BSAI Halibut Abundance-based Management (ABM) of PSC Limits Initial Review Draft September 2019[1]

This document analyzes proposed management measures to index Pacific halibut prohibited species catch (PSC) limits in the Bering Sea and Aleutian Islands (BSAI) groundfish fisheries to halibut abundance. PSC limit modifications are considered for various sectors, including the BSAI trawl limited access (TLAS) sector, the Amendment 80 sector, longline catcher vessels (CVs), longline catcher processors, and the Community Development Quota (CDQ) sector (i.e., a reduction to the CDQ's allocated prohibited species quota reserve). The objective of modifying PSC limits is to index PSC limits to halibut abundance which may achieve different goals of providing flexibility to the groundfish fisheries in times of high halibut abundance, protecting spawning biomass of halibut especially at low levels, and stabilizing in inter-annual variability in PSC limits, all of which may provide additional harvest opportunities in the commercial halibut fishery.

This document is a preliminary draft Environmental Impact Statement (DEIS) for initial review by the Council. A preliminary DEIS provides assessments of the environmental impacts of an action and its reasonable alternatives, the economic benefits and costs of the action alternatives, as well as their distribution. This preliminary DEIS addresses the statutory requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the National Environmental Policy Act, and Presidential Executive Order 12866. A preliminary DEIS is a document produced by the North Pacific Fishery Management Council (Council) and the National Marine Fisheries Service (NMFS) Alaska Region to provide the analytical background for decision-making.

[1] Prepared by Diana Stram, Sam Cunningham, Anna Henry Council staff, Anne Marie Eich, Joe Krieger of NMFS Alaska Region; Curry Cunningham,UAF Dana Hanselman, Carey McGilliard, Jim Ianelli NMFS AFSC, Allan Hicks from the IPHC, and Mike Downs Wislow Research Associates. Authorship does not imply endorsement by their associated agency.

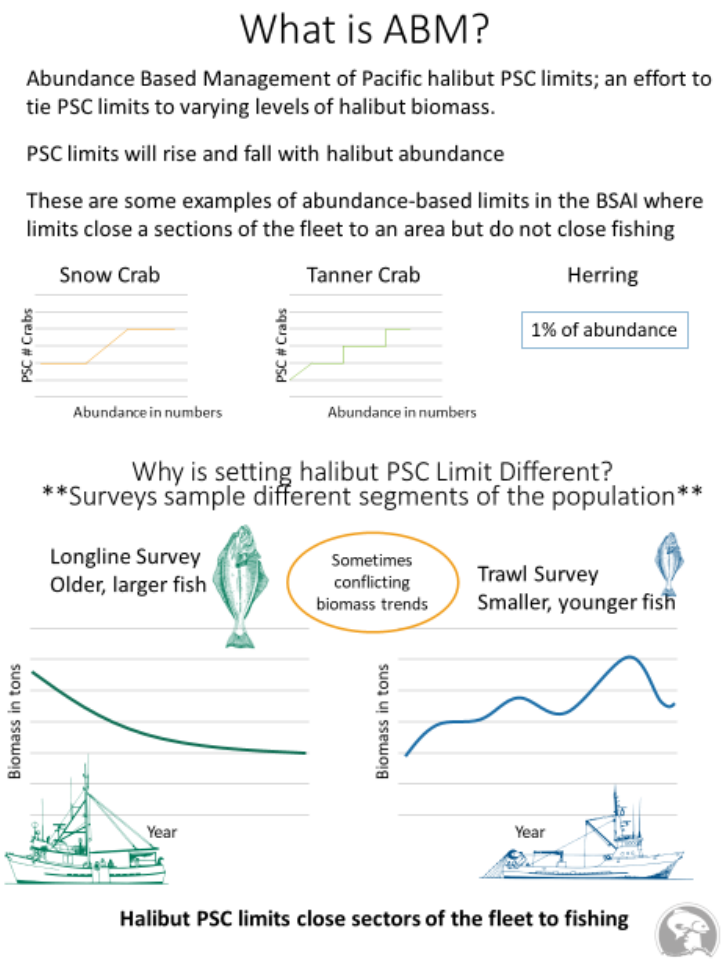
List of Acronyms and Abbreviations

Acronym or Abbreviation	Meaning
AAC	Alaska Administrative Code
ABC	acceptable biological catch
ABM	Abundance-based management
ADF&G	Alaska Department of Fish and Game
AFA	American Fisheries Act
AFSC	Alaska Fisheries Science Center
AKFIN	Alaska Fisheries Information Network
BSAI	Bering Sea and Aleutian Islands
A80	Amendment 80 Sector
BTS	Bottom Trawl Survey
CAS	Catch Accounting System
CDQ	Community Development Quota
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COAR	Commercial Operators Annual Report
Council	North Pacific Fishery Management Council
CP	catcher/processor
CV	catcher vessel
DPS	distinct population segment
E.O.	Executive Order
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EBS	Eastern Bering Sea
EFH	essential fish habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESU	endangered species unit
FMA	Fisheries Monitoring and Analysis
FISS	Fishery Independent Setline Survey (IPHC)
FMP	fishery management plan
FONSI	Finding of No Significant Impact
FR	*Federal Register*
FRFA	Final Regulatory Flexibility Analysis
ft	foot or feet
HALCV	Hook and Line catcher vessel
HALCP	Hook and line catcher processor
GOA	Gulf of Alaska
IPHC	International Pacific Halibut Commission
IPA	Incentive Plan Agreement
JAM	jeopardy or adverse modification
lb(s)	pound(s)
LEI	long-term effect index
LLP	license limitation program
LOA	length overall
m	meter or meters
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MMPA	Marine Mammal Protection Act

Acronym or Abbreviation	Meaning
MSST	minimum stock size threshold
t	tonne, or metric ton
NAICS	North American Industry Classification System
NAO	NOAA Administrative Order
NEPA	National Environmental Policy Act
NMFS	National Marine Fishery Service
NOAA	National Oceanic and Atmospheric Administration
NPFMC	North Pacific Fishery Management Council
NPPSD	North Pacific Pelagic Seabird Database
Observer Program	North Pacific Groundfish and Halibut Observer Program
OMB	Office of Management and Budget
OM	Operating Model
O26	Over 26” halibut
PBR	potential biological removal
PSC	prohibited species catch
PPA	Preliminary preferred alternative
PRA	Paperwork Reduction Act
PSEIS	Programmatic Supplemental Environmental Impact Statement
RFA	Regulatory Flexibility Act
RFFA	reasonably foreseeable future action
RIR	Regulatory Impact Review
RPA	reasonable and prudent alternative
SAFE	Stock Assessment and Fishery Evaluation
SAR	stock assessment report
SBA	Small Business Act
Secretary	Secretary of Commerce
SIR	Supplemental Information Report
SRKW	Southern Resident killer whales
TAC	total allowable catch
U.S.	United States
TLAS	Trawl Limited Access Sector
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
VMS	vessel monitoring system

Table of Contents

Executive Summary



This document analyzes proposed management measures to index Pacific halibut prohibited species catch (PSC) limits in the Bering Sea and Aleutian Islands (BSAI) groundfish fisheries to halibut abundance. PSC limit modifications are considered for various sectors, including the BSAI trawl limited access (TLAS) sector, the Amendment 80 (A80) sector, hook-and-line catcher vessels (HALCVs), hook-and-line catcher processors (HALCPs), and the Community Development Quota (CDQ) sector (i.e., a reduction to the CDQ's allocated prohibited species quota reserve). The objective of modifying PSC limits is to index PSC limits to halibut abundance which may achieve a variety of goals of providing flexibility to the groundfish fisheries in times of high halibut abundance, protecting spawning biomass of halibut especially at low levels, and stabilizing inter-annual variability in PSC limits, all of which may provide additional harvest opportunities in the commercial halibut fishery.

