DRAFT AMENDMENT 8 TO THE ATLANTIC HERRING FISHERY MANAGEMENT PLAN DECISION DOCUMENT FOR FINAL ACTION

September 2018

Prepared by the New England Fishery Management Council

50 Water Street, Mill #2; Newburyport, Massachusetts 01950

The New England Fishery Management Council (Council) has been working on Amendment 8 to the Atlantic Herring Fishery Management Plan (FMP) for several years. The Draft Environmental Impact Statement (DEIS) was available for public comment for 45 days ending June 25, 2018. The Council hosted seven public hearings during that public comment period to gather additional input to take under consideration when making final recommendations. The Council is scheduled to take final action on the amendment during its September 25-27, 2018 meeting in Plymouth, MA.

This decision document was prepared to assist the Council identify final preferred alternatives. The Amendment 8 alternatives are first summarized, followed by several worksheets to help identify and articulate the final Council recommendations and rationale. The worksheets have been included to help members develop strong rationale for their recommendations that are:

1) Supported by analyses prepared in Amendment 8;
2) Grounded by requirements of the Magnuson Stevens Fishery Conservation and Management Act; and
3) Reinforced by input from the stakeholders during the public comment period.

Well supported rationales for the final recommendations that are consistent with the National Standards facilitate their review and approvability.

Relevant sections and page numbers from the main Amendment 8 DEIS document have been highlighted in red.

Advisory panel and Council members are strongly encouraged to review this document ***before*** the final action meetings in September and come with the worksheets completed to help develop final recommendations and supporting rationale.

CONTENTS

1.0 BACKGROUND

Herring is managed in federal waters by the New England Fishery Management Council, and in state waters by the Atlantic States Marine Fisheries Commission (ASMFC). The Council's Herring FMP became effective on January 10, 2001 and has been improved by several subsequent amendment and framework actions over the years (Amendments 1-7 and Frameworks 1-4). The herring fishery is primarily a limited access fishery managed under a stock-wide annual catch limit (ACL) that is allocated among four management areas (sub-ACLs, also known as management area quotas for Areas 1A, 1B, 2 and 3) (Figure 1, p.27 of DEIS).

Herring is used primarily in the U.S. as bait for the American lobster and tuna fisheries but is also frozen whole and canned for human consumption. Atlantic herring landings have been variable in the last decade, averaging about 90,000 mt, with the highest level in 2009 (about 104,000 mt) and lowest in 2016 (about 65,000 mt). Total revenues for the fishery have been above $20 million dollars per year for some time, peaking above $30 million in 2013. Atlantic herring also plays an important role as forage in the Northeast U.S. shelf ecosystem. They are eaten by a wide variety of fish, marine mammals, birds, and by humans (more historically) in the region.

2.0 WHAT IS THE PURPOSE OF AMENDMENT 8?

The primary purpose of Amendment 8 is to modify the fishery management plan for the Atlantic herring fishery by:

1. Proposing a long-term acceptable biological catch (ABC) control rule for the Atlantic herring fishery that may explicitly account for herring's role in the ecosystem and to address the biological and ecological requirements of the Atlantic herring resource.
2. Proposing measures to address potential localized depletion of Atlantic herring to minimize possible detrimental biological impacts on predators of herring and associated socioeconomic impacts on other user groups.

Definition of an Acceptable Biological Catch (ABC) Control Rule

An acceptable biological catch (ABC) control rule is a formulaic approach for setting annual ABCs. For Atlantic herring there is an overfishing limit (OFL) that cannot be exceeded under federal law, and the ABC is generally set below the overfishing limit to prevent overfishing. Annual herring fishery allocations (i.e. area catch limits) are then set based on the approved ABC.

Definition of Localized Depletion and Problem Statement

Localized depletion occurs when harvesting takes more fish than can be replaced either locally or through fish migrating into the catch area within a given time period.

3.0 MANAGEMENT ALTERNATIVES UNDER CONSIDERATION (SECTION 2.0 OF DEIS)

3.1 ABC CONTROL RULE (SECTION 2.1 OF DEIS)

The ABC control rule used in the Atlantic Herring FMP has been modified over time and the FMP is currently using an "interim" control rule (for more details see No Action on page 33 of DEIS). This action is considering alternatives that may replace the interim control rule with one that is more permanent in nature, and could be applied on a longer term basis. The Council can always modify the control rule in a future action, but the intent of this amendment is to identify a control rule that will manage herring sustainably over the long-term.

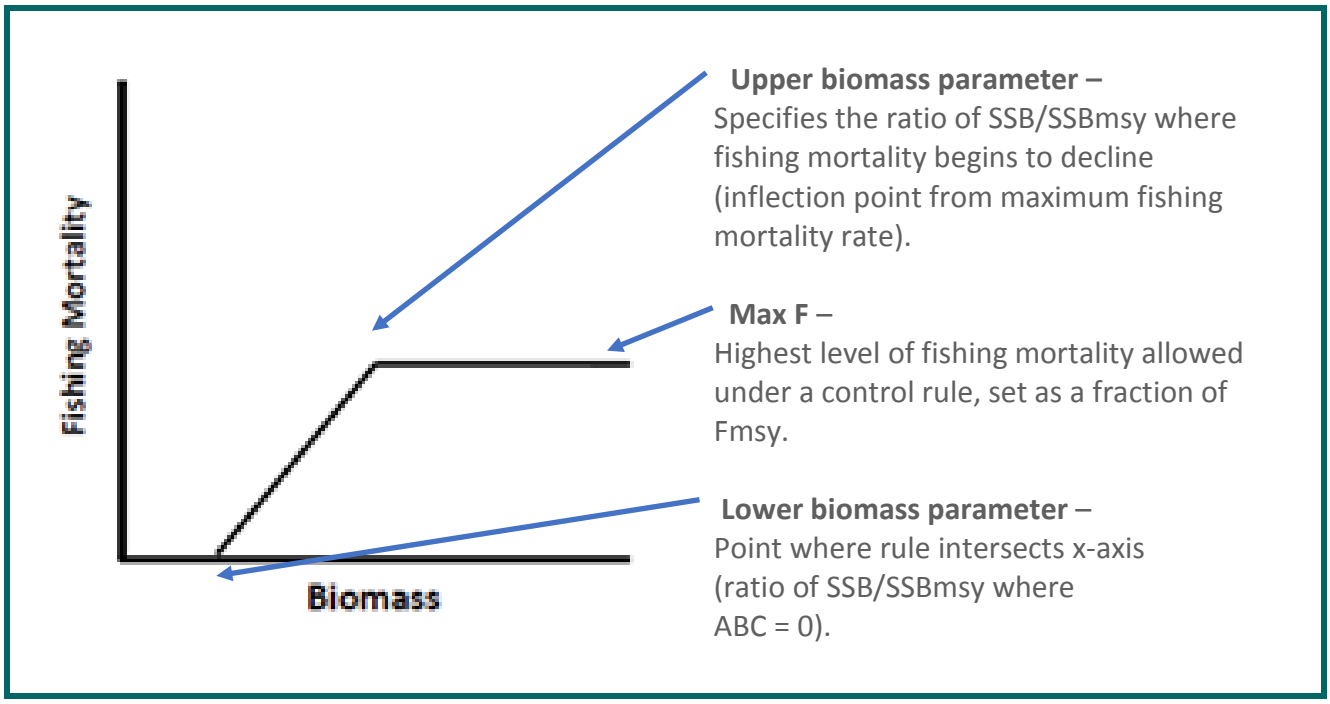
The Amendment 8 goals relative to the ABC control rule are to:

1) Account for the role of Atlantic herring within the ecosystem, including its role as forage; and
2) Stabilize the fishery at a level designed to achieve optimum yield.

