

# APR Part 3

## Management Framework For Summer/Fall Chinook

- Review Logic Path for the Adaptive Management Process
- Review Key Assumptions
- 2022 Outcomes and 2023 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 (2023 pre-season ~ 6,800)
  - Increase % of individual tribal member harvest

## Key Assumptions – Natural Production

HABITAT PARAMETERS	2011	2012	2013	2014	2015	2016	2017	2018	5-year average	Current Conditions
Habitat Productivity		7.5		8.9		5.8			NA	5.8
Habitat Capacity		12,499		7,442		16,296			NA	16,296
<b>OCEAN AND PASSAGE SURVIVAL (SAR)</b>										
Juvenile Outmigration										27.0%
Ocean Survival (BON to BON)										1.98%
Adult Migration										83.0%
Smolt-to-Adult Survival (SAR) (OK to OK)									0.63%	0.44%

- Habitat productivity and capacity assumptions based on EDT (last updated in 2016)
- Juvenile outmigration and adult migration assumptions are based on the BiOp
- Ocean survival (BON to BON) assumption is based on 2016 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 2017-2019 appear to be closer to the long-term average assumption used in EDT.

## Key Assumptions - Harvest

HARVEST RATES-NORs	2018	2019	2020	2021	2022	5-year average
Ocean (unmarked)	23.9%	22.2%	14.4%	18.9%	24.8%	20.5%
Lower Col. Zones 1-5 (unmarked)	0.8%	0.4%	0.8%	0.8%	0.5%	0.6%
Upper Col. Bonneville to Wells (unmarked)	26.8%	18.0%	14.7%	23.0%	20.9%	20.3%
NOR Terminal Induced Mortality Rate	3.0%	3.3%	1.2%	2.9%		3.1%
<b>HARVEST RATES-HORs</b>						
Ocean (marked)	23.9%	22.2%	14.4%	18.9%	24.8%	20.5%
Lower Col. Zones 1-5 (marked)	4.4%	0.4%	2.9%	5.5%	6.3%	2.8%
Upper Col. Bonneville to Wells (marked)	30.6%	30.8%	23.4%	37.4%	35.2%	31.1%
Terminal Above Wells - Integrated	38.1%	34.8%	17.8%	33.7%		29.2%
Terminal above Wells - Segregated	47.9%	56.2%	11.9%	64.3%		31.4%

- 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 39% for NORs and 62% 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	80.1%	(+) 80.1%
Eggs/Female - NORs	4,015	(-) 4,600
Egg to smolt survival-yearlings	65.6%	(-) 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	76.2%	(+) 76.2%
Eggs/Female - HORs	3,856	(-) 4,600
Egg to smolt survival-yearlings	75.4%	(-) 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

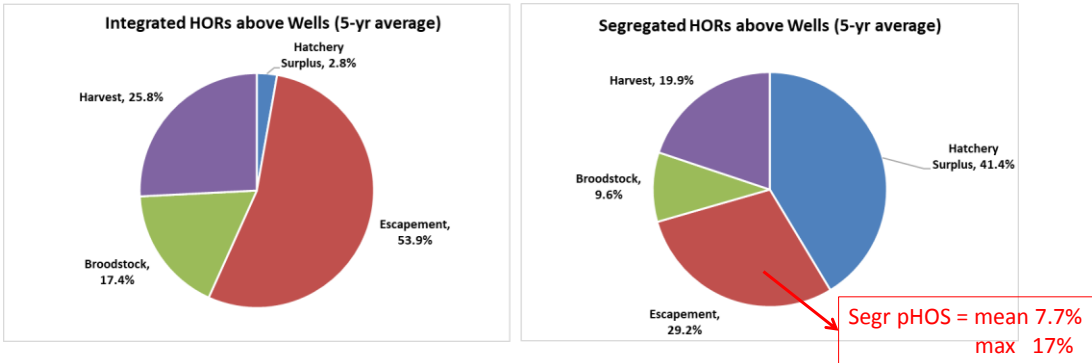
## Key Assumptions - Hatchery

HATCHERY	5-year average	Planning Assumptions
SAR- integrated yearlings - BY	1.33%	0.90%
SAR- integrated subyearlings - BY	0.29%	0.30%
SAR- segregated yearlings - BY	0.99%	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.
- We don't operate the ladder as much as we could, its unclear if ladder operations affect stray rate to the tributaries.

