

Agenda Item Summary

BACKGROUND

As an alternative to a citizen’s initiative seeking to ban non-tribal commercial gill nets and tangle nets in all inland waters of the State (Measure 81), in the summer of 2012 Governor John Kitzhaber asked the Oregon Fish and Wildlife Commission (hereafter, “Commission”) to address the “perennial and divisive conflicts” that involve recreational and non-tribal commercial fisheries on the Columbia River, including gear conflicts, allocation of harvest and available wild fish impacts, and conservation needs. The Governor’s request recognized the importance and economic value of *both* recreational and commercial fisheries to the State, including the importance of adaptive management, while acknowledging the need for management in a conservation-based framework (Attachments 2, 3, and 9).

Consistent with this vision and direction, the Commission adopted administrative rules in December 2012 implementing guiding principles and management strategies for a new fisheries framework for lower Columbia River (LCR) non-tribal fisheries (CR Fisheries Reform). To resolve some concerns raised in litigation, in June 2013 the Commission reconsidered and readopted rules it had adopted in December 2012. As reconsidered, the stated objective of the Columbia River fish management and reform framework outlined in OAR 635-500-6700, et seq., is to:

1. Maintain or enhance the overall economic viability of commercial and recreational fisheries;
2. Optimize overall economic benefits to the State;
3. Promote conservation of native fish; and
4. Promote orderly and concurrent fisheries with the State of Washington.

Background materials and policy links for CR Reform can be found at www.dfw.state.or.us/fish/OSCRP/CRM/LMCR_fisheries_mgmt_reform.asp.

The Washington Fish and Wildlife Commission adopted a similar policy in January 2013 (Policy C-3620; <http://wdfw.wa.gov/commission/policies/c3620.html>).

In general, key elements of CR Reform include shifting allocations to provide a stronger recreational priority in the mainstem, enhancing off-channel hatchery releases to augment commercial harvest, limiting gill nets to off-channel fisheries, developing alternative gears and techniques for commercial mainstem fisheries, and strengthening conservation of native fish.

Guiding Principles

1. Promote the recovery of ESA-listed species and the conservation of wild stocks of salmon, steelhead, and sturgeon in the Columbia River.
2. Continue leadership on fish recovery actions, including improved fish survival through the federal Columbia River hydropower system, improved habitat conditions in the tributaries and estuary, hatchery reform, reduced predation by fish, birds, and marine mammals, and harvest management that meet conservation responsibilities.
3. Continue to meet terms of *U.S. v. Oregon* management agreements with Columbia River Treaty Tribes.

4. In a manner that is consistent with conservation and does not impair the resource, seek to enhance the overall economic well-being and stability of Columbia River fisheries in Oregon and Washington.
5. For steelhead, salmon and sturgeon prioritize recreational fisheries in the mainstem and commercial fisheries in off-channel areas of the lower Columbia River. Toward this end:
 - a) Assign mainstem recreational fisheries a sufficient share of ESA-impacts and harvestable surplus to enhance current fishing opportunity and economic benefit.
 - b) Assign commercial fisheries a sufficient share of the ESA-impacts and harvestable surplus to effectively harvest fish in off-channel areas and harvest surplus fish with selective techniques in the mainstem Columbia River.
6. Phase out the use of non-selective gill nets in non-tribal commercial fisheries in the mainstem Columbia River. Transition gill net use to off-channel areas.
7. Enhance the economic benefits of off-channel commercial fisheries, in a manner consistent with conservation and wild stock recovery objectives. Enhancements should include:
 - a) Providing additional hatchery fish for release in off-channel areas by shifting currently available production, and where possible providing new production for release in off-channel areas, emphasizing complementary conservation benefits in tributaries.
 - b) Expanding existing seasons and boundaries in off-channel areas and/or establishing new off-channel areas, allowing increased harvest in areas where the likelihood of impacting ESA-listed stocks is lower than the mainstem.
8. Develop and implement selective-fishing gear and techniques for commercial mainstem fisheries to optimize conservation and economic benefits consistent with mainstem recreational objectives. Provide incentives to commercial fishers to expand the development and implementation of these gear and techniques.
9. Maintain consistent and concurrent policies between Oregon and Washington related to management of non-tribal Columbia River fisheries, to ensure orderly fisheries as well as the sharing of investments and benefits.
10. To maximize economic return, develop a program that seeks to implement Marine Stewardship Council or other certification of commercial salmon and sturgeon fisheries in the Columbia River as sustainably managed fisheries.

In 2013, Senate Bill (SB) 830 was passed by the Oregon Legislature and signed into law (ORS 508.980 and notes, notes following ORS 508.796) (Attachment 4). In general, this law repealed statutes prohibiting certain commercial fishing gears, established overarching objectives for CR Reform rules, established provisions for adaptive management, established a CR Fisheries Transition Fund to aid commercial fishers harmed by CR Reform rules, established a CR Fisheries Enhancement Fund to aid implementation of CR Reform rules, and allowed the Commission to create a fee (endorsement) on recreational fishers to help support the Enhancement Fund. The overarching objectives for CR Reform rules stated in SB830 align closely with the stated objective of CR Reform rules listed above.

1. Optimize overall economic benefits to this state;
2. Enhance the economic viability of Oregon’s recreational and commercial fisheries and the communities that rely on these fisheries;
3. Contribute to native fish conservation and recovery;
4. Promote orderly fishery management with the State of Washington; and
5. Provide consistency with agreements made with Indian tribes pursuant to state or federal court orders.

Although the CR Fisheries Transition Fund and program were created (currently \$1M) as required by statute, no counties have pursued developing a program to receive and distribute grants to commercial fishers, and we are not aware of any associated claims of economic harm by commercial fishers requesting reimbursements.

Although OAR 635-500-6765 requires “*an initial review in 2014 and... a comprehensive review at the end of the transition period [January 2017],*” Commission members asked for and have received annual updates during the transition period, which ends at the close of this year. While some *preliminary* data is available for 2016, fall fisheries themselves were ongoing during preparation for the Commission’s November 2016 meeting, as are the analyses of spring and summer fisheries. As a result, a full review of the final transition year is not available at this time. This agenda item provides, in an informational format, as comprehensive a review of the transition period as is possible at this date. Some important aspects of the fall 2016 fisheries will be discussed due to their significance to the overall evaluation of the transition period.

2016 PUBLIC INVOLVEMENT

- There has been opportunity for public input at each of the annual updates provided to the Commission throughout the transition period.
- Given that we are just now completing the last year of the transition period, there has not yet been an opportunity for public meetings to discuss the comprehensive review and potential adaptive management measures with the public.
- A large number of public meetings relating to Columbia River fisheries management, during which aspects of Columbia River Reform have been discussed, have been held over the course of 2016, including:
 - January 12, 2016 - Met with the Columbia River Commercial Advisory Group in Rainier, Oregon.
 - January 13, 2016 - Met with the Columbia River Recreational Advisory Group in Vancouver, Washington.
 - January 27 through October 31, 2016 - Held 34 Columbia River Compact and/or Joint State hearings of which 26 dealt with non-treaty mainstem or Select Area commercial fisheries and/or mainstem recreational fisheries.
 - February 16, 2016 – Met jointly with the Columbia River Commercial and Recreational Advisory Groups in Vancouver, Washington to discuss pinniped issues in the lower Columbia River.
 - March 18, 2016 – 3rd annual review of fisheries reform, Commission meeting, Tigard, Oregon.
 - March 17 and April 6, 2016 - Met with Columbia River commercial and recreational fisheries stakeholders as part of the North-of-Falcon process for planning summer and fall fisheries.

OUTLINE OF KEY POLICY COMPONENTS

The CR Reform policy has several key components examined in this review, which provide the basis for staff recommendations for adaptive modifications to the policy as the transition period ends. Given that the transition period is not yet complete, all associated CR Fishery Reform analyses, tables and figures should be considered preliminary.

Below is a brief outline of issues discussed in this agenda item:

- 1) Increase recreational fishery priority in the mainstem by shifting harvest and ESA impact allocations (Issue 1)
- 2) Enhance off-channel (Select Area) commercial fisheries (Issue 2)
 - a) Enhance production in existing off-channel locations
 - b) Evaluate expansion of commercial fishing opportunity in existing sites
 - c) Examine feasibility of establishing new sites
- 3) Develop alternative commercial fishing gears and techniques (Issue 3)
 - a) Gear feasibility evaluations
 - b) Gear Mortality evaluations
 - c) Alternative fisheries implementation
- 4) Enhance conservation of wild native fish associated with these fisheries (Issue 4)
- 5) Assessment of economic effects of implementation of the CR Fisheries Reform policy (Issue 5)
 - a) Recreational fisheries
 - b) Commercial fisheries
- 6) Adaptive management recommendations for continued implementation of the policy

ISSUE 1

ALLOCATION SHIFTS

ANALYSIS

The Commission adopted the following policy objective in rule (635-500-6705): “(5) *For steelhead, salmon and sturgeon, prioritize recreational fisheries in the mainstem and commercial fisheries in off-channel areas of the lower Columbia River. Toward this end: a) Assign mainstem recreational fisheries a sufficient share of ESA-impacts and harvestable surplus to enhance current fishing opportunity and economic benefit. b) Assign commercial fisheries a sufficient share of the ESA-impacts and harvestable surplus to effectively harvest fish in off-channel areas and harvest surplus fish with selective techniques in the mainstem Columbia River.*”

Pre-season recreational/commercial fishery allocations in 2013 were affected by legal actions. Spring and summer fishery allocations remained at pre-policy levels. Remaining annual pre-season allocations were all established per the policy during transition period years (Table 1). The policy allocates fall Chinook differently than other seasons/species. Allocations are no more than 70% of LCR tule or Snake River Wild (SRW) Chinook ESA-impacts in preseason planning as needed to meet recreational objectives, with the balance going to commercial fisheries, and no less than 30% of LCR tule or SRW Chinook to commercial fisheries in any case. Thus, in most fall seasons, recreational fisheries were allocated the maximum of 70% of LCR tule Chinook impacts – the most constraining stock – in preseason planning, to meet season length objectives.

In many years, these objectives remained unmet, however, due to higher than expected catches of this stock in the recreational fishery. Because LCR tule Chinook was most constraining, impacts on SRW were not the limiter for achieving recreational objectives. The average allocation of this stock to commercial fisheries was very similar to expectations in the original policy whereby commercial fisheries were anticipated to use over half of the available Upriver Bright Chinook (URB) surplus (access to these fish is addressed via the SRW allocation). Actual usage of available impact and harvest guidelines is discussed in Issue 4.

Table 1—Summary of pre-season allocations in non-treaty fisheries 2013-2016.

Stock	Allocation Metric	Fishery	2013	2014	2015	2016
Spring Chinook	ESA Impact	Recreational	60%	70%	70%	70%
		Commercial	35%	30%	30%	30%
		<i>Unallocated</i>	5%			
Summer Chinook	Harvestable Surplus	Recreational	55%	60%	70%	70%
		Commercial	45%	40%	30%	30%
Sockeye	ESA Impact	Recreational	70%	70%	70%	70%
		Commercial	30%	30%	30%	30%
LCR Fall Chinook	ESA Impact	Recreational	69%	70%	70%	70%
		Commercial	31%	30%	30%	30%
SRW Fall Chinook	ESA Impact	Recreational	44%	38%	55%	50%
		Commercial	56%	62%	45%	50%

Post-season impact usage for transition years 2013 – 2015 was detailed during March 18, 2016 CR Reform annual review. Run reconstructions are not yet complete for 2016 so additional data for the final transition year is not yet available.

**ISSUE 2
ANALYSIS**

OFF-CHANNEL (SELECT AREA) ENHANCEMENTS

Enhance Production in Existing Off-Channel Fisheries

One of the policy objectives is to enhance the economic benefits of off-channel commercial fisheries by “*providing additional hatchery fish for release in off-channel areas by shifting production, and where possible, providing new production... (OAR 635-500-6705(7)(a)).*” Although not specified in rule, the Commission provided further guidance related to the numbers and stocks of hatchery fish that were to be released in off-channel areas, which have been implemented by Oregon staff.

Enhanced releases associated with CR Reform are described below, including scheduled objectives for 2017 and beyond.

- a) Spring Chinook: Oregon initiated an increase of 250,000 per year in 2010 based on Commission direction in 2008. An additional 500,000 annual Oregon increase was initiated in 2013 as part of the transition period. Washington discontinued releases of 350,000 spring Chinook in Deep River in 2014, as planned in the reform package, due to poor survival and low contribution of these fish, but initiated production of 250,000 additional spring Chinook annually for release at a different site beginning

in 2014. It is believed that survival gains achieved by moving the release could offset the reduction in release numbers. Further Oregon increases of 250,000 are scheduled to begin in 2017 to bring the total to 1,250,000 “additional releases” and a cumulative goal of 2,200,000 by 2017.

- b) Coho: Oregon initiated an increase of 120,000 per year in 2010 based on Commission direction in 2008. An additional 600,000 Oregon increase was implemented in 2013 as part of the transition period. Washington was also to initiate 200,000 additional production in 2013. Further Oregon increases of 1,000,000 are scheduled to begin in 2017 to bring the total to 1,920,000 “additional releases” and a cumulative goal of 6,090,000 by 2017.
- c) Select Area Bright (SAB) fall Chinook: Oregon planned to increase SAB fall Chinook production by 500,000 beginning in 2013 as part of the transition period. Further increases of 250,000 are scheduled to begin in 2017 to bring the total to 750,000 “additional releases” and a cumulative goal of 2,200,000 in 2017.

Enhanced production in off-channel areas is progressing, with actual average Oregon releases through 2016 at or approaching targets except for SAB fall Chinook in 2016 (Table 2). For 2013-2016, average actual releases of spring Chinook, Coho, and SAB fall Chinook have been 93%, 97%, and 82% of their respective targets. Actual releases in 2016 were 100% of target for spring Chinook and 110% of target for Coho. Although the SAB goal was exceeded in 2014, the 2015 SAB return was extremely poor, leading to only 32% of the 2016 release goal being achieved. To date, the 2016 SAB return also appears to be below average. Staff are discussing options to improve brood stock collection methods to support the need for increased production.

Releases of spring Chinook into Cathlamet Channel continued for the 3rd year in 2016 as part of Washington Department of Fish and Wildlife (WDFW) efforts to develop a new Select Area site. To date, disease issues have prevented meeting the 250,000 release goal at this site. Releases in 2014, 2015, and 2016 were 200,000, 141,900, and 107,900 respectively. The initial adult returns from the 2014 releases were expected this past spring, but those returns appear to have been extremely poor with no fish being reported in any fishery (recreational, commercial mainstem or off-channel commercial) this year.

Oregon hatchery production for 2017 releases is currently expected to be within 10% of target for Coho and spring Chinook, but SAB fall Chinook production appears on track for another low year, with approximately 850,000 (preliminary estimate based on current egg take) smolts projected to be released. In Washington, spring Chinook releases for 2017 in Cathlamet Channel are expected to be $\leq 75\%$ of the target.

Table 2—Summary of Select Area production goals and actual releases.

	Period	Release Year	Total Release Goals	Actual Release Totals	% of Goal	First Adult Return Year
Spring Chinook	Pre-Transition	2010 ^a	1,550,000	1,535,200	99%	2012
		2011 ^a	1,550,000	1,290,700	83%	2013
		2012 ^a	1,550,000	1,529,300	99%	2014
	Transition	2013	2,050,000	1,829,200	89%	2015
		2014 ^b	1,950,000	1,846,600	95%	2016
		2015 ^b	1,950,000	1,747,300	90%	2017
		2016 ^b	1,950,000	1,958,800	100%	2018
Long Term	2017+ ^b	2,200,000			2019	
Coho	Pre-Transition	2010 ^a	4,290,000	4,009,700	93%	2011
		2011 ^a	4,290,000	3,811,000	89%	2012
		2012 ^a	4,290,000	3,995,800	93%	2013
	Transition	2013	5,090,000	4,536,700	89%	2014
		2014	5,090,000	4,814,400	95%	2015
		2015 ^c	5,090,000	4,709,300	93%	2016
		2016	5,090,000	5,589,500	110%	2017
Long Term	2017+	6,090,000			2018	
SAB Fall Chinook	Transition	2013	1,950,000	1,850,300	95%	2015
		2014	1,950,000	2,227,400	114%	2016
		2015	1,950,000	1,670,700	86%	2017
		2016	1,950,000	621,900	32%	2018
	Long Term	2017+	2,200,000			2019

^aIncludes 250,000 spring Chinook and 120,000 Coho additional production specified as part of 2008 OFWC Allocation Policies.

^b350,000 spring Chinook from WDFW (Deep River) were discontinued in 2014.