Long-term biomass based ABC control rules need to include specific parameters, or aspects, that enable them to be used in all conditions (increasing or decreasing biomass). The three fundamental aspects of an ABC control rule are: 1) an upper biomass parameter; 2) maximum fishing mortality; and 3) lower biomass parameter. The values assigned to each of these parameters dictate the overall "shape" or function of an ABC control rule. These values drive whether fishing mortality can increase or decrease depending on the current estimate of biomass. For example, if the lower biomass parameter is greater than zero, that means ABC would be set to zero (no fishery) when biomass falls below that value; this is often referred to as a "fishery cutoff". Some of the alternatives in Amendment 8 include fishery cutoffs, and some do not.

Table 2 in the DEIS on page 39 includes the specific ABC control rule parameters for all of the alternatives in Amendment 8.

Figure 2 in the DEIS on page 39 compares the shapes of the ABC control rule alternatives based on the different parameter values.



Generic biomass based ABC control rule that reduces fishing mortality as biomass declines

	Brief Description of ABC Control Rule Alternatives in Amendment 8
No Action	The ABC is set at the same level for three years equivalent to the catch that is projected to produce a ≤50% probability of exceeding F_{MSY} in the third year. This policy has been used in the last two specification cycles (set at 50%).
Alt 1. Strawman A	A control rule was defined that would resemble No Action, but would be converted into a long-term policy having the parameters needed to set ABC in all cases (increasing or decreasing herring abundance). Includes a maximum fishing mortality rate of 90% of Fmsy, an upper biomass parameter of 0.5, and lower biomass parameter of 0.0, no fishery cutoff.
Alt 2. Strawman B	A control rule was defined that would prioritize herring predator forage needs based on limiting fishing mortality to 50% of Fmsy (Fmax = 0.5). This alternative also includes an upper biomass parameter of 2.0, and lower biomass parameter of 1.1. That means fishing mortality would begin to decline from the maximum of 0.5 when biomass falls below the value equivalent to two times Bmsy (2 * Bmsy), and ABC would be set to zero when biomass is less than 1.1 * Bmsy (fishery cutoff at 1.1).
Alt 3. Parameters defined upfront	A control rule was defined that would have similar fishing mortality limits to the current rule (Fmax = 0.9), but reduce fishing mortality when biomass levels are lower to better account for forage. This rule includes an upper biomass parameter of 0.7, and a lower biomass parameter of 0.3. In general, this alternative performs very similar to Alternative 1.
Alt 4a.	This series of alternatives is based on the desired performance of specific metrics, or objectives defined by the Council. Four specific metrics were highlighted from a longer list of 15 metrics evaluated in the Management Strategy Evaluation (MSE) for this action. These six alternatives are expected to meet those desired outcomes, and their performance for all 15 can be evaluated. The desired outcomes are: 1) MSY = 100% (but could be as low as 85%), 2) variation in annual yield <10% (but could be as high as 25%); 3) probability of overfishing = 0%, but could be as high as 25%; and 4) probability of no fishery (ABC=) should be 0%, but could be as high as 10%. All six have slightly different parameters, and rank slightly different in terms of performance across all metrics. In general, this group of alternatives falls somewhere between Alternative 1 and Alternative 2.
Alt 4b.	
Alt 4c.	
Alt 4d.	
Alt 4e.	
Alt 4f.	

This action also includes two alternatives for how ABCs should be set for three-year time blocks **(See Section 2.1.2, page 40-41)**

- Alternative 1 – No Action - set ABC for three years at the same level for each year.
- Alternative 2 – Set ABC for three years, but with annual application of control rule, ABCs may not be the same value each year, expected to vary based on updated short-term projections.

3.2 POTENTIAL LOCALIZED DEPLETION AND USER CONFLICTS (SECTION 2.2 OF DEIS)

A wide range of alternatives was developed to potentially address concerns raised by some stakeholders during the scoping process related to the potential negative socioeconomic impacts on commercial, recreational, and ecotourism businesses that rely on predators of herring from concentrated herring fishing. Figures for these alternatives are included on pages 13 and 14 below.

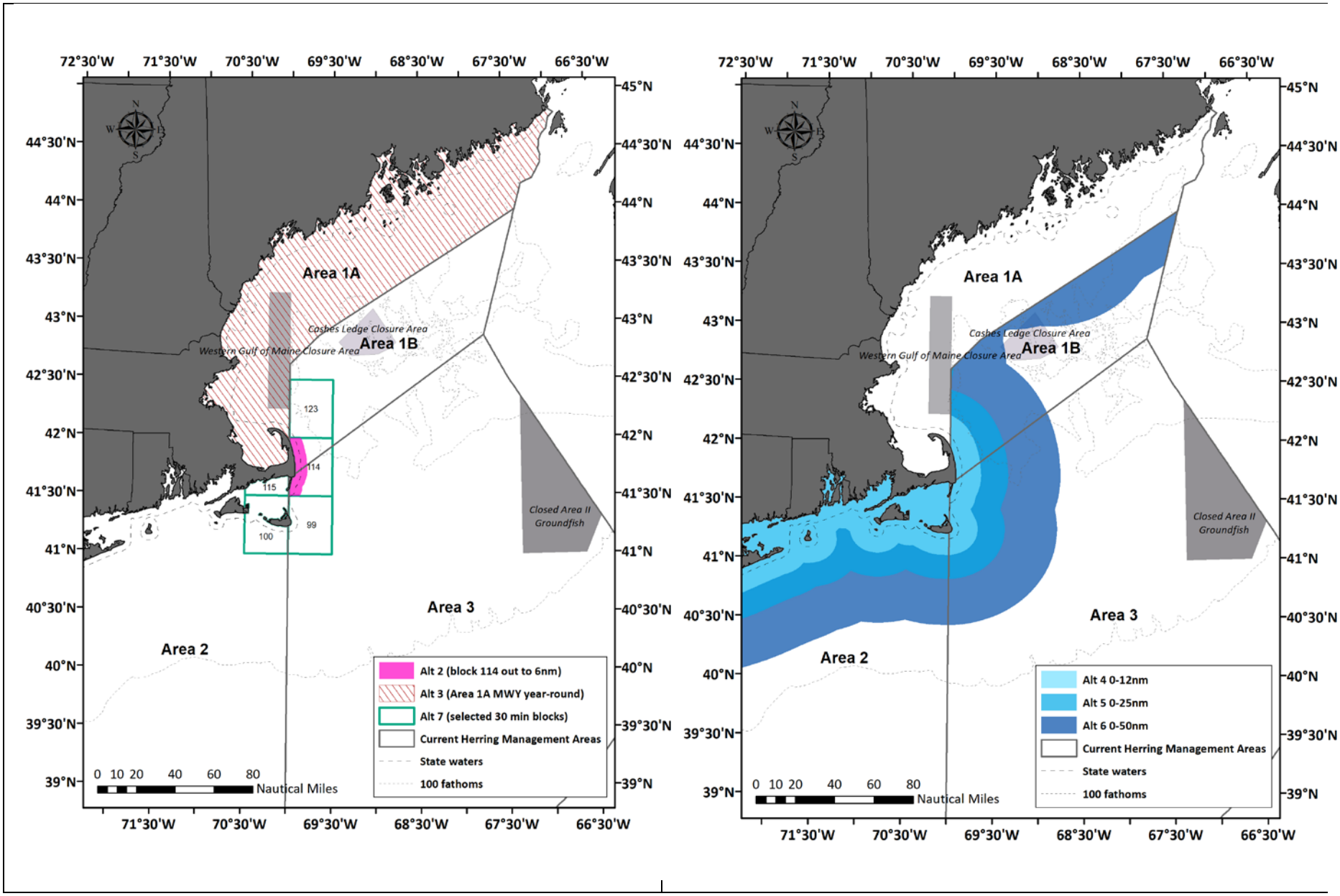
The Amendment 8 goal relative to this section is to:

1) Address localized depletion in inshore waters.

