

**2017-2018 GROUND FISH HARVEST  
SPECIFICATIONS AND MANAGEMENT  
MEASURES INCLUDING CHANGES TO  
GROUND FISH STOCK DESIGNATIONS  
(AMENDMENT 27 TO THE PACIFIC COAST  
GROUND FISH FISHERY MANAGEMENT PLAN)**

**DESCRIPTION AND ANALYSIS FOR COUNCIL  
DECISION-MAKING**

**UPDATED SOCIOECONOMIC  
ANALYSIS (SECTION 4.2)**

**Pacific Fishery Management Council  
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**June 2016**

#### **4.1.5 Summary of Groundfish Mortality under the Alternatives**

Detailed descriptions of the fishery management measures and the modeled estimates of groundfish mortality are reported by alternative and sector in Sections 4.1.1, 4.1.2, 4.1.3, and 4.1.4. Impacts to groundfish stocks are assessed in relation to limit reference points (OFL, MSST). In this context although management measures are designed to achieve but not exceed ACL, impacts to stock status are evaluated under the assumption that all of the ACL is harvested. Historically, however, given a variety of factors like overfished species interactions, market conditions, weather, etc., there are very few stocks and complexes where the ACL is achieved. Each biennium, GMT catch projection models are used to adjust management measures to better attain ACLs while limiting the risk that ACLs are exceeded (and since the ACL is a precautionary reduction from the limit reference point, even exceeding it does not represent a serious adverse impact). Despite the best efforts to improve ACL attainment, there is little interannual variation on ACL attainment for most species.

#### **4.2 Short-Term Socioeconomic Impacts of the Integrated Alternatives**

This section evaluates the effects of the alternatives on fishery participants and fishing communities. Section 3.2 in the EIS for the 2015-2016 harvest specifications and management measures and Amendment 24 (PFMC and NMFS 2015) describes the economic status of these affected groups during the baseline period used for that analysis (2003 to 2012) based on historical commercial landings data, estimates of recreational fishing activity, and census data. Updated baseline information may be found in the 2016

Groundfish SAFE (PFMC 2016). Here, various methods are used to estimate how conditions may change from the baseline, either by applying harvest specifications based on default HCRs and compliant management measures (No Action Alternative) or under Alternatives 1 and 2, which contain different ACLs for key stocks and default ACLs for the remaining stocks, and Alternative 3 which combines the final preferred ACLs with preliminary preferred management measures.

The 2015 EIS (PFMC and NMFS 2015) describes the models and data used to project socioeconomic impacts. Updated documentation of the models may be found in Appendix A. Projection models include:

- GMT catch projection models for different commercial sectors of the groundfish fishery
- GMT fishing effort (angler trips) projection models for the recreational groundfish fishery
- The landings distribution model (LDM), which is used to estimate where landings are likely to occur and the resulting port-level ex-vessel revenue
- The IOPAC model used to evaluate the effect of the alternatives on coastal communities (ports where commercial groundfish landings and recreational groundfish effort occur) by estimating personal income generated (“income impacts”) and associated employment impacts
- Net revenue in commercial fishery operations based on projected landings and vessel cost earnings surveys.

The following sections assess socioeconomic impacts in terms of:

- Changes in commercial ex-vessel revenue by fishery sector
- Change in recreational angler trips by community
- Change in net revenue by fishery sector
- Change in income and employment impacts by community resulting from changes in commercial landings revenue and recreational effort.

## **4.2.1 Change in Commercial Ex-Vessel Revenue and Recreational Angler Trips**

### **4.2.1.1 Commercial Fisheries**

Revenue estimates are based on projected landings estimates from the GMT models referenced above.

Table 4-137 and Table 4-138 compare ex-vessel revenue estimates under the action alternatives to the No Action Alternative. Projections assume average ex-vessel prices observed in 2015. Effects are presented according to groundfish fishery “sectors” (see the 2015 EIS PFMC and NMFS 2015, Section 3.2.2).

Table 4-139, and Table 4-140 compare projected shoreside commercial ex-vessel revenue under the alternatives to the annual average for the 2011-2015 baseline period.<sup>6</sup> Note that revenue projections are more aggregated in these tables and exclude estimates for some of the sectors, such as at-sea whiting, incidental open access and tribal groundfish fisheries.

The TAC for Pacific whiting is set annually outside of this harvest specifications process. The 2015 Pacific whiting TAC and allocations are used to derive an estimate of catch and resulting revenue for the whiting sectors. For the at-sea sectors revenues are assumed to be the same across all alternatives.

Compared to No Action:

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<sup>6</sup> Ex-vessel revenue for 2015 should be considered provisional since not all fish tickets had been entered into PacFIN by the query date of February 3, 2016.

- Alternative 1 shows an overall increase in shoreside ex-vessel revenue of \$6.6 million to a total of \$95.5 million and Alternative 2 shows an increase of \$6.5 million to \$95.4 million. These revenue changes occur exclusively in the shoreside non-whiting IFQ sector (trawl and fixed gear).
- Alternative 3 shows an overall increase in shoreside ex-vessel revenue of \$19.8 million to a total of \$108.7 million. Almost all of this change occurs in the shoreside IFQ sector. Alternative 3 combines the final preferred ACLs with preliminary preferred management measures.

**Table 4-135. Estimated ex-vessel revenues by groundfish harvest sector under the alternatives (2015 \$million).**

	No Action		Alternative 3*		Alternative 1		Alternative 2	
	2017	2018	2017	2018	2017	2018	2017	2018
<b>Shoreside Sectors:</b>								
Whiting	13.3	13.3	<b>13.3</b>	<b>13.3</b>	13.3	13.3	13.3	13.3
Non-whiting Trawl+Non-trawl IFQ	40.1	40.0	<b>60.3</b>	<b>59.3</b>	46.9	46.4	46.8	46.3
Limited Entry Fixed Gear	16.0	16.7	<b>16.5</b>	<b>17.1</b>	16.0	16.7	16.0	16.7
Nearshore Open Access	4.7	4.7	<b>4.7</b>	<b>4.7</b>	4.7	4.7	4.7	4.7
Non-nearshore Open Access	4.4	4.5	<b>4.0</b>	<b>4.1</b>	4.4	4.5	4.4	4.5
Incidental Open Access	0.2	0.2	<b>0.2</b>	<b>0.2</b>	0.2	0.2	0.2	0.2
Tribal (incl. whiting)	9.8	9.9	<b>9.8</b>	<b>10.0</b>	9.8	9.9	9.8	9.9
<b>Shoreside sectors' Totals</b>	<b>88.5</b>	<b>89.3</b>	<b>108.8</b>	<b>108.7</b>	<b>95.3</b>	<b>95.7</b>	<b>95.2</b>	<b>95.6</b>
<b>At-sea Sectors:</b>								
Non Tribal Whiting	25.9	25.9	<b>25.9</b>	<b>25.9</b>	25.9	25.9	25.9	25.9
Tribal Whiting	5.1	5.1	<b>5.1</b>	<b>5.1</b>	5.1	5.1	5.1	5.1
<b>At-sea sectors' Totals</b>	<b>31.0</b>	<b>31.0</b>	<b>31.0</b>	<b>31.0</b>	<b>31.0</b>	<b>31.0</b>	<b>31.0</b>	<b>31.0</b>
<b>TOTAL Groundfish Revenue</b>	<b>119.5</b>	<b>120.4</b>	<b>139.8</b>	<b>139.7</b>	<b>126.4</b>	<b>126.7</b>	<b>126.3</b>	<b>126.6</b>

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

**Table 4-136. Change in groundfish ex-vessel revenues from the No Action Alternative by groundfish harvest sector under the action alternatives, 2017-2018 average (2015 \$million).**

