

Executive Summary

The following summary was authored by Mount Hood Environmental (MHE) with assistance from the Washington Department of Fish and Wildlife (WDFW). MHE received documentation from WDFW and WDFW provided editorial review and suggested revisions to MHE's summary write-up.

The Columbia River Basin Salmon Management Policy (C-3620) was first adopted in January 2013 to promote conservation of natural-origin salmon stocks, reallocate harvest of hatchery fish from commercial to recreational fisheries in the main stem Columbia River, bolster commercial harvest in off-channel areas, and improve the economic wellbeing of Washington's fisheries. The policy included several specific provisions that were expected to be fully implemented by December 2016 (Table 1). However, the policy also included requirements to avoid negative economic impacts to Lower Columbia River non-tribal commercial fisheries. This, in combination with limited success of alternate commercial fishing methods and inadequate development off-channel fishing areas, has impaired the complete implementation of the provisions of C-3620. As a result, mainstem commercial gillnet fisheries have not been phased out and recreational fishing effort has not increased substantially in the Columbia River. However, there have been numerous noteworthy achievements that occurred as a direct result of the Policy, including successful management of Endangered Species Act (ESA)-impacts, increases in releases of hatchery-origin salmon in off-channel areas, improvements in management tools (e.g. run forecasts), assessments of seine and tangle net fisheries, and quantification of fishery impact rates.

In January 2018, the Washington Department of Fish and Wildlife (WDFW) received 40 questions from the Fish and Wildlife Commission about specific aspects of the policy. Detailed responses to those questions, as well as public comments on each question, are provided in subsequent sections of this report. The general theme can be abbreviated as follows: Has the policy been implemented as written, and what has occurred as a result of policy changes? Here we address this overarching theme for each of the three major components of C-3620, which were conservation, allocation, and economic benefits.

Table 1. C-3620 Policy implementation summary

Policy Provision	Implemented	Explanation
Reduce WA gillnet licenses	NO	A contractor was hired to assist with development of a buy-back program, but the effort was abandoned and a new approach has begun
Increase mainstem commercial landings caught with alternate gear types	PARTIAL	Commercial landings from seine and tangle net gear types have been relatively small
Incentivize use of alternate commercial gear types	NO	No significant incentives were provided
Phase out use of gillnets in the main stem Columbia River	NO	Suitable alternative gear types and adequate off-channel fishing areas have not been developed
Establish or evaluate new off-channel commercial fishing sites	PARTIAL	Cathlamet Channel was evaluated for potential use as a spring Chinook fishery, but smolt survival was low
Emphasize allocation to recreational anglers in the Columbia River main stem	YES	Allocations for all major salmon stocks were prioritized for recreational anglers
Evaluate use of logbooks for fishing guides and recreational anglers	PARTIAL	Legislation change has occurred to allow WDFW to require logbook use
Enhance management of both recreational and commercial fisheries	YES	Catch and release mortality rates for commercial and recreational fisheries are being evaluated; Run forecasting techniques have been improved
Implement Spring Chinook management buffer	YES	Implemented in 2013 and was successful in preventing spring Chinook ESA impacts from exceeding target thresholds
Implement use of barbless hooks in mainstem and tributary fisheries	YES	Fishing regulations updated to restrict use of barbed hooks in areas with high concentrations of ESA-listed fish

Conservation

The first guiding principle of C-3620 is to *“Promote the recovery of ESA-listed species and the conservation of wild stocks of salmon and steelhead in the Columbia River...”*

Measures adopted to conserve natural-origin salmon stocks in the Columbia Basin have included fishery regulation changes, monitoring fishing impacts on protected stocks, bolstering hatchery releases in off-channel fishing areas, and use of mark-selective fisheries to reduce the number of hatchery fall Chinook and coho salmon that reach spawning areas. For example, WDFW now requires barbless hooks in mainstem Columbia River and tributary recreational fisheries¹. A study being conducted by WDFW, Mount Hood Environmental, and Tacoma Power to evaluate the impacts of different terminal tackle types on salmon and steelhead catch-and-release mortality in the Cowlitz River, will be used to examine the benefits of this policy change. A full analysis from this three-year study is expected to be available in 2020.