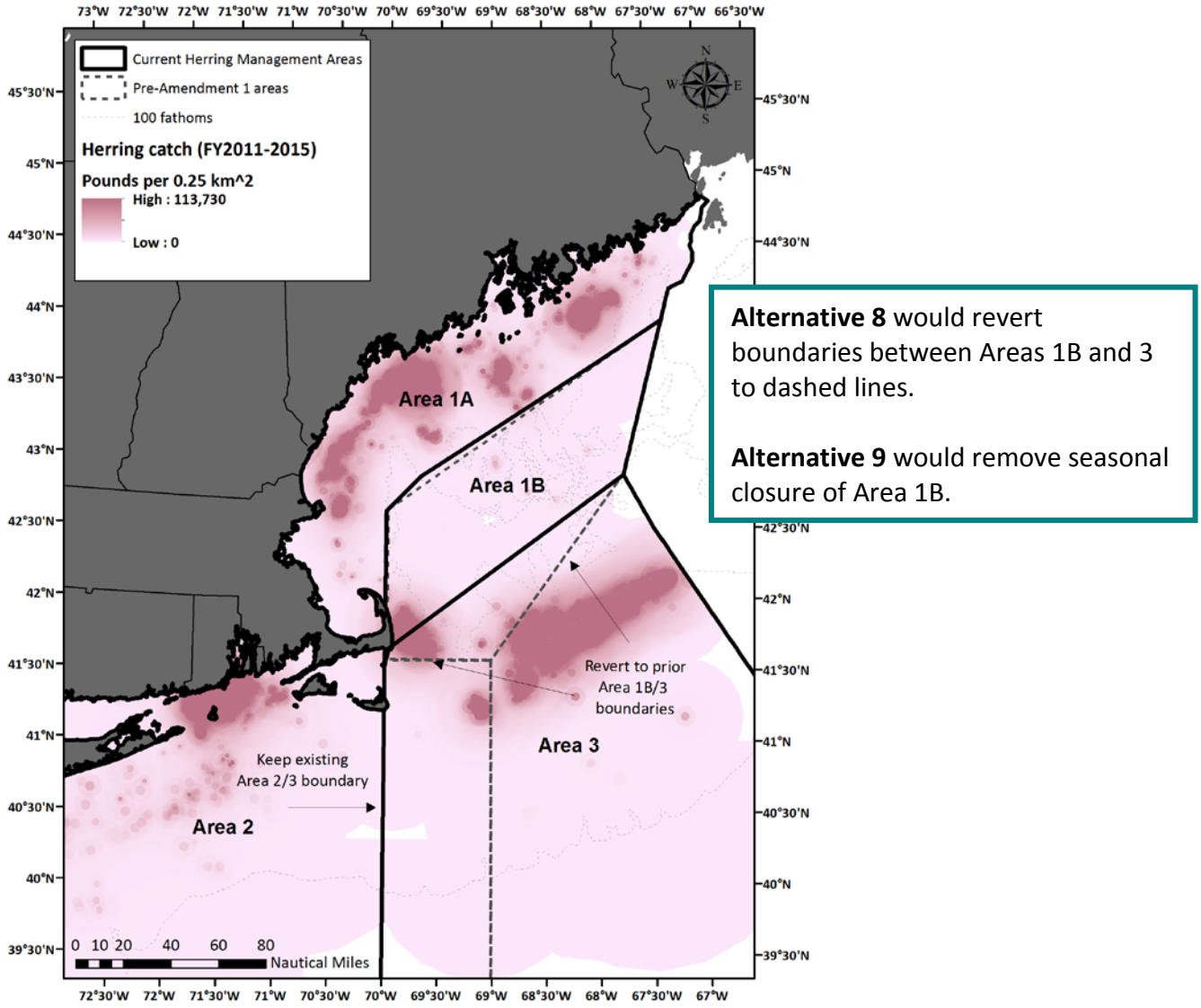
The Council approved a problem statement in April 2016 to help frame the development of alternatives in Amendment 8. This problem statement was incorporated into the purpose and need of this action.

> *"Scoping comments for Amendment 8 identified concerns with concentrated, intense commercial fishing of Atlantic herring in specific areas and at certain times that may cause detrimental socioeconomic impacts on other user groups (commercial, recreational, ecotourism) who depend upon adequate local availability of Atlantic herring to support business and recreational interests both at sea and on shore. The Council intends to further explore these concerns through examination of the best available science on localized depletion, the spatial nature of the fisheries, reported conflicts amongst users of the resources and the concerns of the herring fishery and other stakeholders."*

	Brief Description of Potential Localized Depletion and User Conflict Alternatives in Amendment 8
Alt 1. No Action	Vessels fishing for herring with midwater trawl gear would continue to be excluded from Area 1A from June 1 through September 30. (Implemented by Amendment 1 to the Herring FMP in June 2007)
Alt 2. 6nm closure in Area 114	Waters inshore of 6 nautical miles in the thirty minute square 114 would be closed to all vessels fishing for herring, regardless of gear type or herring permit type. This alternative has 2 seasonal sub-options (June 1-Aug 31 or June 1 – Oct 31).
Alt 3. Extend Area 1A prohibition of MWT gear year-round	The prohibition of midwater trawl gear in Area 1A from June 1 through September 30 would be extended to be a year-round restriction (Jan-Dec); vessels that currently use midwater trawl gear would be permitted to convert to other gear types allowed in the area.
Alt 4. 12 nm prohibition of MWT gear	Waters within 12 nautical miles south of Area 1A would be closed to midwater trawl gear. This alternative has 2 seasonal sub-options (Year-round or June 1-Sept 30 only); and two spatial sub-options (Area 1B, 2 and 3 or Areas IB and 3 only). Vessels that currently use midwater trawl gear would be permitted to use other gear types allowed in the area.
Alt 5. 25 nm prohibition of MWT gear	Waters within 25 nautical miles south of Herring Management Area 1A would be closed to midwater trawl gear. This alternative has 2 seasonal sub-options (Year-round or June 1-Sept 30 only); and two spatial sub-options (Area 1B, 2 and 3 or Areas IB and 3 only). Vessels that currently use midwater trawl gear would be permitted to convert to other gear types allowed in the area.
Alt 6. 50 nm prohibition of MWT gear	Waters within 50 nautical miles south of Herring Management Area 1A would be closed to midwater trawl gear. This alternative has 2 seasonal sub-options (Year-round or June 1-Sept 30 only); and two spatial sub-options (Area 1B, 2 and 3 or Areas IB and 3 only). Vessels that currently use midwater trawl gear would be permitted to convert to other gear types allowed in the area.
Alt 7. Prohibit MWT gear in five 30-minute squares	Vessels with midwater trawl gear would be prohibited to fish within several thirty minute squares around Cape Cod (Areas 99, 100, 114, 115, and 123). This alternative has two seasonal sub-options (Year-round or June 1-Sept 30 only); and two spatial sub-options (30 minute squares in Areas 1B, 2 and 3 or 30 minute squares in Areas IB and 3 only). Vessels that currently use midwater trawl gear would be permitted to convert to other gear types allowed in the area.
Alt 8. Revert boundary between Areas 1B/3	The boundaries between Area 1B and 3 would revert back to what they were under the original Herring FMP, maintaining the current boundary between Areas 2 and 3. This measure is expected to prevent Area 3 catch from being caught relatively close to shore. This action will not change the sub-ACLs.
Alt 9. Remove seasonal closure of Area 1B	The seasonal closure in Area 1B that currently exists from January 1 – April 30 would be removed. Framework 2 implemented it to boost herring landings when the bait market needed it most (in May before the summer lobster fishing season typically begins).