	No Action	Alternative 3*	Alternative 1	Alternative 2
	2017-18	2017-18	2017-18	2017-18
<b>Shoreside Sectors:</b>				
Whiting	13.3	-0.0	+0.0	+0.0
Non-whiting Trawl+Non-trawl IFQ	40.0	+19.753	+6.605	+6.504
Limited Entry Fixed Gear	16.3	+0.476	+0.0	+0.0
Nearshore Open Access	4.7	-0.042	+0.0	+0.0
Non-nearshore Open Access	4.5	-0.395	+0.0	+0.0
Incidental Open Access	0.2	+0.0	+0.0	+0.0
Tribal (incl. whiting)	9.9	+0.015	+0.0	+0.0
<b>Shoreside sectors' Totals</b>	<b>88.9</b>	<b>+19.806</b>	<b>+6.605</b>	<b>+6.504</b>
<b>At-sea Sectors:</b>				
Non Tribal Whiting	25.9	+0.0	+0.0	+0.0
Tribal Whiting	5.1	+0.0	+0.0	+0.0
<b>At-sea sectors' Totals</b>	<b>31.0</b>	<b>+0.0</b>	<b>+0.0</b>	<b>+0.0</b>
<b>TOTAL Groundfish Revenue</b>	<b>119.9</b>	<b>+19.8</b>	<b>+6.6</b>	<b>+6.5</b>

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

**Table 4-137. Change in groundfish ex-vessel revenues from the No Action Alternative by shoreside harvest sector under the action alternatives (percent).**

	No Action	Alternative 3*	Alternative 1	Alternative 2
	2017-18	2017-18	2017-18	2017-18
<b>Shoreside Sectors:</b>				
Whiting	13.3	-0.0%	+0.0%	+0.0%
Non-whiting Trawl+Non-trawl IFQ	40.0	+49.3%	+16.5%	+16.2%
Limited Entry Fixed Gear	16.3	+2.9%	+0.0%	+0.0%
Nearshore Open Access	4.7	-0.9%	+0.0%	+0.0%
Non-nearshore Open Access	4.5	-8.9%	+0.0%	+0.0%
Incidental Open Access	0.2	+0.0%	+0.0%	+0.0%
Tribal (incl. whiting)	9.9	+0.1%	+0.0%	+0.0%
<b>Shoreside sectors' Totals</b>	<b>88.9</b>	<b>+22.3%</b>	<b>+7.4%</b>	<b>+7.3%</b>
<b>At-sea Sectors:</b>				
Non Tribal Whiting	25.9	+0.0%	+0.0%	+0.0%
Tribal Whiting	5.1	+0.0%	+0.0%	+0.0%
<b>At-sea sectors' Totals</b>	<b>31.0</b>	<b>+0.0%</b>	<b>+0.0%</b>	<b>+0.0%</b>
<b>TOTAL Groundfish Revenue</b>	<b>119.9</b>	<b>+16.5%</b>	<b>+5.5%</b>	<b>+5.4%</b>

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

Compared to the 2011-2015 baseline period (Table 4-138-Table 4-140):

- Alternative 3 shows the largest increase in ex-vessel revenue \$26.3 million. This is about twice the increase in ex-vessel revenue estimated for Alternatives 1 and 2. Alternative 3 combines the final preferred ACLs with preliminary preferred management measures.
- Alternatives 1 and 2 show an increase in ex-vessel revenue of about \$13 million across all shoreside sectors.
- The shoreside whiting sector shows a decline of \$8.3 million from the baseline, but it must be remembered that these ex-vessel revenue estimates assume the Pacific whiting TAC in 2017-2018 will be the same as the 2015 TAC. In reality, the TAC could be higher or lower. For example, the 2016 TAC, which is known at this time, is 42,481 metric tons greater than the 2015 TAC.
- Alternative 2 only differs in projected ex-vessel revenue from Alternative 1 by approximately \$100,000 less revenue in the shoreside non-whiting IFQ sector.
- No Action shows the smallest increase from the baseline, an increase of \$6.4 million to a total of \$78.7 million, or an increase of approximately 9 percent.
- In relative terms the smallest projected revenue increase is 21.4 percent in the non-nearshore fixed gear sector under Alternatives 1 and 2; the estimate under Alternative 3 is slightly higher for this sector. The largest relative increase occurs in the non-whiting IFQ fishery under Alternative 3, at 99.5 percent, or about a doubling in revenue compared with the baseline.

**Table 4-138. Groundfish ex-vessel revenues under the Baseline (5-year 2011 to 2015 inflation-adjusted average annual ex-vessel revenue) and 2017-18 Alternatives by aggregated non-tribal shoreside commercial harvest sector under the commercial fishery alternatives (2015 \$million).**

\$ million	Baseline	No Action	Alternative 3*	Alternative 1	Alternative 2
		2017-18	2017-18	2017-18	2017-18
Whiting	21.6	13.3	13.3	13.3	13.3
Non-whiting Trawl+Non-trawl IFQ	30.0	40.0	59.8	46.7	46.5
Nearshore Fixed Gear	3.6	4.7	4.7	4.7	4.7
Non-nearshore Fixed Gear	17.1	20.8	20.9	20.8	20.8
<b>Totals</b>	<b>72.3</b>	<b>78.8</b>	<b>98.6</b>	<b>85.5</b>	<b>85.3</b>

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

**Table 4-139. Change in groundfish ex-vessel revenues from the Baseline (5-year 2011 to 2015 inflation-adjusted average annual ex-vessel revenue) by aggregated non-tribal shoreside commercial harvest sector under the commercial fishery alternatives (2015 \$million).**

\$ million	Baseline	No Action	Alternative 3*	Alternative 1	Alternative 2
		2017-18	2017-18	2017-18	2017-18
Whiting	21.6	-8.284	-8.284	-8.284	-8.284
Non-whiting Trawl+Non-trawl IFQ	30.0	+10.072	+29.824	+16.677	+16.576
Nearshore Fixed Gear	3.6	+1.095	+1.052	+1.095	+1.095
Non-nearshore Fixed Gear	17.1	+3.672	+3.753	+3.672	+3.672
<b>Totals</b>	<b>72.3</b>	<b>+6.555</b>	<b>+26.346</b>	<b>+13.160</b>	<b>+13.059</b>

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

**Table 4-140. Change in groundfish ex-vessel revenues from the Baseline (5 year 2011–2015 inflation-adjusted average annual ex-vessel revenue) by aggregated non-tribal shoreside commercial harvest sector under the commercial fishery alternatives (percent).**

\$ million	Baseline	No Action	Alternative 3*	Alternative 1	Alternative 2
		2017-18	2017-18	2017-18	2017-18
Whiting	21.6	-38.4%	<b>-38.4%</b>	-38.4%	-38.4%
Non-whiting Trawl+Non-trawl IFQ	30.0	+33.6%	<b>+99.5%</b>	+55.6%	+55.3%
Nearshore Fixed Gear	3.6	+30.0%	<b>+28.9%</b>	+30.0%	+30.0%
Non-nearshore Fixed Gear	17.1	+21.4%	<b>+21.9%</b>	+21.4%	+21.4%
<b>Totals</b>	<b>72.3</b>	<b>+9.1%</b>	<b>+36.4%</b>	<b>+18.2%</b>	<b>+18.1%</b>

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

In the 2015 EIS, the discussion of modeling commercial fishery impacts presented a number of caveats:

- Effort displaced by management measures is assumed not to switch readily into another fishery sector or geographic region
- Landings projection models and economic impact models like IOPAC are calibrated to represent a baseline or “snapshot” of the economy at a particular point in time. Consequently these models are best able to address impacts of scenarios that are not too far removed from the realm of what has occurred in the recent past.
- Catch projections in the IFQ fishery may not reflect the leveraging effect of increases in ACLs for “choke” species (those with low ACLs/allocations. A higher allocation of, for example, canary rockfish to the shorebased IFQ fishery may generate more actual revenue than is forecast using the current catch projection models.
- Stock recruitment variability and catch monitoring uncertainty mean that actual catches may differ from the projections. Although actual ACL attainment may differ from projections, inseason management measures are applied to prevent ACLs from being exceeded
- As noted above, the Pacific whiting TAC is determined annually, consistent with the Agreement with Canada on Pacific Hake/Whiting; 73.88 percent of the TAC is allocated to U.S. fisheries. Since the TAC and resulting allocation is not determined during the harvest specifications process, a historical TAC is used to estimate socioeconomic impacts. The actual TACs for 2017 and 2018 could be higher or lower than the assumed value.

For more discussion of these caveats see pages 370-371 in the 2015 EIS.