This document is a preliminary draft Environmental Impact Statement (DEIS). A preliminary DEIS provides assessments of the environmental impacts of an action and its reasonable alternatives, and the economic benefits and costs of the action alternatives, as well as their distribution. This DEIS addresses the statutory requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the National Environmental Policy Act, and Presidential Executive Order 12866. A preliminary DEIS is a document produced by the North Pacific Fishery Management Council (Council) and the National Marine Fisheries Service (NMFS) Alaska Region to provide the analytical background for decision-making.

Pacific halibut (*Hippoglossus stenolepis*) is utilized in Alaska as a target species in subsistence, personal use, recreational (sport), and commercial halibut fisheries. Halibut has significant social, cultural, and economic importance to fishery participants and fishing communities throughout the geographical range of the resource. Halibut is also incidentally taken as bycatch in groundfish fisheries.

The Council is examining abundance-based approaches to set halibut PSC limits in the BSAI groundfish fisheries. Currently halibut PSC limits are specified as a fixed amount of halibut mortality in metric tons (t). When halibut abundance declines, halibut PSC becomes a larger proportion of total halibut removals and can result in lower catch limits for directed halibut fisheries. Both the Council and the International Pacific Halibut Commission (IPHC) have expressed concern about impacts on directed halibut fisheries under the status quo and identified abundance-based management (ABM) of halibut PSC limits as a potential management approach to address these concerns.

The Council has been reviewing multiple discussion papers and revising a suite of alternatives for this action since 2016. The Council has previously set other PSC limits (crab, herring) based upon abundance of the stock in the BSAI. However, this action was complicated by consideration of a broad range of sources of information with which to index the BSAI portion of the coastwide halibut stock (see inset on ABM and issues). The Council selected two abundance indices to track Pacific halibut abundance and guide PSC limit setting in the BSAI groundfish fisheries. These are the NMFS AFSC EBS shelf bottom trawl survey (BTS) and from the IPHC setline survey covering IPHC Areas 4ABCDE (also referred to as the fishery independent setline survey or FISS) which select different segments of the halibut populations (younger and older fish respectively). Both indices represent the best available scientific information.

Roadmap for understanding EIS structure

The document has been structured to streamline required information in a preliminary DEIS and to organize it so it is most easily understood by the reader. As such the biological and economic sections (often included as separate stand-alone sections), for both background and impacts have been organized together. For example, all background information on groundfish stock status, specifications and fishery descriptive information is combined into a groundfish chapter (Chapter 3). Likewise, all halibut information on biology, stock status, management and fishery is contained in Chapter 4. Impacts of the alternatives on groundfish and halibut stocks and fishery participants are contained in Chapter 6.

Purpose and Need

The Council's purpose and need statement for this action is:

The current fixed yield-based halibut PSC caps are inconsistent with management of the directed halibut fisheries and Council management of groundfish fisheries, which are managed based on abundance. When halibut abundance declines, PSC becomes a larger proportion of total halibut removals and thereby further reduces the proportion and amount of halibut available for harvest in directed halibut fisheries. Conversely, if halibut abundance increases, halibut PSC limits could be unnecessarily constraining. The Council is considering linking PSC limits to halibut abundance to provide a responsive management approach at varying levels of halibut abundance. The Council is considering abundance-based PSC limits to control total halibut mortality, particularly at low levels of abundance. Abundance based PSC limits also could provide an opportunity for the directed-halibut fishery and protect the halibut spawning stock biomass. The Council recognizes that abundance-based halibut PSC limits may increase and decrease with changes in halibut abundance.

The Council derived the following objectives from the purpose and need statement for this action to guide the development of appropriate management measures:

- Halibut PSC limits should be indexed to halibut abundance
- Halibut spawning stock biomass should be protected especially at lower levels of abundance
- There should be flexibility provided to avoid unnecessarily constraining the groundfish fishery particularly when halibut abundance is high
- Provide for directed halibut fishing operations in the Bering Sea.
- Provide for some stability in PSC limits on an inter-annual basis.

These objectives have not been prioritized by the Council and may contradict each other thus designing a management program which meets all of them equivalently may be challenging. The goal of this analysis of the Council's alternatives, is to evaluate how well each alternative meets the purpose and need statement, these competing objectives and the National Standards.

The Council has been managing Pacific halibut bycatch by a range of measures since the inception of the FMP (Figure ES-1).