Amendment 8 Alternatives 2, 3, and 7 on LEFT and Alternatives 4, 5, and 6 on RIGHT



<u>Conditions applicable to all measures to address potential localized depletion and user conflicts</u>

All measures would be additive to the existing measure in the FMP implemented to address potential localized depletion of herring in Area 1A, the seasonal prohibition of midwater trawl gear from June 1 – September 30 (from Amendment 1).

RSA fishing would be exempt from any new restrictions. RSA compensation fishing is currently exempt from seasonal closures (January – May for Area 1A and January – April for Area 1B), as well as any closures after a sub-ACL is reached for a herring management area. However, RSA compensation fishing with MWT gear is *not* exempt from the prohibition of MWT gear in Area 1A (from June-September).

Any existing or new closures approved to address potential localized depletion and user conflicts could be modified via amendment or framework action.

4.0 CONSIDERATION OF FINAL RECOMMENDATIONS

There are three parts to this section. The Herring Advisory Panel and Herring Committee are encouraged to use all three sections to help identify and support final preferred alternatives for Amendment 8; analyses from Amendment 8, requirements of the Magnuson Stevens Act, and input from stakeholders from the public comment period.

4.1 AMENDMENT 8 ANALYSES

The analyses prepared for Amendment 8 can be a useful resource to support a final decision. The following sections summarize the analyses within Amendment 8 and highlight key findings that could be used as rationale for a recommendation. The information in Amendment 8 is much more detailed, and this summary does not cover all the possible rationale that is contained in the main document.

Review these pages to help identify final preferred alternatives and consider specific findings to support your rationale.

4.1.1 ABC control rule alternatives

The primary analyses used to develop and evaluate the ABC control rule alternatives in Amendment 8 are model results from the Management Strategy Evaluation. A general "user guide" was prepared to review why MSE analyses are used in fisheries management, and to help summarize the results (Appendix V).

This MSE included three models: a Gulf of Maine/Georges Bank Atlantic herring model, a model of Atlantic herring predators, and an economic model. To evaluate the effects of uncertainties in this system eight separate "operating models", or different states of nature were developed. The MSE produced a large volume of results to compare alternatives in terms of potential long term performance. These have been synthesized in several ways. Stakeholders identified fifteen different metrics to evaluate the control rule alternatives (i.e. yield relative to MSY, variation in yield, proportion of years with positive term production, etc.). Separate decision support tables were prepared for each metric. In addition, results have been presented across multiple metrics to help evaluate tradeoffs of different alternatives.

MSE analyses by nature focus on long-term impacts; the model simulations in this case were run for 150 years. However, the Council typically sets fishery specifications on 1-3 year time frames, so our process tends to prioritize near-term impacts. Amendment 8 also included an analysis of short-term impacts to help illustrate how various ABC control rules would function in more present day terms. Section 4.1.1.6 on page 260 of the DEIS summarizes the short term impacts. Two approaches were included: 1) four different herring biomass levels were selected from the past and ABC estimates were calculated from those biomass levels for each ABC control rule; and 2) data from the last assessment were used to prepare three-year projections of herring biomass and ABC for FY2016-2018 to help illustrate how these control rules would function compared to the No Action ABC control rule that was recently used.

In addition, after the DEIS was published the 2018 Atlantic herring benchmark assessment was completed. The estimated level of biomass went from well above targets in 2014 to below biomass targets in 2017. Therefore, the Herring Plan Development Team completed updated analyses incorporating the 2018 assessment that will be added to the final EIS. In general, the short-term impacts of the alternatives are the same on a relative scale whether biomass is high, medium, or low; but the impacts themselves are driven by the resource condition (generally positive if biomass is high and negative if biomass is low).

Section 4.0 of the DEIS includes over 250 pages of detailed analyses of the potential impacts of all of the alternatives across all valued ecosystem components. The following pages attempt to boil all that information down to a pages and summary tables. The general impacts are categorized into seven broad categories ranging from negative impacts (colored in red) to positive impacts (colored in green). Separate tables have been developed for the ABC control rule alternatives, as well as the measures to address potential localized depletion and user conflict alternatives. These issues are very complex and it can be misleading to characterize the potential impacts in a few words. Therefore, the Council and stakeholders should review the more detailed analyses in Section 4.0 of the DEIS before making recommendations for preferred alternatives. Several key findings have been included in the bullets below to accompany the general impacts in the summary tables that follow.

Impact Categories for summary of impact tables

negative	low neg	neutral to low neg	neutral	neutral to low pos	low positive	positive

General Findings for ABC control rule alternatives

- The eight operating models developed help evaluate variability in the system, but may not reflect the full range of possibilities.
- **Herring resource** – Figure 78 on page 281 of the DEIS summarizes the long-term impacts on the herring resource based on metrics such as probability of overfished status, biomass relative to unfished biomass, proportion of years overfishing is expected to occur, etc. Overall, the alternatives are expected to perform similar if not better than No Action in terms of positive impacts on the resource.
- However, other factors likely have even greater influence on herring biomass; there is lots of variability in the system and current conditions not likely to persist regardless of control rule.
- **Impacts on bycatch and EFH** – Generally neutral impacts are expected since fishing levels are similar or lower; bycatch caps used to manage and control bycatch.
- **Predators** - This system is complex and linkages are not as strong between prey and predators because many predators are generalists and the food web in this area is diverse. Figure 97 on page 328 of the DEIS compared the long-term impacts of the ABC control rule alternatives on predators. In general, the results were very similar across alternatives. While the amount of herring available for predators varies, the overall magnitude of the differences is small in terms of the fraction of the total estimated herring biomass, especially in the long-term.
- **Protected species** – Not sufficient data available to build a marine mammal model in the MSE analysis, but a metric was developed for tern production (Figure 63 page 251 of DEIS). Figure 98 summarizes the metrics that are indicators of potential impacts on protected species (page 342 of the DEIS).

- **Alternatives for setting three-year ABCs** - Overall, there may be slightly low negative impacts on the herring resource when ABC is set at the same level for three years (Alt2), but the differences are very minor and are not expected to outweigh the low positive impacts on the herring fishery in the short term from more stable catches.

- **Long-term human community impacts -** Table 99 to Table 106 and Figure 102 to Figure 107 (p. 376-383) show the long-term (MSE) results for the metrics such as net revenue and interannual variability (IAV) of net revenue, which help characterize the potential impacts on the herring, mackerel and lobster fisheries of the alternatives under consideration.