#### 4.2.1.2 Recreational Fisheries

For recreational fisheries, projected marine area angler boat trips (charter plus private) taken in groundfish plus Pacific halibut recreational fisheries are compared to historical recreational fishing effort under the proposed management alternatives. Table 4-141, Table 4-142, and Table 4-143 compare average annual recreational angler trips during the 2010-2014 baseline period to projected angler effort under the alternatives. Results are shown by coastal regions that are aggregated from statistical reporting regions.<sup>7</sup>

<sup>7</sup> The Puget Sound region is not shown in these tables because Council managed recreational fisheries do not occur in this region.



The Council wished to explore a number of recreational management options under each of the alternative ACLs and allocations. Most of these management variations have a modest effect on project angler fishing effort. To produce a tractable number of projections that cover the range of potential effort levels (and below, personal income and employment), the alternatives and these management options are presented in five scenarios in addition to No Action. For more information about the proposed management options see Section 4.

The change in recreational fishing effort from the baseline period:

- Under Alternatives 1 and 2:
  - With California Options 1 and 3 the increase from the baseline is 204,800 angler trips or 25 percent.
  - With California Option 4 there is a substantial decrease in angler trips of 260,100 (-31 percent).
- Under Alternative 1, with California Options 1 and 3 and the Washington State Option, a very similar increase—204,400 angler trips (25 percent) is estimated.
- No Action shows the same increase as Alternatives 1 and 2 combined with California Options 1 and 3.<sup>8</sup>
- Alternative 1 with California Option 2 shows the largest increase, 212,800 angler trips, approximately 26 percent above the baseline.
- Alternative 3 is estimated to result in an increase of 209,000 angler trips from the baseline, or approximately 25 percent above the baseline.

There are regional differences in the projected changes in angler trips:

- Since Southern California accounts for the largest share of coastwide recreational angler trips (61% during the baseline period), the Santa Barbara to San Diego region also shows the largest nominal changes in effort ranging from an increase of 102,000 trips (20%) across all the scenarios except for California Option 4 where angler trips would decline by 238,800 (-47%).
- The largest relative increases across all the alternatives are projected for the Fort Bragg to Bodega Bay region. These increases range from 85% to 98% except for under California Option 4 where the increase is 50%.
- The San Francisco region shows the next largest relative increase for all scenarios (except California Option 4) at almost 80 percent. This is an increase of 44,400 angler trips to a total of approximately 100,000.
- The rest of Northern California (Crescent City to Bodega Bay) also shows higher relative increases than Southern California or Washington/Oregon. The highest relative increase in Northern California (98%) is projected for the Fort Bragg-Bodega Bay region under Alternative 3, which represents final preferred ACLs combined with preliminary preferred management measures. This represents an increase of 11,200 angler trips to a total of 22,600. Angler trips in the Crescent City-Eureka region would increase by 10,200 or almost 44%.
- Washington and Oregon account for 15 percent of total angler trips during the baseline period, and the projected changes in angler trips are more modest than in the California regions. The Washington Coast shows relative increases across the alternatives, ranging from 16.3 percent to 16.8 percent. (The Washington groundfish season alternative under Alternative 1 shows the smaller increase.) This translates into 5,200-5,400 more angler trips to push the totals to above 37,000.

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<sup>8</sup> Due to rounding there are slight differences in the fractional percentages for equivalent angler effort estimates.

- In Oregon relative changes range from declines of less than 1 percent in the Coos Bay-Brookings region to an increase of 7.4 percent for the Astoria-Tillamook region. These changes do not vary across the alternatives.

In modeling recreational fishery impacts, it is assumed that anglers who are displaced or discouraged by management measures under a particular alternative cannot switch readily into a different fishery in the same region or another region elsewhere along the coast. Thus the numbers reported below probably represent something of an upper bound on regional economic impacts on recreational fisheries, or the maximum amount of displacement likely to occur under the alternatives. This also means that the models may not necessarily be able to distinguish subtle differences resulting from relatively fine distinctions between the alternatives if those differences lie within the models' margins of error.

**Table 4-141. Estimated Recreational Effort (halibut+bottomfish) under the Baseline and 2017-18 Alternatives (thousands of angler trips).**

<b>Community Groups</b>	<i>Baseline (average 2010-2014)</i>	<i>No Action</i>	<i>Alternative 3*</i>	<b>Alternative 1 (CA Ops 1 and 3)</b>	<b>Alternative 2 (CA Ops 1 and 3)</b>	<b>Alternatives 1 and 2 (CA Op 2)</b>	<b>Alternatives 1 and 2 (CA Op 4)</b>	<b>Alternative 1 (CA Ops 1 and 3) + WA Groundfish Season Alt</b>
Puget Sound		-	-	-	-	-	-	-
Washington Coast	32.1	37.4	<b>37.4</b>	37.4	37.4	37.4	37.4	37.3
Astoria-Tillamook	15.0	16.1	<b>16.1</b>	16.1	16.1	16.1	16.1	16.1
Newport	45.4	48.0	<b>48.0</b>	48.0	48.0	48.0	48.0	48.0
Coos Bay-Brookings	34.8	34.7	<b>34.7</b>	34.7	34.7	34.7	34.7	34.7
Crescent City-Eureka	23.2	30.6	<b>33.4</b>	30.6	30.6	38.1	23.1	30.6
Fort Bragg - Bodega Bay	11.4	21.1	<b>22.6</b>	21.1	21.1	21.6	17.2	21.1
San Francisco Area	56.0	100.4	<b>100.4</b>	100.4	100.4	100.4	51.3	100.4
SC – Mo – MB*	105.6	137.9	<b>137.9</b>	137.9	137.9	137.9	74.5	137.9
SB – LA – SD*	509.0	611.0	<b>611.0</b>	611.0	611.0	611.0	270.1	611.0
<b>Coastwide Total</b>	<b>832.4</b>	1,037.2	<b>1,041.5</b>	1,037.2	1,037.2	1,045.2	572.3	1,037.0

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

**Table 4-142. Estimated change from Baseline Recreational Effort (halibut+bottomfish) under the 2017-18 Alternatives (thousands of angler trips).**

<b>Community Groups</b>	<i>Baseline (average 2010-2014)</i>	<i>No Action</i>	<b>Alternative 3*</b>	<b>Alternative 1 (CA Ops 1 and 3)</b>	<b>Alternative 2 (CA Ops 1 and 3)</b>	<b>Alternatives 1 and 2 (CA Op 2)</b>	<b>Alternatives 1 and 2 (CA Op 4)</b>	<b>Alternative 1 (CA Ops 1 and 3) + WA Groundfish Season Alt</b>
Puget Sound		-	-	-	-	-	-	-
Washington Coast	32.1	+5.4	<b>+5.4</b>	+5.4	+5.4	+5.4	+5.4	+5.2
Astoria-Tillamook	15.0	+1.1	<b>+1.1</b>	+1.1	+1.1	+1.1	+1.1	+1.1
Newport	45.4	+2.5	<b>+2.5</b>	+2.5	+2.5	+2.5	+2.5	+2.5
Coos Bay-Brookings	34.8	-0.1	<b>-0.1</b>	-0.1	-0.1	-0.1	-0.1	-0.1
Crescent City-Eureka	23.2	+7.4	<b>+10.2</b>	+7.4	+7.4	+14.9	-0.2	+7.4
Fort Bragg - Bodega Bay	11.4	+9.7	<b>+11.2</b>	+9.7	+9.7	+10.2	+5.8	+9.7
San Francisco Area	56.0	+44.4	<b>+44.4</b>	+44.4	+44.4	+44.4	-4.7	+44.4
SC – Mo – MB*	105.6	+32.3	<b>+32.3</b>	+32.3	+32.3	+32.3	-31.1	+32.3
SB – LA – SD*	509.0	+102.0	<b>+102.0</b>	+102.0	+102.0	+102.0	-238.8	+102.0
<b>Coastwide Total</b>	<b>832.4</b>	+204.8	<b>+209.0</b>	+204.8	+204.8	+212.8	-260.1	+204.6

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

**Table 4-143. Estimated change from Baseline Recreational Effort (halibut+bottomfish) under the 2017-18 Alternatives (percent).**