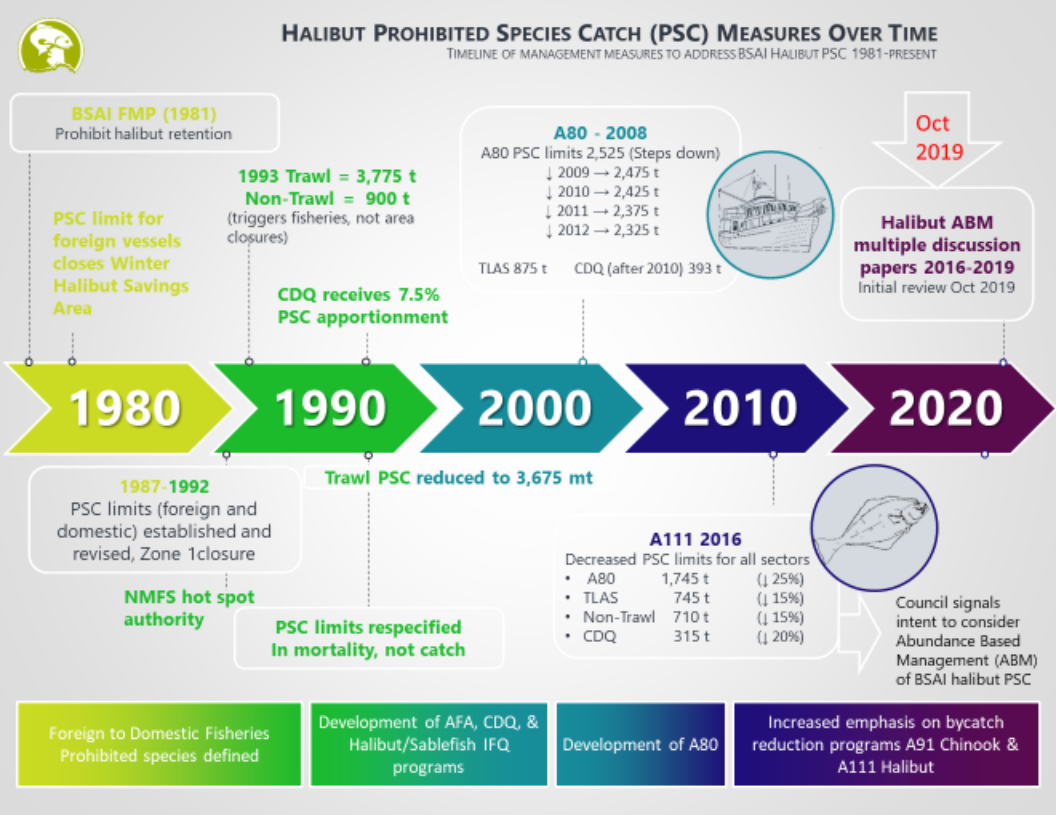


Figure ES-1 Timeline of management of BSAI halibut PSC

Alternatives

Alternatives 1 through 3

There are three overarching Alternatives under consideration by the Council. These have been developed through multiple discussion papers and Council considerations, and consultation with stakeholders. These Alternatives range from status quo with fixed halibut PSC limits by sector to a range of gear-specific PSC limits indexed to BSAI halibut abundance. These are described in detail in **Chapter 2** of this analysis and summarized below.

Alternative 1: Status Quo. BSAI halibut PSC limits are fixed at a total of 3,515 t for all sectors with individual sector level limits as follows: Amendment 80 cooperatives (A80) 1,745 t, BSAI Trawl limited access fisheries (TLAS) 745 t, non-trawl fisheries 710 t, and community development quota fisheries (CDQ) 315 t. Further apportionment of limits to seasons and sectors occurs during the annual harvest specifications process by the Council (Figure ES-2)

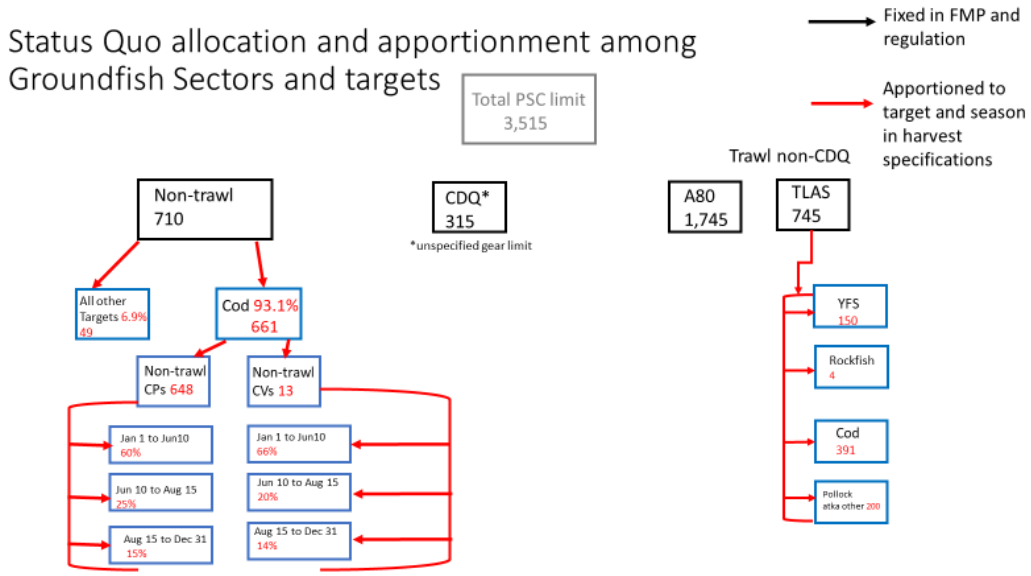
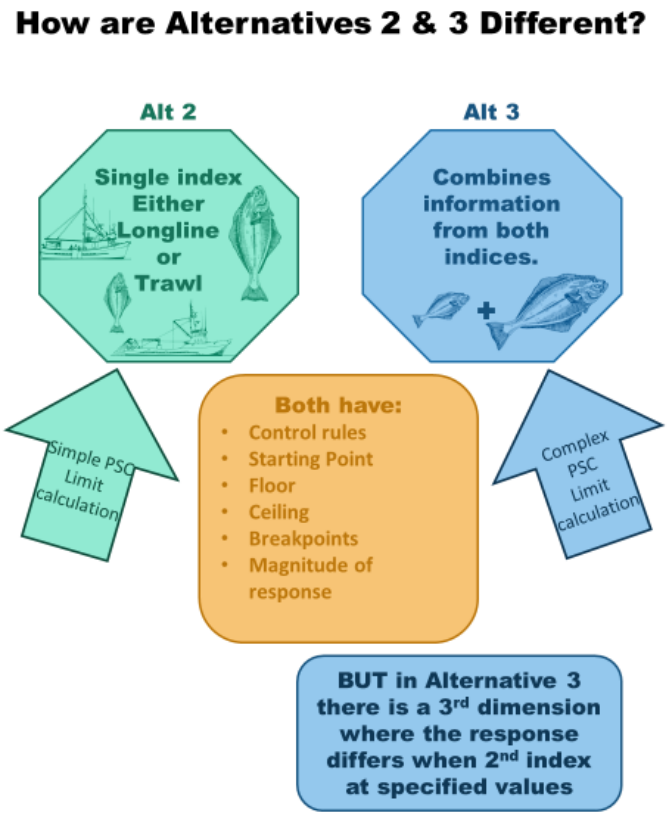
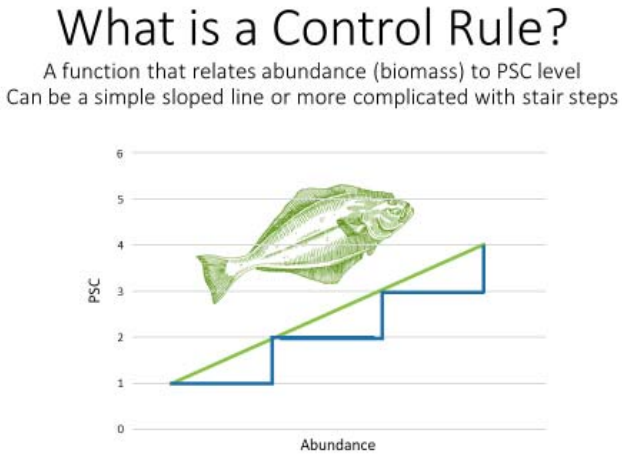


Figure ES-2 Flow Chart of BSAI Halibut PSC Limits for 2019

Alternatives 2 and 3

In Alternatives 2 and 3, PSC limits are established by gear type (aggregate trawl PSC limit and an aggregate non-trawl PSC limit) using a control rule applied to one or two biomass. The indices are the NMFS EBS bottom trawl survey index and the IPHC Area 4 setline survey index.

