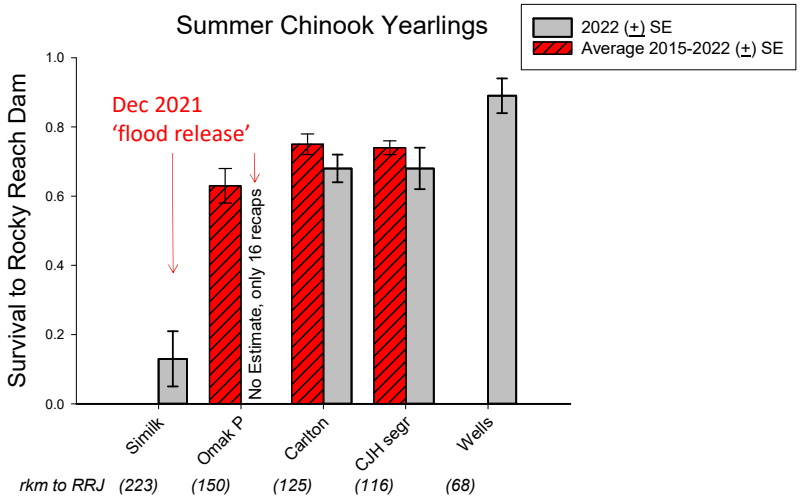
	Management Targets	2023 Performance Review Final Targets	2023 Actuals	Bio-target met?
Harvest	Okanogan HORs retained in Terminal Fisheries	528	762	
	CJH HORs retained in Terminal Fisheries	574	223	
	Incidental Loss of NORs	53	53	
Hatchery and Weir	Return of Okan. HORs to Hatchery	156	4	
	Return of CJH HORs to Hatchery	478	91	
	Okanogan HORs retained at Weir	62	-	
	CJH HORs retained at Weir	6	-	
Integrated Hatchery Program	Natural Origin Brood (NOB)-Okan (collected)	210	196	
	Hatchery Origin Brood (HOB)-Okan (collected)	489	475	
	Hatchery Origin Brood (HOB)-CJHP (collected)	-	151	
	Projected Annual pNOB-Okan	30%	23%	(-)
		800,000 Yearl.	132,079 Yearl.	
	Smolt Release-Okanogan	300,000 Subs	0 Subs	(-)
Segregated Hatchery Program	Hatch. Origin Brood (HOB) - Int	60	-	
	Hatch. Origin Brood (HOB)-Seg (purse seine and ladder)	544	554	
		500,000 Yearl.	411,272 Yearl.	
	Smolt Release-CJH	400,000 Subs	115,890 Subs	(-)
Natural Spawning Escapement	Natural Origin Spawners (NOS)	2,391	1,316	(-)
	Hatchery Origin Spawners (HOS) - Int	2,000	735	
	Hatchery Origin Spawners (HOS) - Seg	225	378	
	Hatchery Origin Spawners (HOS) - out-of-basin	-	303	
	Total Number of Spawners (excludes jacks)	4,615	2,732	(-)
	Effective pHOS	43%	46%	(-)
	PNI	0.41	0.33	(-)

Wells Dam Run Forecast – 2024

2024 Forecasts	Preseason TAC Run Forecast (53,000 to BON)	Life Cycle Model Forecast
Okanogan NOR Forecast	3,695	7,438
Okanogan HOR Forecast	2,213	3,150
CJH HOR Forecast	1,239	2,338
Total Return Forecast	7,147	12,926

- 2024 Preseason TAC estimate for summer Chinook at Bonneville is 53,000 (last year's was 84,800)
- Life Cycle model estimates for 2024 are based on SAR of 0.4% (NOR), 1% (yearling integrated HOR), 0.9% (yearling seg. HOR), and <0.3% for subs.
- Life Cycle model HOR forecasts account for actual hatchery release levels in previous years, which were well below average in 2020-2021. The forecast does not account for environmental conditions leading to early release of integrated HOR juveniles in December 2021.