In addition to estimating mortality rates of caught and released salmon and steelhead in recreational fisheries, WDFW partnered with the Oregon Department of Fish and Wildlife (ODFW) to estimate steelhead and sturgeon encounters in the gillnet fishery upstream of the Lewis River. A total of 128 commercial gillnet vessels were observed in August and September 2017. Four hundred and seven A and B-run steelhead were captured, or 3% of the 14,366 fish handled. The steelhead/Chinook encounter ratio was 41% higher than pre-season estimates. However, instantaneous steelhead mortality rates were lower than expected. Taken together, the higher than expected encounter rate (0.028) and lower than expected instantaneous mortality rate (0.24) led to similar pre and post-season cumulative impacts to steelhead encountered during the fishery. A total of 691 white sturgeon were also encountered, though no expectations were set prior to monitoring and no instantaneous mortality rates were recorded.

WDFW has invested over \$8 million to develop alternative fishing methods for Lower Columbia River commercial fisheries. Grants and contracts with commercial licensees were also pursued for alternative gear development and testing. Catch rates, bycatch, post-capture fish condition and survival, and gear investment costs have been evaluated for purse seines and beach seines for summer and fall fisheries (Table 2). Unfortunately, despite these efforts, no alternative gear types have been fully adopted, though coho and spring Chinook tangle net and fall seine net (beach and purse) fisheries have been operated under the Washington Administrative Code and RCW 77.70.180, respectively².

¹ This requirement was removed for certain periods of time on the Cowlitz River, Deep River, Drano Lake, Elochoman River, Green River, Klickitat River, Mayfield Lake, South Fork Toutle River, and Wind River due to presence of few ESA-listed fish.

² During 2013-2015, the coho tangle net fishery was open for a total of 20 days (average = 7 days/year), and a total of 24,058 coho (average = 8,019 fish/year) were landed. The fall Chinook seine fishery was open 2014-2016 for a total of 71 days (average = 24 days/year), and a total of 6,902 Chinook were landed. The coho seine net fishery was open 2014-2015 for a total of 47 days (average = 24 days/year), and a total of 1,657 coho were landed.

Barring successful identification of an alternate gear that can efficiently capture salmon while limiting impacts to non-target stocks, WDFW has not developed direct incentives for use of alternate gear types. However, some commercial licensees have made notable investments to use alternate gears.

To promote development of off-channel commercial fishing areas, WDFW released juvenile spring Chinook in 2014 from Cathlamet Channel net pens. Unfortunately, this did not result in a new Washington Select Area fishery due to poor smolt survival and unsuccessful test fishing. ODFW also evaluated four potential new off-channel fishing sites in the Lower Columbia River, including Coal Creek Slough, located 10 miles west of Longview, Washington. The assessment revealed concerns about excessive catch of upriver-migrating spring Chinook, lack of acclimation infrastructure, and the potential for high stray rates due to insufficient source waters. No further steps have been taken to develop the Coal Creek Slough fishery.

Although exploration for new off-channel fisheries in Washington has not been successful, additional salmon smolt releases have occurred in Oregon to support Select Area commercial fisheries. Target goals included a 24% increase during the transition period and 16% increase long term. Actual releases during the transition period did constitute about a 24% increase relative to pre-policy releases, but remained 9% below targets. Releases in 2017 were nearly equivalent to the pre-policy goal of 7,290,000 total smolts, but fell below the long term, post-policy goal by 15% (1,262,400) smolts.

Reducing the proportion of hatchery-origin fall Chinook and coho spawners (pHOS) on spawning grounds was an important conservation measure in C-3620. WDFW sought to accomplish this by increasing mark-selective fisheries and managing weirs designed to collect hatchery fish downstream of primary natural spawning areas. During the policy implementation period, pHOS decreased by an average of 20% compared to the pre-policy average in five primary Lower Columbia River fall Chinook populations. The bulk of this reduction was attributed to the use of weirs; however, limited mark-selective mainstem recreational and commercial fisheries for hatchery fall Chinook and coho were also implemented, 2013-2017. Estimated pHOS reductions for tule fall Chinook due to mark-selective fisheries were quite small, ranging between 0% and 2% in the Elochoman, Coweeman, Green, and Washougal Rivers.