^c200,000 Coho from WDFW scheduled for release beginning in 2015 were discontinued due to budget cuts.

Off-channel Harvests

Enhanced harvest in off-channel areas is assumed proportional to increased hatchery releases (lagged appropriately for adult return year) for a given run year strength. As part of analyses considered during policy adoption in 2013, hypothetical projections of future harvest and ex vessel value were made based on average run sizes from 2009-2012 (referred to as tables C4 and C5). Average harvest of Select Area stocks of Coho, all fall Chinook and SABs during the transition period exceeded projections from Table C4/C5 (114%, 118% and 236%, respectively), but not spring Chinook (86%) (Table 3). Harvest varied by year and was influenced by actual run size.

Observed catches in Table 3 reflect only fish that resulted from releases in the off-channel areas. They do not include catches of “dip-ins” – non-local stocks that are harvested in some areas. This approach was necessary to allow for comparison to projected values in Tables C4/C5, which only projected catches of fish released in the off-channel sites. Estimated catches of non-local fish are derived from CWT analysis of the catch.

Table 3—Assumed (projected) in pre-reform modeling and actual Off-Channel adult salmon harvest, 2013-15.

Species/Stock ¹	Reform Assumptions (Table C4)					Actual Harvest			
	“Baseline”	2013	2014	2015	13-15 Avg	2013	2014	2015	Avg
SAFE Stock CHS	5,000	6,234	6,250	8,805	7,096	5,042	2,164	11,055	6,087
SAFE Stock COH	56,700	58,380	69,580	69,580	65,847	40,344	160,696	26,130	75,723
Total CHF ²	18,528	18,528	18,528	19,173	18,743	24,142	24,117	18,027	22,095
<i>SAB CHF</i> ³	--	<i>4,350</i>	<i>4,350</i>	<i>4,649</i>	<i>4,450</i>	<i>15,288</i>	<i>9,761</i>	<i>6,798</i>	<i>10,616</i>
Total ⁴	80,228	83,142	94,358	97,558	91,686	69,528	186,977	55,212	103,906

¹ CHS = Spring Chinook, CHF = Fall Chinook, SAB = Select Area Bright, COH = Coho

² Includes SAB, tule and non-local bright fall Chinook harvested in fall Off-Channel fisheries.

³ Includes SAB fall Chinook caught in spring, summer and fall Off-Channel fisheries.

⁴ Includes SAFE Stock CHS, SAFE Stock COH and SAFE Total CHF.

For 2013-15, actual annual ex-vessel value of all stocks in off-channel commercial harvest averaged \$2.1M/yr, compared to projections in C5 of \$1.7M/yr. Although still underway, off-channel ex-vessel value in 2016 is currently projected to be below expectations from C5 for fall fisheries.

As required by SB 830, the Youngs Bay Control Zone (YBCZ) was established in 2014 to prohibit recreational fishing off the mouth of Youngs Bay in an effort to increase returns of hatchery fish returning to the Youngs Bay Select Area. The statute also requires Commission review, and potential modification or removal of the zone, within three years (2017).

- Harvest of SAB Chinook in B10 actually increased after implementation of the YBCZ, likely as a result of much increased angler effort for the Buoy 10 fishery in those years and larger SAB returns.
- The portion of overall catch of SAB Chinook caught in the B10 fishery appears to be primarily driven by total angler effort in B10.
- It is not possible to determine whether the Buoy 10 catch of SAB Chinook would have been different (lower or higher) without the YBCZ.
- Hatchery SAB Chinook stray rates into LCR tributaries remains a significant concern, accentuating the need to increase harvest of hatchery fish in all fisheries.

Evaluate Expansion of Commercial Fishing Opportunity in Existing Select Area (Off-Channel) Sites

The Commission’s rules also include a policy objective to enhance the economic benefits of off-channel commercial fisheries by “*expanding existing seasons and boundaries in off-channel areas and/or establishing new off-channel areas (OAR 635-500-6705(7)(b)).*”

Season Expansion: Because of the duration of existing fishing seasons, opportunities to expand current seasons in existing Oregon Select Area (off-channel) sites are limited to the winter timeframe in Tongue Point/South Channel and in Knappa Slough. In 2016, expanded winter season fisheries were opened for the fourth consecutive year in these two areas. During 2013-2016, new winter seasons added an average of 22 commercial

fishing days, 29 deliveries, and 75 landed spring Chinook annually (Table 4). Fish abundances are generally low during this timeframe, thus participation and harvest to date have been limited, though prices are relatively high. (For example, in 2016 prices during the winter Select Area season were 37% higher than during the spring Select Area season).

Table 4—Summary of expanded seasons in existing off-channel winter-spring fisheries, 2013-2016. Includes the year, date of fisheries, number of open days, deliveries, Chinook landed and the percent of the total winter/spring season catch.

Site	Year	Date Range	Days	Deliveries	Chinook	% of Total
Tongue Point/ South Channel	2013	Feb 11-Mar 12	9	23	70	18.7%
	2014	Feb 10-Mar 14	10	17	33	45.8%
	2015	Feb 9-Mar 13	10	26	70	5.6%
	2016	Feb 8-Mar 11	10	39	104	9.9%
	Average		9.8	26.3	69.3	20.0%
Knappa Slough	2013	Feb 11-Mar 12	9	2	6	0.6%
	2014	Feb 10-Mar 14	10	2	4	0.9%
	2015	Feb 9-Mar 20	12	3	10	0.3%
	2016	Feb 9-Mar 18	17	2	3	0.1%
	Average		12.0	2.3	5.8	0.5%

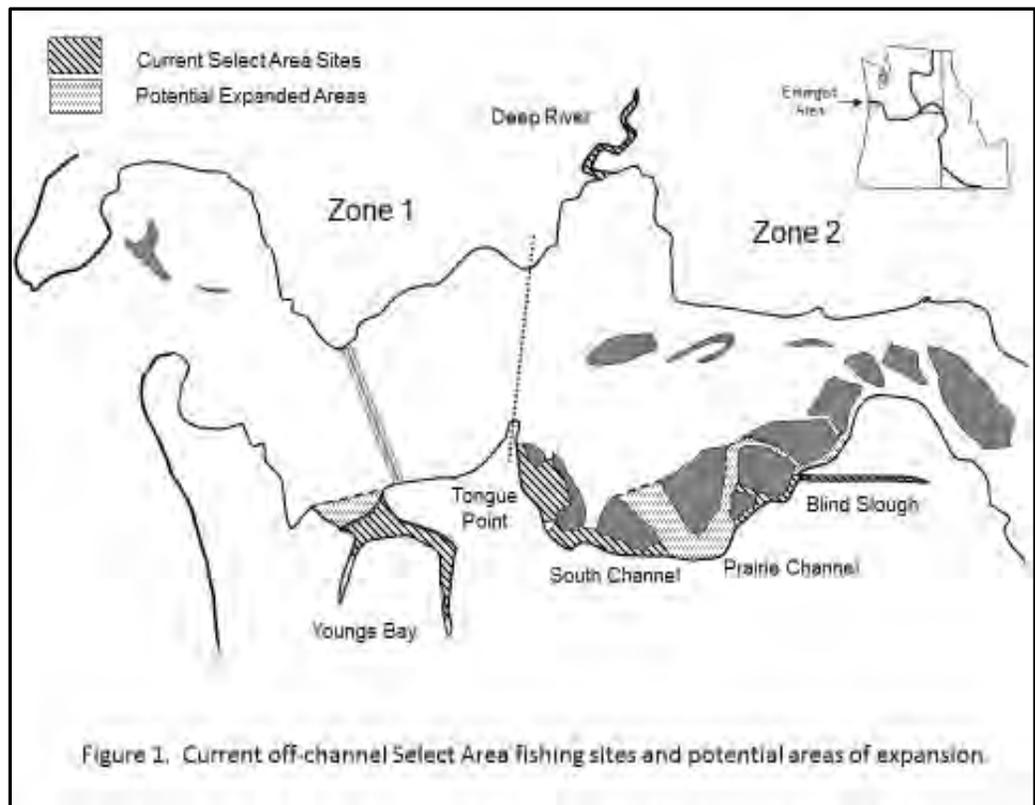
Non-local upriver spring Chinook comprised an average of 21% of the landed catch in Tongue Point/South Channel and 11% in Knappa/Blind Slough. On average, upriver impacts accrued during the winter season weeks accounted for 23% of the annual impacts accumulated in Tongue Point during the winter-spring season. Winter landings made up 21% and 0.5% of the total landings for Tongue Point and Knappa Slough, respectively, during the winter-spring season. Despite the fact that winter landings were relatively low, they averaged 38% of winter-spring ex-vessel revenue.

Although fishing effort was low during the winter season (due to lower fish abundance at that time), it provided an important opportunity to harvest fish when ex-vessel prices tend to be two times greater than during the spring season. This opportunity comes at a relatively low impact cost when compared to subsequent weeks of the spring fishery.

Expanding the spring season into the summer (June 16 – July 19) was evaluated in Tongue Point/South Channel and Blind Slough/Knappa Slough areas during 2016 because catch rates remained adequate and impacts were available. This expansion added a total of 20 fishing days, 100 deliveries, and 1,137 harvested spring Chinook (ex-vessel value of \$72,562) for both sites combined. When there are sufficient numbers of harvestable fish in the area and available impacts, extension of the spring season into a summer timeframe appears to be a viable opportunity to increase harvest of hatchery origin Select Area stock spring Chinook.

Area Boundary Expansion: To determine if the boundaries of existing Select Area sites can be expanded to provide additional fishing area, test fishing was initiated in 2011 in areas adjacent to existing Select Area sites during the spring and/or fall (Figure 1). Test

fishing in potential expanded areas concluded in fall 2015 once each site had been evaluated. Potential for expanding area boundaries was evaluated in Outer Youngs Bay (spring/summer/fall 2013-15), Lower Prairie Channel (spring/fall 2012-15), Grant Slough (spring/fall 2011-15), and Upper Prairie Channel (spring/fall 2011-15). These four areas are identified by shading in Figure 1; Outer Youngs Bay is downstream of the current open area while the Prairie Channel and Grant Slough sites are between South Channel and Blind Slough. Our sampling design targeted a total of three seasons to be evaluated at each site, thus, not all seasons were evaluated every year at each site. Test fishing was also conducted in Inner Youngs Bay (spring/summer 2013-15) to provide a reference to an established Select Area site. Spring analysis focused on data for a “standard” season (statistical weeks 7-12 and 16-24 for Youngs Bay, and weeks 7-12 and 17-24 for Tongue Point/South Channel and Blind Slough/Knappa Slough). Test fishing effort and catch to date are summarized in Tables 5 (spring) and 6 (fall).



Among the expansion sites tested in the spring, Chinook catch rates were highest in Lower Prairie Channel. However, the percentage of upriver spring Chinook in the catch and steelhead catch rates were also highest in this location, indicating that this area may be more heavily used as a migration route by upriver spring Chinook and steelhead, compared to the other expansion sites considered in the spring. Because of this reason, this site has the potential to accumulate impacts rapidly and limited potential as an expanded area.

Fall Chinook catch rates were highest in Lower Prairie Channel and this site also had the highest percentage of non-local bright stock Chinook in the catch. Together Upper and Lower Prairie Channel had the highest percentage of unmarked tule-stock Chinook in the catch. Lower Prairie Channel also had the highest steelhead catch rates; as in spring, Lower Prairie Channel appears to be more heavily used by non-local Chinook and steelhead than the other potential expansion sites.

Table 5—Summary of **winter-spring-summer** Select Area site expansion test fishing results, 2013-2015.

Sampling Area	Year	Fisher-Days ^a	Drifts	Catch (Adults)			
				Chinook ^b	Chinook/Drift	% Upriver	Steelhead
Inner Youngs Bay	2013	20	40	13	0.33	0%	3
	2014	12	23	14	0.61	0%	4
	2015	6	24	87	3.63	8%	4
	Sum/Avg	38	87	114	1.52	3%	11
Outer Youngs Bay	2013	19	40	7	0.18	14%	3
	2014	20	44	5	0.31	20%	2
	2015	39	137	33	0.28	9%	8
	Sum/Avg	78	201	45	0.19	14%	13
Lower Prairie Channel	2013	22	70	56	0.80	34%	19
	2014	20	60	80	1.33	55%	25
	2015	29	29	15	0.52	33%	3
	Sum/Avg	71	159	151	0.88	41%	47
Grant Slough	2013	--	--	--	--	--	--
	2014	20	20	0	0	0	2
	2015	56	56	17	0.30	29%	4
	Sum/Avg	76	76	17	0.30	29%	6
Upper Prairie Channel	2013	23	43	9	0.21	11%	10
	2014	20	20	6	0.30	67%	6
	2015	27	27	21	0.78	24%	1
	Sum/Avg	70	90	36	0.43	34%	17

^aStandard season weeks: YB = 7 to 12 & 16 to 24; TP/SC and BS/KS = 7 to 12 & 17 to 24.

^bMay include some summer Chinook.

Table 6—Summary of fall Select Area site expansion test fishing, 2011-2015.

Sampling Area	Year	Fisher Days	Drifts	Catch (Adults)			
				Chinook	Coho	Steelhead	CHF/STH
Outer Youngs Bay	2011	--	--	--	--	--	--
	2012	--	--	--	--	--	--
	2013	14	29	18	32	3	6.00
	2014	40	80	106	304	12	8.83
	2015	22	47	27	23	1	27.00
	Sum	76	156	151	359	16	13.94
Lower Prairie Channel	2011	--	--	--	--	--	--
	2012	12	34	50	21	6	8.33
	2013	12	32	135	76	8	16.88
	2014	18	54	151	126	16	9.44
	2015	--	--	--	--	--	--
	Sum	42	120	336	223	30	11.55
Grant Slough	2011	10	21	15	5	0	0
	2012	12	26	30	4	1	10.00
	2013	11	20	16	29	1	36.00
	2014	--	--	--	--	--	--
	2015	--	--	--	--	--	--
	Sum	33	67	61	38	2	23.00
Upper Prairie Channel	2011	10	19	15	5	0	0
	2012	12	24	20	3	2	10.00
	2013	10	18	22	8	1	22.00
	2014	--	--	--	--	--	--
	2015	--	--	--	--	--	--
	Sum	32	61	57	16	3	16.00

Although spring test fishing data for Outer Youngs Bay suggested that impact use could be relatively low there, these results may have been biased low due to high predation rates by sea lions, i.e., if Chinook were consumed before they could be observed then the actual impact rate could be higher than anticipated. In addition, Outer Youngs Bay is immediately adjacent to the main river channel, and upriver spring Chinook can easily move into the area. Therefore, implementation of spring fisheries in this area could pose a substantial risk to off-channel fisheries as a whole. On the other hand, use of Outer Youngs Bay for fall fisheries may be possible due to acceptably high catch rates of fall Chinook and Coho, and relatively low catches of unmarked tule Chinook and Coho. Steelhead handle was also modest in the fall. Outer Youngs Bay is located on the outer fringe of the current Youngs Bay off-channel area, and as such has no access to infrastructure, and therefore could not directly receive any additional production; however, it could provide additional fishable area during the fall season. Expanding fishing area in the fall would also be contingent upon managing potential conflicts between recreational and commercial fishers if the YBCZ restrictions were lifted.

Upriver spring Chinook impact use in Grant Slough was low, and catches of unmarked tule Chinook and steelhead in the fall were low – despite this it has limited potential for implementation due to low catches and insufficient depths, i.e., fishable space, in much

of the area. The number of fishers that it could accommodate is likely small (≤ 5). Furthermore, because of the lack of road access and infrastructure, Grant Slough would not be able to receive additional production.

Evaluate the Feasibility of Establishing New Select Area (Off-Channel) Commercial Fishing Sites

As stated above, the Commission’s rules also include a policy objective to enhance the economic benefits of off-channel commercial fisheries by “*expanding existing seasons and boundaries in off-channel areas and/or establishing new off-channel areas (OAR 635-500-6705(7)(b)).*” (Emphasis added)

Area Evaluation: In early 2014, ODFW began a new examination of all terminal and off-channel areas of the Columbia River below Bonneville Dam that might hold the potential to become a new Select Area site. Twenty-nine areas were included in initial site evaluation (Table 7).

Table 7—Terminal and off-channel areas in the lower Columbia River downstream of Bonneville Dam that were considered for evaluation as potential, future Select Area fishery sites. (Arranged alphabetically not geographically).