Herring/Mackerel and Lobster industries *- Alternatives 1-4 expected to provide a degree of certainty about the long-term management of the fishery, a low positive impact relative to No Action. Generally, high net revenues benefit the herring fishery, but high IAV is assumed bad, as it would produce unstable and unpredictable market outcomes. For the lobster fishery, buyers of herring for bait, benefits are assumed when yield (ABC) is high, volatility (IAV) is low, and prices are low. MSE results indicate that net revenue is lowest for Alternative 2, similar between Alternatives 1 and 3 and generally higher for Alternative 4, but also depend on the state of the herring resource (Figure 61, p.247). IAV of Yield (Figure 59, p.245) for Alternative 1 and Alternatives 4A-4F is similarly low, and higher for Alternatives 2 and 3 (Figure 59, p.245). Alternatives 2 and 3 also result in fishery closures (setting ABC=0 for up to 12% of years, depending on the model; Figure 60, p.247).*

Predator fisheries and ecotourism *- As industries reliant on herring as a prey item in the ecosystem, the predator fisheries (e.g., groundfish, tuna) and ecotourism (whale and bird watching) are expected to fare better with sufficient herring to sustain their predators. Direct and indirect metrics for the predators of Atlantic herring are reported in Sections 4.1.1.3.13 to 4.1.1.3.15. The performance of tuna weight and dogfish biomass (direct metrics) changes little across the alternatives. Tern production (direct metric) is highest for Alternative 2 and slightly lower for the other control rules.*

Fishing Communities *- Lowering the Atlantic herring ABC could result in short-term revenue reductions, which may, in turn, have negative impacts on the Size and Demographic Conditions of the Atlantic herring fishery within fishing communities, with ripple effects on the communities involved in the Atlantic mackerel and American lobster fisheries. Likewise, increasing allowable harvests is expected to have positive short-term impacts on fishing communities. In the long term, fishing under a control rule that ensures continued, sustainable harvest of the resource not only benefits the directed herring fishery and its communities, but indirect fisheries that rely on herring as prey in the ecosystem. The specific communities potentially impacted are identified in Section 3.6.3.*

- **Short-term human community impacts – Section 4.1.1.6**

Herring/Mackerel and Lobster industries *– Under a high biomass state of herring, No Action and Alternatives 1 and 3 would have neutral impacts, producing essentially the same ABC, and Alternative 2 would produce the lowest ABC (negative impacts). If biomass is low, there would be negative impacts under all control rules, including No Action, when compared to current ABC levels.*

	Herring Biomass	Non-target species (Bycatch)	Predator Species	Protected Resources	Physical Environment and EFH	Herring Fishery (and related mackerel and lobster fisheries)	Predator Fisheries and Ecotourism
No Action	ST: Low positive LT: more uncertain	Negligible/Neutral	Neutral	Low negative	Neutral	ST: Low positive LT: Uncertain, likely not significant	ST: Neutral to low positive; LT: Uncertain, likely not significant
Alt. 1 (Strawman A)	ST: Low positive; LT: Low positive		Neutral	Low negative, neutral compared to No Action		ST: Neutral to low positive; LT: Low positive	ST: Low positive; LT: Low positive
Alt. 2 (Strawman B)	ST: Positive; LT: Positive		Low Positive	Low negative, Low positive compared to No Action		ST: Low Negative LT: low positive to low negative	ST: Low positive; LT: positive
Alt. 3	ST: Low positive; LT: Low positive		Neutral	Low negative, neutral compared to No Action		ST: Neutral to low positive; LT: low positive to low negative	ST: Low positive; LT: Low positive
Alt. 4A – 4F	ST: Positive; LT: Positive		Low Positive	Low negative, but depending on the option, Neutral to Low Positive compared to No Action		ST: Low negative to low positive LT: low positive	ST: Low positive; LT: low positive

Summary of potential impacts of ABC control rule alternatives across all valued ecosystem components
(ST = short-term; LT = long-term)

4.1.2 Measures to address potential localized depletion and user conflicts

Section 4.1.2 of the DEIS describes the analyses prepared to assess the impacts of the measures to address potential localized depletion and user conflicts under consideration in Amendment 8. This is not a straightforward issue. It is challenging to identify if and how other fisheries have been impacted by herring catches. There are many constraints that determine where and when a fishery is prosecuted (e.g., area closures, weather windows, mobility of fish) that need to be understood in an investigation of whether there is causality to any correlations. Furthermore, the data that is available is limited, often not detailed enough to fully evaluate whether localized depletion is occurring. To date, there has not been sufficient research in this area to directly assess the potential impacts of different fishing gears on herring abundance and potential related effects of localized depletion on predators of herring.

To support this action, the Herring Plan Development Team (PDT) has summarized what is known about the role of herring as forage in this ecosystem, developed mapping tools to describe the footprint of the herring fishery and key predator fisheries, completed an overlap analysis of these fisheries to identify the areas and seasons that have been most important and quantify the degree of overlap, or potential user conflict. The PDT has also evaluated if there is a correlation between herring fishery removals and negative impacts on predator fisheries based on available data. Finally, the PDT worked with industry advisors to help identify possible effort shifts that may result from area closures. All these analyses are summarized in the DEIS as well as Appendices VI, VII, and VIII. A few highlights of these analyses are described below, but stakeholders are encouraged to review the more detailed discussions in the DEIS.

In general, the level of overlap between the herring MWT fishery and all other predator fisheries and users analyzed (commercial groundfish, commercial tuna, and whale watching effort) dropped significantly in 2007 with the passing of Amendment 1. But overlap may not always equate to direct negative impacts on predators and/or predator fisheries. Reducing overlap may decrease potential user conflicts, which can have low positive impacts, so long as herring fishing effort does not shift into areas or seasons with higher potential for overlap.

General Findings for potential localized depletion and user conflict alternatives

- **No Action**

  Biological impacts – It is not possible to determine direct impacts in isolation of other measures adopted in Amendment 1. Catch limits in Area 1A have been reduced 50%, no research available on differential impacts of gear type, larger catches over shorter time period now for both gear types, capacity of the vessel is the driver.
  Economic Impacts – Neutral on herring fishery overall (but positive for PS and negative for MWT); negative for mackerel fishery, neutral for lobster industry, and potentially positive on predator fisheries and ecotourism industries in the GOM.

- **General PDT input on localized depletion issue overall:**
  1) *depletion occurs regardless of gear type, all concentrated removals;*
  2) *depletion different than user conflicts;*
  3) *catch rates not a good measure of depletion for schooling, pelagic fish;*
  4) *more direct research needed;*
  5) *effort shifts difficult to predict so impacts somewhat uncertain.*

- **Biological impacts -** Overall, there are generally neutral impacts on the resource if the fishery is able to still harvest sub-ACLs, and low positive impacts if alternatives prevent full harvest of sub-ACLs and more herring is available. When the spatial sub-option to exclude Area 2 is considered for many of the alternatives, any potentially positive biological and negative economic impacts are somewhat neutralized, especially when combined with the summer only sub-option.
- **Bycatch impacts** - Somewhat uncertain because too many unknowns about effort shifts. Negative for RH/S if effort shifts inshore or to Area 2 in the winter; generally negative for GB haddock if effort shifts to GB in the fall. Generally negative if fishing pushed to areas and times with higher bycatch rates; generally negative if switch from MWT gear to bottom trawl; uncertain if effort shifts to places not fished now.
- **Impacts on predators** – This is a complex ecosystem - many species in this region are generalists, and feed on multiple prey. No research in this region on direct impacts of herring fishing on predator abundance.
- **Protected species** - In general, low negative to negative impacts depending on effort shifts. But if effort declines – positive impacts. If less herring is removed when seabirds are feeding their young in Area 1B in Aug-Sept there could be positive impacts on seabirds that feed on herring.
- **Essential Fish Habitat –** MWT gear assumed to contact the bottom only occasionally. Under No Action generally neutral impacts overall (low + in GOM because less potential contact with hard bottoms, and low – on GB because effort has increased). If vessels convert to bottom trawls there could be low negative impacts.