Though not a direct result of the Policy, predator reduction programs are occurring in parallel with C-3620's Guiding Principles. The most successful work has been focused on fish and avian piscivores. For example, the Columbia River Predator Control Program, funded by Bonneville Power Administration, seeks to remove large (>250 mm) Northern Pikeminnows, a native cyprinid that thrives in Columbia River reservoirs and consumes outmigrating juvenile salmon and steelhead. The Pikeminnow Program achieved its annual goals during 2013-2017, removing 10-20% of the adult Pikeminnow population and reducing predation on juvenile salmonids by an estimated 24% during 2017. WDFW also increased or eliminated bag limits on piscivorous warm-water species, such as

smallmouth bass, in several Columbia River and tributary fisheries. However, the effectiveness of these regulations has not been formally evaluated. Similarly, aggressive action has been taken to address overpopulation of avian predators as well. Sand Island Caspian Terns (*H. caspia*) have been relocated and Double-crested Cormorants (*P. auritus*) have been lethally removed from the island by WDFW and the U.S. Army Corps of Engineers (USACE). Still, piscivorous birds remain a concern since management efforts likely resulted in population relocation.

Unfortunately, little progress has been made to curtail marine mammal predation on adult salmon and steelhead in the Lower Columbia River. Recent research has estimated that marine mammals are taking more ESA-listed Columbia River adult salmonids than commercial and sport fisheries combined (Chasco et al. 2017). Despite removing 24 California Sea Lions in 2017, the USACE estimated that Sea Lions still consumed 9% of the steelhead return that year. Washington, Oregon, and Idaho are currently waiting for federal legislation (H.R. 2083) to pass that will allow management agencies to remove 10% of each species of Sea Lion (California and Steller) that are identified as jeopardizing salmon, steelhead or sturgeon populations in the Lower Columbia River.

Table 2. Alternative commercial fishing gear types considered during the policy implementation period.

Gear	Pre/Post 2013 Policy	Catch Rates	Bycatch	Released Fish Condition	Gear Investment Cost	Chance of Success
Merwin Trap	Pre	Low	Low	Moderate	High	Low
Tangle Net – Spring	Pre	Fair	Low	Good	Low	High
Tangle Net – Coho	Post	Fair	Low	Moderate	Low	High
Purse Seine – Summer	Post	Moderate	High	Good	High	Low
Beach Seine – Summer	Post	Low	High	Good	Moderate	Low
Purse Seine – Fall	Both	High	Moderate	Good	High	High
Beach Seine – Fall	Both	High	High	Good	Moderate	High
Pound Net – Fall	Post	Moderate	High	Good	High	Moderate

Allocation

Recreational and commercial fisheries have been prioritized in the mainstem and off-channel areas, respectively, through ESA-impact allocations. One of the most interesting findings in this assessment is that increasing pre-season ESA-impact allocation for the recreational fishery did not have a large effect, particularly for spring Chinook, because the recreational fishery is not constrained by its ESA-impact allocation and impacts are typically reallocated to the commercial fishery through in-season management (Table 3). As a result, ESA-impacts used by each fishery during the policy implementation period were often similar to pre-policy values. For example, despite substantial increases in pre-season impact allocations to recreational fisheries under the Policy, the proportion of total non-treaty spring Chinook ESA-impacts used by recreational fisheries increased just slightly from 56.7% during 2010-2012 to 57.9% during 2013-2017 (Figure 1), and the proportion of total harvest by the recreational fishery increased by 5.5% during the same time period (Figure 2). Similar patterns were observed for fall Chinook.