• Bachelor Island Slough	• Cowlitz River	• Martin Slough
• Baker Bay	• Dibblee Slough	• Multnomah Channel
• Bradbury Slough	• Elochoman Slough	• Pierce Island
• Camas Slough	• Fisher Island	• Sandy Island Slough
• Carrols Channel	• Grays Bay	• Skipanon Waterway
• Cathlamet Channel	• Hayden Island	• Steamboat Slough
• Clifton Channel	• Knappa Slough	• Svensen
• Coal Creek Slough	• Lake River	• Wallace Island
• Coffee Pot Island	• Lewis River	• Westport Slough
• Columbia River Gorge	• Lower Willamette River	

A panel of agency subject matter experts scored each of the 29 sites using a suite of criteria (Table 8) that considered attributes that ranged from homing potential to infrastructure to potential number of fishers who could use the site at any one time.

Table 8—Site attributes that were scored by panel members to rank off-channel sites to be evaluated for potential fisheries development.

• Capacity (i.e. fishable area)	• Definable boundary
• Potential for non-local harvest	• Known dock present
• Potential for homing	• Terminal or Off-Channel
• Rearing site potential	• Enforceable boundary
• Potential for negative residential interaction	• Fisher access
• Potential for negative navigational interaction	

Initial screening identified three primary candidate sites: Clifton Channel (OR), Westport Slough (OR), and Coal Creek Slough (WA) for further evaluation using adult test fishing and examination of attributes related to juvenile rearing, acclimation, and homing (Figure

2). In an effort to add an additional moderate size location, Bradbury Slough (OR) was added to the list of candidate sites in 2015.

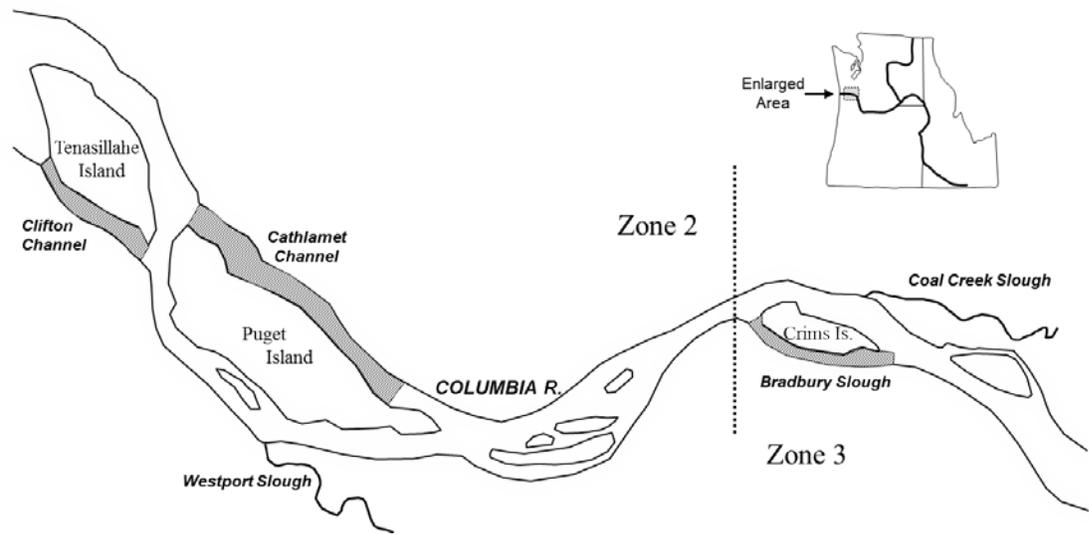


Figure 2—Potential new Select Area site locations evaluated as part of harvest reform efforts. (NOTE: WDFW began releases of spring Chinook into a potential new Cathlamet Channel Select Area site in 2012, and adult test fishing there is ongoing. We include information for Cathlamet Channel when available and where appropriate).

Adult Presence Evaluation: Similar to the expansion sites, spring test fishing analysis for the potential new sites was focused on the “standard” Select Area season. Test fishing effort and catch to date for the potential new sites are summarized in Tables 9 (spring) and 10 (fall).

The Chinook catch rate, the percentage of upriver spring Chinook, and the steelhead catch rate were all highest in side-channel areas (Clifton Channel and Bradbury Slough), and lowest in terminal areas (Westport Slough and Coal Creek Slough). Because side channels can be heavily used by migrating spring Chinook and steelhead, Clifton Channel and Bradbury Slough have the potential to accumulate impacts rapidly during the spring.

Table 9— Spring test fishing results for potential new Select Area sites (2014-2016) during standard season^a weeks.

Sampling Area	Year	Fisher-Days ^a	Drifts	Catch (Adults)			
				Chinook	Chinook/Drift	% Upriver	Steelhead
Clifton Channel	2014	37	148	92	0.62	37%	38
	2015	26	109	98	0.90	48%	35
	2016	--	--	--	--	--	--
	Sum/Avg	63	257	190	0.76	42%	73
Westport Slough	2014	32	126	6	0.05	0%	9
	2015	22	88	64	0.73	3%	26
	2016	22	88	45	0.51	0%	4
	Sum/Avg	76	302	115	0.43	1%	39
Bradbury Slough	2014	--	--	--	--	--	--
	2015	42	171	64	0.37	39%	42
	2016	19	75	58	0.77	19%	32
	Sum/Avg	61	246	122	0.57	29%	74
Coal Creek Slough	2014	16	64	0	0.00	0%	0
	2015	20	80	4	0.05	0%	9
	2016	--	--	--	--	--	--
	Sum/Avg	36	144	4	0.03	0%	9

^aStandard season weeks include weeks 7-12 and 17-24 for new Select Area evaluation sites.

Table 10— Fall test fishing results for potential new Select Area sites (2014-2016). (INC = sampling is incomplete for the year).

Sampling Area	Year	Fisher Days	Drifts	Catch (Adults)			
				Chinook	Coho	Steelhead	CHF/STH
Clifton Channel	2014	20	82	71	174	9	7.89
	2015	20	78	55	29	10	5.50
	2016	--	--	--	--	--	--
	Sum	40	160	126	203	19	6.69
Westport Slough	2014	38	152	144	138	0	0.00
	2015	--	--	--	--	--	--
	2016	--	--	--	--	--	--
	Sum	38	152	144	138	0	0.00
Bradbury Slough	2014	--	--	--	--	--	--
	2015	18	72	68	10	12	5.67
	2016 ^a	INC	INC	INC	INC	INC	INC
	Sum	INC	INC	INC	INC	INC	INC
Coal Creek Slough	2014	22	88	15	32	2	7.50
	2015	18	72	13	9	4	3.25
	2016 ^a	INC	INC	INC	INC	INC	INC
	Sum	INC	INC	INC	INC	INC	INC

^a2016 fall test fishing not yet complete in Bradbury and Coal Creek sloughs.

Fall Chinook catch rates were highest in Westport Slough and Bradbury Slough, and lowest in Coal Creek Slough. We found the highest percentage of unmarked tule Chinook in Westport Slough and Coal Creek Slough, and the highest percentage of non-local upriver bright Chinook Salmon were found in Clifton Channel and Bradbury Slough. Coho catch rates were highest in Clifton Channel and Westport Slough, with relatively low mark rates in Westport Slough. Due to concerns with impacts on wild tule Chinook and Coho salmon, fall test fishing was discontinued in Westport Slough after 2014. The off-channel sites of Bradbury Slough and Clifton Channel had the highest catch rates for steelhead, and also had the highest percentage of wild Group B steelhead in the catch.

Based purely on adult test fishing and likely due to their terminal nature, Coal Creek Slough and Westport Slough appear to present the best options for establishing new off-channel fishing sites in the spring due to their low encounter rates of upriver spring Chinook. Coal Creek Slough also had a very low encounter rate for unmarked winter steelhead. Although their fishable areas are relatively small, these terminal sites could allow spring fisheries within their boundaries to operate with minimal impact to ESA-listed stocks.

Because wild Group B steelhead impacts can be very limiting for fall fisheries, Bradbury Slough and Clifton Channel would likely not be feasible as fall fishery locations based on adult test fishing data. Westport Slough would also not be feasible in the fall because of high encounter rates for ESA-listed tule Chinook and Coho. Although Coal Creek had a high percentage of unmarked tules Chinook in the catch, the overall catch rates were low, as was the encounter rate for steelhead. Because of these factors Coal Creek appears to be the only feasible option for establishing a new off-channel fishery in the fall.

Juvenile Acclimation and Homing Potential Evaluation: Potential new sites were also evaluated for their capability to support successful acclimation and homing of salmon released from the sites. This evaluation was based on:

- Infrastructure for anchoring and securing juvenile net pens (e.g. pilings, docks, etc.).
- Permission from upland landowners for access to, and use of, infrastructure (only checked for the most promising locations).
- Minimum low tide depth of 10 feet at net pen site.
- Adequate water quality for rearing or acclimation of juveniles, and holdover of returning adults.
- Unique water source and sufficient discharge for successful imprinting of juveniles and homing of returning adults.

Existing infrastructure capable of securing net pens was only available at two sites (one each in Coal Creek and Bradbury sloughs); if existing infrastructure is not available the cost to implement a new site increases dramatically. The majority of surveyed locations were not checked for access permission because of their low potential for implementation. Of the five locations where landowner contact was made, three landowners (one each at Coal Creek Slough, Westport Slough, and Bradbury Slough) gave tentative permission for access.

We found at least one location with adequate depth for supporting net pens at each of the candidate sites (range 1-4). Although water quality was good year-round in the side

channel sites (Clifton Channel and Bradbury Slough), summer water temperatures in the terminal sites (Westport Slough and Coal Creek Slough) were elevated, and could present a problem for early returning fall salmon. Only Coal Creek Slough had a unique water source (Coal Creek) with sufficient discharge, using existing acclimation techniques, to facilitate imprinting of juveniles and homing of returning adults.

Although no one site met all the requirements for acclimation and homing, there was a site within Coal Creek Slough that appeared to have the best overall potential. However, that site would need to have infrastructure put in place.

New Net Pen Cost Evaluation: We estimated costs for developing a juvenile net pen site at each of the potential new Select Area sites. Although costs for Clifton Channel and Bradbury Slough were calculated, we do not include them there as we aren't recommending them for further evaluation. Costs for Westport and Coal Creek sloughs are presented in Table 11. In our costing exercise we assumed no existing infrastructure at the net pen sites and that costs would be same for all four sites. The variation in total estimated costs between sites is then due to fish transportation costs (i.e. distance from the hatchery) and the number of fish that needed to be coded-wire tagged.

We found that Westport Slough had lowest estimated total cost to implement, but this was due to only acclimating spring Chinook which meant that there were 100,000 fewer fish than the other sites), and that Coal Creek Slough had the second lowest estimated total cost. Costs at Coal Creek Slough were lower due to (assumed) lower transportation costs from its relatively close proximity to a potential source hatchery.

Table 11—Estimated costs associated with development of juvenile acclimation facilities for potential new Select Area sites in Westport and Coal Creek sloughs. (CWT = Coded Wire Tagging).

<i>Westport Slough</i>		
Dock:	8' x 100' dock with 60 ft. gangway	\$ 75,000
Pilings:	4 pilings (materials, install, and mobilization)	\$ 16,000
Pens:	One, 4-pen unit	\$ 30,000
Nets:	Four nets @ \$875 each	\$ 3,500
Trucking:	Spring Chinook: 181 miles @ \$2.25/mile (12 loads)	\$ 9,774
CWT:	Spring Chinook: 300,000 @ \$0.17/fish	\$ 51,000
Total:		\$185,274

Assumptions:

- An upland landowner will be found who is willing to have a dock constructed on their property and provide access to ODFW
- Potential undetermined costs not included: Federal/state/county permits, submerged land lease fee with upland owner, fish feed during acclimation period, recurring maintenance
- Spring Chinook and originating from the Marion Forks Hatchery
- Releases of Coho are not planned due to potential for high catch rates of ESA-listed wild, tule fall Chinook and Coho
- 100% marking/tagging initially to evaluate site performance
- Dock and piling costs could be reduced if a planned expansion (timeline unknown) to the Kerry West Marina is successfully completed and ODFW is granted permission to access and utilize private infrastructure

Table 11 (continued).

Coal Creek Slough

Dock:	8' x 100' dock with 60 ft. gangway	\$ 75,000
Pilings:	4 pilings (materials, install, and mobilization)	\$ 16,000
Pens:	One, 4-pen unit	\$ 30,000
Nets:	Four nets @ \$875 each	\$ 3,500
Trucking:	Spring Chinook: 50 miles @ \$2.25/mile (8 loads)	\$ 1,800
	Coho: 50 miles @ \$2.25/mile (8 loads)	\$ 1,800
CWT:	Spring Chinook: 200,000 @ \$0.17/fish	\$ 34,000
	Coho: 200,000 @ \$0.17/fish	\$ 34,000
	Total:	\$196,100

Assumptions:

- Potential undetermined costs not included: Federal/state/county permits, submerged land lease fee with upland owner, additional pilings, feed during acclimation period, recurring maintenance
- Trucking costs are unknown as this site is in Washington waters and production site is undetermined
- Fish originate from Washington facility 50 miles from Coal Creek and trucking/tagging costs are equal to those for ODFW
- Does not include personnel costs
- 100% marking/tagging initially to evaluate site performance
- Piling costs could possibly be eliminated if agreement is reached with upland landowner possessing existing infrastructure

Economic Assessment of New Sites: Potential annual ex-vessel value was estimated for the four new Select Area candidates (Table 12). We used average harvest rates from current Select Area sites during 2013-15 to estimate harvest of returning adults. Harvest rates were applied to the maximum number of smolts that could be released from each site. For consistency with pre-Harvest Reform modeling, we did not include harvest and ex-vessel value of non-Select Area stocks in analyses for this section. It should be noted that actual revenue from harvest of non-local stocks could be significant in side-channel sites such as Clifton Channel and Bradbury Slough because they are migration corridors for multiple stocks. We estimated ex-vessel values for two scenarios in Coal Creek Slough: 1) spring Chinook and Coho production, and 2) spring Chinook production only (to maximize value and avoid water quality issues in the fall for returning Coho).

Our results indicate that production of spring Chinook only at Westport Slough and Coal Creek Slough would yield the highest ex-vessel values (approximately \$123,000 per year at each site). If the goal is to maximize ex-vessel value, because of the far greater value of spring Chinook compared to Coho, the available net pen space at Coal Creek Slough would be better used by focusing production on spring Chinook only. However, if the goal is to have a new Select Area site for that is capable of supporting multiple fisheries across seasons, then all of the potential new sites, with the exception of Westport Slough, would be capable of producing the same ex-vessel value of approximately \$97,000 per year by releasing both spring Chinook and Coho salmon.

Table 12—Estimated annual ex-vessel revenue from commercial fisheries in potential new Select Area sites.

Site	Smolts Released		Adults Harvested		Ex-Vessel Value		
	CHS	Coho	CHS	COH	CHS	COH	Total
Clifton Channel	200,000	200,000	780	3,120	\$61,456	\$35,318	\$96,775
Westport Slough	400,000	n/a	1,560	n/a	\$122,912	n/a	\$122,912
Bradbury Slough	200,000	200,000	780	3,120	\$61,456	\$35,318	\$96,775
Coal Creek Slough	200,000	200,000	780	3,120	\$61,456	\$35,318	\$96,775
Coal Creek Slough	400,000	n/a	1,560	n/a	\$122,912	n/a	\$122,912

Assumptions:

- Spring Chinook harvest rate and \$/fish are 0.39% and \$78.79, respectively
- Coho harvest rate and \$/fish are 1.56% and \$11.32, respectively
- Harvest rates in potential new sites will be equal to those in current Select Area fisheries
- Straying among returning adults is minimal and fish persist in the area for a sufficient amount of time to be harvested in commercial fisheries

Conclusions for Potential New Sites: The combined assessment for both the adult and juvenile aspects of new site selection is presented in Table 13.

Table 13—Overall assessment of potential new Select Area sites following adult test fishing and juvenile acclimation evaluations.

Evaluation Site	Adult Assessment	Juvenile Assessment
Clifton Channel	<ul style="list-style-type: none"> • Excessive catch of upriver spring Chinook 	<ul style="list-style-type: none"> • Lacking acclimation infrastructure • Questionable homing source/potential for straying
Westport Slough	<ul style="list-style-type: none"> • Spring: OK for development • Fall: natural-origin Coho present 	<ul style="list-style-type: none"> • Lacking acclimation infrastructure; access permission contingent on Kerry West expansion • Potential straying to Clatskanie
Bradbury Slough	<ul style="list-style-type: none"> • Upriver spring Chinook catch could lead to ineffectual use of SA allocation 	<ul style="list-style-type: none"> • Insufficient homing source; potential for straying
Coal Creek Slough	<ul style="list-style-type: none"> • OK for spring and fall 	<ul style="list-style-type: none"> • Lacking acclimation infrastructure • No access permission at existing dock • Potential water quality issues (temperature, dissolved oxygen)

As expected, the sites with the highest potential are both terminal locations. Coal Creek Slough appears to have the most overall potential for implementation as a new Select Area site. Although it could be used for both spring and fall seasons, focusing on spring Chinook would provide the greatest economic return, and avoid potential water quality issues during the summer and early fall. A potential net pen site has been identified;

however, it lacks usable infrastructure, so building the necessary structures would present a significant cost (~\$125,000). In addition, the fishable area is relatively small, so a large number of fishers could not be accommodated. Westport Slough also has potential for implementation during the spring; however, its fishable area is also small and the ability to obtain a location for a net pen site is still uncertain.