- **Human Community Impacts -** Impacts on the herring, mackerel, and lobster fisheries, predator fisheries and ecotourism, and port communities are described in the DEIS (Pages 398-458).

- **General PDT approach for economic impacts -** What were the herring/mackerel landings/revenue from an area/season? How likely are effort shifts: to other gear types, areas or seasons? How likely would a closure hamper harvesting OY? What degree of overlap has existed with other user groups?
  Some effort may shift to mitigate impacts – but
    - Added cost (travel/search time).
    - Herring may not be available in other seasons and/or areas.
    - Reduced conflict inside closure; crowding outside.

  Some MWT vessels may consider shifting gear type – but
    - Added cost ($100K for BT and $1-3M PS).
    - Additional training/time and crew needed to convert.
    - PS not feasible in currents or when herring are in deep water.
    - Regulatory constraints for BT in GOM and off Cape.

  Unintended consequences of effort shifts?
    - EFH, bycatch, other fisheries, etc.

- **General High-level findings**
    - The level of overlap between the herring MWT fishery and all other predator fisheries and users analyzed dropped significantly in 2007 with the passing of Amendment 1 (Figure 76, p.275). The seasonal profile of overlap has also changed since 2007 (Figure 77, p. 276), with less overlap in summer months in recent years. These changes in seasonal overlap are due, in part, to Amendment 1, but adjustments have also been made to predator fisheries (i.e. groundfish regulation changes) that also impact spatial fishing patterns and degree of overlap.
    - Some herring effort may shift to mitigate impacts, but there are several constrains to doing so (e.g., carrier limits, operational constraints, herring are migratory, increased costs of fishing offshore).
    - Given the regulatory restrictions on small mesh bottom trawls, it is unlikely that this gear would expand substantially into Areas 1B and 3.
    - Use of purse seines is unlikely east of Cape Cod and farther offshore, as purse seining is difficult in strong tides, rough ocean conditions, and when herring occur in deep water.
    - Most MWT fishing in Area 1B is currently inside of 12 nm.
    - Herring are migratory and may not be available in other areas or seasons.
    - User conflicts may be reduced inside a closure, but with effort shifts, impacts on user conflicts, bycatch and essential fish habitat may increase elsewhere, especially if MWT vessels convert to bottom trawl gear.
    - Shifting herring and mackerel effort to winter months may reduce user conflicts, but the price of herring is generally lower in winter.
    - Since at least 2007, the price of herring has been highest in July and August (Section 3.6.1.7), so summertime closures probably would result in lower annual revenue for the fishery because of the higher demand for lobster bait during those months.

Alternative	Herring Resource	Non-target	Predator species	Protected resources	EFH/Physical Environment
Alternative 1 (No Action)	Neutral - Hard to assess impacts in isolation of other measures that have been implemented	Neutral Bycatch caps in place limit impacts on bycatch	Low positive in GOM Low negative on GB	Low negative on protected species Neutral on ESA species	Neutral
Alternative 2	Neutral – no impact overall Area is relatively small	Neutral, Somewhat uncertain, but minimal	Neutral Relatively small area	Neutral	Neutral
Alternative 3	Neutral Area 1A TAC would still be harvest by other gear types	Neutral Effort shifts could reduce impacts on RH/S but increase impacts on haddock, but caps in place	Depends on how vessels react – impacts could range from low - to low +. Depends on how vessels react – impacts could range from low - to low +.	Low negative to negative on protected species. Neutral to negative on ESA species if effort shifts to areas and gears with higher interactions.	Neutral to low negative
Alternative 4 Alternative 5 Alternative 6	Neutral to low positive If sub-ACLs not harvested could be low + impacts, but fishing activity may adjust, so could be neutral impacts	Neutral, somewhat uncertain due to unknown effort shifts. Effort more likely to move offshore under Alt 6 and longer season sub option	Somewhat uncertain. Low negative to low positive. Somewhat uncertain. Low negative to low positive. More neutral if vessels convert gear and harvest the same level of herring.		Neutral to low negative for Alt. 4 and 5. Low negative for Alt 6 if vessels more inclined to convert to bottom trawl
Alternative 7	Neutral – little impact, Area 1B likely impacted, a corridor area	Neutral - Effort shifts could reduce impacts on RH/S but increase impacts on haddock, but caps in place	Mostly neutral with low positive impacts inshore and low negative impacts offshore		Neutral to low negative
Alternative 8	Neutral – if sub-ACLs stay the same, more uncertain if they change in future action, but still relatively low impacts.	Neutral Minimal amount of potential effort shift compared to others	Somewhat uncertain, Low positive to low negative Somewhat uncertain, Low positive to low negative	Neutral	Neutral
Alternative 9	Neutral – little impact, when fish removed not expected to have direct impacts	Neutral Minimal impact – just season	Low positive, but somewhat uncertain	Low negative on protected species Neutral on ESA species	Neutral

Summary of potential impacts of measures to reduce potential localized depletion and user conflicts across biological and physical environment

Alternative	Herring Fishery	Mackerel Fishery	Herring/Mackerel MWT revenue[1]	Lobster Fishery	Predator Fisheries/Ecotourism
1	Fishery-wide = Neutral MWT = Low negative PUR = Positive	Low negative		Neutral	Low positive
2A (J-A) & 2B (J-O)	Low negative	Low negative	0.5-0.6%	Low negative	Low positive
3	Fishery-wide = Neutral MWT = Low negative PUR = Positive	Low negative	18%	Neutral	Low positive
4A/A	MWT = Negative PUR = Neutral	Negative	18%	Negative	Low positive
4B/B	MWT = Low negative PUR = Neutral	Low negative	0.3%	Low negative	
5A/A	MWT = Negative PUR = Neutral	Negative	26%	Negative	Low positive
5B/B	MWT = Low negative PUR = Neutral	Low negative	0.6%	Low negative	
6A/A	MWT = Negative PUR = Neutral	Negative	45%	Negative	Low positive
6B/B	MWT = Negative PUR = Neutral	Low negative	5%	Low negative	
7A/A	MWT = Low negative PUR = Neutral	Low negative	8.7%	Low negative	Low positive
7B/B	MWT = Low negative PUR = Neutral		0.5%		
8	Low negative	Low negative	4%	Low negative	Neutral
9	Low negative	Low positive	n/a	Low positive	Low positive

[1] *2007-2015 annualized MWT revenue for the areas/seasons that may be closed/inaccessible as a percent of all MWT revenue for the seasons.*

Summary of potential impacts of measures to reduce potential localized depletion and user conflicts across human environment compared to No Action

4.2 REQUIREMENTS OF MAGNUSON STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

As the Council considers final action, it is important to ground all recommendations with the requirements of the Magnuson Stevens Act (MSA). Consistency with all National Standards is required. The National Standard Guidelines are intended to aid decision-making. FMPs formulated according to the guidelines normally have a better chance for expeditious Secretarial review, approval, and implementation. There are several National Standard Guidelines that more directly relate to the measures under consideration in this action, and they are identified for both the ABC control rule alternatives as well as the measures to address potential localized depletion and user conflicts. For further explanation of these considerations, please review the full text of the National Standard Guidelines, https://www.fisheries.noaa.gov/national/laws-and-policies/national-standard-guidelines .