The catch-balance provision in *U.S. v. Oregon* specifies allocations of Upriver spring Chinook ESA impacts to treaty and non-treaty fisheries. For non-treaty spring Chinook salmon, catch-balance is often more constraining to recreational fisheries, while ESA-impacts allocated under C-3620 tend to be more constraining to commercial fisheries. This is due to differences in release mortality rates, as well as the time and location of recreational and commercial fisheries. In-season allocation changes are often needed to maximize harvest of hatchery fish, while remaining below the total ESA-impact threshold for both fisheries. For example, during 2014 and 2015, the recreational fishery utilized a high percentage of catch-balance and a lower percentage of ESA-impacts. Therefore, the Columbia River Compact reallocated impacts to the commercial fishery. These reallocations, in conjunction with a 30% management buffer, allowed recreational and commercial fisheries to utilize a high percentage of their spring Chinook catch-balance allocation (88% and 95%, respectively) during the policy implementation period without exceeding ESA-impact thresholds established by the National Marine Fisheries Service.

For the summer Chinook fishery, recreational fishing opportunity above Priest Rapids Dam (PRD) is WDFW's highest priority. During 2013-2017, recreational and non-treaty tribal fisheries were not constrained and harvest of summer Chinook was greater upstream of PRD. However, harvest fell below the allocation objectives for these fisheries each year. Recreational and non-treaty tribal fisheries upstream of PRD utilized an average of only 69% of the allocated harvest, while commercial and recreational fisheries downstream of PRD utilized an average of 87% of the allocated harvest³. The non-tribal commercial fishery exceeded its share of harvest each year of the policy, except in 2017, when there was not a summer Chinook commercial fishery.

³ The harvestable share of non-treaty summer Chinook below PRD was allocated to commercial fisheries below Bonneville Dam and recreational fisheries in accordance with C-3620.

Policy objectives for fall Chinook allocation were largely met during the implementation period, though occasional exceedance of ESA-impacts occurred. Specifically, pre-season tule Chinook ESA-impact allocations were exceeded in 2013 by both recreational and commercial fisheries; however, there were remaining ESA-impacts available from ocean fisheries. The recreational fishery also exceeded its share of tule Chinook ESA-impacts in 2014 and 2017, but the aggregate impact of both commercial and recreational fisheries remained under the total impact allocation. On average, commercial and recreational fisheries utilized a high percentage of ESA-impacts for tule Chinook (94% and 92%, respectively). Similarly, commercial and recreational fisheries utilized a high percentage of Upriver Bright (URB) fall Chinook ESA-impacts (94% and 91%, respectively). Allocation objectives for URB ESA-impact shares were met during 2013-2017; however, ESA-impacts were exceeded in 2014 and 2016 by the commercial fishery, and in 2017 by the recreational fishery. Often during in-season management, decisions are made to reallocate impacts from one fishery to another to achieve the overall non-treaty allocations, consistent with the objectives of the Policy.

A portion of the Lower Columbia Natural (LCN) Coho ESA-impacts were allocated to off-channel coho and fall Chinook commercial fisheries, as well as the main stem commercial fall Chinook fishery, and the balance was provided to mainstem recreational fisheries. If these fisheries were expected to be unable to use all of their ESA-impacts, the remainder was reallocated to mainstem commercial coho fisheries. Allocation objectives were met annually as off-channel coho and fall Chinook fisheries occurred each year of the policy and mainstem fall Chinook fisheries were not constrained by LCN Coho ESA-impacts. Due to large coho runs in 2013-2015, WDFW was able to reallocate ESA-impacts to mainstem gillnet and tangle net commercial fisheries. Unfortunately, a low forecasted coho run size in 2017 and few allowable summer steelhead impacts prevented any opportunity for a sanctioned mainstem coho commercial fishery.

Additional allocation objectives included meeting the subsistence and ceremonial needs of the Confederated Tribes of the Colville Reservation and the Wanapum Band (RCW 77.12.453). The Colville Tribes were allocated an average of 53%, and harvested an average of 50%, of non-treaty summer Chinook above PRD during 2013-2017. The needs of the Wanapum Band were also met annually, with average harvests of 28 spring Chinook, 210 summer Chinook, 470 sockeye, and 251 fall Chinook.

The effort to bolster commercial harvest in off-channel areas has seen mixed results. For example, the proportion of total spring Chinook commercial harvest by off-channel fisheries increased from 69% during 2010-2012 to 75% during 2013-2017. However, the fall Chinook off-channel fishery saw a decrease in proportion of total commercial harvest from 37% during 2010-2012 to 21% during 2013-2017, and the proportion of total coho commercial harvest by off-channel fisheries (78%) did not change during the policy implementation period.