<b>Community Groups</b>	<i>Baseline (average 2010-2014)</i>	<i>No Action</i>	<i>Alternative 3*</i>	<b>Alternative 1 (CA Ops 1 and 3)</b>	<b>Alternative 2 (CA Ops 1 and 3)</b>	<b>Alternatives 1 and 2 (CA Op 2)</b>	<b>Alternatives 1 and 2 (CA Op 4)</b>	<b>Alternative 1 (CA Ops 1 and 3) + WA Groundfish Season Alt</b>
Puget Sound		-	-	-	-	-	-	-
Washington Coast	32.1	+16.8%	<b>+16.8%</b>	+16.8%	+16.8%	+16.8%	+16.8%	+16.3%
Astoria-Tillamook	15.0	+7.4%	<b>+7.4%</b>	+7.4%	+7.4%	+7.4%	+7.4%	+7.4%
Newport	45.4	+5.6%	<b>+5.6%</b>	+5.6%	+5.6%	+5.6%	+5.6%	+5.6%
Coos Bay-Brookings	34.8	-0.3%	<b>-0.3%</b>	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%
Crescent City-Eureka	23.2	+31.8%	<b>+43.8%</b>	+31.8%	+31.8%	+64.2%	-0.7%	+31.8%
Fort Bragg - Bodega Bay	11.4	+85.1%	<b>+98.1%</b>	+85.1%	+85.1%	+89.2%	+50.4%	+85.1%
San Francisco Area	56.0	+79.3%	<b>+79.3%</b>	+79.3%	+79.3%	+79.3%	-8.3%	+79.3%
SC – Mo – MB*	105.6	+30.6%	<b>+30.6%</b>	+30.6%	+30.6%	+30.6%	-29.5%	+30.6%
SB – LA – SD*	509.0	+20.0%	<b>+20.0%</b>	+20.0%	+20.0%	+20.0%	-46.9%	+20.0%
<b>Coastwide Total</b>	<b>832.4</b>	+24.6%	<b>+25.1%</b>	+24.6%	+24.6%	+25.6%	-31.2%	+24.6%

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

## 4.2.2 Cost and Net Revenue Estimates

Table 4-144 and Table 4-145 contain updated net revenue estimates for the non-whiting trawl IFQ fishery, non-whiting non-trawl IFQ fishery, limited entry fixed gear fishery, open access nearshore fishery, and open access non-nearshore fishery. Results were calculated using the estimated ex-vessel revenue data sent on June 5 and include results for Alternative 3.<sup>9</sup> For each alternative, the tables provide revenue, variable costs, fixed costs, variable cost net revenue (revenue minus variable cost) and total cost net revenue (revenue minus total costs) by fishery. Results are presented for each alternative as the average of estimates for 2017 and 2018<sup>10</sup>.

Estimates of costs for each scenario were developed using estimates from the Landings Distribution Model as well as information collected through the Northwest Fisheries Science Center's economic data collection program. For the trawl fishery, data as recent as 2014 was available for analysis. For the limited entry fixed gear and open access groundfish fishery, data from 2011-2012 was used for analysis. While our cost surveys attempt to capture a complete picture of the costs of operating a commercial fishing vessel, there are a small share of costs that are not captured by these surveys. As a result, net revenue provides an upward biased measure of profitability.

Accounting net revenues are calculated as the difference between the ex-vessel value of landings and the estimated costs incurred in achieving those landings.<sup>11</sup> Net revenue results are not provided for the shoreside whiting fishery for two reasons. First, whiting prices in the various scenarios for 2017 and 2018 were assumed to be \$0.08 per pound (i.e., the average ex-vessel price observed in 2015), while during the period for which we have economic data (2011 to 2014) to estimate variable costs in the IFQ fishery, whiting prices ranged from \$.10 to \$.14 per pound. Since crew members are typically paid a share of revenue with some deductions, the lower whiting prices will likely have a substantial impact on crew costs, the largest variable cost category. However, this effect is not quantifiable at this time. Second, the NWFSC does not have sufficient economic data reflecting costs in the newly emerging non-whiting mid-water trawl fishery. Some scenarios for 2017 and 2018 assume the non-whiting mid-water trawl fishery is harvesting over 10 million pounds per year, whereas in 2014 (the most recent year of economic data) less than 2 million pounds of non-whiting were landed with mid-water gear. Given the emerging nature of this fishery, it is likely that the NWFSC's data will be substantially improved when 2015 data from trawl fishery participants is collected (which is due September 1, 2016).

These two problems do not affect the other five fishery sectors for which net revenue results are provided (see Table 4-144). The variable cost net revenue estimates (revenue minus variable costs) measure short-run profitability of operating a catcher vessel. Total cost net revenue (revenue minus total cost) measures the long-run profitability of operating a catcher vessel.

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<sup>9</sup> The ex-vessel revenue estimates are derived from the Landings Distribution Model.

<sup>10</sup> This analysis was performed by Dr. Carl Lian and Dr. Erin Steiner at the NWFSC.

<sup>11</sup> These estimates are based on a comparison of landings revenues projected under the alternatives with landings and average costs reported in economic data reports (for IFQ sectors) and on cost-earnings surveys of samples of vessels in the remaining groundfish sectors. Values reported are "total cost net revenues," which include pro-rations of certain estimated fixed cost components in addition to the variable costs directly associated with each groundfish fishery sector.

**Table 4-144. Estimates of ex-vessel revenue (output from Landings Distribution Model), variable cost net revenue (ex-vessel revenue net of variable costs), and total cost net revenue (ex-vessel revenue net of variable costs and fixed costs) by fishery sector under the alternatives. Values are averages of estimates for 2017 and 2018 reported in millions of dollars, and for total cost net revenue, as a percentage of gross revenue.**

<b>Fishery Sector</b>	<b>No Action</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>
<b>Ex-vessel Revenue (All Groundfish Species) by Fishery Sector</b>				
Non-whiting Trawl	\$33.15	\$36.64	\$36.55	\$49.21
Non-whiting Fixed Gear	\$6.03	\$6.03	\$6.02	\$6.05
LE Fixed Gear	\$16.34	\$16.34	\$15.70	\$16.82
Open Access Nearshore	\$4.57	\$4.57	\$4.57	\$4.70
Open Access Non-nearshore	\$4.45	\$4.45	\$4.21	\$4.06
<b>Variable Cost Net Revenue by Fishery Sector</b>				
Non-whiting Trawl	\$17.57	\$20.12	\$20.08	\$27.64
Non-whiting Fixed Gear	\$3.82	\$3.85	\$3.86	\$3.66
LE Fixed Gear	\$10.89	\$10.89	\$10.44	\$11.30
Open Access Nearshore	\$2.28	\$2.28	\$2.28	\$2.40
Open Access Non-nearshore	\$2.40	\$2.40	\$2.23	\$2.32
<b>Total Cost Net Revenue by Fishery Sector</b>				
Non-whiting Trawl	\$11.00	\$11.93	\$11.89	\$16.99
Non-whiting Fixed Gear	\$1.06	\$1.03	\$1.01	\$1.24
LE Fixed Gear	\$2.98	\$2.98	\$2.79	\$3.07
Open Access Nearshore	\$0.39	\$0.39	\$0.39	\$0.40
Open Access Non-nearshore	\$0.35	\$0.35	\$0.28	\$0.20
<b>Total Cost Net Revenue as a Percentage of Total Ex-vessel Revenue</b>				
Non-whiting Trawl	<b>33%</b>	<b>33%</b>	<b>33%</b>	<b>35%</b>
Non-whiting Fixed Gear	<b>18%</b>	<b>17%</b>	<b>17%</b>	<b>21%</b>
LE Fixed Gear	<b>18%</b>	<b>18%</b>	<b>18%</b>	<b>18%</b>
Open Access Nearshore	<b>9%</b>	<b>9%</b>	<b>9%</b>	<b>8%</b>
Open Access Non-nearshore	<b>8%</b>	<b>8%</b>	<b>7%</b>	<b>5%</b>

**Table 4-145. Estimates of vessel costs by fishery sector under the alternatives. Values are averages of estimates for 2017 and 2018 reported in millions of dollars.**