MSA National Standards

Conservation and management measures must:

1. Prevent overfishing while achieving optimum yield
2. Be based on best scientific information available
3. Manage individual stocks as a unit throughout range to the extent practicable
4. Not discriminate between residents of different states and allocate privileges fairly and equitably, reasonably promoting conservation, with no one acquiring an excessive share
5. Consider efficiency where practicable, but no measure may have economic allocation as sole purpose
6. Take into account and allow for variations among fisheries, resources, and catches
7. Minimize costs/avoid duplication where practicable
8. Consider importance of fishery resources to fishing communities to sustain their participation and minimize adverse economic impacts to the extent practicable
9. Minimize bycatch and bycatch mortality to the extent practicable
10. Promote safety at sea to the extent practicable

4.2.1 ABC control rule alternatives

When selecting a recommendation for an ABC control rule, the National Standards that are most relevant are probably National Standard 1, 2, 6 and 8. The table below has been developed using the National Standard Guidelines to aid selection of a preferred alternative.

Preferred Alternative: _____ *If you have a preferred alternative, respond to these questions for each National Standard to help show how the alternative is consistent with these requirements.*	
Considerations:	**Rationale:**
National Standard 1 – Optimum Yield (OY) OY is the long-term average amount of fish that provides the greatest benefit to the nation with respect to food production, recreational opportunities, and protection of marine resources. OY is the Maximum Sustainable Yield (MSY) as reduced by relevant economic, social, or ecological factors.	*How would this alternative achieve OY on a continuing basis?* *Which economic, ecological and/or social factors associated with this alternative support the reduction or lessen the reduction from MSY and how do they?*
National Standard 2 – Scientific Information Conservation and management measures shall be based upon the best scientific information available. Scientific information includes, but is not limited to, factual input, data, models, analyses, technical information, or scientific assessments. Scientific information used to inform decision making should include an evaluation of its uncertainty and identify gaps in the information. Management decisions should recognize the biological (e.g., overfishing), ecological, sociological, and economic (e.g., loss of fishery benefits) risks associated with the sources of uncertainty and gaps in the scientific information.	*How is this alternative supported by the best scientific information available?* *How does this alternative recognize any risks associated with sources of uncertainty or gaps in the scientific information?*
National Standard 6 – Variations and contingencies Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.	*How does this alternative build in the control rule an appropriate consideration of risk, taking into account uncertainties in estimating harvest, stock conditions, life history parameters, or the effects of environmental factors?* *Does this alternative provide adequate flexibility to respond to variations and contingencies arising from biological, social, and economic occurrences, as well as from fishing practices?*

Preferred Alternative: _____ *If you have a preferred alternative, respond to these questions for each National Standard to help show how the alternative is consistent with these requirements.*	
Considerations:	**Rationale:**
	For example, how does this alternative consider unexpected resource surges or failures, climatic conditions, or environmental catastrophes? *How does the alternative provide, to the extent practicable, a suitable buffer in favor of conservation*
National Standard 8 – Communities Management measures must take into account the importance of fishery resources to fishing communities by using economic and social data that are based on best available scientific information to provide sustained participation of, and to extent practicable minimize adverse economic impacts on, those communities.	*Does this alternative provide for the sustained participation of fishing communities within the constraints of the condition of the resource?* *Are there other alternatives with similar conservation goals but greater potential for sustained participation of fishing communities that would minimize adverse economic impacts?* *Would this alternative benefit some communities at the expense of others?* *Which biological and/or socioeconomic factors associated with this alternative further the objectives of the Herring FMP?*

4.2.2 Measures to address potential localized depletion and user conflicts

When selecting a recommendation for measures to address potential localized depletion and user conflicts, the National Standards that are most relevant are probably National Standard 1, 2, 4, 5, 7, 8 and 10. The table below has been developed using the National Standard Guidelines to aid selection of a preferred alternative.

Preferred Alternative: _____ *If you have a preferred alternative, respond to these questions for each National Standard to help show how the alternative is consistent with these requirements.*	
Considerations:	**Rationale:**
National Standard 1 – Optimum Yield (OY) OY is the long-term average amount of fish that provides the greatest benefit to the nation with respect to food production, recreational opportunities, and protection of marine resources. OY is the Maximum Sustainable Yield (MSY) as reduced by relevant economic, social, or ecological factors.	*How would this alternative achieve OY on a continuing basis?* *Which economic, ecological and/or social factors associated with this alternative support the reduction or lessen the reduction from MSY and how do they?*
National Standard 2 – Scientific Information Conservation and management measures shall be based upon the best scientific information available. Scientific information includes, but is not limited to, factual input, data, models, analyses, technical information, or scientific assessments. Scientific information used to inform decision making should include an evaluation of its uncertainty and identify gaps in the information. Management decisions should recognize the biological (e.g., overfishing), ecological, sociological, and economic (e.g., loss of fishery benefits) risks associated with the sources of uncertainty and gaps in the scientific information.	*How is this alternative supported by the best scientific information available?* *How does this alternative recognize any risks associated with sources of uncertainty or gaps in the scientific information?*
National Standard 4 – Allocations Management measures must be fair and equitable to all fishermen and reasonably calculated to promote conservation, and prevent excessive shares. Fishing privileges may be allocated if such measures are necessary or helpful in furthering legitimate objectives or in achieving the OY.	*How is this alternative fair and equitable and reasonably calculated to promote conservation?* *How is this alternative necessary or helpful in furthering the objectives of the Herring FMP or in achieving OY fairly and equitably?* *If hardship is imposed on one group from this alternative, how is that outweighed by the total benefits received by another group or groups?*

Preferred Alternative: _____ *If you have a preferred alternative, respond to these questions for each National Standard to help show how the alternative is consistent with these requirements.*	
Considerations:	**Rationale:**
National Standard 5 – Efficiency Management measures shall, where practicable, consider the efficient use of resources, except no measure may have economic allocation as its sole purpose. An efficient fishery harvests OY with minimum use of labor, capital, interest, and fuel. An FMP should show that measures aimed at efficiency do not simply redistribute gains and burdens without increasing efficiency. Use of inefficient measures must contribute to the attainment of other social or biological objectives.	*How does this alternative increase the efficiency in harvesting, processing, marketing, or non-consumptive uses of this resource?* *If this alternative increases inefficiency in harvesting, processing, marketing, or non-consumptive uses of the resource, what social or biological objectives support the increase, and how does any increase relate to the FMP's objectives?*
National Standard 7 – Costs and Benefits Management measures, where practicable, minimize costs and avoid unnecessary duplication. Measures should not impose unnecessary burdens on the economy, individuals, or organizations.	*Are the benefits associated with this alternative real and substantial relative to the costs?* *Identify and evaluate burdens, costs, and gains on user groups and how the biological and/or socioeconomic factors associated with this alternative further the objectives of the Herring FMP?*
National Standard 8 – Communities Management measures must take into account the importance of fishery resources to fishing communities by using economic and social data that are based on best available scientific information to provide sustained participation of, and to extent practicable minimize adverse economic impacts on, those communities.	*Does this alternative provide for the sustained participation of fishing communities?* *Are there other alternatives with similar conservation goals but greater potential for sustained participation of fishing communities that would minimize adverse economic impacts?* *Would this alternative benefit some communities at the expense of others?* *Which biological and/or socioeconomic factors associated with this alternative further the objectives of the Herring FMP?*
National Standard 10 – Safety of Life at Sea Management measures should, to the extent practicable, promote the safety of life at sea.	*How would this alternative promote safety at sea?*

4.3 INPUT FROM PUBLIC COMMENTS

A separate document summarizes all the oral and written public comments received during the Amendment 8 public comment period. The vast majority of all commenters identified a preference for specific alternatives (Table 5 of public comment summary document). The tables below include bullets with condensed, paraphrased public comments with the main rationale provided by stakeholders. The lists are not exhaustive and the original comments should be reviewed as well.