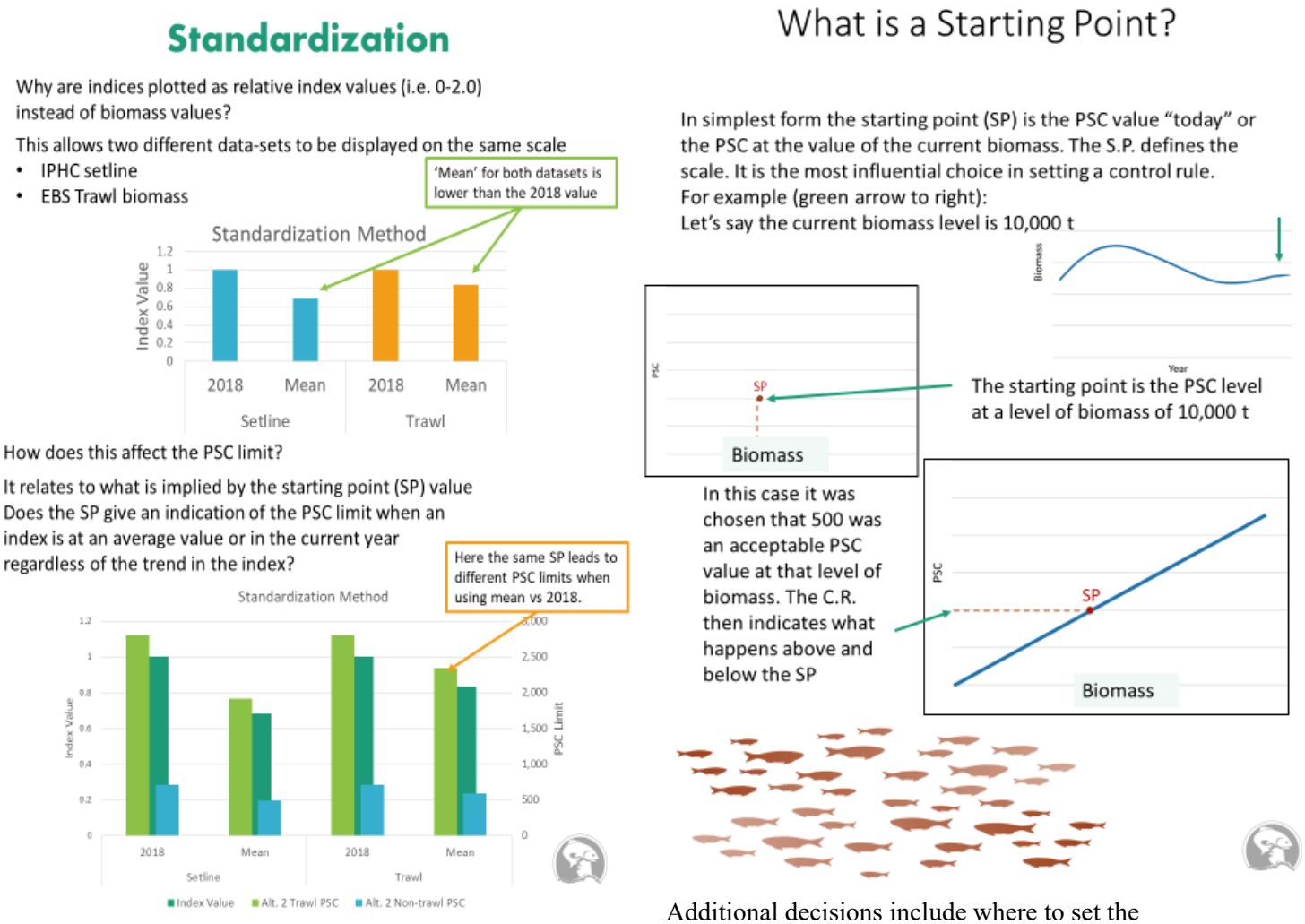




The Council requested that the indices be considered from 1998-2018 and by default standardized to the most recent year (2018). Note that an additional option is provided for the time period over which the indices are standardized (mean from 1998-2018 or 2018 only) which affects the PSC limit implied by the starting point.

The main distinction between these two alternatives lies in whether a PSC limit by gear type employs a single index (**Alternative 2**) or both a primary and a secondary index to set the PSC limit (**Alternative 3**). Under Alternative 3 the secondary index modifies the PSC limit established by the primary index at a specified value or 'breakpoint". The extent to which the secondary index influences the PSC limit above or below selected breakpoints is determined by selection of options within the alternative. Either index may be selected as the primary or secondary index.

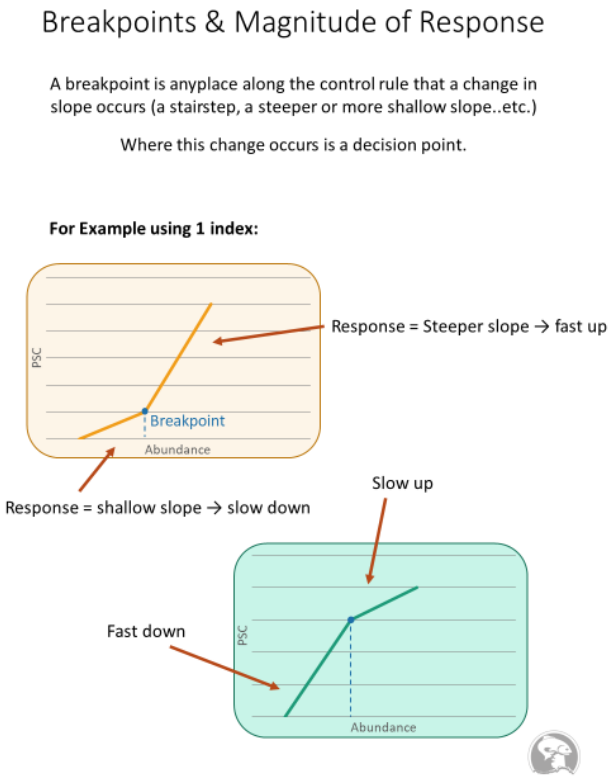
Both Alternatives 2 and 3 have a similar suite of Elements and Options to define the shape and behavior of the control. The Elements and Options are decision points to establish the overall control rule. These decisions include the Starting Point (Element 1) which defines the value of the PSC limit prescribed by the control rule when the index or indices are at the current year value.