Spring Chinook Impact Use Assessment for Existing, Expanded and New Off-Channel Areas: Beginning in 2017, and in accordance with the Commission policies, commercial fisheries are scheduled to be allocated 20% of the harvestable spring Chinook impacts (see Table 1) with the understanding that the priority for those impacts will be for use in off-channel areas. To evaluate this potential, the upriver spring Chinook impacts expected to be used by current, expanded current, and new off-channel sites after full implementation of the Harvest Reform Policy in 2017 were evaluated (Table 14). We assumed that these would become standard seasons to be implemented in Select Areas beginning in 2017. These standard seasons represent our best estimates of seasons that will optimize the balance between maximizing exploitation of Select Area production and expenditure of impacts. We estimate that these seasons will, on average, increase overall impact use to 0.27%. This is compared to a recent average of 0.18%, which incorporates years with substantial closures of Select Area spring fisheries to remain within ESA allocations and buffers. With 0.40% of the spring Chinook impacts (20% of the overall 2% impact rate) allocated to Select Areas beginning in 2017, this leaves an average of 0.13% to cover unexpected increases in impacts for standard seasons, or for expanded and new sites in addition to standard seasons, as well as potential tangle net opportunities in the mainstem following positive run updates (typically mid-May).

From an impact standpoint, existing Select Area fisheries could be standardized to provide more certainty of consistent fishing opportunity, and additional opportunity could be provided by adding Outer Youngs Bay and Grant Slough as expanded sites, and adding Westport Slough and Coal Creek Slough as new sites. These could all be implemented while remaining within the *modeled* overall commercial allocation for spring Chinook. However, given uncertainties surrounding pinniped predation biases, adding Outer Youngs Bay in the spring could pose a risk to Select Areas in general.

Table 14—Estimated Select Area upriver spring Chinook impacts for current, expanded, and potential new sites during winter/spring seasons. Standard season impact estimates utilize Youngs Bay season structure (weeks 7 to 12 and 16 to 24) for Youngs Bay and Outer Youngs Bay and a Tongue Point season structure (weeks 7 to 12 and 17 to 24) for all other sites.

	Current Season Impacts	Expected Standard Season Impacts
Current Select Areas		
Youngs Bay	0.140%	0.223%
Tongue Point	0.024%	0.034%
Blind/Knappa	0.011%	0.016%
Deep River	0.004%	
Subtotal	0.179%	0.273%
Expanded Select Areas		
Outer Youngs Bay	n/a	0.033%
Lower Prairie Channel	n/a	2.019%
Grant Slough	n/a	0.026%
Upper Prairie Channel	n/a	0.284%
Subtotal	--	2.361%
New Areas		
Clifton Channel	n/a	1.035%
Cathlamet Channel (Low & Mid only)	n/a	1.508%
Westport Slough	n/a	0.013%
Coal Creek Slough	n/a	0.000%
Bradbury Slough	n/a	0.241%
Subtotal	--	2.797%
GRAND TOTAL (%)	0.179%	5.431%

ISSUE 3

EVALUATION OF ALTERNATIVE COMMERCIAL FISHING GEAR AND TECHNIQUES

ANALYSIS

Another policy objective adopted in rule by the Commission is: “develop and implement selective fishing gear and techniques for commercial mainstem fisheries to optimize conservation and economic benefits consistent with mainstem recreational objectives” (OAR 635-500-6705(8)). Since 2009, Oregon and Washington fisheries staff have been evaluating alternative gear types for use in Columbia River commercial fisheries. Department funding for this research is from base budget and federal Mitchell Act funds, in addition to funding appropriated and authorized through SB 830 passed by the Oregon legislature in 2013.

Summary of Alternative Gear Feasibility Evaluations conducted by ODFW and WDFW 2009-2016

In an effort to determine the feasibility of implementing live-capture mark-selective fisheries (MSF) in the mainstem Columbia River, ODFW and WDFW have evaluated 13 combinations of alternative commercial fishing gears and seasons between 2009 and 2016. Alternative gears were evaluated on:

- Catch rate and mark rate of target species;

- Handle of non-target species and condition at release; and
- Economic and social/regulatory considerations for fishery implementation.

The results of individual gear evaluations are summarized in supporting documentation (Attachment 5).

Of note, no single gear type was satisfactory in all categories; each alternative gear has positive and negative characteristics. Gears were considered to have high feasibility for fisheries implementation if they had high catch rates for target species, low handle of non-target species, and low economic/social/regulatory impediments to implementation. Some gears rated fairly high in catch rates for target species, but issues such as non-target fish handle and economic performance still posed significant challenges.

Fall purse and beach seines were implemented in limited entry fisheries during 2014-16, and ODFW issued experimental gear permits to purse seiners to harvest shad in the spring. Due to market volatility, spring seining operations for shad have met with limited success.

The Coho tangle net had lower catch rates of target fish, but has a reasonable chance for long-term fishery implementation based on favorable ratings for target species mark rate, handle of non-target species, and economic/social factors. Low gear investment cost was a particularly important consideration in this favorable determination. The Coho tangle net was implemented in late fall commercial fisheries during 2013-15, with one successful year in 2014 and modest harvests in 2013 and 2015.

A few promising alternative gears have been implemented in trial commercial fisheries, and we will continue to closely monitor and evaluate these gears to determine whether or not these alternative fisheries can be successfully prosecuted in broad scale fisheries over a longer time frame.

Evaluation of Post-Release Mortality Rates of Fish Released from Alternative Commercial Fishing Gear

Purse and Beach Seine Evaluations: Immediate mortality rates can be derived relatively easily from observation of actual fisheries; however, estimation of post-release mortality rates requires specially designed, and statistically rigorous, studies. Post-release mortality studies were conducted for the three alternative gear types with the most promising prospects for fisheries implementation: fall purse seine, fall beach seine, and Coho tangle net.

WDFW conducted a post-release mortality study using a Ricker-Two-Release (RTR) study design. This design was very similar to one conducted to evaluate post-release mortality of spring Chinook in tangle nets. The study was conducted to assess mortality of fall Chinook, Coho, and steelhead caught in Commercial Zone 5 by purse and beach seines during 2011-2013, and it evaluated survival over a few important time scales; short-term (survival in the gear during capture + survival to Bonneville Dam PIT tag detection), and intermediate-term (survival from Bonneville Dam PIT tag detection to McNary Dam PIT tag detection).

Steelhead survival (short-term plus intermediate) estimates were high (range 95-99% survival). Valid post-release mortality rates for Coho could not be estimated due to PIT tagged treatment and control groups not being comprised of fish from the same population (RTR method), and low detection probabilities/high tag loss in the radio-telemetry study, both of which violated key assumptions of the method.

Intermediate-term survival estimates for fall Chinook were also high (range 95-100%). However, short-term survival estimates for Chinook using the RTR method were lower (range 60% to 94%) and may have been confounded by violating one or more of the method assumptions. The proportion of fish PIT-tagged as juveniles in interior basins, subsequently captured in the treatment group and then detected at Bonneville Dam was high (89-100%); however, the proportion of treatment group fish PIT-tagged during the study that ultimately passed Bonneville Dam was substantially lower. The yearly sample sizes for these PIT-tagged as juveniles treatment fish were small (range 10 – 36 per year), precluding the ability to solely use this information to calculate survival rates. A radio-telemetry study was also conducted for Chinook in 2013 to evaluate migratory behavior of treatment fish, in an attempt to produce an adjusted short-term survival estimate. Radio-telemetry results suggested that cumulative survival (short-term combined with intermediate-term survival) was high for fall Chinook (range 92-95%), but this finding was dependent upon the assumption that a high proportion of treatment-group Chinook originating from areas downstream of Commercial Zone 5, which would differ from the control group collected at Bonneville Dam. This assumption is completely at odds with long-term stock composition data from coded wire tags (CWT) from fisheries in Commercial Zone 5 *and* the results of the genetics study (described below) both which indicate very low presence of lower river Chinook in this area.

To determine whether or not the key assumption in the radio-telemetry adjustment to the seine survival estimate for fall Chinook had any validity, ODFW conducted a stock composition study during 2015 using DNA samples and CWTs obtained from Chinook caught by purse seines, beach seines, and gill nets in Commercial Zone 5. Both DNA and CWT analyses indicated that very few ($\leq 3\%$) of the Chinook had origins below Commercial Zone 5 (Figure 3), nor was there a significant difference in stock composition between Chinook caught in purse seines, beach seines, and gill nets ($p = 0.825$).

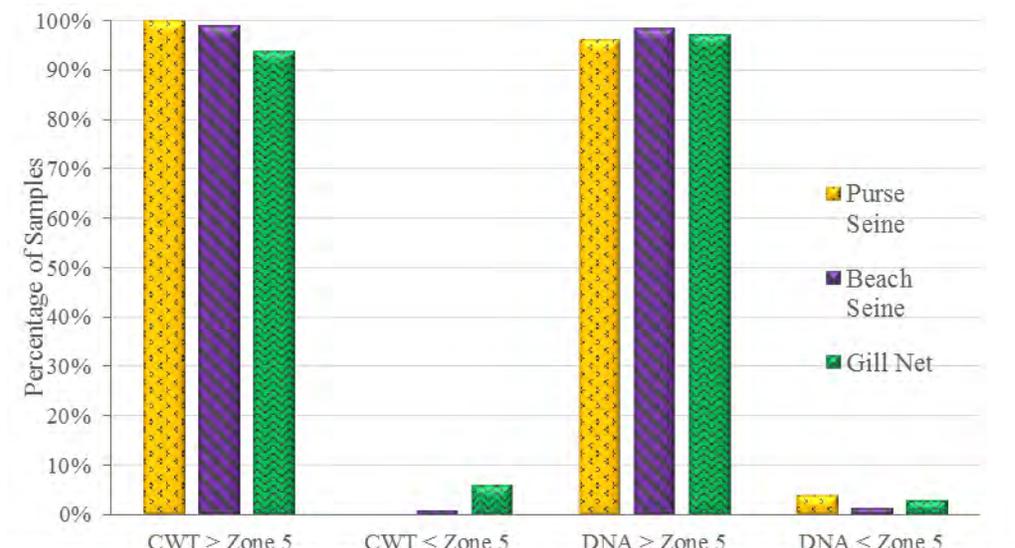


Figure 3—Stock composition (based on CWT and DNA analysis), above and below Commercial Zone 5, of adult Chinook caught in Commercial Zone 5 by purse seine, beach seine, and gill net in August and September, 2015.

Both the long-term CWT stock composition and the information from the 2015 genetics study raise questions about the validity of survival estimate adjustments made from the radio-telemetry data. As a result, explanations for potential confounding effects in the RTR study remain unknown. In the face of confounding information the *U.S. v Oregon* Technical Advisory Committee (TAC) adjusted the estimated Chinook and Coho survival rates from the RTR to take into account historical CWT data when estimating ESA impacts,. Chinook mortality rates (1-survival rate) currently used are 33% for beach seines and 21% for purse seines. Coho mortality rates are 38% for beach seines and 29% for purse seines. The steelhead mortality rates derived from the RTR study have been refined and are now 5% for beach seines and 2% for purse seines. Although the adjusted RTR Chinook estimates seem incongruous with the information from fish PIT-tagged as juveniles, they are currently the only estimates accepted by NOAA Fisheries and the *US v Oregon* co-managers.

Coho Tangle Net Evaluation: The ODFW conducted a post-release mortality study for Coho salmon captured in tangle nets during 2013-16. The 2013-14 study used the RTR method, similar to the seine mortality study conducted by WDFW. During the second year of the evaluation ODFW researchers realized that critical assumptions with the study design were being violated and the mortality estimates derived were also likely confounded by differential migratory behavior of treatment and control fish.

In 2015, the study design was changed to a net-pen holding study, with all Coho treatment groups held for at least two days (short-term holding), and a subset of treatment groups held for an additional six days (long-term holding). Short and long-term holding tests resulted in mortality rate estimates of 7.5% (95% CI: 4.9% to 11.4%) and 4.9% (95% CI: 1.7% to 13.5%), respectively. We are repeating the net-pen holding study in 2016; however, final results are not yet available.

The cumulative post-release mortality estimate for Coho tangle nets is currently 22.3% (including an observed immediate mortality rate of 11.6% from the 2013-15 Coho tangle net fisheries).

Implementation of Alternative Gear Fisheries

Seine Fishery Implementation: Fall commercial seine fisheries were conducted in the lower Columbia River in 2014 through 2016 (finalized data from the 2016 fishery not yet available). Except for two fishing days in 2016 (one each for purse and beach seine), the seine fishery was mark-selective for fin-clipped hatchery Chinook and Coho salmon. The fishery was conducted on a limited entry basis, with individual fisher quotas (IFQ) assigned to each permit holder (Table 15). The IFQ approach allowed for reliable management of ESA impacts and ensured that 100% of seine fishing trips had an ODFW or WDFW observer on board.

Chinook landings for the 2014-15 seine fisheries averaged 2,894 fish (adults and jacks), with an average annual ex-vessel value of \$53,420 (Table 16). Coho landings averaged 829 fish, with an average annual ex-vessel value of \$7,404 (Table 17).

Table 15—IFQs for fall commercial seine fisheries, 2014-16.

Year	Gear	Chinook ¹	Coho ¹	Steelhead
2014	Beach	500	250	360
	Purse	750	450	360
2015	Beach	400	150	180
	Purse	650	200	150
2016	Beach	600	400	320
	Purse	750	600	230

¹ Kept adults

For purse and beach seines combined, mark rates averaged 39% for Chinook and 38% for Coho during 2014-15 fisheries, and resulted in >1½ times as many unmarked salmon being released for every marked salmon kept. Beach seines had a higher Chinook mark rate compared to purse seines, possibly due to a greater propensity to capture near-shore travelling tule stock Chinook, which are marked at a higher rate than upriver bright Chinook. The ratio of steelhead to kept marked adult Chinook averaged 0.40 for beach seines and 0.16 for purse seines during 2014-15 seine fisheries. This ratio may have been higher for beach seines because of a greater likelihood of also capturing near-shore travelling steelhead in that gear. Observed immediate mortality rates for Chinook, Coho, and steelhead were < 0.5% for both beach and purse seines.

Table 16—Chinook salmon landed in the commercial fall seine fishery, 2014-15.

Year	Gear	Days Fished	Permits Fished	Chinook Landed ¹	Mark Rate	Avg Wt (lb)	Avg \$/lb	Value/ Fish	Total Ex-Vessel Value
2014	Beach	12	6	1,337	44%	13.1	\$1.52	\$19.93	\$26,647
	Purse	15	4	1,457	33%	13.5	\$1.47	\$19.74	\$28,760
	Total	27	10	2,794	38%	13.3	\$1.49	\$19.83	\$55,407
2015	Beach	6	3	681	64%	10.9	\$1.39	\$15.21	\$10,360
	Purse	14	4	2,312	38%	10.4	\$1.71	\$17.77	\$41,075
	Total	20	7	2,993	41%	10.5	\$1.63	\$17.18	\$51,434
2014-15 Avg		24	9	2,894	39%	11.9	\$1.56	\$18.51	\$53,420

¹ Includes adults and jacks.**Table 17**—Coho salmon landed in the commercial fall seine fishery, 2014-15.

Year	Gear	Days Fished	Permits Fished	Coho Landed ¹	Mark Rate	Avg Wt (lb)	Avg \$/lb	Value/ Fish	Total Ex-Vessel Value
2014	Beach	12	6	509	35%	7.8	\$1.22	\$9.56	\$4,864
	Purse	15	4	561	29%	7.7	\$1.09	\$8.43	\$4,729
	Total	27	10	1,070	32%	7.8	\$1.15	\$8.96	\$9,593
2015	Beach	6	3	58	32%	6.8	\$1.50	\$10.19	\$591
	Purse	14	4	529	46%	5.7	\$1.52	\$8.74	\$4,624
	Total	20	7	587	44%	5.8	\$1.52	\$8.88	\$5,215
2014-15 Avg		24	9	829	38%	6.8	\$1.34	\$8.92	\$7,404

¹ Includes adults and jacks.