Table 3. Summary of ESA-impacts and harvest allocations for recreational and commercial Chinook fisheries. Instances where policy allocations were exceeded or in-season allocations were changed are highlighted in grey.

Run	Fishery	2013		2014		2015		2016		2017	
		Policy	Actual [Catch Balance]								
Spring Chinook (ESA Impacts)	Recreational	65%	54% [78%]	70%	63% [83%]	70%	46% [75%]	70%	55% [80%]	80%	71% [94%]
	Commercial	35%	46% [22%]	30%	37% [17%]	30%	54% [25%]	30%	45% [20%]	20%	29% [6%]
	Recreational Above Bonneville	25%	21%	25%	27%	25%	26%	25%	25%	25%	28%
	Recreational Below Bonneville	75%	79%	75%	73%	75%	74%	75%	75%	75%	72%
Summer Chinook (Harvest)	Recreational and Tribal Above Priest Rapids Dam	67%	60%	64%	54%	60%	59%	62%	52%	67%	60%
	Recreational and Commercial Below Priest Rapids Dam	33%	40%	36%	46%	40%	41%	38%	48%	33%	40%
	Recreational below Priest Rapids Dam	60%	55%	60%	50%	70%	63%	70%	58%	80%	99%
	Commercial below Bonneville	40%	45%	40%	50%	30%	37%	30%	42%	20%	1%
Tule Fall Chinook (ESA Impacts)	Recreational	≤70%	70%	≤70%	79%	≤70%	61%	≤70%	49%	≤75%	91%
	Commercial	≥30%	30%	≥30%	21%	≥30%	39%	≥30%	51%	≥25%	9%
UPR Bright Fall Chinook (ESA Impacts)	Recreational	≤70%	45%	≤70%	36%	≤70%	58%	≤70%	44%	≤75%	64%
	Commercial	≥30%	55%	≥30%	64%	≥30%	42%	≥30%	56%	≥25%	36%