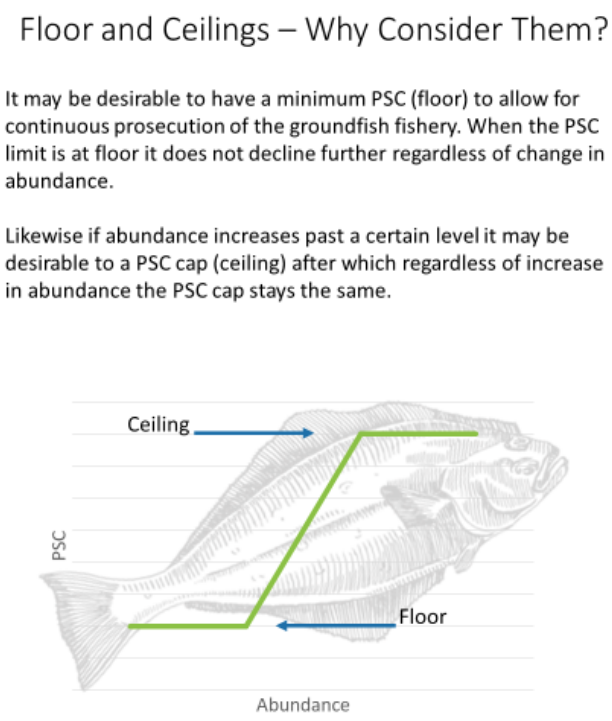


Additional decisions include where to set the maximum PSC limit or 'ceiling' (Element 2) and the minimum PSC limit or 'floor' (Element 3). These two elements define the bounds over which the maximum and minimum PSC limit can vary regardless of levels of abundance.

An additional Element (Element 4) may be selected if breakpoints for either the primary and/or the secondary index are desired. The magnitude of the response (Element 5) must be specified for either the primary or secondary index which is applicable to both Alternatives 2 and 3. The response (or slope) is defined as the change in the PSC limit relative to the change in the index.

Element 6 offers an optional provision for responsiveness to abundance changes by limiting the possible interannual percentage change in PSC limits. Finally, under Element 7, breakpoints may be specified in a lookup table rather than breakpoints and responsiveness in Elements 4 and 5 (where the PSC limit is defined continuously along the control rule). Element 7 includes options for standardizing each index.





Decision steps for Alternatives 2 and 3

A summary of different decisions related to Alternative indices, Elements and Options as well as which are options or required to formulate alternatives is provided in Table ES-1.

Table ES-1 Summary of selection of Elements and options under Alternatives 2 and 3

Alternative	Primary index	Secondary index	Standardization
2	Trawl or Setline	Not applicable	2018 (default); 2 year average
3	Trawl or Setline	Trawl or Setline	Primary: 2018 (default); 2 year average Secondary: mean

Element	Description	Range	Optional?
1	Starting Point	1,958-3,515 t	No
2	Ceiling	3,515-4,426 t	No
3	Floor	1,000-2,354 t	No
4	Breakpoint	Breakpoint occurs when index value is greater than or less than one of the 2 values below: 25% average of index or average value of index	Yes For Alt 2 No for Alt 3 (unless Element 7 selected)
5	Response	1:1 >1:1 <1:1	N (unless Element 7 selected)
6	Constraint	5-25%	Y
7	Look up Table	Up to 12 breakpoints; standard to mean or 2018	Y

Given the range of multiple Elements and Options for Alternatives 2 and 3 as described above, a subset of Alternatives was simulated which were selected based upon input from stakeholders, Council, SSC and workgroup members. In total 16 were simulated (Table ES-2) including a forward simulation of status quo limits under Alternative 1[2]. Section 2.7 of this analysis provides additional explanation of the Elements and Options and notations included in this table.

[2] In addition, 4 fixed limit suboptions proposed by the SSC and the working group to contrast the effect of fixed limits versus abundance-based limits were simulated. These are shown in some of the results in Chapter 6 for contrast but are not included in the Council's suite of Alternatives.

Table ES-2. Combination of alternatives included in analysis. Numbering for each alternative shows the Overarching Alternative (1,2,3) then secondary numbering to group sub-sets by similar elements and options (e.g., 201, 3-1). See Section 2.7 (and Table 2.4) for further explanation of the Elements and Options and notations included in this table.

		Indices used		Elements						
				1	2	3	4	5	6	7
Alternative	Source	Primary	Secondary	Starting point	Ceiling	Floor	Break points	Responsiveness	Constraint	Type
1	Status quo	NA	NA	3,515						
2-1	WG	By gear	NA	3,515	4,426	1,758	none	1:1	15% max	Continuous
2-1.a	WG	By gear	NA	3,515	4,426	1,758	none	1:1	none	Continuous
2-1.b	SSC	By gear	NA	1,958	4,426	1,758	none	1:1	15% max	Continuous
2-2	Stakeholder	By gear	NA	3,515	4,426	2,354	specified	Stairsteps	2 yr avg	Continuous
2-3	Stakeholder	By gear	NA	3,515	4,426	2,354	none	1:1	15% max	Continuous
2-4	Stakeholder	By gear	NA	2,018	3,515	1,000	Start	1:1 (low) 0.5:1 (high)	15% max	Continuous
3-1	WG	By gear	Other (mean)	3,515	4,426	1,758	±25%	1:1	15% max	Continuous
3-1.a	WG	By gear	Other (mean)	3,515	4,426	1,758	±25%	1:1	none	Continuous
3-1.b	WG	By gear	Other (mean)	3,515	4,426	1,758	±25%	2nd Index 0.5:1 (low),1.5:1 (high)	15% max	Continuous
3-1.c	WG	By gear	Other (mean)	3,515	4,426	1,758	±25%	1:1	15% max	Discrete
3-1.d	SSC	By gear	Other (mean)	1,958	4,426	1,758	±25%	1:1	15% max	Continuous
3-2.a	Stakeholder	Gear (mean)	Other (mean)	2,941	4,124	1,758	none	Interpolated	15% max	Discrete
3-2.b	WG	Gear (mean)	Other (mean)	2,941	4,124	1,758	none	1:1	15% max	Discrete
3-3a	Stakeholder	Setline	Trawl (mean)	1,958	3,515	1,000	S.P	Secondary 0.35:1	20% max	Continuous
3-3b	WG	Trawl	Setline (mean)	1,958	3,515	1,000	S.P	Secondary 0.35:1	20% max	Continuous

A simplified example of the selected control rules for Alternative 2 is shown in Figure ES-3. Here the control rules for a range of sub-alternatives are shown to demonstrate how these control rules are modified (by selection of options for Elements 1-5) at different values of the relative index (EBS bottom trawl survey for trawl PSC and Setline survey for non-trawl PSC). A companion table shows the value of the PSC limits calculated at the reference index level of '1.0' (i.e. standardized to 2018) for Alternative 2 as well as ones calculated for the simulated sub-alternative for Alternative 3(Alternative 3 is not pictured in Figure ES-3 but PSC limits are shown in Table ES-3). Note that these limits shown are the values calculated prior to application of the Element 6 constraint (as shown in Table ES-1).