### 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

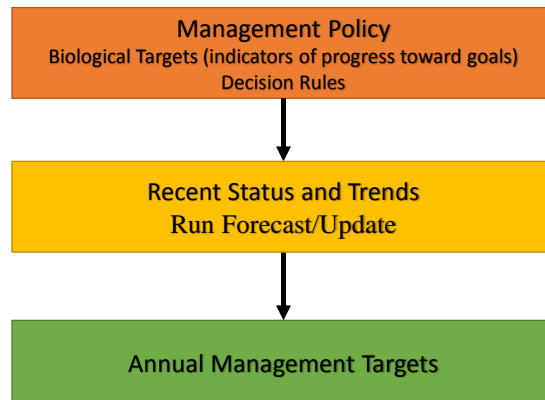


# Components of Adaptive Management

- 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 is 84,800
- 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)

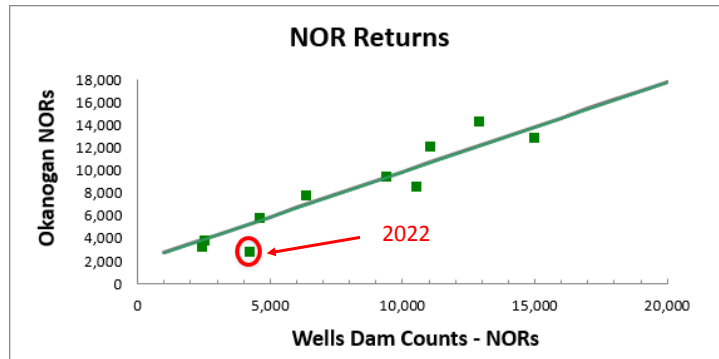
## Wells Dam Run Forecast and Returns – 2022

2022 Forecasts	Preseason TAC Run Forecast (57,500 to BON)	Life Cycle Model Forecast	Inseason TAC Run Forecast (82,300 to BON)	Forecast Based on 7/15 Wells Dam Counts	PIT Tag Forecast as of 7/15	Final PIT tag forecast	Actual Returns
Okanogan NOR Forecast	5,205	5,827	6,509	5,214	NA	NA	2,755
Okanogan HOR Forecast	3,222	1,991	4,029	3,420	2,307	2,202	3,528
CJH HOR Forecast	1,913	1,576	2,393	2,094	1,743	1,517	991
<b>Total Return Forecast</b>	<b>10,340</b>	<b>9,394</b>	<b>12,931</b>	<b>10,728</b>	<b>4050 HORs</b>	<b>3719 HORs</b>	<b>7,274</b>

- TAC pre-season forecast was very similar to the in-season forecast based on July 15 Wells Dam counts; but none of the methods did a good job of predicting actual NORs.
- This was a tough year for the NOR forecast. Other factors influencing actual returns include pre-spawning mortality (assumption is 10%). Higher PSM than expected would result in fewer actual returns (later we will see that Similkameen was very warm (the warmest ?)
- TAC pre-season forecast and 7/15 Wells forecast did a great job of predicting integrated HORs
- TAC pre-season forecast and 7/15 Wells forecast for segregated HORs were similar; actual returns likely do not account for all seg. HORs due to ladder operations
- 'Actual Returns' are also estimates, with unknown error (creel, redd counts, etc.)



# NOR Forecast based on July 15 Wells Dam Counts



## Management Targets and Outcomes – 2022

Actuals are based on final Wells Dam run sizes of:  
 2,755 NORs  
 3,528 Integrated HORs  
 991 Segregated HORs

Targets are based on final run forecasts of:  
 5,214 NORs  
 2,307 Integrated HORs  
 1,743 Segregated HORs

	Management Targets	2022 Performance Review	
		Final Targets	2022 Actuals
Harvest	Okanogan HORs retained in Terminal Fisheries	673	654
	CJH HORs retained in Terminal Fisheries	376	181
	Incidental Loss of NORs	178	99
Hatchery and Weir	Return of Okan. HORs to Hatchery	162	59
	Return of CJH HORs to Hatchery	1,094	334
	Okanogan HORs retained at Weir	45	14
	CJH HORs retained at Weir	8	1
Integrated Hatchery Program	Natural Origin Brood (NOB)-Okan (collected)	726	500
	Hatchery Origin Brood (HOB)-Okan (collected)	-	158
	Hatchery Origin Brood (HOB)-CJHP (collected)	-	7
	Projected Annual pNOB-Okan	100%	57%
	Smolt Release-Okanogan	800,000 Yearl. 300,000 Subs	584,716 Yearl. 0 Subs
Segregated Hatchery Program	Hatch. Origin Brood (HOB) - Int	592	556
	Hatch. Origin Brood (HOB)-Seg (purse seine and ladder)	-	185
	Smolt Release-CJH	500,000 Yearl. 400,000 Subs	453,575 Yearl. 134,706 Subs
Natural Spawning Escapement	Natural Origin Spawners (NOS)	3,879	1,940
	Hatchery Origin Spawners (HOS) - Int	751	1,878
	Hatchery Origin Spawners (HOS) - Seg	239	255
	Hatchery Origin Spawners (HOS) - out-of-basin	NA	200
	Total Number of Spawners (excludes jacks)	4,869	4,273
	Effective pHOS	17%	49%
	PNI	0.85	0.54