During the 2014 fall seine fishery, commercial fishers were tested on their ability to accurately identify live tule stock Chinook, using visual stock identification (VSI) techniques, in order to assess whether or not wild tule Chinook could be differentiated from wild upriver bright stock Chinook and subsequently released, as a means to reduce impacts on ESA-listed LCR tule Chinook. No training or guidance was provided prior to this effort, and fishers were asked to identify the stock based on their own expertise. Based on our results in 2014, it appears that some commercial fishers have a bias towards identifying a Chinook as “bright” based on a silvery appearance and how the fish will be graded by fish buyers (which affects the price they will receive for it), rather than on the biological origin of the fish. This assessment based on perceived market conditions more than biological indicators likely confounds the accuracy of the fleet’s stock identification ability (without any research or training on actual differentiating characteristics) and our ability to make inferences from the results.

VSI accuracy for purse seiners was 68%; however, it was only 35% for beach seiners. Since bright tule Chinook are more difficult to identify than bright stock Chinook due to overlapping characteristics, and beach seines appear to catch more tule Chinook, this may explain the lower VSI accuracy score of beach seiners.

When VSI accuracy scores for beach and purse seiners were combined, the fishers’ overall ability to accurately differentiate between the two stocks was 52%. This assessment is not sufficient to determine that VSI can be used at this time to selectively release wild tule Chinook with a high degree of reliability. A more rigorous assessment that involved training and guidance to fishers would likely better inform the management question.

Although catch rates could be relatively high, mark rates for target species were low, leading to high handle and release of unmarked (non-target) salmon. Steelhead encounter rates were lower for purse seines than beach seines but still high enough to be problematic and fishery constraining – despite very high post-release survival (95-98%). Low immediate mortality rates suggest fish condition may be good upon release; however, final post-release mortality rates from research studies are still pending.

Overall, and based on the 2014-15 fall seine fisheries, it appears that in the hands of experienced and skilled fishers, and fished in a location free of snags, beach and purse seines are capable of relatively high catch rates of target species. Less experienced or skilled seine fishers, or those fishing more marginal locations, had a much lower performance. Economic viability of seine fishery appears to be limited when low landings (constrained by steelhead encounters or low mark rates) and ex-vessel value (Table 18) are combined with high harvest costs associated with seine gear. Efforts to reduce bycatch of steelhead, increase overall catch of target species and value of landed catch, or offset costs of implementation with Transition Fund funding could alter this assessment

Table 18—Summary of combined Chinook and Coho landings and ex-vessel values for the 2014-15 fall seine fisheries.

Year	Gear	Avg Days Fished	Salmon Landed ²	Total Ex-Vessel Value
2014	Beach	4	1,846	\$31,511
	Purse	5	2,018	\$33,488
	Total	9	3,864	\$64,999
2015	Beach	3	739	\$10,951
	Purse	6	2,841	\$45,698
	Total	9	3,580	\$56,649
2014-15 Avg		9	3,722	\$60,824

¹ In 2015, the three beach seine permittees fished as a cooperative using one vessel and crew.

² Includes Chinook and Coho (adults and jacks).

³ Includes Capital. (Annual amortized loan cost for boats, net, and rigging), annual and daily operating costs. Assumes beach seiners do not need to purchase a new main vessel.

Coho Tangle Net Fishery Implementation: Coho tangle net fisheries were conducted in the lower Columbia River from 2013 through 2015. The implemented tangle net fisheries were mark-selective for fin-clipped hatchery Coho, and non-mark selective for Chinook (tule Chinook impacts are negligible in October). During 2013-15, ODFW and WDFW field staff observed an average of 9% of the Coho landed in the tangle net fishery.

Coho landings for the 2013-15 tangle net fisheries averaged 8,019 fish, with an average ex-vessel value of \$67,369. Chinook landings from the same fisheries averaged 1,914 fish, with an average ex-vessel value of \$32,112. Coho mark rates were high, averaging 76% during 2013-15 fisheries. The ratio of steelhead to kept marked adult Coho averaged 0.12; however, it was 0.02 in two of the three years. Observed immediate mortality rates for adult Coho averaged 11.6%, and there is a strong correlation between water temperature and immediate mortality rate ($R^2 = 0.95$), which also equates to a seasonal effect as water temperatures tend to decline later in the fall. Results of the analysis indicate that the volatility of Coho returns greatly affect landings and ex-vessel value from year to year (Table 19).

Table 19—Summary of combined Chinook and Coho landings and ex-vessel values for the 2013-15 Coho tangle net fisheries.

Year	Avg # of Vessels ¹	Salmon Landed ²	Total Ex-Vessel Value
2013	22	6,693	\$86,085
2014	27	20,222	\$162,732
2015	34	2,886	\$49,624
Average	28	9,934	\$99,480

¹ Represents the average number of vessels fishing during the season. Estimated based on average number of deliveries per day.

² Includes Chinook and Coho (adults and jacks).

Overall, the 2013-15 Coho tangle net fisheries had catch rates (catch of marked adults per drift) that were relatively low; however, the ability to make numerous drifts in a day helps mitigate for this. Coho mark rates were high in October when the tangle net fishery occurred, and harvesting excess hatchery fish is an important conservation action as well as an economic one. The handle of non-target species such as steelhead and Chum salmon was low in the tangle net fishery, as was the immediate mortality rate for encountered Coho. Combined with post-release mortality rates derived from research studies, we estimate a total mortality rate (22.3%) which is comparable to some sport fisheries (e.g. Buoy 10 = 19%).

The economic performance of Coho fisheries is uncertain given ‘normal’ volatility of Coho returns. This applies to current gears and to the viability of a Coho tangle-net fishery. Operating costs for the tangle net are low compared to other alternative gears, and given similarities to traditional gears it is relatively easy for current gillnet fishers to adopt.

ISSUE 4

CONSERVATION ENHANCEMENTS

A primary objective of CR Fisheries Reform is to provide additional conservation benefits to wild salmon stocks. In addition to promoting conservation of native fish basin-wide, the policy seeks to achieve increased mark-selective harvest rates of hatchery Chinook and hatchery Coho; higher overall harvest rate of hatchery salmon; slightly increased escapement of wild salmon to spawning grounds; and reduced number of hatchery fish on spawning grounds.

Of particular importance is the need to increase harvest rates on hatchery tule Chinook and hatchery Coho in the lower Columbia River downstream of the Lewis River. This action is needed to help reduce the proportion of hatchery origin spawners (pHOS) in natural spawning populations. Reduction of pHOS is a key action specified in ESA Recovery Plans for lower Columbia River tributary populations of both species. Further, remaining high pHOS levels in these populations have contributed to current active litigation against federally-funded Mitchell Act hatchery programs. Increasing the ability of fisheries to selectively remove hatchery fish, with equal or reduced impacts on ESA listed populations, can be a key contributor to reducing pHOS in lower river tributaries.

WDFW has recently developed a model that estimates relative contributions to pHOS in several “primary” Chinook populations – those that are targeted to achieve high viability in Recovery Plans. The model allows for estimates to be generated under varying assumptions of overall hatchery production from several programs, average survival rate

of fish released from these programs, and removals by harvest, among other inputs. ODFW staff used this model to assess the relative sensitivity of pHOS levels in primary Chinook populations to 1) increased hatchery fish harvest rates, and 2) reduced hatchery production. For populations with relatively high recent pHOS levels, a proportional increase in harvest rate tended to yield a larger reduction in pHOS levels than a decrease in total hatchery releases by the same proportion. We interpret this finding to indicate that increased selective harvest rates targeting hatchery Chinook can provide substantial benefits in reducing pHOS in primary populations. In order for this approach to fully contribute to recovery, harvest rates on ESA-listed wild stocks must not similarly increase, highlighting the need for this harvest to occur with live-capture, mark-selective methods which can leverage ESA-impacts into maximized catch of hatchery fish.

Lower Columbia River hatchery programs contribute significantly to commercial and recreational fisheries in the river and ocean, including fisheries that are part of important international agreements. As such, opportunities to reduce pHOS risks through fisheries targeting hatchery fish is preferred over reducing hatchery releases. Reductions in hatchery programs may be required to achieve Recovery Plan pHOS goals, would negatively impact both commercial and recreational fisheries. However, increased harvest rates on hatchery fish can help offset the magnitude of such reductions.

Current CR Fisheries Reform implementation has had limited success in developing alternative commercial gears and techniques to selectively target hatchery fish at the kinds of rates needed to measurably reduce pHOS. These efforts must continue, with an emphasis on areas downstream of the Lewis River (Commercial Zones 1-3), if commercial fisheries are going to effectively contribute toward the reduction in pHOS. ODFW staff have outlined a potential approach to improve the ability of both recreational and commercial fisheries to selectively remove more hatchery Chinook and Coho in the lower river.

This approach would create a “conservation set-aside” by sequestering 1% of total ESA tule fall Chinook impacts from all non-tribal fisheries occurring south of the U.S./Canada border, including the Columbia River, and using these impacts in a conservation fishery to selectively harvest hatchery fall Chinook and Coho in the lower Columbia River (Commercial Zones 1-3). Many of these fisheries that would contribute to the “set-aside” are highly dependent upon production of hatchery tule Chinook and hatchery Coho salmon, which comprise a large portion of their annual catch. Reducing allowable impacts by 1% represents a contribution by these fisheries to selectively remove hatchery fish from spawning grounds, in order to reduce pHOS levels and thereby help maintain the hatchery production that contributes so substantially to their fisheries. In recent years, about 60% of the non-tribal tule fall Chinook impacts south of the U.S./Canada border have been allocated to ocean fisheries (both North and South of Falcon) and 40% have occurred in the Columbia River.

The 1% set-aside would be allocated to Columbia River fisheries to support selective removal of lower Columbia River hatchery tule Chinook and hatchery Coho to reduce pHOS levels. This conservation set-aside would be separate and distinct from subsequent allocation of ESA-impacts for general commercial and recreational fisheries, as it represents contributions to reducing pHOS to aid recovery of these stocks.

The conservation fishery created with this set-aside would strive to provide opportunity for both commercial and recreational participation, based on availability, feasibility and efficiency of mark-selective gears and techniques. For example, an initial priority would be to ensure commercial fisheries are incentivized to refine appropriate selective gears and techniques (e.g., late season tangle net for hatchery Coho, seine for hatchery Chinook), and all lower river recreational fisheries allow retention of hatchery fish caught. Long term, conservation fisheries would be prioritized to those that best leverage the conservation set-aside impacts to harvest the most hatchery Chinook and Coho. Conservation set-aside impacts would not be transferable to the Commercial Zone 4-5 Chinook fishery, or other non-selective fisheries, e.g., non-MSF Buoy 10.

Optimizing the efficiency of hatchery releases is another important component of both conservation and economic objectives of the CR Fisheries Reform policy. Some hatchery spring Chinook were shifted from releases in or near tributaries with wild fish concerns, to releases in off-channel Select Areas. These shifts reduced pHOS risk in the tributaries, dramatically increased the Columbia River commercial harvest rate on those reprogrammed hatchery fish (increased from <20% up to >90%), and increased the cost-effectiveness of these hatchery programs as they relate to commercial fisheries. For example, hatchery spring Chinook and Coho smolts released in off-channel Select Areas are over 30 times more likely to be commercially harvested than hatchery smolts released from hatcheries farther upriver (but still downriver from Bonneville Dam). Thus, for commercial fisheries, the cost-benefit of releasing hatchery fish in off-channel Select Areas is orders of magnitude more efficient than hatchery releases from non-off-channel areas for mainstem commercial fisheries. The conservation benefit is two-fold, shifting hatchery releases from wild fish areas and dramatically increasing the number of hatchery fish harvested from hatchery releases.

ISSUE 5 ANALYSIS

ECONOMIC EVALUATION

As directed by statute, CR Fisheries Reform rules should “*optimize overall economic benefits to this state*” and “*enhance the economic viability of Oregon’s recreational and commercial fisheries and the communities that rely on these fisheries*” (ORS 580.908). One of the primary policy objectives in rules adopted by the Commission in June 2013 states “*in a manner that is consistent with conservation and does not impair the resource, seek to enhance the overall economic well-being and stability of Columbia River fisheries in Oregon*” (OAR 635-500-6705 (4)).

For recreational and commercial salmon fisheries, angler trips and ex-vessel value, respectively, were the primary economic measures considered during the CR Fisheries Reform process. These continue to be our primary economic measures for this review.

Both angler trips and ex-vessel value are strongly affected by factors beyond the control of managers, particularly overall fish returns which are dynamic. This makes isolating effects of management actions, like CR Fisheries Reform, problematic. In an effort to evaluate changes while keeping the inherent uncertainty in mind, Department staff have taken a “weight of evidence” approach in which we examine the economic differences using multiple metrics: 1) comparing what actually occurred to what was expected in pre-reform planning and modeling, and 2) using an economic assessment model to help evaluate and describe the effects of policy implementation year-to-year during the

transition period and into the future assuming transition run sizes and characteristics remain the same into the future. These assessments should be viewed as uncertain and are intended to provide context to the relative magnitude of effects, not to predict outcomes. Recreational and commercial fisheries results reflect combined data from Oregon and Washington.

Recreational Fisheries

Angler trips are the primary measure for changes to the recreational fishery associated with CR Fisheries Reform. When analyzing the impact of allocation shifts, it is important to recognize that angler trips are strongly and positively correlated with salmon run sizes ($r^2 = 0.78$; Figure 4).

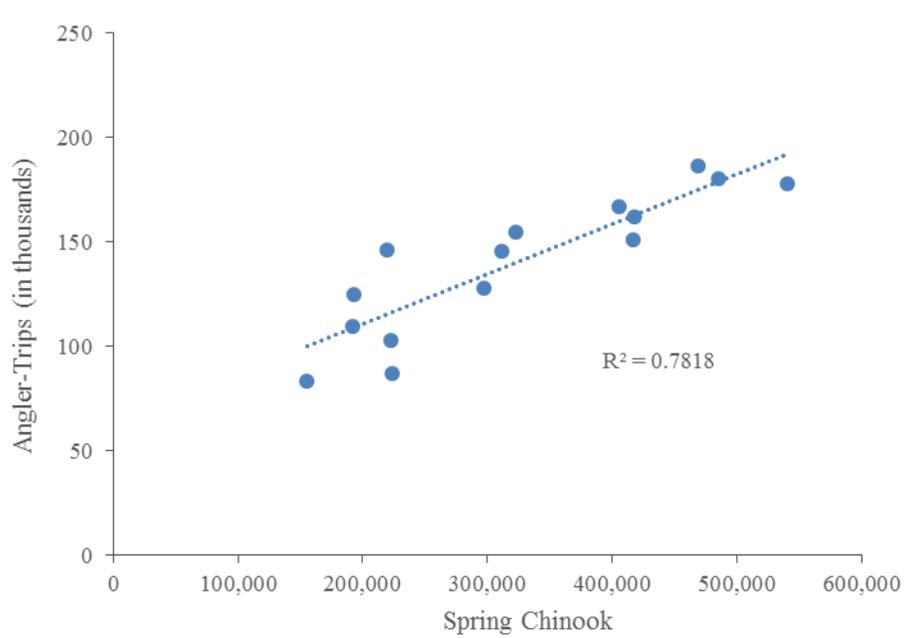


Figure 4—Relationship between spring Chinook run size and angler effort in the lower Columbia River spring Chinook fishery, 2001-15

Generally speaking Columbia River hatchery and non-ESA listed salmon and steelhead runs have been relatively robust over the last two and a half decades, and as runs varied so too did recreational angler effort (Figure 5) and commercial ex-vessel value (Figure 7).

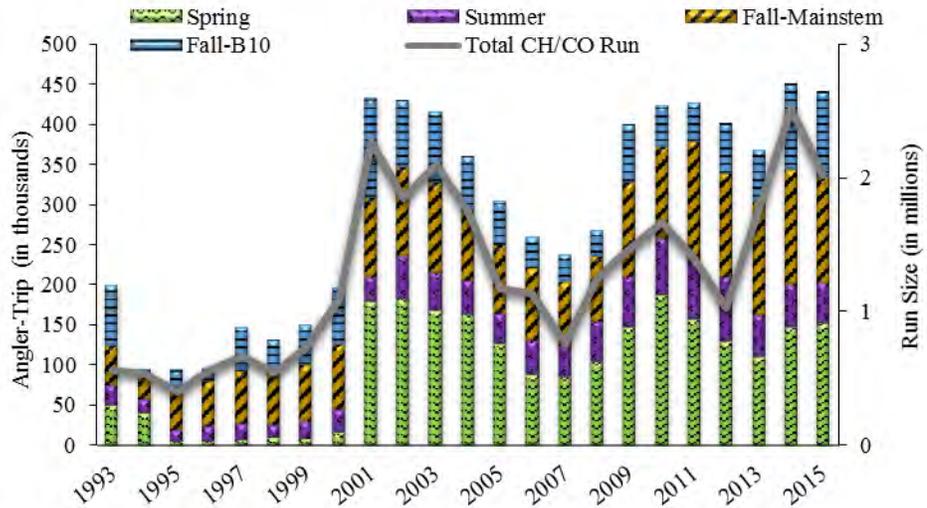


Figure 5—Total annual angler-trips and combined Chinook and Coho salmon run size for lower Columbia River recreational fisheries, 1993-2015.