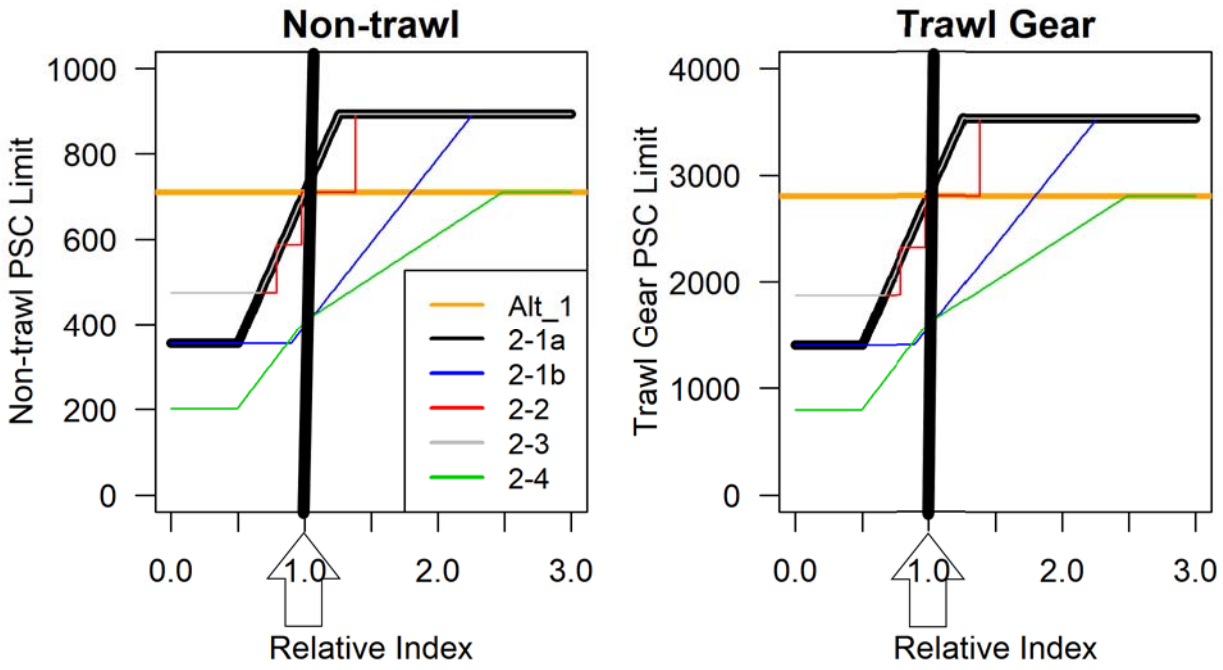


Figure ES-3 An example of PSC limit control rules for multiple versions of Alternative 2 which will vary by values of the relative index (EBS bottom trawl survey for trawl PSC and Setline survey for non-trawl PSC). These are shown for similar control rules by gear according to the colored legend as compared to static PSC limits by gear for Alternative 1 (shown in orange). Also shown is a black reference line with an arrow at the relative index level of '1.0' as these indices have been standardized to the 2018 value thus all control rules to read what the corresponding PSC limit should be where they intersect with that reference line.

Table ES-3 PSC limits by gear type associated with the Alternative 2 control rules shown in Figure ES-3 as well as calculated PSC limits under the sub-alternatives for Alternative 3 (not pictured in Figure ES-3). Note that these are the limits calculated prior to application of the constraints under Element 6.

Alternative	Trawl PSC limit	Non-Trawl PSC limit
Alt 1	2,805	710
Alt 2-1	2,805	710
2-1.a	2,805	710
2-1.b	1,563	395
2-2	2,805	710
2-3	2,805	710
2-4	1,610	408
Alt. 3-1	2,619	710
3-1.a	2,619	710
3-1.b	1,712	710
3-1.c	2,468	732
3-1.d	1,459	395
3-2.a	1,781	451
3-2.b	1,403	355
3-3a	1,473	372
3-3b	1,390	351

Allocation to sectors for Alternatives 2 and 3

Allocations of the gear-specific PSC limits under Alternatives 2 and 3 are intended to reflect the current (Status Quo) allocation proportions to the extent possible. As such proportional allocations of the trawl limit to the Amendment 80, TLAS and CDQ fisheries are provided in this analysis similar to the status quo[3]. Seasonal and target apportionments are based upon the 2019 specifications (Figure ES-4). Therefore and as described in Chapter 5 Section 5.7, the relative proportion of the trawl gear limit to the Amendment 80, TLAS and CDQ sectors is proportionally divided to approximate status quo CDQ with the remaining to the other trawl sectors (62.2% to Amendment 80, 26.6% to TLAS and 11.2% to CDQ). This is done consistently for all trawl PSC limits for the analysis but implies a proportional allocation to sectors that should be specified by the Council. Additional information showing the individual PSC limits by gear and sector associated with Table ES-3 are described in Section 2.7, Table 2-6). As with status quo, decisions on the seasonal and target apportionments would continue to be made during the annual harvest specifications process by the Council.

[3] The Council provided direction in February 2019 that the CDQ limit should vary with the trawl limit.

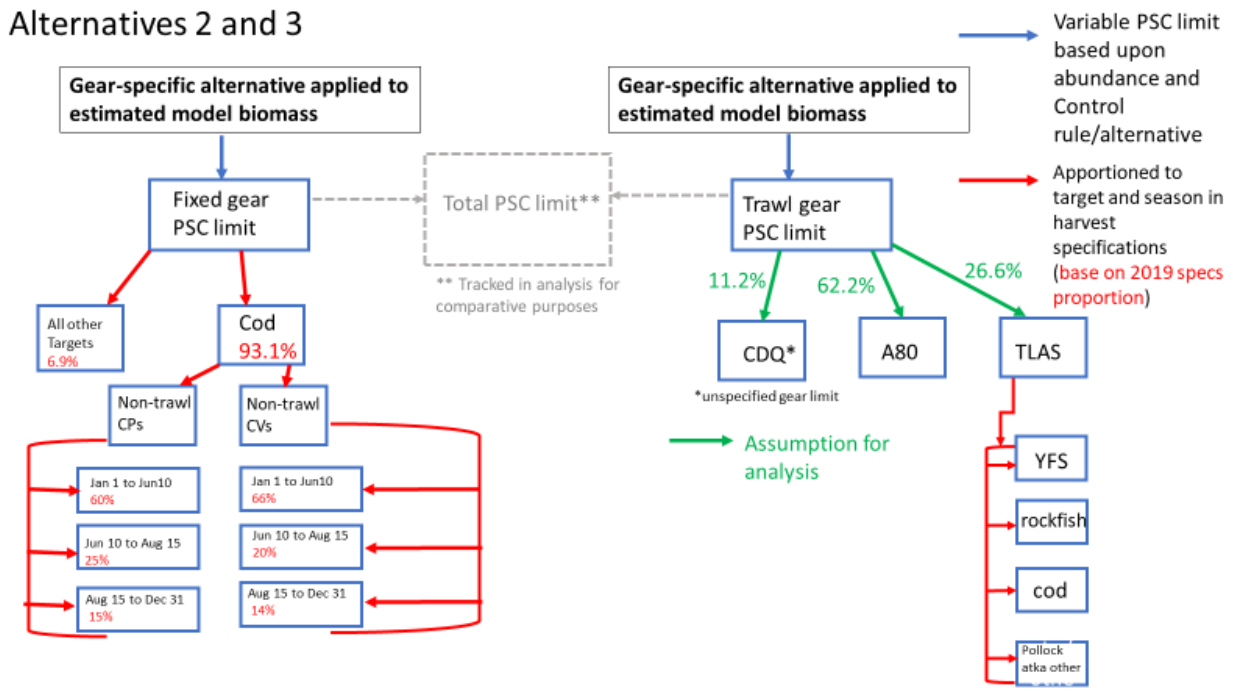


Figure ES-4 Alternative 2 and 3 analytical assumptions on proportional allocation of the Trawl PSC limit to sectors and apportionments to targets of the fixed gear PSC and TLAS PSC limits based upon 2019 harvest specifications proportions

The Pacific halibut simulation model

A simulation framework was used to compare the Pacific halibut stock trends and PSC limits across the set of alternatives. The steps of a closed-loop simulation are as follows: (i) simulating the true biology of the natural system (referred to as the operating model, OM), (ii) sampling from the true population, (iii) calculating the measures of stock status (assessment), (iv) calculating recommended fishing restrictions using management alternatives, and (v) applying updated restrictions to the fishery, which allows the dynamics of the true population to be updated.