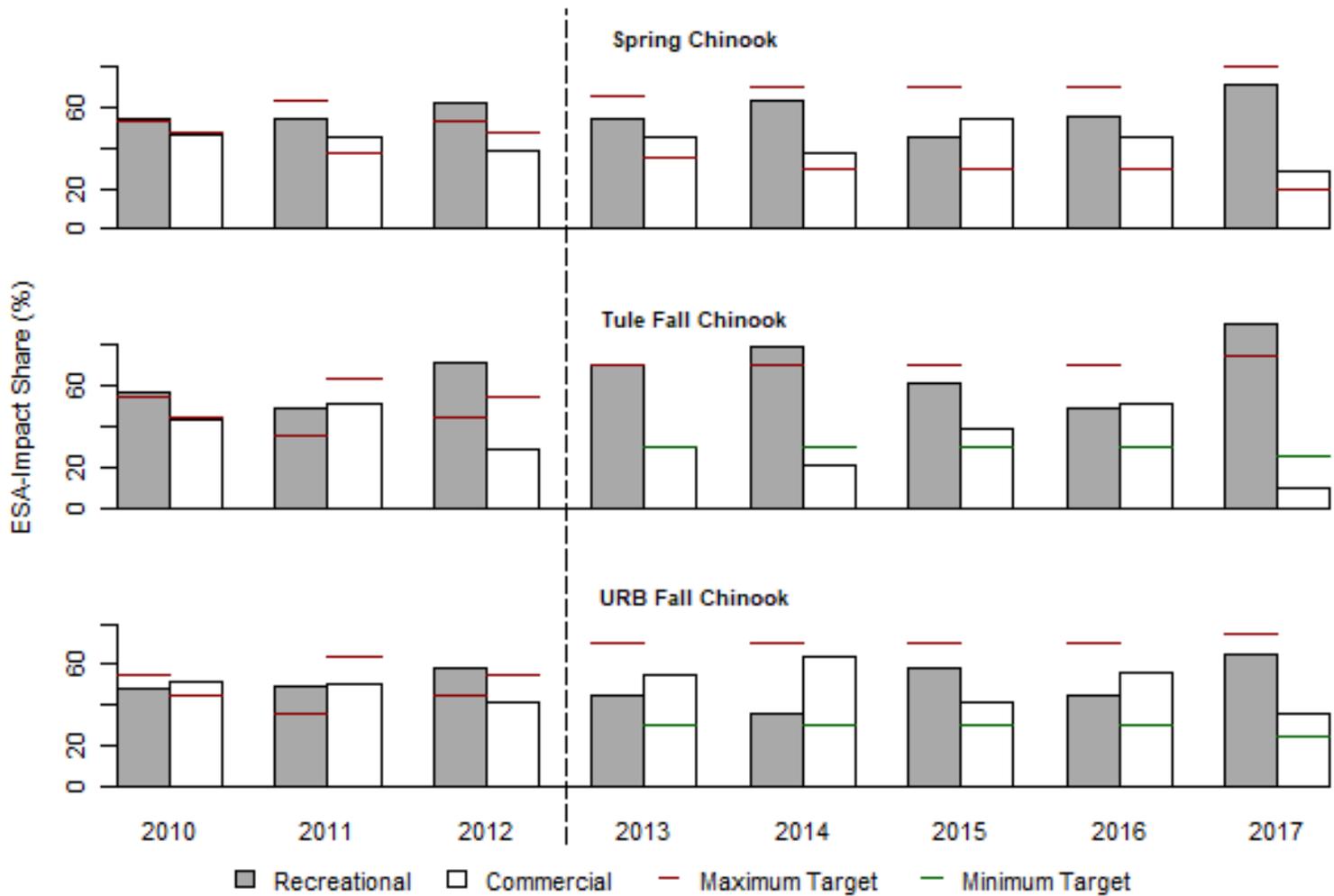


Figure 1. Proportion of total non-treaty ESA-impacts used by commercial and recreational fisheries, 2010-2017.