<b>Fishery Sector</b>	<b>No Action</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>
<b>Variable Costs by Fishery Sector <sup>1</sup></b>				
Non-whiting Trawl	\$17.57	\$20.12	\$20.08	\$27.64
Non-whiting Fixed Gear	\$3.82	\$3.85	\$3.86	\$3.66
LE Fixed Gear	\$10.89	\$10.89	\$10.44	\$11.30
Open Access Nearshore	\$2.28	\$2.28	\$2.28	\$2.40
Open Access Non-nearshore	\$2.40	\$2.40	\$2.23	\$2.32
<b>Fixed Costs by Fishery Sector <sup>2</sup></b>				
Non-whiting Trawl	\$4.58	\$4.58	\$4.58	\$4.58
Non-whiting Fixed Gear	\$1.15	\$1.15	\$1.15	\$1.15
LE Fixed Gear	\$2.46	\$2.46	\$2.46	\$2.46
Open Access Nearshore	\$1.90	\$1.90	\$1.90	\$1.90
Open Access Non-nearshore	\$1.70	\$1.70	\$1.70	\$1.70
<b>Total Costs by Fishery Sector <sup>3</sup></b>				
Non-whiting Trawl	\$22.15	\$24.71	\$24.66	\$32.23
Non-whiting Fixed Gear	\$4.97	\$4.99	\$5.01	\$4.80
LE Fixed Gear	\$13.36	\$13.36	\$12.91	\$13.76
Open Access Nearshore	\$4.18	\$4.18	\$4.18	\$4.31
Open Access Non-nearshore	\$4.10	\$4.10	\$3.93	\$4.02

1 Variable costs including crew and captain compensation, fuel, ice, and bait.

2 Fixed costs including fishing gear, vessel and on-board equipment, repair and maintenance and moorage.

3 Total costs including both variable costs and fixed costs (from cost earnings survey and economic data collection program).



### 4.2.3 Communities: Change in Income and Employment Impacts by Community

Socioeconomic impacts to fishing communities engaged in the groundfish fishery are evaluated based on the change in personal income (income impacts) and employment-related measures under the alternatives. These effects are a function of the projected changes in commercial and recreational fishing activity described above. Comparisons are with respect to the No Action Alternative. Impacts were estimated using NWFSC IOPAC input-output model, and they convey combined direct, indirect, and induced economic effects resulting from projected changes in recreational angling, commercial fishing, fish processing, and related input supply and support activities.

For simplification and ease of combining and comparing impacts from commercial and recreational fishing activities, coastal ports are grouped regionally. For a description of the counties included in these regions see page 378 in the 2015 EIS.

Commercial fishery and recreational fishery impacts are calculated and displayed separately. Impacts are calculated by applying income and employment multipliers generated using IOPAC regional impact models to the projected levels of local expenditures by commercial harvesters, processors, and recreational anglers under the alternatives.

Income and employment impacts from Pacific whiting caught in the at-sea catcher-processor and mothership sectors are not included in these totals. Most of the associated income and employment impacts would likely accrue in the Seattle region.

Economic impact models like IOPAC are calibrated to represent a baseline or “snapshot” of the economy at a particular point in time. Consequently these models are best able to address impacts of scenarios that are within the realm of what may have occurred over the past five to ten years. Analysis of scenarios that represent particularly large departures from baseline conditions may, therefore, result in biased impact estimates.

#### 4.2.3.1 Income Impacts

Table 4-146 presents estimates of personal income impacts by region due to projected commercial groundfish fishing activity under the Alternatives. Table 4-147 and Table 4-148 compare this information relative to No Action. Table 4-149 presents the estimated income impacts resulting from recreational groundfish fisheries with Table 4-150 and Table 4-151 presenting the estimates relative to No Action. As with the angler trip estimates presented above, recreational income impacts are presented in terms of the five management option scenarios that reflect different approaches to recreational fishery management in Washington and California. (See Sections 4.1.1 through 4.1.3 for a description of these management options.)

Commercial fishery income impacts:

- Coastwide estimated personal income from commercial groundfish fishing ranges from \$124 million under No Action to \$160 million under Alternative 3.
- Oregon accounts for about two-thirds of coastwide personal income generated by the shoreside commercial groundfish fishery and also accounts for \$30 million of the estimated \$35 million increase in income under Alternative 3 compared to No Action. This is because the bulk of commercial revenue comes from the IFQ fishery, which is concentrated in Oregon (and southern Washington coast) ports. Oregon communities show a 39 percent increase from No Action under Alternative 3, or \$29.7 million.

- California accounts for a 22 percent of coastwide income, most of this occurring in the two Northern California regions. There is no measurable change in personal income impacts in California under Alternatives 1 and 2. (Income impacts are reported to the nearest \$100,000; the +/- signs before zero values in Table 4-147 and Table 4-148 indicate changes less than this reporting threshold.) Under Alternative 3, personal income in California communities would increase by \$4.2 million. More than half of the increase in personal income in California, \$2.3 million, occurs in the Crescent City-Eureka region.
- Washington Coast communities would realize \$2 million more income under Alternative 3 compared to No Action, and a \$1 million increase under Alternatives 1 and 2. Under Alternatives 1 and 2 Puget Sound shows no change in personal income compared to No Action.

**Table 4-146. Commercial fishery income impacts under the alternatives by community group (\$mil) in 2017-2018.**

Community Groups	No Action		Alternative 3*		Alternative 1		Alternative 2	
	2017	2018	2017	2018	2017	2018	2017	2018
Puget Sound	4.3	4.5	<b>4.6</b>	<b>4.8</b>	4.3	4.5	4.3	4.5
Washington Coast	13.3	13.4	<b>15.1</b>	<b>15.2</b>	14.4	14.5	14.3	14.4
Astoria-Tillamook	44.2	43.9	<b>69.3</b>	<b>68.8</b>	53.3	52.3	53.2	52.2
Newport	15.7	16.0	<b>18.5</b>	<b>18.5</b>	18.1	18.1	18.1	18.1
Coos Bay-Brookings	15.8	16.0	<b>17.9</b>	<b>17.8</b>	15.7	15.9	15.7	15.9
Crescent City-Eureka	9.3	9.3	<b>11.7</b>	<b>11.5</b>	9.2	9.3	9.2	9.3
Fort Bragg – Bodega Bay	8.7	8.8	<b>9.9</b>	<b>9.8</b>	8.7	8.8	8.7	8.8
San Francisco Area	2.3	2.3	<b>2.5</b>	<b>2.5</b>	2.3	2.3	2.3	2.3
SC – Mo – MB	6.2	6.3	<b>6.7</b>	<b>6.7</b>	6.2	6.3	6.2	6.3
SB – LA – SD	3.9	4.0	<b>4.1</b>	<b>4.2</b>	3.9	4.0	3.9	4.0
Coastwide Total	123.7	124.5	<b>160.3</b>	<b>159.8</b>	136.2	136.0	136.0	135.8

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

Note: SC – Mo – MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

**Table 4-147. Change in commercial fishery income impacts (from No Action Alternative) under the action alternatives by community group (\$mil) in 2017-2018. Estimates are presented as the average annual value for the two-year management period.**

Community Groups	No Action	Alternative 3*	Alternative 1	Alternative 2
	2017-18	2017-18	2017-18	2017-18
Puget Sound	4.4	+0.3	-0.0	-0.0
Washington Coast	13.4	+1.8	+1.1	+1.0
Astoria-Tillamook	44.0	+25.1	+8.8	+8.6
Newport	15.9	+2.7	+2.2	+2.2
Coos Bay-Brookings	15.9	+2.0	-0.1	-0.1
Crescent City-Eureka	9.3	+2.3	-0.0	-0.0
Fort Bragg – Bodega Bay	8.8	+1.1	+0.0	+0.0
San Francisco Area	2.3	+0.1	-0.0	-0.0
SC – Mo – MB	6.3	+0.5	+0.0	+0.0
SB – LA – SD	4.0	+0.2	+0.0	+0.0
Coastwide Total	124.1	+35.9	+12.0	+11.8

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

Note: SC – Mo – MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

**Table 4-148. Change in commercial fishery income impacts (from No Action Alternative) under the action alternatives by community group (percent).**