The OM consisted of a two-area, age- and sex-structured model of Pacific halibut population dynamics with the BSAI modeled as one area and the remaining components of the range of the halibut stock comprising the "other" area (this includes the GOA, British Columbia, and US West Coast). Recruitment is assumed to occur at the coastwide level and the proportion of new recruits that settle in the BSAI is time-varying and temporally autocorrelated. The OM allows adult movement between the two areas. Weight-at-age is assumed to be constant and equal to 2018 values used in the 2018 IPHC assessment models. The model included five fishing fleets: the halibut fishery in the BSAI, the halibut fishery in the other area, the BSAI trawl PSC fishery, the BSAI hook-and-line (HAL) PSC fishery, and the bycatch fishery in the other area. Many values for halibut population dynamics were fixed based on results from the 2018 IPHC coastwide long assessment model.

Additional details on model assumptions, formulations as well as detailed model validation discussion and results are contained in **Chapter 5** as well as in **Appendices 3, 4 and 5** to the preliminary DEIS.

Comparison of Alternatives

Comparative analyses were completed to evaluate multiple sub-alternatives under Alternatives 2 and 3 with both the current status quo fixed PSC limit as well as some lower fixed PSC limits to compare performance in relation to more complex control rule formulations under Alternatives 2 and 3. In total 20

different alternative sub-alternatives were simulated. Specific combinations of Elements and Options to form these sub-alternatives for Alternatives 2 and 3 were selected based upon input from Stakeholders, the Council, the SSC and the analysts. Multiple sub-alternatives are shown to best demonstrate which features of the control rules have the most influence on the results. Broadscale results are characterized according to variability in PSC limits, PSC usage, impacts on halibut spawning stock biomass (SSB) and directed halibut fishery catch over a 20-year timeframe.

A summary of the broadscale results across all of the alternatives is provided in the bullets below.

- PSC and directed halibut fishery catch are most sensitive to the starting point value.
- The additional constraint of Element 6 (a 15% constraint on changes to PSC limits) results in a slow trajectory to low starting point values when starting at the 2018 value.
- Floors and ceilings further dampen variability as some of the Alternatives result in control rules which are stuck on floors and ceilings.
- The majority of both the trawl and non-trawl PSC limits are highly correlated with the indices that were used as the primary index for those limits. Where PSC limits do not track abundance closely, it is due to the additional constraints that limit variability (floors, ceiling, percentage change constraint).
- Impacts to spawning stock biomass (SSB) in the BSAI is minimal across all alternatives at the PSC levels realized within the range of the alternatives because total mortality is balanced between PSC usage and halibut fishery catch. SSB does decline when very high PSC levels (10,000 t) are simulated which is outside of the range of alternatives currently considered. This scenario also shows that spawning biomass in the BSAI would decline dramatically, but that there would still be spawning biomass in the 'other' area. The bottom trawl survey index would also be non-zero, as there is some recruitment allocation to the BSAI from the coastwide stock every year included in model specification.
- There is limited impact on the overall performance (in relation to SSB and directed fishery catch) from the addition of a secondary index however there was additional variability in PSC limits and usage. Features of the control rules are more influential than combining two indices under the current trajectory of SSB simulated.
- There is a trade-off between PSC usage and halibut fishery catch because the mortality limit of over 26" (O26) halibut (TCEY) is composed of halibut fishery catch and O26 PSC usage. The halibut fishery catch is the TCEY minus the O26 PSC usage.
- Under nearly all of the alternatives, the halibut fishery catch limits are reduced from 2018 levels. This is driven by the fact that the TCEY is reduced due to declines in the SSB trajectory. A different model validation scenario with an increase in SSB may show an increase in halibut fishery catch relative to 2018 levels.
- The alternatives illustrate tradeoffs between PSC limits and halibut catch limits, and present tradeoffs between sectors of the groundfish fishery. Projected median values of PSC limits are summarized for 2024 and 2030 and represent reductions from current limits for the non-trawl fishery in every alternative, although these represent reductions from current PSC limits, none represent reductions from recent PSC use. Under the projected median values of PSC limits for those years, the trawl fishery receives reductions in PSC limits under only seven of the 15 calculated alternatives (See Section 6.3). This is related to the different surveys and relative trends in those surveys used to calculate PSC limits. In particular:
    - The non-trawl PSC limits are established by the setline survey (with the exception of Alternative 3.3b), which is highly correlated to the spawning biomass because the survey gear catches larger, older fish that are more likely to be mature.

  - The trawl PSC limits are related to the bottom trawl survey, which tends to catch smaller, younger fish that are less likely to be mature. In addition, the biomass of smaller fish is a function of incoming recruitment. Recruitment in the BSAI in the model is a function of spawning biomass, but is also highly variable. Additionally, the proportion of recruitment between the BSAI and the other area is variable, and doesn't show the consistent downward trend in spawning biomass at the start of the simulation.

- The 2030 non-trawl PSC limits are generally larger than those in 2024, consistent with the fact that spawning biomass (and thus the setline trend) stabilizes in the BSAI and show a very slight increase between 2025 and 2030.

Performance metrics

Performance metrics were developed to evaluate each of the 5 Council-defined objectives for ABM. These objectives are listed by gear type in Table ES-4 with results characterized by color coding across objectives and Alternatives. A key to colors is listed below the table. Note that the order of listing these objectives does not convey prioritization:

- Halibut PSC limits should be indexed to halibut abundance
- There should be flexibility provided to avoid unnecessarily constraining the groundfish fishery particularly when halibut abundance is high
- Provide for some stability in PSC limits on an inter-annual basis.
- Provide for directed halibut fishing operations in the Bering Sea.
- Halibut spawning stock biomass should be protected especially at lower levels of abundance

A small set of metrics are calculated for each alternative over the full 20 years of the simulation to provide some additional comparison across the different alternatives to assess how well each alternative (or sub-alternative) met a subset of the Council objectives. These performance metrics can be used to evaluate trade-offs amongst alternatives.