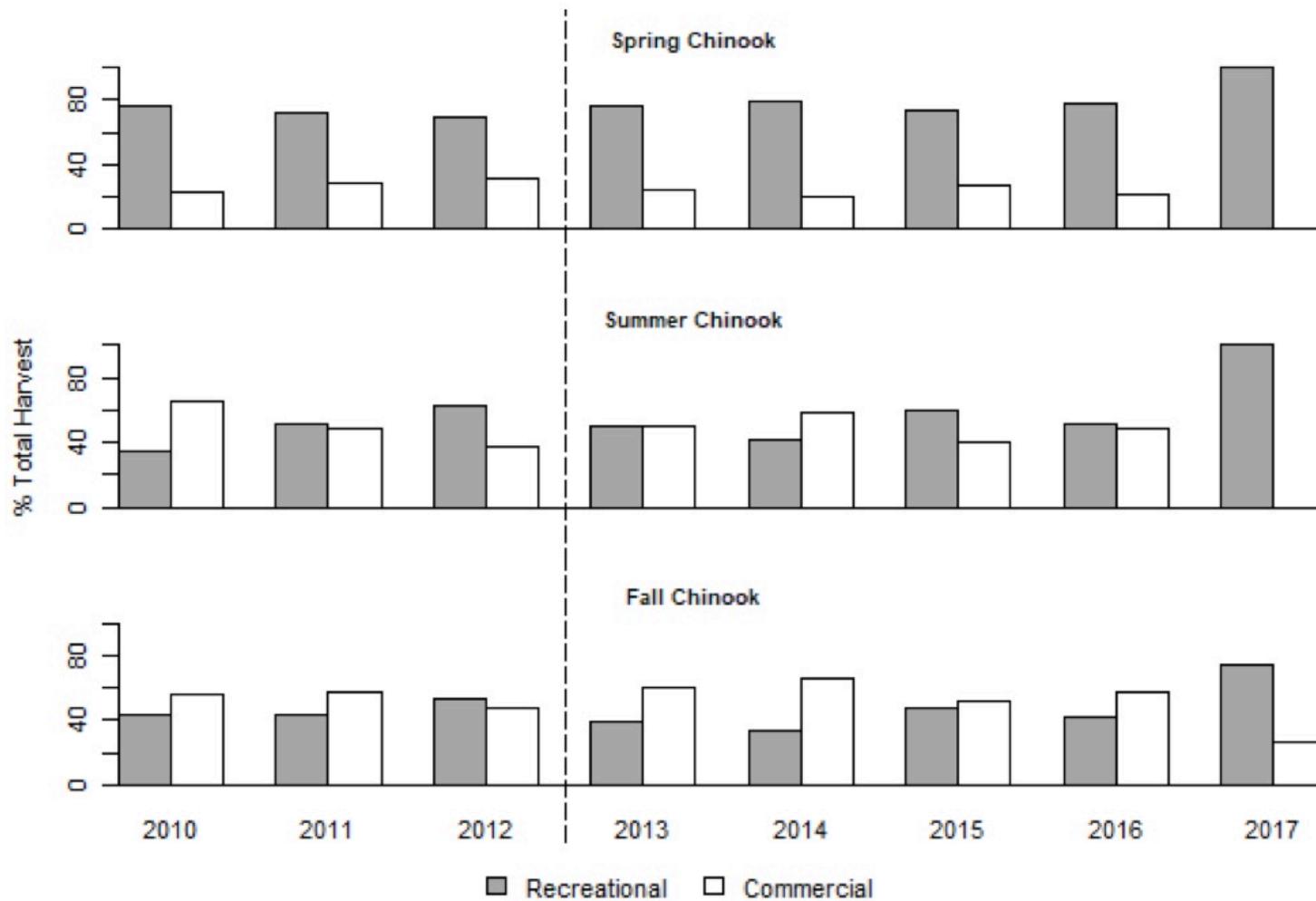


Figure 2. Proportion of total non-treaty mainstem Columbia River harvest by commercial and recreational fisheries, 2010-2017.

Economic Benefits

C-3620 endeavored to “*enhance the overall economic well-being and stability of Columbia River fisheries*” by prioritizing use of alternate commercial gear types in the Columbia River main stem, increasing commercial harvest in off-channel fishing areas, and boosting recreational angling opportunity. The full suite of actions necessary to implement these measures has not occurred. Therefore, expectations about the economic response to the Policy should be tempered. Moreover, the primary factor affecting the economic value of both recreational and commercial fisheries is the abundance of fish returning to the Columbia Basin, and accurately assessing the policy’s economic benefits in the short term is confounded by the influence of variable ocean conditions on salmon and steelhead run sizes.

Recreational angler trips in the main stem Columbia River, valued at approximately \$58 per trip, were expected to increase by 13% during the first four years of policy implementation; instead, average annual recreational angler trips remained about the same (<1% decrease) compared to the pre-policy period, as did economic value of the recreational fishery (Figure 3). Average annual angler trips declined for spring Chinook by 24% during the policy implementation period and by 60% during 2017. Summer Chinook saw a 33% loss during policy implementation, and a 45% loss during 2017. In concert with strong returns of fall Chinook and coho salmon, angler effort increased by an average of 22% during the fall season. Across all years, the number of annual angler trips declined by an average of 5% during 2013-2017 (Table 4). After standardizing the data for total salmon returns to the Columbia Basin (angler trips/fish returns), the annual number of angler trips to mainstem fisheries downstream of Bonneville Dam decreased by 20% overall during the post policy period (2013-2017) despite a slight increase in total fishing days.

Commercial fisheries generally fared better than recreational fisheries, though not as well as expected, with a 14% average annual increase in ex-vessel value during the post policy period (Figure 3) and a 4% decrease in ex-vessel value after standardizing the data for total salmon returns (ex-vessel value/fish returns). Lower than average commercial landings for spring and summer Chinook were offset by a relatively high price per pound. Gillnet fishing remained the primary gear type for the industry, but a small proportion of landings were made via experimental seine and tangle net fisheries² representing 2% of the annual commercial fishery ex-vessel value. On average, 59% of the total gillnet ex-vessel value was derived from mainstem fisheries during the post-policy period—up 6% relative to the economic contribution of mainstem fisheries during the pre-policy period. Ex-vessel value derived from off-channel fisheries did not change during the policy implementation period (<1% decrease).