This confounding nature of run-size can be seen when looking at the spring, summer, and fall Chinook fisheries during the 2013-16 transition period. The average actual number of angler-trips for the summer and fall seasons during 2013-15 exceeded the trips from pre-reform modeling (139% and 133% of modeled, respectively) while the average actual number of trips for the spring season was 77% of what was modeled (Table 20). The effect of run-size can overshadow other effects, such as management actions, if raw change in angler trips is analyzed in isolation. This emphasizes the importance of a weight of evidence approach.

Table 20— Comparison of CR Fisheries Reform modeled angler trips with comparable actual angler trips, 2013-16 (2016 fall trips are a **preliminary** projection).

Angler Trips (<Bonn)	Reform Assumptions (Tables C1-3)			Actual Results				Average
	Baseline	2013-2016	2017+	2013	2014	2015	2016 ¹	
Spring	165,362	175,376	180,453	109,655	145,642	151,173	126,800	133,300
Summer	25,000	33,746 (2013-14) 45,047 (2015-16)	70,000	52,037	53,661	50,555	59,000	53,800
Fall	160,000	175,000	175,000	207,248	251,468	239,693	225,800	231,000

¹Data from 2016 should be considered preliminary in nature

An additional confounding factor for spring Chinook angler trips involves the catch balancing and run-size buffer provisions of the *U.S. v Oregon* agreement. Since “catch balancing” and the run-size buffer became management factors for spring Chinook fisheries in 2010, the percentage of the allowed catch balance used by the recreational fishery has exceeded the percentage of impacts used in a given year. Because catch balancing, rather than ESA impacts, has become the primary limiting factor for recreational spring Chinook fisheries, the change in the number of angler trips cannot be examined solely as a function of ESA allocation shift.

To mitigate for the effects of run size (and additional catch balance effects in spring Chinook fisheries), staff modeled the effects of the allocation shift by simulating what

the 2013-15 fisheries would have looked like without the allocation shifts (under 2010-12 average allocations). Differences in angler-trips produced at pre- and post-reform allocations were used to quantify the change in trips that could be attributed to the change in allocation policy (as distinct from run-size effects).

The analysis focused on mainstem recreational fisheries downstream of Bonneville Dam, as they account for over 90% of the angling effort for salmonids on the Columbia, and was done separately for spring, summer, and fall fisheries. Because the mark-selective fishery tool has become an important part of managing fall recreational fisheries on the Columbia, fall fisheries modeling characterized any changes in angler-trips in terms of changes in *non-MSF* trips (the marginal increase in effort when a fishing day is changed from MSF to non-MSF). Therefore, daily changes in angler-trips were lower than in the spring when a fishing day is changed from closed to open. The results of the 2013-15 recreational allocation modeling are presented by season/fishery in Table 21.

Table 21—Summary of gains in fishing days and angler-trips due to allocation changes for lower Columbia River recreational Chinook fisheries, by year and season, 2013-15.

			2013	2014	2015
Spring Chinook		Fishing Days Gained	0	5	2
		Angler-Trips Gained	0	10,788	10,321
Summer Chinook		Fishing Days Gained	0	0	0
		Angler-Trips Gained	0	0	0
Buoy 10		Non-MSF Days Gained	5	6	2
		Angler-Trips Gained	4,560	1,015	907
Fall Chinook	Below Lewis River	Non-MSF Days Gained	3	6	5
		Angler-Trips Gained	2,470	2,265	10,402
Fall Total		Non-MSF Days Gained	8	12	7
		Angler-Trips Gained	7,030	3,280	11,309
All Seasons Total		Fishing Days Gained	8	17	9
		Angler-Trips Gained	7,030	14,068	21,630

For spring Chinook no gain in angler-trips was noted in 2013 due to minimal change in the allocation (see Table 1). Gains of approximately 10,500 angler-trips per year in 2014 and 2015 (+8%) were noted as the recreational allocation increased from 65% to 70%. For spring fisheries, the number of trips added due to an allocation increase is highly dependent on what part of the season the trips are added to. Mid-April trips are more costly in terms of impacts used per-trip because fishing is better than earlier in the season, though they are also more valued for the same reason. As a result, the percent gain in spring trips is not linearly proportional to the percent gain in allocation.

For summer Chinook we observed no gain in angler-trips due to allocation changes in any of the transition years. The observed level of angler effort in those years has not been able to fully exploit catch allocations exceeding approximately 50% at recent larger than average run sizes and harvestable numbers. However, based on past fishery performance, we know that at smaller run sizes and lower catch guidelines, the sport allocation could again become constraining even at levels exceeding 50%.

Similar to spring, the estimated gains in fall angler trips are not linearly proportional to gains in allocation. However, in this case, this is mostly due to modeling only for gains in effort associated with changing from MSF to non-MSF days (rather than closed vs. open). This approach was taken because it is consistent with how fishery managers have modified the recreational fishery fall season structures to meet season-length objectives in recent years. Managers converted fishing days from non-MSF to MSF in order to slow the fishery and attempt to meet season-length objectives outlined in Commission policies. Under this analysis, fall Chinook gains for the Buoy 10 fishery averaged 2,200 trips per year (+3%), while gains for the mainstem fishery downstream of the Lewis River averaged 5,000 trips per year (+4%). Total fall trips gained averaged 7,200 trips per year (+3%) over what might've been expected with pre-reform allocations. Modeling for the fall recreational fishery only applied to B10 and areas downstream of the Lewis River, as these are the areas in which management has been affected by allocations of LCR tule Chinook impacts. There are effects of fall allocation in upstream areas, primarily in allocation of Snake River Wild (SRW) Chinook impacts. However, these effects were most relevant only in fall of 2016, and analyses are still incomplete.

The total gain in annual angler-trips each year was 7,000 (+2%) in 2013, 14,100 (+3%) in 2014, and 21,600 (+5%) in 2015, with an average of 14,200 trips (+3%) (Figure 6). Information from 2016 is not yet available.

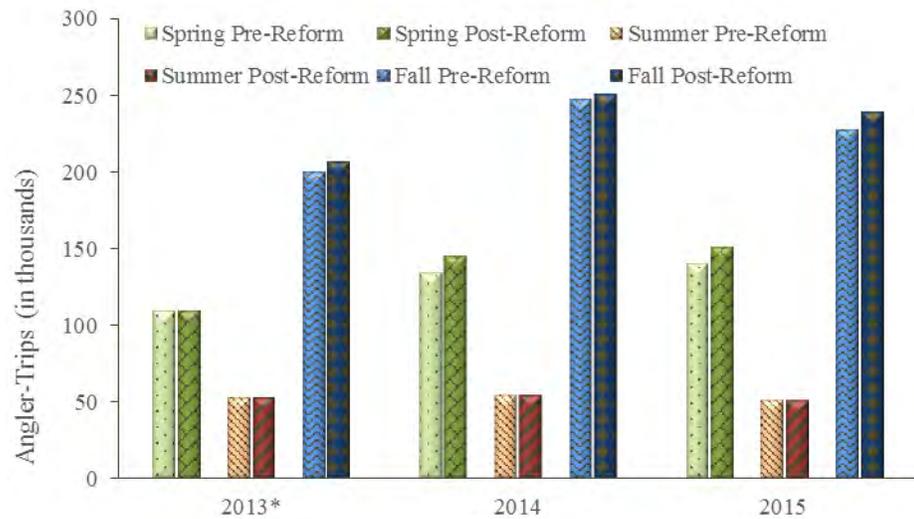


Figure 6—Changes in seasonal angler effort due to Harvest Reform-related allocation increases for the 2013-15 lower Columbia recreational fisheries. *No change in recreational spring allocation in 2013 due to court ordered stay of harvest reform policy.

Commercial Fisheries

Ex-vessel value is the primary measure for changes to the commercial fishery associated with the harvest reform policy. Similar to angler-trips in recreational fisheries, there is a strong correlation between total commercial ex-vessel value and salmon run size ($r^2 = 0.85$; Figure 7). Therefore, as run size varies by year so too does ex-vessel values (Figure 8).

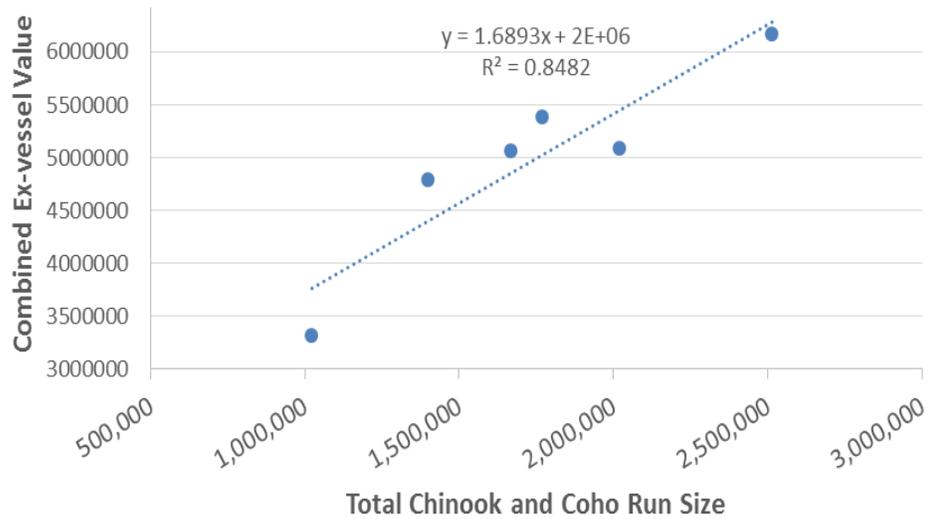


Figure 7—Relationship between total non-treaty commercial ex-vessel value and combined Chinook and Coho run size, 2010-2015.

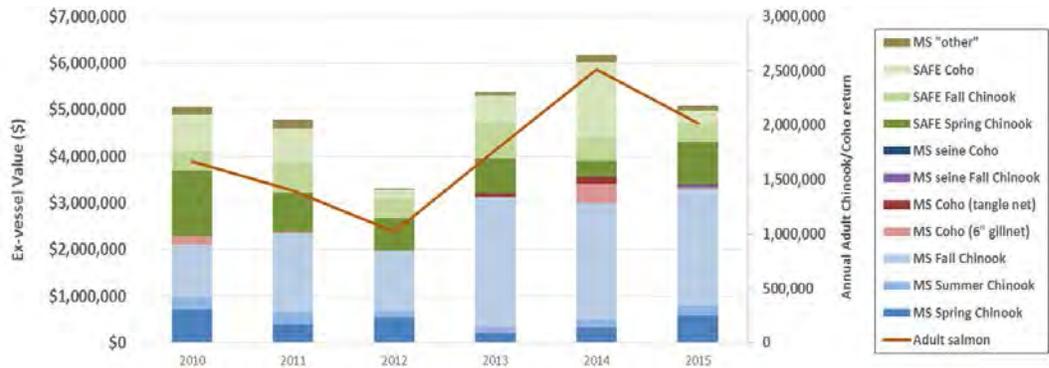


Figure 8—Annual ex-vessel value of non-Indian mainstem (MS) and Select Area commercial salmon fisheries in the lower Columbia River compared to total adult Chinook and Coho returns, 2010-2015.

A weight-of-evidence approach to assessing policy effects on commercial fisheries includes comparing post-reform ex-vessel values to a pre-reform baseline to assess viability moving forward, as well as comparing observed ex-vessel values relative to modeled values of what might have occurred without reform actions. As with analyses for recreational fisheries, we also sought to account for effects of run size and relative stock composition in assessing the policy effects on commercial fisheries.

Overall commercial harvest and ex-vessel value was higher during the transition period than the prior baseline period. Commercial harvest of Chinook and Coho salmon in the mainstem lower Columbia River during the first three years (2013-15) of the transition period averaged 125,900 fish per year compared to 61,800 per year during 2010-12 pre-

reform period. Increased harvest during the transition period was primarily due to large fall Chinook returns in 2013-15 and a large Coho return in 2014.

For 2013-15, the average ex-vessel value was estimated to be approximately \$368,580 for spring fisheries (Table 22) and \$174,512 for summer fisheries (Table 23).

Table 22—Summary of landings and ex-vessel value for the 2013-15 spring mainstem commercial gill net fisheries.

Year	Avg # of Vessels ¹	Chinook Landed ²	Total Ex-Vessel Value
2013	75	2,213	\$202,405
2014	71	4,074	\$322,675
2015	67	7,231	\$580,660
2013-15 Avg	71	4,506	\$368,580

¹ Represents the average number of vessels fishing during the season. Estimated based on average number of deliveries per day.

² Includes adults and jacks.

Table 23—Summary of landings and ex-vessel values for the 2013-15 summer mainstem commercial gill net fisheries.

Year	Avg # of Vessels ¹	Chinook Landed ²	Total Ex-Vessel Value
2013	77	1,868	\$144,962
2014	34	2,743	\$172,266
2015	45	3,944	\$206,307
2013-15 Avg	52	2,852	\$174,512

¹ Represents the average number of vessels fishing during the season. Estimated based on average number of deliveries per day.

² Includes adults and jacks.

The 2014-15 Commercial Zone 4-5 gillnet fisheries were compared to the 2014-15 beach and purse seine fisheries in terms of Chinook landings, catch rate (Chinook landed per delivery), average fish weight, and fishery ex-vessel value (Table 24 Attachment 6).

Average Chinook landings were 84,800 for the Commercial Zone 4-5 fishery, 1,000 for beach seines, and 1,900 for purse seines, though the Chinook catch per-delivery was higher for beach and purse seines (90 and 99 fish/delivery, respectively) than for the Commercial Zone 4-5 gillnet fishery (59 fish/delivery). The average fish weight was 27% lower for seine-caught fish (12.0 lbs.) compared to gillnet-caught fish (16.4 lbs.). Lower landings and smaller fish had an obvious effect on ex-vessel values, which averaged \$18,500 for beach seines, and \$35,000 for purse seines, compared to \$2.5 million for the Commercial Zone 4-5 gillnet fishery (Table 24, Attachment 6). The average net return per vessel/permit (after costs were incorporated) was negative for both beach and purse seines. Higher landings, larger fish, and lower operating costs contributed to higher net returns per vessel for the Commercial Zone 4-5 gillnet fishery (\$33,000; Table 24). Although the 2014-15 seine fisheries were limited entry and quota-based, only about 1/3 of the permit holders came within 90% of achieving their Chinook quotas. Even if the seine fishery were expanded, smaller fish and higher harvest costs will still affect the profitability for participants.

We compared the 2014-15 seine fisheries to Commercial Zone 4-5 gillnet fisheries in the same year to assess the relative ex-vessel value that could be generated on a per-impact

basis. Primary constraints for these fisheries are ESA impacts on wild B-run steelhead and LCR tule Chinook.

Despite a low mortality rate per fish for steelhead caught in seines, these gears do not selectively exclude steelhead to the same degree that large mesh gillnets do. As a result, seines handle many more steelhead per fishing event, and per Chinook encountered.

Because seines are most effective at the peak of the fall Chinook run (September), they encounter a higher proportion of wild Group B steelhead compared to the gillnet fishery, which harvests a high percentage of its catch in August. Due to a lower average weight, the average value of seine-caught Chinook is about 70% of gillnet-caught Chinook. As a result of these factors, the Commercial Zone 4-5 gillnet fishery was able to generate over five times the ex-vessel value of the seine fishery, as currently configured, for each estimated wild B-run steelhead mortality (Figure 9).