A big picture summary of Alternatives relative to performance metrics is provided in Table ES-4. Additional information on the actual metrics calculated is provided in Chapter 5 Section 5.4 and results presented in Chapter 6 Section 6.1.4 and not repeated below. **These general trends were summarized from the metrics that were simulated after 20 years and detailed results are contained in Table 6-2 through Table 6-4**. This summary table below is intended to reflect general performance for a given metric (only one was selected from Table 6-2 through Table 6-4 when multiple metrics were calculated) to show the variability amongst the Alternatives at addressing the Council's chosen objectives. As anticipated Alternatives meet varying objectives to different degrees. In general, many of the performance metrics calculated do not show a great deal of contrast for a given objective across alternatives and consideration of different performance metrics may be necessary to best indicate how well alternatives meet different objectives.

Table ES-4 Summary of relative performance of Alternatives against Council objectives for this analysis. Note that trawl and non-trawl performance is listed separately. These trends are generally summarized from information contained in Table 6-2 through Table 6-4 of this document.

	Index to abundance (trawl)	Flexibility (trawl)	Stability (trawl)	Index to abundance (non-trawl)	Flexibility (non-trawl)	Stability (non-trawl)	Directed halibut catch	Protect SSB*
Alt_1								
Alt_2.1								
Alt_2.1a								
Alt_2.1b								
Alt_2.2								
Alt_2.3								
Alt_2.4								
Alt_3.1								
Alt_3.1a								
Alt_3.1b								
Alt_3.1c								
Alt_3.1d								
Alt_3.2a								
Alt_3.2b								
Alt_3.3a								
Alt_3.3b								

*as noted in the document the SSB performance metric was not calculated due to low variation amongst alternatives.

Legend:

	Metric = best value Biomass= high correlation
	Metric = metric was somewhat met but did not produce the 'best' value
	Metric= worst value for that metric Biomass= low correlation
	Metric= improvement over the worst value but still in a lower range

Here dark blue indicates which alternative had the best value for that metric as a measure that it met that objective (based on the selected metrics employed) more so than other Alternatives that are shaded

differently. Light blue indicates that the metric was somewhat met but did not produce the 'best' value of the suite of Alternatives. Dark orange indicates that it was the worst value for that metric over all of the Alternatives while light orange was an improvement over the dark orange value but still in a lower range for meeting the metric. No shading indicates it was neither near the best nor near the worse of the range. For the objective relating to "Index to Abundance" a correlation analysis with the indices was provided to inform how well the alternatives address this objective. Here blue indicates well correlated while orange indicates that the alternative does not correlate well (due to characteristics of the Alternative) with the gear-specific survey (BTS for trawl and FISS for non-trawl). Generally, all of the Alternatives were well correlated with the survey index with a few exceptions.

Additional sections contained in this preliminary DEIS

Chapters 3 and 4 of this preliminary DEIS contain comprehensive background information on the groundfish and halibut fisheries, resources, management and characteristics. This for important context for the alternative management measures under consideration.

Appended separately (**Appendix 1**) is a social impact assessment (SIA) which evaluates community and regional participation patterns in the Bering Sea/Aleutian Islands (BSAI) groundfish and halibut fisheries as well as potential community level impacts from the various action alternatives and the no-action alternative. Potential impacts to subsistence and sport halibut fisheries are also evaluated.

As noted previously, appended separately are details on the comprehensive suite of indices considered during the process of identifying the two indices for this analysis (**Appendix 2**), model validation overview (**Appendix 3**), complete model results by alternative (**Appendix 4**) and sensitivity runs on the operating model (**Appendix 5**).

Where are we in the process?

The Council has reviewed several discussion papers and drafted a suite of alternatives for analysis. Figure ES-5 shows where this initial review of this preliminary DEIS fits into the overall Council and NEPA process and how decisions at this meet might affect scheduling moving forward.

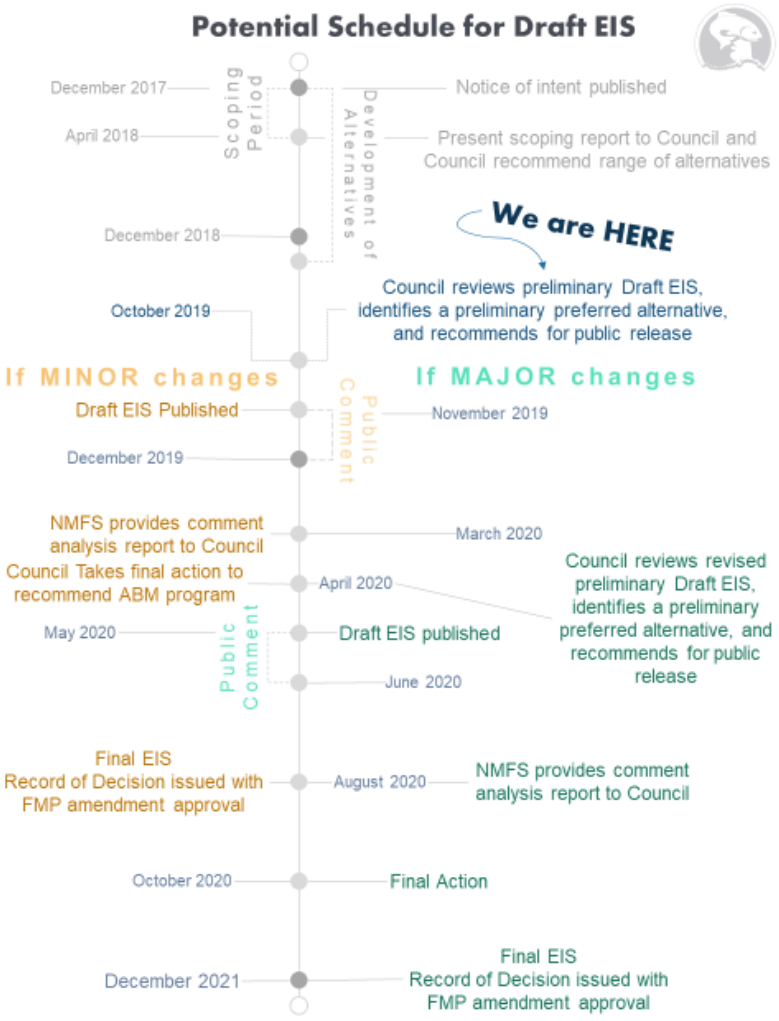


Figure ES-5 Previous Council considerations (grey), proposed NEPA schedule and potential Council schedule for DEIS

Key discussions and decision points at this meeting include the following:

- Review the suite of Alternatives and provide any revisions as desirable. Key considerations include:
    - Do these Alternatives as currently constructed meet the intent of the Council's action?
    - Could complexity and redundancy be reduced and still address the Council's intent?
- Review the halibut simulation model, including analytical assumptions and application for purposes of informing the Council's policy decisions for this analysis.
- Review the suite of draft performance metrics and revise as needed. Revised performance metrics may better characterize results across alternatives to indicate where they address conflicting Council objectives.

The analysts are also looking for input from the stakeholders on the background information provided in Chapters 3 and 4 to understand the operational and management issues within both the directed halibut fishery and directed groundfish fisheries as well as the context within which this analysis is being considered among other Council BSAI groundfish analyses and priorities.