ODFW conducted an analysis that attempted to isolate the effects of Policy changes from other confounding factors by simulating the expected response of each fishery to both pre and post-policy ESA-impact allocations and Select Area production levels

during the same time series of years, 2010-2017 (ODFW, personal communication). The analysis incorporated information about annual run sizes, fish mark rates, price per pound, average fish weights, effort, and in-season management decisions. Modelers estimated a 3% average annual gain in angler trips and a 7% average annual reduction in commercial ex-vessel values due to the Policy during the post-policy period (2013-2017).

Interpretations of the economic response could range from moderately negative to slightly positive in the recreational fishery, and slightly negative to moderately positive within the commercial fishery. It is clear, however, that the large economic benefits predicted by the Columbia River Fishery Management Workgroup were not observed during the policy implementation period. Appreciable changes in economic benefits to Washington’s non-tribal fisheries will require additional steps to institute the Policy’s primary provisions, specifically greater emphasis on use of alternate commercial gear types in the main stem and development of new off-channel fishing areas.

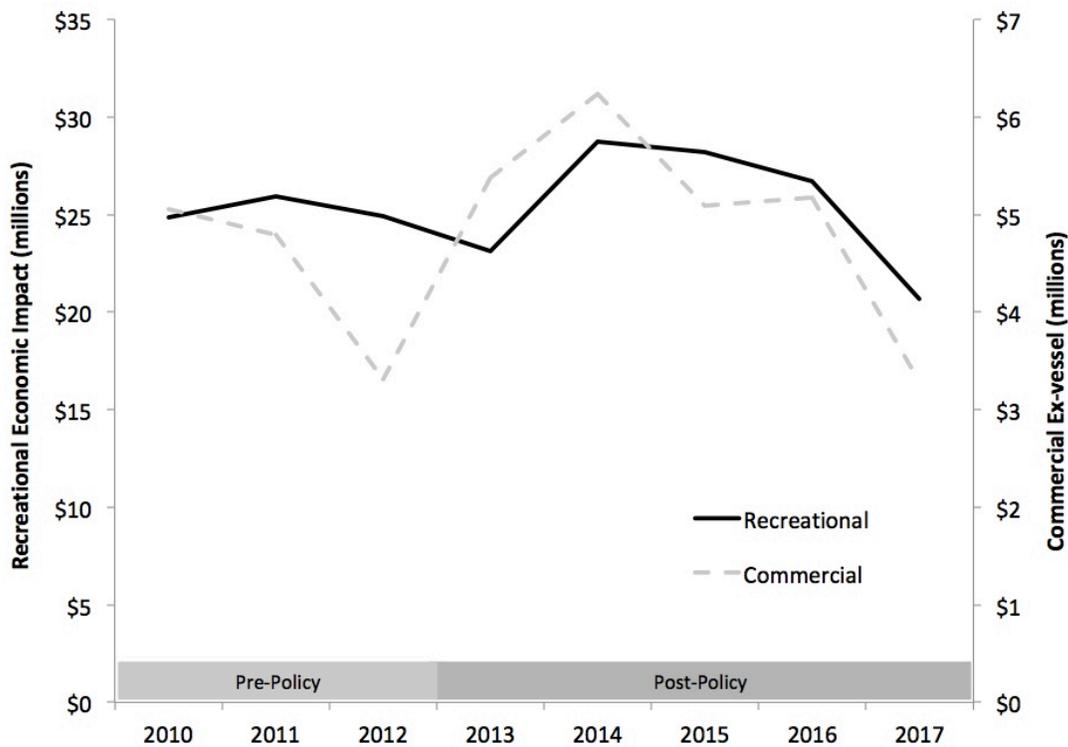


Figure 3. Economic value of Washington Columbia River commercial and recreational fisheries, 2010-2017.

Table 4. Average annual total salmon returns, recreational angler trips, and commercial ex-vessel values in Columbia River fisheries during the pre (2010-2012) and post-policy (2013-2017) implementation periods.

	Pre-policy	Post-policy
Salmon returns	1,734,904	2,056,362
Angler trips	417,799	397,467
Ex-vessel value	\$4,400,000	\$5,000,000