Outmigration year 2022 (BY 2020 for yearlings)



Wells Dam Run Forecast – 2024

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Management Targets for 2024

Based on 2024 preseason TAC forecast, with adjustments to extend to Wells Dam:

3,695 Okanogan NORs
2,213 Integrated HORs
(what if = 788)
1,239 Segregated HORs

What if NOR is more like the LCM preseason (7,438)?
-then increase pNOB

	Management Targets	2024 Targets	What if int HORs very low
Harvest	Okanogan HORs retained in Terminal Fisheries	332	118
	CJH HORs retained in Terminal Fisheries	471	186
	Incidental Loss of NORs	56	56
Hatchery and Weir	Return of Okan. HORs to Hatchery	55	20
	Return of CJH HORs to Hatchery	615	314
	Okanogan HORs retained at Weir	40	14
	CJH HORs retained at Weir	3	16
Integrated Hatchery Program	Natural Origin Brood (NOB)-Okan (collected)	467	467
	Hatchery Origin Brood (HOB)-Okan (collected)	230	230
	Hatchery Origin Brood (HOB)-CJHP (collected)	-	-
	Projected Annual pNOB-Okan	67%	67%
	Smolt Release-Okanogan	800,000 Yearl. 300,000 Subs	800,000 Yearl. 300,000 Subs
Segregated Hatchery Program	Hatch. Origin Brood (HOB) - Int	587	59
	Hatch. Origin Brood (HOB)-Seg (purse seine and ladder)	-	528
	Smolt Release-CJH	500,000 Yearl. 400,000 Subs	500,000 Yearl. 400,000 Subs
Natural Spawning Escapement	Natural Origin Spawners (NOS)	2,854	2,854
	Hatchery Origin Spawners (HOS) - Int	872	312
	Hatchery Origin Spawners (HOS) - Seg	135	175
	Hatchery Origin Spawners (HOS) - out-of-basin	NA	NA
	Total Number of Spawners (excludes jacks)	3,861	3,342
	Effective pHOS	22%	12%
	PNI	0.75	0.85

Expected outcomes if 2024 preseason run forecast is correct and management targets are met

STATUS OF BIOLOGICAL INDICATORS (5-year Running Averages)

	Program Biological Targets	Status in 2023 (5-year average)	Projected status in 2024 (based on pre-season TAC forecast)	Projected status in 2024 (5-year average)
NOS	5,250	3,532	2,854	3,619
pHOS	30%	35%	22%	31%
PNI	0.67	0.65	0.75	0.68

Conclusions

- **2023 NOR returns to the basin were well below average, below the preseason TAC forecast and July 15 in-season Wells forecast**
  - Ocean harvest rates for both NORs and HORs were below average; Lower Columbia and Zone 6 harvest rates were above average for both HORs and NORs
  - PUD count of NORs at Wells on 7/15 was lowest ever recorded in 23 years of monitoring, and NOR escapement was around 33% of target. This was the second year our 7/15 NOR forecast failed us (2022 was the first).
  - As a result of low NOR escapement, did not achieve PNI or pHOS target
  - Challenging to collect enough brood for both integrated and segregated programs
  - <20% smolt release target (integrated yearling program); >80% for segregated yearling program
  - Zero integrated subyearling releases; ~30% for segregated subyearling program
  - Ocean conditions were average for the 2023 outmigrating smolts (9th/23 years) www.fisheries.noaa.gov/content/ocean-conditions-indicators-trends)
- **2024 preseason TAC NOR forecast is below average based on weak Columbia forecast; the LCM is quite optimistic based on anticipated return of 4-year olds following strong run of 8,000 NOR spawners in BY 2020, but this assumes good conditions on the spawning grounds and in the ocean**
- **If NORs show up as expected….**
  - Full brood collection (>80% pNOB for integrated program)
  - Expect to meet pHOS and PNI targets
- **If NORs don't show up as expected…..**
  - Reduce pNOB in integrated to 30-50% (how far depends on catch of integrated HOB)
  - Collect NOB from the ladder and, if necessary, Wells Dam
- **Integrated HORs are expected to have a tough year….**
  - Early release of BY 2020 from acclimation ponds in December 2021 due to extreme runoff and flooding event; anticipated low survival of juveniles
  - May need to collect segregated HORs for integrated program again this year