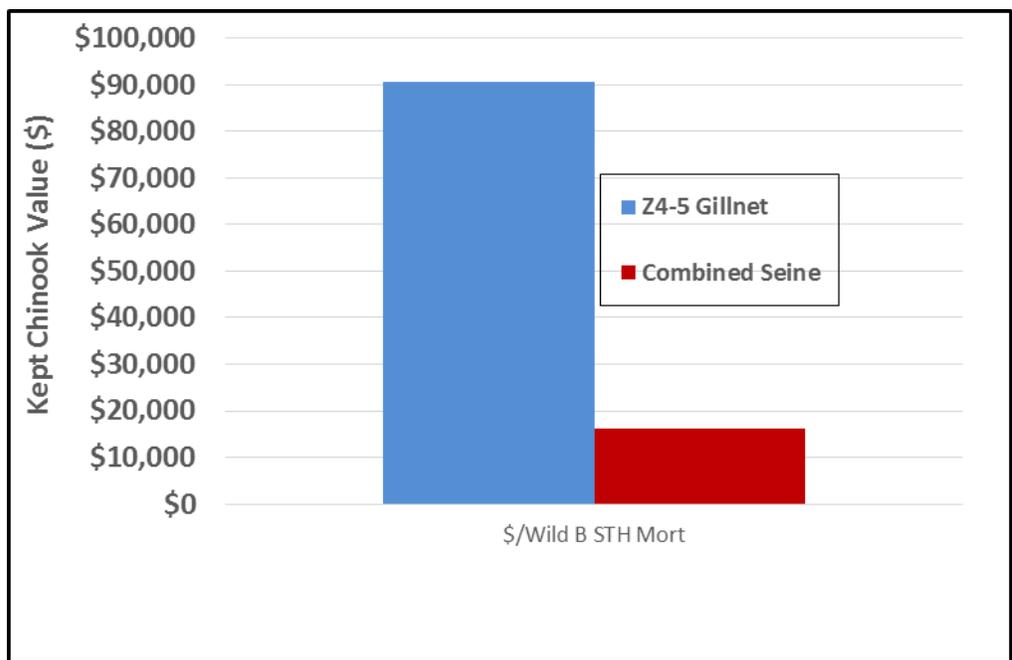


Figure 9—Comparison of kept adult Chinook value per ESA-listed stock wild Group B steelhead mortality in mainstem Columbia River commercial fisheries, 2014-15.

The seine fisheries also handled more tule Chinook compared to Commercial Zone 4-5 gillnets, which is a predictable result given that the gears have been fished in different areas. For ESA-listed LCR tule Chinook, the Commercial Zone 4-5 gillnet fishery was able to generate about twice the ex-vessel value of the seine fishery for each LCR tule mortality (Figure 10).

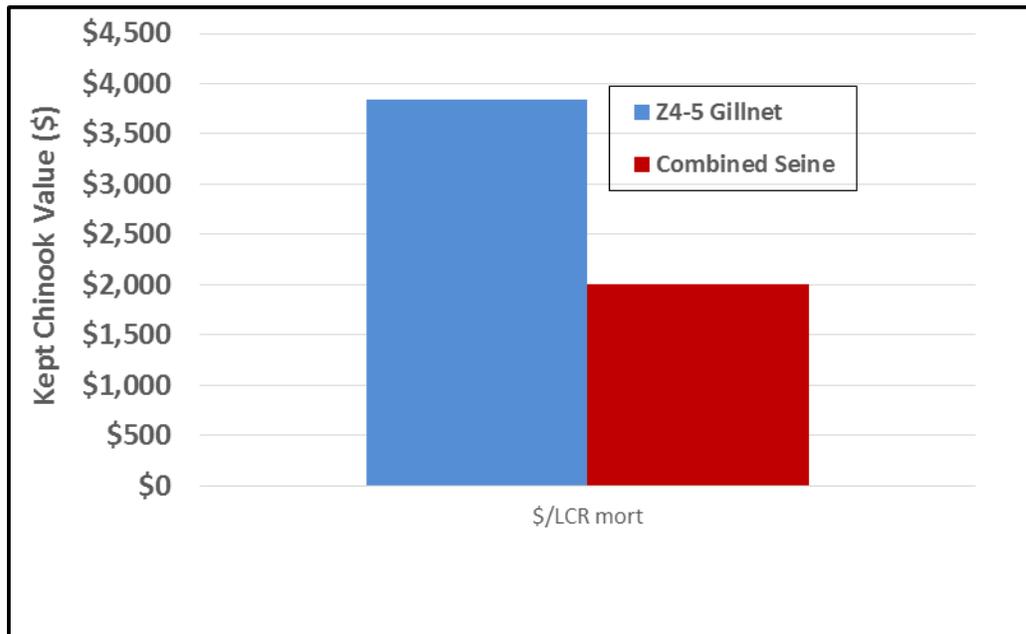


Figure 10—Comparison of kept adult Chinook value per ESA-listed stock LCR tule Chinook mortality in mainstem Columbia River commercial fisheries, 2014-15.

The 2013-15 6-inch gillnet Coho fishery was compared to the 2013-15 Coho tangle net fishery in terms of Coho landings, catch rate (Coho landed per delivery), average fish weight, and fishery ex-vessel value (Table 25, Attachment 6). Average Coho landings for the 6-inch fishery was double that of the tangle net fishery (16,000 vs. 8,000). This is largely a factor of less effort in the tangle net fishery as landings per delivery were slightly higher for the tangle net fishery (38 fish/delivery vs. 33 fish/delivery). Average fish weight was 19% lower for Coho caught in tangle nets (6.0 lb vs. 7.4 lb). Lower overall effort and landings as well as lower size per fish meant that average annual ex-vessel for the tangle net fishery was only 43.4% of the 6-inch fishery (\$67,400 and \$154,900 respectively; Table 25, Attachment 6). When controlling for participation (about half as many fishers participated in the tangle net fishery compared to the 6-inch fishery), the tangle net fishery averaged \$2,406 per vessel compared to \$3,222 per vessel for 6-inch. The volatility of Coho runs appeared to affect both fisheries since both had positive net returns per vessel in 2014 when the Coho run was strong, and both had negative net returns in 2013 and 2015 when Coho runs were much weaker.

Observed ex-vessel values for 2013-15 commercial fisheries (Select Area catches standardized for target stocks only) were compared to modeled values from pre-reform planning (Table 26).

Mainstem fishery ex-vessel values varied above and below pre-reform modeled values, but collectively exceeded pre-reform expectations by 41%. The correlation between run-size and ex-vessel value, and the fact that salmon returns were larger than expected, (and in the case of fall Chinook, much larger) is the primary driver in why actual ex-vessel values exceeded pre-reform modeling, which was based upon 2009-2012 average run sizes.

Table 26—Comparison of CR Fisheries Reform modeled commercial fishery ex-vessel values with comparable actual ex-vessel value, 2013-15.

Fishery	Target Stock	Current	%	2013			2014			2015				
				CS Modeled	%	Adjusted Actual Value ¹	CS Modeled	%	Adjusted Actual Value ¹	CS Modeled	%	Adjusted Actual Value ¹		
Mainstem Gillnet	Spring Chinook	\$ 395,911	10%	\$287,059	7%	\$202,405	\$205,272	5%	\$322,675	6%	\$205,272	5%	\$580,660	12%
	Summer Chinook	\$ 151,719	4%	\$136,552	3%	\$144,962	\$121,332	3%	\$172,266	3%	\$90,999	2%	\$206,307	4%
	Z4-5 Fall Chinook	\$ 1,272,247	33%	\$958,790	24%	\$2,767,880	\$958,790	23%	\$2,504,803	43%	\$958,790	23%	\$2,508,461	52%
	Z5 Gillnet Fall Chinook	\$ 222,745	6%	\$309,341	8%	\$0	\$309,341	8%	\$0	0%	\$309,341	7%	\$0	0%
	Coho	\$ 316,682	8%	\$270,442	7%	\$29,030	\$270,442	7%	\$409,201	7%	\$270,442	6%	\$26,391	1%
Mainstem Tangle net	Coho	NA	0%	\$246,713	6%	\$55,251	\$246,713	6%	\$137,556	2%	\$246,713	6%	\$9,299	0%
Mainstem Seine	Fall Chinook	NA	0%	\$190,851	5%	\$0	\$190,851	5%	research ²	0%	\$190,851	5%	\$51,434	1%
	Coho	NA	0%	\$73,562	2%	\$0	\$73,562	2%	research ²	0%	\$73,562	2%	\$5,215	0%
	Mainstem SUM	\$ 2,359,304	61%	\$2,473,310	61%	\$3,199,528	\$2,376,303	58%	\$3,546,501	61%	\$2,345,970	56%	\$3,387,767	71%
Select Area	Spring Chinook	\$ 316,415	8%	\$394,493	10%	\$594,348	\$395,519	10%	\$269,366	5%	\$503,300	12%	\$748,136	16%
	Fall Chinook	\$ 436,943	11%	\$436,943	11%	\$779,085	\$436,943	11%	\$497,362	8%	\$457,237	11%	\$378,842	8%
	Coho	\$ 743,337	19%	\$765,362	19%	\$543,399	\$912,194	22%	\$1,547,781	26%	\$912,194	22%	\$283,430	6%
	Select Area SUM	\$ 1,496,695	39%	\$1,596,798	39%	\$1,916,832	\$1,744,656	42%	\$2,314,509	39%	\$1,872,731	44%	\$1,410,409	29%
Total	\$ 3,855,999	100%	\$4,070,108	100%	\$5,116,360	\$4,120,959	100%	\$5,861,010	100%	\$4,218,701	100%	\$4,798,176	100%	

¹ To allow for direct comparison with CS modeled values, actual ex-vessel commercial values were adjusted to match C4/5 assumptions which did not include value of: COH landed in CHF fisheries, CHF landed in COH fisheries, or non-local CHS or COH landed in SAFE fisheries.
² 2014 seine fisheries operated under research impacts, so value not included since commercial impacts and fishery values were not decreased proportionately to amount used in seine fishery
Note: Earnings results that exceeded model predictions shown in GREEN, results that fell short of model predictions shown in RED.

Actual Select Area ex-vessel values averaged 108% of the modeled values for 2013-15. This difference may be attributable to different realized SARs or other effects that cannot be identified at this time. As with mainstem fisheries, ex-vessel values for specific species/stocks varied both above and below modeled values, with no clear pattern emerging.

While run size was the primary driver in overall ex-vessel value in mainstem fisheries, some differences in observed vs. modeled prices have also occurred. The effects of these changes cannot be extracted from our analyses. Actual ex-vessel value of combined mainstem and Select Area commercial fisheries exceeded modeled expectations by an average of \$1.12 million annually (27%) during 2013-15 (Figure 11).

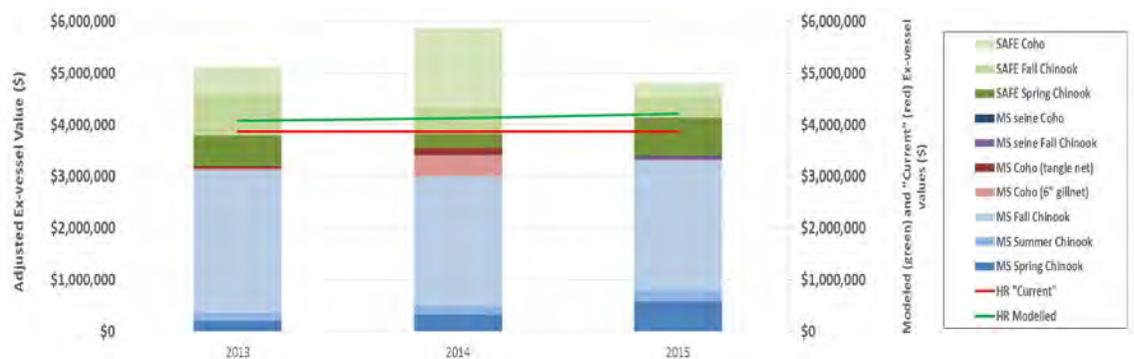


Figure 11—Adjusted annual ex-vessel value of non-Indian mainstem (MS and Select Area commercial salmon fisheries in the lower Columbia River compared to “Current” and annual modeled estimates used in the CR Fisheries Reform process.

We also conducted modeling that compared actual ex-vessel values at 2013-15 transition period allocations (Table 27) to what they would have been in the same year if fisheries had been conducted at pre-reform allocations (Table 28). So even though commercial fisheries had higher gross ex-vessel values during the transition period than before, this examined whether they could have made more money during these higher run years if allocations were not shifted. The commercial models used average pre-reform allocations from the same baseline period as the recreational models (2010-12), and incorporated changes in releases in Select Areas resulting from the CR Fisheries Reform policy.

Table 27—Actual ex-vessel value of lower Columbia River commercial fisheries, 2013-2015.

Fishery	Target Stock	2013	2014	2015	Average \$
Mainstem Gillnet	Spring Chinook	\$ 202,405	\$ 322,675	\$ 580,660	\$ 368,580
	Summer Chinook	\$ 144,962	\$ 172,266	\$ 206,307	\$ 174,512
	Z4-5 Fall Chinook	\$ 2,812,736	\$ 2,575,129	\$ 2,515,140	\$ 2,634,335
	2S Gillnet Fall Chinook	\$ -	\$ -	\$ -	\$ -
	Coho	\$ 39,486	\$ 460,466	\$ 78,612	\$ 192,855
Select Area Gillnet	Spring Chinook	\$ 747,281	\$ 353,896	\$ 925,104	\$ 675,427
	Fall Chinook	\$ 779,085	\$ 497,362	\$ 378,842	\$ 551,763
	Coho	\$ 569,780	\$ 1,622,922	\$ 297,190	\$ 829,964
MS Z4-5 (gear TBD)	Fall Chinook	\$ -	\$ -	\$ -	\$ -
Mainstem 2S (gear TBD)	Fall Chinook	\$ -	\$ -	\$ -	\$ -
Mainstem Seine	Fall Chinook	\$ -	\$ -	\$ 51,434	\$ 17,145
	Coho	\$ -	\$ -	\$ 5,215	\$ 1,738
Mainstem Tangle net	Coho	\$ 86,085	\$ 162,732	\$ 49,624	\$ 99,480
SUM		\$ 5,381,820	\$ 6,167,447	\$ 5,088,127	\$ 5,545,798

Table 28—Expected ex-vessel value of lower Columbia River commercial fisheries under pre-reform (2010-12) average allocations and Select Area releases, 2013-2015.

Fishery	Target Stock	2013	2014	2015	Average
Mainstem Gillnet	Spring Chinook	\$ 262,673	\$ 550,820	\$ 777,035	\$ 530,176
	Summer Chinook	\$ 192,223	\$ 204,169	\$ 289,034	\$ 228,475
	Z4-5 Fall Chinook	\$ 3,475,916	\$ 2,868,149	\$ 3,547,915	\$ 3,297,327
	2S Gillnet Fall Chinook	\$ -	\$ -	\$ -	\$ -
	Coho	\$ 28,742	\$ 534,392	\$ 102,809	\$ 221,981
Select Area Gillnet	Spring Chinook	\$ 730,514	\$ 336,492	\$ 737,727	\$ 601,578
	Fall Chinook	\$ 779,085	\$ 497,362	\$ 359,096	\$ 545,181
	Coho	\$ 569,780	\$ 1,456,864	\$ 252,187	\$ 759,610
MS Z4-5 (gear TBD)	Fall Chinook	\$ -	\$ -	\$ -	\$ -
Mainstem 2S (gear TBD)	Fall Chinook	\$ -	\$ -	\$ -	\$ -
Mainstem Seine	Fall Chinook	\$ -	\$ -	\$ -	\$ -
	Coho	\$ -	\$ -	\$ -	\$ -
Mainstem Tangle net	Coho	\$ -	\$ -	\$ -	\$ -
SUM		\$ 6,038,933	\$ 6,448,248	\$ 6,065,803	\$ 6,184,328

The differences in ex-vessel value identified in our modeling between pre- and transition-reform commercial allocations for 2013-15 vary by season/fishery and range from moderately positive (Select Area spring Chinook) to strongly negative (mainstem Commercial Zone 4/5 fall Chinook gillnet; Table 29).

Table 29— Expected change in ex-vessel value of lower Columbia river commercial fisheries resulting from CR Fisheries Reform allocation shifts and Select Area releases, 2013-2015.

Fishery	Target Stock	2013	2014	2015	Average
Mainstem Gillnet	Spring Chinook	\$ (60,269)	\$ (228,145)	\$ (196,374)	\$ (161,596)
	Summer Chinook	\$ (47,260)	\$ (31,903)	\$ (82,727)	\$ (53,963)
	Z4-5 Fall Chinook	\$ (663,179)	\$ (293,020)	\$ (1,032,775)	\$ (662,992)
	2S Gillnet Fall Chinook	\$ -	\$ -	\$ -	\$ -
	Coho	\$ 10,744	\$ (73,926)	\$ (24,197)	\$ (29,126)
Select Area Gillnet	Spring Chinook	\$ 16,766	\$ 17,404	\$ 187,376	\$ 73,849
	Fall Chinook	\$ -	\$ -	\$ 19,746	\$ 6,582
	Coho	\$ -	\$ 166,058	\$ 45,003	\$ 70,354
MS Z4-5 (gear TBD)	Fall Chinook	\$ -	\$ -	\$ -	\$ -
Mainstem 2S (gear TBD)	Fall Chinook	\$ -	\$ -	\$ -	\$ -
Mainstem Seine	Fall Chinook	\$ -	\$ -	\$ 51,434	\$ 17,145
	Coho	\$ -	\$ -	\$ 5,215	\$ 1,738
Mainstem Tangle net	Coho	\$ 86,085	\$ 162,732	\$ 49,624	\$ 99,480
SUM		\$ (657,113)	\$ (280,801)	\$ (977,676)	\$ (638,530)

Relative to what would have been seen without policy changes, mainstem commercial fisheries generally lost value while off-channel Select Area fisheries gained value. This is consistent with the policy objectives and allocations. The average relative loss in ex-vessel value for mainstem spring Chinook fisheries was 30% (-\$161,600, range -\$60,300 to -\$228,100); for mainstem summer Chinook the relative loss was 24% (-\$54,000, range -\$31,900 to -\$82,700); and for mainstem fall Chinook (Commercial Zone 4-5) the relative loss was 20% (-\$663,000, range -\$293,000 to -\$1,032,800). Mainstem 6-inch Coho fisheries averaged a 13% loss (-\$29,100, range -\$73,900 to \$10,700).