## Wells Dam Run Forecast – 2023

2023 Forecasts	Preseason TAC	
	Run Forecast (84,800 to BON)	Life Cycle Model Forecast
Okanogan NOR Forecast	6,904	6,038
Okanogan HOR Forecast	3,743	2,934
CJH HOR Forecast	1,970	1,882
<b>Total Return Forecast</b>	<b>12,618</b>	<b>10,854</b>

- 2023 Preseason TAC estimate for summer Chinook at Bonneville is 84,800 (last year's was 57,500)
- Life Cycle model estimates for 2023 are based on SAR of 2% (NOR), 1.3% (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. Releases were well below average in 2019-2020.

## Management Targets for 2023

Based on 2023 preseason  
TAC forecast, with adjustments to  
extend to Wells Dam:

6,904 Okanogan NORs  
3,743 Integrated HORs  
1,970 Segregated HORs

	Management Targets	2023 Targets
Harvest	Okanogan HORs retained in Terminal Fisheries	1,094
	CJH HORs retained in Terminal Fisheries	618
	Incidental Loss of NORs	229
Hatchery and Weir	Return of Okan. HORs to Hatchery	138
	Return of CJH HORs to Hatchery	1,082
	Okanogan HORs retained at Weir	56
	CJH HORs retained at Weir	6
Integrated Hatchery Program	Natural Origin Brood (NOB)-Okan (collected)	699
	Hatchery Origin Brood (HOB)-Okan (collected)	-
	Hatchery Origin Brood (HOB)-CJHP (collected)	-
	Projected Annual pNOB-Okan	100%
	Smolt Release-Okanogan	800,000 Yearl. 300,000 Subs
Segregated Hatchery Program	Hatch. Origin Brood (HOB) - Int	604
	Brood (HOB)-Seg (purse seine and ladder)	-
	Smolt Release-CJH	500,000 Yearl. 400,000 Subs
Natural Spawning Escapement	Natural Origin Spawners (NOS)	5,378
	Hatchery Origin Spawners (HOS) - Int	1,666
	Hatchery Origin Spawners (HOS) - Seg	238
	Hatchery Origin Spawners (HOS) - out-of-basin	NA
	Total Number of Spawners (excludes jacks)	7,282
	Effective pHOS	22%
	PNI	0.82

## Expected outcomes if 2023 preseason run forecast is correct and management targets are met

### STATUS OF BIOLOGICAL INDICATORS (5-year Running Averages)

	Program Biological Targets	Status in 2022 (5-year average)	Projected status in 2023 (based on pre-season TAC forecast)	Projected status in 2023 (5-year average)
NOS	5,250	3,863	5,378	4,345
PHOS	30%	33%	22%	31%
PNI	0.67	0.67	0.82	0.72

## Conclusions

- **2022 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 above average; Lower Columbia and Zone 6 harvest rates were above average for HORs
  - PUD count of NORs at Wells on 7/15 slightly below last year, but NOR escapement was <50% of target. This was the first year our 7/15 forecast failed us.
  - 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
  - ~75% smolt release target (integrated yearling program); >90% for segregated yearling program
  - Zero integrated subyearling releases; ~35% for segregated subyearling program
  - Ocean conditions were moderate for the 2022 outmigrating smolts (9<sup>th</sup>/23 years) [www.fisheries.noaa.gov/content/ocean-conditions-indicators-trends](http://www.fisheries.noaa.gov/content/ocean-conditions-indicators-trends))
- **2023 preseason TAC forecast is above average and consistent with LCM for NORs**
  - **If NORs show up as expected....**
    - Aggressive HOR terminal harvest
    - Full brood collection (60-100% pNOB for integrated program, integr. HORs for segr. program)
    - Expect to meet PHOS and PNI targets; NOR escapement ~5,400 (above goal), total escapement (~7,200) just below the goal, so a few extra integrated fish on the spawning grounds would be good.
    - Overescapement of NORs would be good because the biological targets (5 yr means) are 'recovering' from some down years