Community Groups	No Action	Alternative 3*	Alternative 1	Alternative 2
	2017-18	2017-18	2017-18	2017-18
Puget Sound	4.4	+6.6%	-0.0%	-0.0%
Washington Coast	13.4	+13.1%	+7.9%	+7.8%
Astoria-Tillamook	44.0	+56.9%	+19.9%	+19.6%
Newport	15.9	+16.8%	+14.1%	+14.0%
Coos Bay-Brookings	15.9	+12.7%	-0.4%	-0.6%
Crescent City-Eureka	9.3	+24.9%	-0.3%	-0.3%
Fort Bragg – Bodega Bay	8.8	+12.0%	+0.2%	+0.0%
San Francisco Area	2.3	+6.4%	-0.2%	-0.3%
SC – Mo – MB	6.3	+7.2%	+0.2%	+0.2%
SB – LA – SD	4.0	+5.2%	+0.0%	+0.0%
Coastwide Total	124.1	+29.0%	+9.7%	+9.5%

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

Note: SC – Mo – MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

Recreational fishery income impacts:

- Coastwide, income impacts vary slightly across the alternatives/options scenarios with the exception of California Option 4. Except for the California Option 4 scenario, coastwide income impacts under the management scenarios are estimated at approximately \$236 million. Under Option 4 coastwide income impacts would be considerably less at \$119 million. All of the differences occur in California regions.

- In relative terms, Northern California (Crescent City-Eureka and Fort Bragg-Bodega Bay) shows a 15 percent increase under California Option 2 under Alternatives I and 2, or \$929,000.
- All California regions show declines from No Action under California Option 4 ranging from about \$96 million in the Santa Barbara to San Diego region to \$542,000 in the Fort Bragg-Bodega Bay region.
- No change from No Action is estimated for California Options 1 and 3.
- The Washington Season Option would result in a small, \$12,000 reduction in income compared to No Action.
- Alternative 3 is estimated to have the same income impacts as under No Action, with the exception of Northern California (Crescent City-Eureka and Fort Bragg-Bodega Bay), where an increase of approximately \$0.5 million (8 percent) is estimated.

**Table 4-149. Recreational fishery income impacts of the alternatives and recreational management options by community group (\$1,000s).**

	<i>No Action (\$,000)</i>	<i>Alternative 3*</i>	<i>Alternative 1 (CA Ops 1 and 3)</i>	<i>Alternative 2 (CA Ops 1 and 3)</i>	<i>Alternatives 1 and 2 (CA Op 2)</i>	<i>Alternatives 1 and 2 (CA Op 4)</i>	<i>Alternative 1 (CA Ops 1 and 3) + WA Groundfish Season Alt</i>
Puget Sound	-	-	-	-	-	-	-
Washington Coast	5,826	<b>5,826</b>	5,826	5,826	5,826	5,826	5,814
Astoria-Tillamook	1,512	<b>1,512</b>	1,512	1,512	1,512	1,512	1,512
Newport	6,820	<b>6,820</b>	6,820	6,820	6,820	6,820	6,820
Coos Bay-Brookings	2,809	<b>2,809</b>	2,809	2,809	2,809	2,809	2,809
Crescent City-Eureka	3,506	<b>3,827</b>	3,506	3,506	4,370	2,642	3,506
Fort Bragg - Bodega Bay	2,894	<b>3,097</b>	2,894	2,894	2,958	2,352	2,894
San Francisco Area	20,891	<b>20,891</b>	20,891	20,891	20,891	10,679	20,891
SC – Mo – MB	20,046	<b>20,046</b>	20,046	20,046	20,046	10,827	20,046
SB – LA – SD	171,552	<b>171,552</b>	171,552	171,552	171,552	75,845	171,552
<b>Coastwide Total</b>	235,856	<b>236,380</b>	235,856	235,856	236,784	119,312	235,844

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

Note: SC – Mo – MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

**Table 4-150. Change in recreational fishery income impacts from No Action under the action alternatives by community group (\$1,000s).**

<b>Community Groups</b>	<i>No Action (\$ mil)</i>	<i>Alternative 3*</i>	<b>Alternative 1 (CA Ops 1 and 3)</b>	<b>Alternative 2 (CA Ops 1 and 3)</b>	<b>Alternatives 1 and 2 (CA Op 2)</b>	<b>Alternatives 1 and 2 (CA Op 4)</b>	<b>Alternative 1 (CA Ops 1 and 3) + WA Groundfish Season Alt</b>
Puget Sound	-	-	-	-	-	-	-
Washington Coast	5.8	-	-	-	-	-	-0.0
Astoria-Tillamook	1.5	-	-	-	-	-	-
Newport	6.8	-	-	-	-	-	-
Coos Bay-Brookings	2.8	-	-	-	-	-	-
Crescent City-Eureka	3.5	+0.3	-	-	+0.9	-0.9	-
Fort Bragg - Bodega Bay	2.9	+0.2	-	-	+0.1	-0.5	-
San Francisco Area	20.9	-	-	-	-	-10.2	-
SC – Mo – MB*	20.0	-	-	-	-	-9.2	-
SB – LA – SD*	171.6	-	-	-	-	-95.7	-
<b>Coastwide Total</b>	<b>235.9</b>	<b>+0.5</b>	-	-	+0.9	-116.5	-0.0

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

Note: SC – Mo – MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

**Table 4-151. Change in recreational fishery income impacts from No Action under the action alternatives by community group (percent).**

<b>Community Groups</b>	<i>No Action (\$ mil)</i>	<i>Alternative 3*</i>	<b>Alternative 1 (CA Ops 1 and 3)</b>	<b>Alternative 2 (CA Ops 1 and 3)</b>	<b>Alternatives 1 and 2 (CA Op 2)</b>	<b>Alternatives 1 and 2 (CA Op 4)</b>	<b>Alternative 1 (CA Ops 1 and 3) + WA Groundfish Season Alt</b>
Puget Sound	-	-	-	-	-	-	-
Washington Coast	5.8	-	-	-	-	-	-0.2%
Astoria-Tillamook	1.5	-	-	-	-	-	-
Newport	6.8	-	-	-	-	-	-
Coos Bay-Brookings	2.8	-	-	-	-	-	-
Crescent City-Eureka	3.5	<b>+9.2%</b>	-	-	+24.7%	-24.6%	-
Fort Bragg - Bodega Bay	2.9	<b>+7.0%</b>	-	-	+2.2%	-18.7%	-
San Francisco Area	20.9	-	-	-	-	-48.9%	-
SC – Mo – MB*	20.0	-	-	-	-	-46.0%	-
SB – LA – SD*	171.6	-	-	-	-	-55.8%	-
<b>Coastwide Total</b>	235.9	<b>+0.2%</b>	-	-	+0.4%	-49.4%	-0.0%

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

Note: SC – Mo – MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.



#### 4.2.3.2 Employment Impacts

Table 4-152 shows projected employment impacts due to the commercial groundfish fishery under the alternatives; Table 4-153 and Table 4-154 show the impacts relative to No Action. Table 4-155 shows projected employment impacts due to the recreational groundfish under the alternatives; Table 4-156 and Table 4-157 show the impacts relative to No Action.

Commercial fishery employment impacts:

- Averaging employment estimates for 2017 and 2018, No Action is expected to result in 2,015 jobs; the action alternatives would result in higher employment, with Alternative 1 resulting in 2,155 jobs, 2,153 jobs for Alternative 2, and 2,439 jobs for Alternative 3. Alternative 3 combines the final preferred ACLs with preliminary preferred management measures.
- Similar to income impacts, the largest projected job increases under the action alternatives are expected in communities on the Washington Coast and north and central Oregon coasts. Southern Oregon and California communities for the most part show fewer resulting jobs impacts compared to No Action. Alternative 2 would result in 2 fewer jobs in this region compared to No Action; Alternative 1 would result in one less job. In contrast, Alternative 3 would result in an increase of 75 jobs in Southern Oregon and California compared with No Action.
- Under No Action 55 percent of jobs are associated with Oregon ports, 33 percent in California, and 12 percent in Washington.
- Compared to No Action, under Alternative 1 employment would increase by 127 jobs in Oregon and in by 14 jobs in Washington. California shows no appreciable change in the number of jobs (i.e., less than one job).
- Compared to No Action, under Alternative 2 jobs in Oregon would increase by 125 and in Washington increase by 13 jobs. California shows no appreciable change in the number of jobs (i.e., less than one job).
- Compared to No Action, under Alternative 3 employment in Oregon would increase by 345 jobs, in Washington increase by 25 jobs, and in California increase by 54 jobs.