The average relative gain in ex-vessel value for Select Areas were: spring Chinook fisheries 12% (\$73,900, range \$16,800 to \$187,400); fall Chinook fisheries on average, 1% (\$6,600, range \$0 to \$19,700); and Coho fisheries averaged a 10% gain (\$77,700, range \$0 to \$166,000).

Mainstem fall Chinook seine fisheries represent a gain in overall ex-vessel value as they did not exist in pre-reform fisheries. The magnitude of those gains were constrained by steelhead catch, Chinook and Coho mark rate, stock composition of Chinook encountered, participation, and commercial impacts allotted to the seine fishery. The ex-vessel values for mainstem fall Chinook seine fisheries in the model are from 2015 only, because there were no commercial seine fisheries in 2013, and in 2014 the fishery used research impacts. The seine fishery was conducted again in 2016, but those results are not yet available. The gain in 2015 ex-vessel value was \$56,649, (\$51,434 for Chinook and \$5,215 for Coho). Again, Coho tangle nets – a gear not previously used - produced positive gains. Mainstem tangle net Coho averaged ex-vessel value of \$99,500; range \$49,600 to \$162,700.

Although there were some positive gains (Select Area Fisheries and alternative gear fisheries), there was an overall average relative net loss in total commercial ex-vessel value of \$631,200 (-10%); range -\$280,800 to -\$955,600 (Figure 12) observed during the transition period.

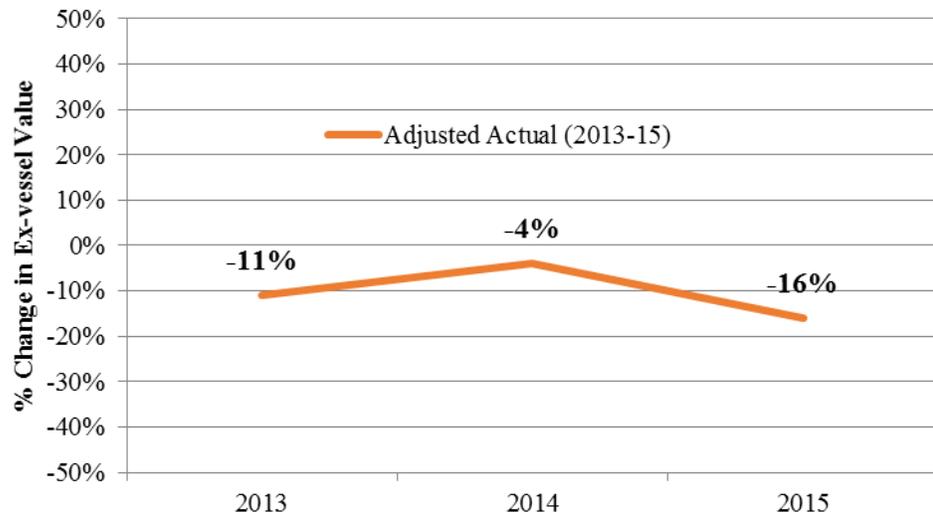


Figure 12— Comparison of percent difference in actual ex-vessel values during the first three transition years (2013-15) compared to modeled estimates if CR Fisheries Reform was not implemented for those same years (0% equals no change). Adjusted actual is the difference between the actual ex-vessel and the expected value under policies in effect during 2010-2012.

ADAPTIVE MANAGEMENT RECOMMENDATIONS

Existing rules and statutes governing CR Fisheries Reform require adaptive management to best align policy implementation with policy objectives and expected outcomes. A key purpose of the transition period was to phase-in implementation, reassess based on new information, and, if necessary, adapt management actions to best achieve overarching objectives of the policy for long-term implementation.

As requested by the Commission in March of 2016, staff have prepared this summary document including assessment of potential adaptive management measures.

We used angler trips, commercial ex-vessel values, and total personal income impacts from each to assess overall economic benefits of three scenarios. This was done using expansion values for each fishery (\$40 per angler trip, and ex-vessel value multiplied by 1.88) as presented in the Fiscal Impact Statement approved by the Commission in June 2013. Table 30 compares modelled estimates from three scenarios: full policy implementation (Full Implementation), locking in the last year of the transition period (Keep Transition), and a strategic rebalance (Rebalance), as well as an estimate of pre-2012 ‘equivalents’ for reference (Base).

If the Commission takes no action on CR Fisheries Reform policy, the full policy will be implemented. Model estimates for this scenario are shown in Table 30 as “Full Implementation”. This would: continue additional allocation shifts (generally 80:20 recreational:commercial, although no allocation is currently specified in Oregon rules for summer Chinook); exclude gillnets from mainstem fisheries; require alternative gears for all commercial mainstem fisheries; continue to provide off-channel enhancements as currently outlined in policy. This meets the policy objective to phase out gillnets in mainstem fisheries and meets the policy objective for recreational fishery priority in the mainstem (maximum increase in angler trips). However it fails to meet the policy objective to enhance viability of commercial fisheries, primarily because effective

alternative gears for mainstem fisheries are not currently available. The modeled ex-vessel values are approximately 50% of potential value if no policy was in place, and are 82% of the observed values for the pre-reform baseline period. Conservation benefits would be less than in the staff proposal described below.

The Commission could also act to continue into the future under the policies as they have been implemented during the transition period. Modeled outputs for this option are shown in Table 30 and labeled “Keep Transition”. If the last year of transition was implemented as the final long-term approach, it would continue allocations (generally 70:30), gear allowances, and production levels from 2016. This option best meets the policy objective to enhance viability of commercial fisheries, with modeled ex-vessel values similar to what could have accrued for commercial fisheries during transition years without policy implementation. This option results in increased angler trips over pre-reform policies. However this option does not meet the policy objective to phase out gill nets in mainstem fisheries and results in a smaller increase in angler trips for mainstem fisheries than either full implementation or the rebalance proposal below. This option also has an elevated risk of failing to reach agreement with Washington (based on preliminary feedback from their Commission’s Fish Committee). Conservation benefits would be less than in the staff proposal described below.

Staff assessments indicate that neither full implementation nor locking in transition period conditions will optimize the multiple competing objectives of CR Fisheries Reform. While there are numerous modifications that could be made to better meet the policy objective, staff is recommending adaptive management to create a strategic rebalance of the policies.

Staff Recommendation for Adaptive Management - Strategic Rebalance to optimize competing objectives. Model estimates for this option are shown in Table 30 and labeled as “Rebalance”.

This recommendation would continue allocation shifts in spring and summer (80:20), but not in fall (70:30), which is the most economically important for commercial fisheries. Mainstem gillnet fisheries would be limited to Commercial Zones 4-5 targeting Upriver Bright fall Chinook, which is the most efficient area to harvest the most economically-important fish for commercial fisheries within ESA impact limitations. This recommendation would incorporate the “conservation set-aside” approach described earlier, which would incentivize conservation fisheries in the lower Columbia River to remove hatchery Chinook and Coho in order to aid in achieving conservation objectives and limit future hatchery cuts. Additionally this recommendation would provide further production enhancements to off-channel fisheries and has less risk of non-concurrent management with Washington. This recommendation meets the policy objective to remove gillnets from the mainstem for significant portions of the year (spring and summer seasons) and continues to pursue the policy objective to develop better alternative gears and techniques for commercial use in the lower mainstem Columbia. This recommendation meets the policy objective for a viable commercial fishery (modeled ex-vessel values, after full accrual of benefits in about 2022, are about 94% of potential value if no policy in place, and modeled ex-vessel values exceed (146%) the observed values for pre-reform baseline period). This recommendation results in a slight loss in commercial ex-vessel values relative to the potential if no policy were in place and full benefits from additional off-channel enhancements are not expected for several

years. Under this recommendation the increase in angler trips is less than under full implementation but more than during the pre-reform and transition periods.

Table 30—Modelled outputs under policy scenarios.

	Base	Full Implementation	Keep Transition	Rebalance
Angler trips	406,099	437,121	422,567	427,133
Ex-vessel	\$6,184,328	\$3,027,209	\$5,840,690	\$5,803,781
Personal Income Impacts				
Sport	\$16,243,960	\$17,484,840	\$16,902,680	\$17,085,320
Commercial	\$11,626,536	\$ 5,691,152	\$10,980,496	\$10,911,108

Season, gear and allocation details for the staff proposal are as follows:

Spring Season (Jan. 1 – Jun. 15)

- Allocation
 - Assign 80% of the upriver spring Chinook ESA-impact to mainstem recreational fisheries and the balance (20%) to commercial fisheries.
 - As outlined in the current policy for 2017 and beyond, runsize buffers would not be applied to commercial impacts used for off-channel fisheries.
 - Priority for use of the commercial allocation is to support full fishing in off-channel fisheries. Commercial mainstem openers with selective gear (tangle net) may occur only after the run update if impacts are available. Impacts could include unused recreational impacts if they are not projected to be used in recreational fisheries (including those upriver from Bonneville Dam) or unused off-channel commercial impacts after optimizing harvest in those areas.
- Mainstem Commercial Gears
 - Non-tribal mainstem commercial fisheries in spring would be restricted to the use of tangle nets or other non-gillnet selective gear and fishing techniques, if developed.
- Off-Channel Commercial
 - Gillnets would remain in use for off-channel areas.
 - No runsize buffer applied to allocated impacts; utilize full impact allocation as necessary to optimize harvest and access in off-channel fisheries; unused impacts may be used in commercial mainstem openers with selective gear (tangle net) but may occur only after the run update.
 - Existing sites (with current boundaries) and new sites have priority for available impacts.
 - Impacts can be used to expand boundaries and fishing days only if they pose low risk to existing fisheries.
 - Off-channel hatchery production commitments will continue.
 - An additional 500,000 spring Chinook will be released at Gnat Creek Hatchery to augment some existing off-channel SAFE fisheries. **(New)**
 - A new site will be developed at Westport Slough (OR) to accommodate an additional 250,000 spring Chinook. **(New)**
 - The agency will encourage Washington to develop an off-channel commercial site in Coal Creek on the Washington side of the Columbia River and shift

current hatchery salmon from Cathlamet Channel to Coal Creek (approximately 250,000 spring Chinook). **(New)**

- Sport Regulations
 - Remove barbless hook requirement for lower Willamette River and Oregon off-channel recreational fisheries. **(New)**

Summer Season (Jun. 16 – Jul. 31)

- Allocation
 - Summer Chinook: Assign 80% of the harvestable surplus to mainstem recreational fisheries and the balance (20%) to commercial fisheries. **(New – Oregon policy for 2017+ is silent on summer Chinook)**
 - Reserve approximately one fourth of the commercial allocation (5% of overall allocation below PRD) for Select Area fisheries to support off-channel commercial fisheries targeting late-returning spring Chinook and early-returning Select Area Bright fall Chinook. **(New)**
 - Remaining commercial allocation available for mainstem harvest using non-gillnet selective gears and fishing techniques (currently undetermined) that minimize bycatch impacts on sturgeon, steelhead and sockeye. **(New)**
 - If commercial allocation is unlikely to be used, transfer the allocation to the recreational fishery upstream of Bonneville Dam (if it can be utilized), or leave unharvested to aid spawning escapement. **(New)**
- Sockeye: 80:20 as in existing policy.
- Mainstem Commercial Gears
 - No gillnets.
 - Agencies to work with commercial fleet to develop alternatives for low-impact release of non-target fish (sturgeon, sockeye, steelhead). **(New)**
- Off Channel Commercial
 - Gillnets would remain in use for off-channel areas.
 - Continue SAB releases with increased efforts to contain conservation risks (weir, release location) and meet egg take goal unnecessarily restricting fisheries **(New)**.

Fall Season (Aug. 1 – Dec. 31)

- Conservation
 - Set aside 1% of impacts off the top of allowable ESA tule Chinook impacts for non-tribal fisheries south of the U.S./Canada border to create a conservation fishery targeting hatchery Coho and hatchery fall Chinook in areas downstream of the Lewis River (Commercial Zones 1-3). **(New)**
 - Contribution to this set-aside will be proportionate to tule impacts allocated between non-tribal ocean and river fisheries south of the U.S./Canada border (currently averages 60:40). The amount set-aside (0.4% for non-tribal Columbia River fisheries) is independent of Commission sport-commercial allocation policy and will not be considered as part of allocation formulas. **(New)**
 - Conservation set-aside impacts are reserved to maximize removal of hatchery Chinook and Coho in the lower river. Unused conservation set-aside impacts are not transferable to non-selective fisheries or to fisheries upstream of the Lewis River. **(New)**

- Allocation
 - Chinook:
 - Assign $\leq 70\%$ of the ESA-impact (after deduction of in-river conservation set-aside) of the most constraining ESA Chinook stock to mainstem recreational fisheries to meet management objectives. **(New)**
 - Assign $\geq 30\%$ of the ESA-impact (after deduction of in-river conservation set-aside) of the most constraining ESA Chinook stock to off-channel commercial fisheries and to mainstem commercial fisheries in Commercial Zones 4-5 that target Upriver Bright fall Chinook. **(New)**
 - At large Upriver Bright run sizes and when lower Columbia tule Chinook are the most constraining stock, it is anticipated that over half of the lower river harvestable surplus of Upriver Bright fall Chinook would occur in mainstem commercial fisheries.
 - Coho:
 - Assign commercial fisheries a sufficient share of the ESA-impact for Lower Columbia Natural Coho to implement off-channel Coho and fall Chinook fisheries, and mainstem fall Chinook fisheries in Commercial Zones 4-5.
 - Assign the balance to mainstem recreational fisheries.
- If recreational fisheries do not harvest all of the ESA-impact for Lower Columbia Natural Coho, assign the remainder to mainstem commercial Coho fisheries in Commercial Zones 1-3 with selective gear. Mainstem commercial Coho opportunity will use selective gears (e.g., tangle nets) and is expected to occur in mid- to late-October.
- Mainstem Commercial Gears
 - Because access to upriver bright fall Chinook is critically important to ensure economic viability of the commercial fishery, fall mainstem commercial gillnet fisheries will continue to occur in Zones 4 and 5 using gillnets to target upriver bright fall Chinook. **(New)**
 - Additional information will be collected during this fishery to observe bycatch of sturgeon and steelhead (with an emphasis on B-run wild steelhead) as necessary to evaluate impacts and update bycatch data used in commercial fishery models. **(New)**
 - Fall commercial fisheries in Commercial Zones 1-3 would be restricted to using non-gillnet selective gear and techniques using conservation set-aside Tule impacts and/or LCN coho impacts to target hatchery fall Chinook and hatchery Coho for conservation purposes.
 - In collaboration with commercial fishers, research will continue to investigate alternative commercial gears and techniques. Incentive for participation will be access to the conservation set-aside impacts. **(New)**
 - Work with WDFW to conduct another seine mortality study with a lower river focus and improved experimental design. **(New)**
- Off Channel Commercial
 - Gillnets would remain in use for off-channel areas.
- Recreational Fisheries
 - Continue to utilize mix of selective and non-selective fisheries as needed to meet season length objectives.
 - Recreational use of set-aside Tule impacts to be used to add mark-selective Chinook and/or Coho retention downstream of the Lewis River. **(New)**

- Remove Youngs Bay “control zone” fishery closure (**New**; SB 830 required revisit by 2017).
- Additional Research
 - Priority focus on methods to externally differentiate wild Tule from wild Upriver Bright Fall Chinook and, as appropriate, incorporate into management measures, fishery monitoring, and fishery models. (**New**)
 - If successful, use this differentiation to better leverage available Tule impacts to harvest surplus upriver bright fall Chinook in recreational and commercial fisheries that are currently non-selective. (**New**)

Adaptive Management

- The Commission will continue tracking implementation and results of CR Fisheries Reform, with annual updates by staff as well as a comprehensive review every five years with recommendations for necessary adaptive management.