Recreational fishery employment impacts:

- Averaging 2017 and 2018, 3,372 jobs are projected under No Action. The differences among the alternatives are relatively small (with the exception of under California Option 4).
- California Option 4 is estimated to result in 1,743 fewer jobs—about half the number under No Action. Most of this difference from No Action would occur in Southern California.
- Under Alternative 3, employment is projected to be the same as under No Action except in Northern California (Crescent City-Eureka and Fort Bragg-Bodega Bay), where employment is projected to increase by a total of 9 jobs.

**Table 4-152. Commercial fishery employment impacts under the alternatives by community group (number of jobs).**

Community Groups	No Action		Alternative3*		Alternative 1		Alternative 2	
	2017	2018	2017	2018	2017	2018	2017	2018
Puget Sound	48	50	<b>51</b>	<b>53</b>	48	50	48	50
Washington Coast	180	183	<b>203</b>	<b>205</b>	194	196	194	196
Astoria-Tillamook	556	553	<b>852</b>	<b>847</b>	664	652	662	651
Newport	219	222	<b>249</b>	<b>250</b>	245	246	244	246
Coos Bay-Brookings	341	344	<b>363</b>	<b>363</b>	340	343	340	342
Crescent City-Eureka	152	152	<b>183</b>	<b>181</b>	151	152	151	152
Fort Bragg – Bodega Bay	162	165	<b>180</b>	<b>179</b>	162	165	162	165
San Francisco Area	46	47	<b>48</b>	<b>48</b>	46	47	46	47
SC – Mo – MB	203	204	<b>207</b>	<b>208</b>	203	204	203	204
SB – LA – SD	100	102	<b>104</b>	<b>105</b>	100	102	100	102
Coastwide Total	2,008	2,022	<b>2,441</b>	<b>2,438</b>	2,154	2,157	2,151	2,155

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

Note: SC – Mo – MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

**Table 4-153. Change in commercial fishery employment impacts (from No Action Alternative) under the action alternatives by community group (number of jobs).**

Community Groups	No Action	Alternative 3*	Alternative 1	Alternative 2
	2017-18	2017-18	2017-18	2017-18
Puget Sound	49	+2.8	-0.0	-0.0
Washington Coast	181	+22.5	+13.5	+13.4
Astoria-Tillamook	554	+295.2	+103.4	+101.9
Newport	220	+29.4	+25.0	+24.9
Coos Bay-Brookings	342	+20.6	-1.1	-1.5
Crescent City-Eureka	152	+29.7	-0.3	-0.4
Fort Bragg – Bodega Bay	164	+15.5	+0.0	-0.2
San Francisco Area	47	+1.6	-0.1	-0.1
SC – Mo – MB	203	+4.1	+0.3	+0.3
SB – LA – SD	101	+3.6	+0.0	+0.0
Coastwide Total	2,015	+424.8	+140.8	+138.3

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

**Table 4-154. Change in commercial fishery employment impacts (from No Action Alternative) under the action alternatives by community group (percent).**

Community Groups	No Action	Alternative 3*	Alternative 1	Alternative 2
	2017-18	2017-18	2017-18	2017-18
Puget Sound	49	+5.6%	-0.0%	-0.0%
Washington Coast	181	+12.4%	+7.5%	+7.4%
Astoria-Tillamook	554	+53.2%	+18.6%	+18.4%
Newport	220	+13.3%	+11.4%	+11.3%
Coos Bay-Brookings	342	+6.0%	-0.3%	-0.4%
Crescent City-Eureka	152	+19.5%	-0.2%	-0.3%
Fort Bragg – Bodega Bay	164	+9.4%	+0.0%	-0.2%
San Francisco Area	47	+3.3%	-0.1%	-0.2%
SC – Mo – MB	203	+2.0%	+0.2%	+0.2%
SB – LA – SD	101	+3.5%	+0.0%	+0.0%
Coastwide Total	2,015	+21.1%	+7.0%	+6.9%

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

Note: SC – Mo –MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

**Table 4-155. Recreational fishery employment impacts under the alternatives and recreational management options by community group (number of jobs).**

<b>Community Groups</b>	<i>No Action</i>	<b>Alternative 3*</b>	<b>Alternative 1 (CA Ops 1 and 3)</b>	<b>Alternative 2 (CA Ops 1 and 3)</b>	<b>Alternatives 1 and 2 (CA Op 2)</b>	<b>Alternatives 1 and 2 (CA Op 4)</b>	<b>Alternative 1 (CA Ops 1 and 3) + WA Groundfish Season Alt</b>
Puget Sound	-	-	-	-	-	-	-
Washington Coast	161	<b>161</b>	161	161	161	161	161
Astoria-Tillamook	42	<b>42</b>	42	42	42	42	42
Newport	174	<b>174</b>	174	174	174	174	174
Coos Bay-Brookings	74	<b>74</b>	74	74	74	74	74
Crescent City-Eureka	57	<b>63</b>	57	57	71	43	57
Fort Bragg - Bodega Bay	47	<b>50</b>	47	47	48	38	47
San Francisco Area	283	<b>283</b>	283	283	283	145	283
SC – Mo – MB*	336	<b>336</b>	336	336	336	181	336
SB – LA – SD*	2,558	<b>2,558</b>	2,558	2,558	2,558	1,131	2,558
<b>Coastwide Total</b>	3,732	<b>3,741</b>	3,732	3,732	3,748	1,989	3,732

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

Note: SC – Mo – MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

**Table 4-156. Change in recreational fishery employment impacts from No Action under the action alternatives by community group (number of jobs).**

<b>Community Groups</b>	<i>No Action</i>	<b>Alternative 3*</b>	<b>Alternative 1 (CA Ops 1 and 3)</b>	<b>Alternative 2 (CA Ops 1 and 3)</b>	<b>Alternatives 1 and 2 (CA Op 2)</b>	<b>Alternatives 1 and 2 (CA Op 4)</b>	<b>Alternative 1 (CA Ops 1 and 3) + WA Groundfish Season Alt</b>
Puget Sound	-	-	-	-	-	-	-
Washington Coast	161	-	-	-	-	-	-0
Astoria-Tillamook	42	-	-	-	-	-	-
Newport	174	-	-	-	-	-	-
Coos Bay-Brookings	74	-	-	-	-	-	-
Crescent City-Eureka	57	+5	-	-	+14	-14	-
Fort Bragg - Bodega Bay	47	+3	-	-	+1	-9	-
San Francisco Area	283	-	-	-	-	-139	-
SC – Mo – MB*	336	-	-	-	-	-154	-
SB – LA – SD*	2,558	-	-	-	-	-1,427	-
<b>Coastwide Total</b>	<b>3,732</b>	<b>+9</b>	-	-	<b>+15</b>	<b>-1,743</b>	<b>-0</b>

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

Note: SC – Mo – MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

**Table 4-157. Change in recreational fishery employment impacts from No Action under the action alternatives by community group (percent).**

<b>Community Groups</b>	<i>No Action</i>	<i>Alternative 3*</i>	<b>Alternative 1 (CA Ops 1 and 3)</b>	<b>Alternative 2 (CA Ops 1 and 3)</b>	<b>Alternatives 1 and 2 (CA Op 2)</b>	<b>Alternatives 1 and 2 (CA Op 4)</b>	<b>Alternative 1 (CA Ops 1 and 3) + WA Groundfish Season Alt</b>
Puget Sound	-	-	-	-	-	-	-
Washington Coast	161	-	-	-	-	-	-0.1%
Astoria-Tillamook	42	-	-	-	-	-	-
Newport	174	-	-	-	-	-	-
Coos Bay-Brookings	74	-	-	-	-	-	-
Crescent City-Eureka	57	+9.2%	-	-	+24.7%	-24.6%	-
Fort Bragg - Bodega Bay	47	+7.0%	-	-	+2.2%	-18.7%	-
San Francisco Area	283	-	-	-	-	-48.9%	-
SC – Mo – MB*	336	-	-	-	-	-46.0%	-
SB – LA – SD*	2,558	-	-	-	-	-55.8%	-
<b>Coastwide Total</b>	3,732	<b>+0.2%</b>	-	-	+0.4%	-46.7%	-0.0%

\*Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

Note: SC – Mo – MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.

#### 4.2.3.3 Other Impacts

The 2015 EIS (PFMC and NMFS 2015) discusses other socioeconomic impacts. Impacts to processors can be inferred from commercial ex-vessel revenue estimates, which represent processor purchases. Quantitatively, the dollar values in Table 4-135 represent these purchases and the relative impacts are the same as described above in Section 4.2.1.1.

The 2015 EIS also briefly discusses effects related to non-market and non-use (NMNU) values. These are non-consumptive uses that range from recreational enjoyment of the environment (e.g., wildlife viewing) to option or existence value (benefit derived from the knowledge that these resources will be available in the future or simply that environmental quality is maintained). However, it is not possible to quantify how the proposed action would affect these values. Generally speaking, the proposed action must comply with MSA National Standards and the goals and objectives enumerated in the FMP. All of the alternatives are consistent with the resulting harvest management framework, which has as its goal maintaining stocks at their target biomasses. This goal may support realization of NMNU values.

Fishery management regulations can indirectly affect vessel safety, either because of disinvestment by vessel operators due to low revenue or incentives that causes them to go out in hazardous weather. No regulatory changes under the proposed action have been identified that would have a substantial impact on these factors. Furthermore, much of the groundfish fishery has transitioned to catch shares management either through the IFQ program, co-ops for the at-sea Pacific whiting fishery, or individual vessel allocations in the limited entry fixed gear sablefish fishery. A study reported to the Council in the 2015 State of the California Current Report (Agenda Item E.1.b, NMFS Report 2, March 2015) found that the transition to catch shares reduced the probability of a fisherman taking a fishing trip on a high wind day.

Management of the fishery may also affect human wellbeing but it is very difficult to directly measure these effects. NOAA's California Current Integrated Ecosystem Assessment program has been developing indicators of human wellbeing, which are reported to the Council annually in the aforementioned report. Past EISs, including the 2015 EIS, have also presented demographic data and assessment of community vulnerability to represent wellbeing. While this information can help distinguish among communities in terms of their status, the effect of the alternatives wellbeing can only be inferred from projected changes in personal income in communities.

#### 4.2.3.4 Impact Summary

It is important to note that the commercial and recreational impact estimates are not necessarily comparable. The underlying assumption in both the commercial and recreational impact estimates is that there is no substitution for either activity. On the commercial side, if a management alternative reduces groundfish landings, vessels have no ability to substitute towards some other fishing opportunity, nor do they have an ability to substitute towards some other non-fishing occupation such as agriculture, construction, education, hospitality, etc. Likewise, on the commercial side, processors have no ability to substitute towards some other source of fish in the production process such as foreign or Alaska imports, nor do processors have ability to substitute towards non-fishing opportunities. On the recreational side, the underlying assumption is that anglers participating in recreational fishing have no other recreational substitution possibilities within the region. If a management alternative reduces the number of angler trips for groundfish, there is no ability for anglers to substitute towards some other fishing activity such as targeting tuna or salmon, nor is there an ability to substitute towards some other non-fishing related activity such as scuba diving, camping, etc. The underlying assumption is that if recreational groundfish trips are reduced, then all spending by anglers for food, fuel, tackle, etc. related to these trips would essentially leave the region. Currently, there is a dearth of information about the likelihood with which commercial anglers would substitute towards some other business opportunity, and the same is true for the likelihood of substitution by recreational anglers.

Nevertheless, it is not unreasonable to expect that recreational anglers may more easily substitute towards some other recreational opportunity than commercial anglers can find new business opportunities. Consequently, caution should be used in direct comparison between commercial and recreational impacts.

Recognizing the caveats discussed above, Table 4-158 displays recreational and commercial income impacts for the No Action Alternative, Alternative 1, Alternative 2, and Alternative 3 side by side. These tables also show the relative share of commercial versus recreational income impacts by community.

- The **No Action Alternative** is estimated to result in \$124 million in commercial income impacts and \$236 million in recreational income impacts.
- **Alternative 1** is estimated to result in \$136 million in commercial income impacts and with California recreational Options 1 or 3, \$236 million in recreational income impacts—the same as No Action.
- **Alternative 2** is estimated to result in \$136 million in commercial income impacts and with California recreational Options 1 or 3, \$236 million in recreational income impacts—the same as No Action.
- **Alternative 3** is estimated to result in \$160 in commercial income impacts and \$236 million in recreational income impacts. Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

The difference between the alternatives as measured by commercial fishery ex-vessel revenue occur mainly in the shoreside IFQ fishery.

The recreational fishery is a major contributor to coastwide personal income. Taking the no action alternative as an example, \$172 million in recreational income impacts is occurs in the Santa Barbara to San Diego region. More generally, the recreational fishery accounts for the vast majority of income impacts in communities from San Francisco to San Diego. This is a function of both the large income impacts from recreational fishing and the relatively small income impacts derived from commercial fishing. The reverse is true for more northerly communities.

California recreational management Option 4 shows the biggest difference with respect recreational fishery income impacts. Based on Table 4-149, California Option 4 would result in \$118 million less personal income compared to California Option 2 under either action alternative, representing a large proportion of the coastwide combined personal income impacts under any of the alternatives.



**Table 4-158. Comparison of projected personal income impacts from recreational and commercial groundfish fisheries by community group under No Action and the Three Action Alternatives.**

Community Groups	No Action		Alternative 1*		Alternative 2*		Alternative 3†	
	Commercial	Recreational	Commercial	Recreational	Commercial	Recreational	Commercial	Recreational
<b>\$ millions</b>								
Puget Sound	4.4	-	4.4	-	4.4	-	4.7	-
Washington Coast	13.4	5.8	14.4	5.8	14.4	5.8	15.1	5.8
Astoria-Tillamook	44.0	1.5	52.8	1.5	52.7	1.5	69.1	1.5
Newport	15.9	6.8	18.1	6.8	18.1	6.8	18.5	6.8
Coos Bay-Brookings	15.9	2.8	15.8	2.8	15.8	2.8	17.9	2.8
Crescent City-Eureka	9.3	3.5	9.3	3.5	9.3	3.5	11.6	3.8
Fort Bragg – Bodega Bay	8.8	2.9	8.8	2.9	8.8	2.9	9.8	3.1
San Francisco Area	2.3	20.9	2.3	20.9	2.3	20.9	2.5	20.9
SC – Mo – MB	6.3	20.0	6.3	20.0	6.3	20.0	6.7	20.0
SB – LA – SD	4.0	171.6	4.0	171.6	4.0	171.6	4.2	171.6
Coastwide Total	124.1	235.9	136.1	235.9	135.9	235.9	160.1	236.4
<b>Percent of coastwide impacts</b>								
Puget Sound	4%	-	3%	-	3%	-	3%	-
Washington Coast	11%	2%	11%	2%	11%	2%	9%	2%
Astoria-Tillamook	35%	1%	39%	1%	39%	1%	43%	1%
Newport	13%	3%	13%	3%	13%	3%	12%	3%
Coos Bay-Brookings	13%	1%	12%	1%	12%	1%	11%	1%
Crescent City-Eureka	7%	1%	7%	1%	7%	1%	7%	2%
Fort Bragg – Bodega Bay	7%	1%	6%	1%	6%	1%	6%	1%
San Francisco Area	2%	9%	2%	9%	2%	9%	2%	9%
SC – Mo – MB	5%	8%	5%	8%	5%	8%	4%	8%
SB – LA – SD	3%	73%	3%	73%	3%	73%	3%	73%
Coastwide Total	100%	100%	100%	100%	100%	100%	100%	100%

\*California recreational options 1 and 3.

†Alternative 3 combines final preferred ACLs with preliminary preferred management measures.

Note: SC – Mo – MB: Santa Cruz – Monterey – Morro Bay; SB – LA – SD: Santa Barbara – Los Angeles – San Diego.