This input may be useful to include as part of the Council rationale for final recommendations. Review these bullets and identify which comments you agree with.

4.3.1 ABC control rule alternatives

ABC Control Rule Alternatives	
Alternatives	**Public comments**
No Action	• The current stock assessment and control rule sufficiently account for the role of herring in the ecosystem. • Any further restrictions on the herring fishery will put pressures on all other bait sources, driving up costs for the lobster fishery. • The action alternatives are too rigid and negative fishery impacts would not be outweighed by any measurable benefit to predator fisheries or ecotourism. • No Action continues to be the alternative that balances herring fishery needs with predator needs. • With likely quota reductions ahead, flexibility is needed. • Use of a control rule removes the role of public participation in management. • Given the results of the 2018 benchmark stock assessment, the lack of meaningful differences between the control rules in the key metric of impacts on forage stocks (though most have significant adverse economic impacts on the fishery itself), and the lack of a legal mandate to adopt a long-term control rule, No Action is preferred.
Action	• A control rule enables the Council to decide how catches are set beforehand, regardless of assessment outcomes etc; a political fight does not happen every time quotas are set- decisions are made upfront.
Alternative 1	• If the Council rejects No Action, Alternative 1 and 3 perform equal to or better than the other alternatives for the unbiased models, especially for absolute yield relative to MSY.
Alternative 2	• It acknowledges the importance of herring in the ecosystem and their primary role as forage. • It would provide a more stable herring population in the long run, benefiting not just the ecosystem, but providing stability for the many commercial, recreational and tourism businesses that depend on a healthy herring resource. It has the greatest chance to benefit everyone. • Given current uncertainties, it would best account for the highly variable population dynamics of Atlantic herring. • It is consistent with approaches successfully applied in other fisheries. • It ranks the highest across all MSE operating models and has a near-zero chance of causing the stock to be overfished for most operating models. • Reducing Atlantic herring catches will also reduce the amount of river herring

ABC Control Rule Alternatives	
Alternatives	**Public comments**
	and shad (RH/S) caught as bycatch, additional important forage fish species. • Maintaining adequate forage to support feeding and production of economically valuable predator fish is a priority for NOAA Fisheries, and this alternative best satisfies the purpose and need of the amendment, as well as the goals and objectives of the Atlantic Herring FMP. • Setting a strong control rule is important for the lobster industry which relies on herring for bait. Having a steady supply, rather than a very reduced supply, is an important consideration. The Council should avoid control rules that have massive fluctuations and provide inconsistent fishing to the industries that rely on this fish.
Alternative 4e and 4f	• These alternatives have positive impacts predicted across several ecosystem components supporting short and long term herring biomass, predator fisheries, ecotourism and the herring fishery. • Managing forage species is complex, and needs a strong formula that will identify how much fish can be removed by the human population and provide a sufficient forage base for predator species; these rules will provide additional stability and benefits for predators and the herring fishery in the long run.

ABC Control Rule Timeframe Alternatives	
Alternatives	**Public comments**
Alternative 1	• It allows for more stability for making business decisions in both the herring and lobster fisheries.
Alternative 2	• Annual application is critical due to the uncertainty of the fishery stock; this uncertainty could be further exacerbated by the effects of climate change and potential range shifts of populations. Recent research shows that meaningful quotas should not be set farther out than 12-18 months. • Annual ABC could enable us to reverse the recent decline of Atlantic herring and carefully monitor its recovery.
Recommendation for a modified alternative	
Allow the Council to select either approach in future specification package	• This could provide much needed flexibility for the public and the Council to make a decision that is best for the fishery and resource.

4.3.2 Measures to address potential localized depletion and user conflicts

Localized Depletion Alternatives	
Alternatives	**Public comments in support**
No Action/ Alternative 1	• Localized depletion is unlikely, given that both Atlantic herring and its predators are highly mobile and there are many other prey species in the region. • If the purse seine vessels cannot get to the fish when they go deeper, there will not be enough fish for the bait market. Converting to seining is not an option for most of these vessels. • Much more data and science are needed before being convinced that depletion happens. The Magnuson Act requires that management be based on science. • The economic costs far outstrip any biological benefit which are only speculative. • Alternatives 4-6 should not apply to Area 2. The herring fishery in Area 2 is seasonal, only occurring when the fish are migrating through the area in the winter months and often occurs close to shore when many other commercial and recreational species have migrated offshore. Localized depletion cannot occur on a transient stock. • The assessment results make it imperative that Council not adopt any of the "buffer zones" that will merely add to the industry's woes. Obviously, the lower TAC will reduce the fisheries' footprint significantly. That should also reduce any perceived conflicts.
Alternative 2	• There is a need for precaution considering the shifting baseline of the marine environment, including global warming, eutrophication and other competing ocean uses (e.g., wind farms).
Alternative 3	• It would sustain inshore herring and benefit the predator populations in the Gulf of Maine (i.e., cod, bluefin tuna, whales, seabirds) and businesses that depend on them. • When herring are spawning they stay put, sometimes closer to the bottom and do not flee after fishing, this behavior allows the MWT vessels to target spawning fish. • This plan could provide more bait for the lobster and mackerel fisheries that use alternative gear types within the MWT gear prohibited zones. Combining alternatives 3 & 5 will increase prey escapement for foraging nearshore species.
Alternative 4	• We have experienced success in the Gulf of Maine with a buffer zone, and for that reason we support the creation of a coastal buffer zone off the shore of Cape Cod. • It is the only way to completely protect New England marine and coastal ecosystems, and prevent overfishing of ecologically significant Atlantic Herring, river herring and menhaden.”
Alternative 5	• Pair trawling is not compatible with groundfishing in our area. It just doesn't work. • Be sure that Rhode Island is included to protect our shoreline and Block Island as well. • We see a user conflict occurring in Area 2 up to 25 miles from shore including Cox’s Ledge. A lot of members of our group fish in both the summer and winter so it is important that the restriction is year-round. • The decline of alewife and blueback herring in Connecticut Rivers is well documented despite millions of dollars spent on dam removals and restoration efforts. River herring stage outside of Long Island as the documents show, and the bycatch is responsible for a lot of the decline.”
Alternative 6	• It “will provide the most benefit to the forage fish as well as the federally protected marine mammal species which depend on them.” • “The capability and speed of today's boats allow many fishermen daily access to these areas leading to a widespread user conflict that needs to be addressed in this Amendment. • The new herring assessment will emphasize the poor lack of recruitment. As such, increased protection of the Nantucket Shoals and Georges Bank spawning areas will be essential to rebuilding the herring resource. • While the very idea of 145-foot small-mesh pair trawlers fishing hundreds of yards from land is hard to accept, more concerning is the fact that those are over-wintering aggregations made up in part of Area lA fish being caught in the middle of winter, when essentially no U.S. lobstermen are even fishing.

Localized Depletion Alternatives	
Alternatives	**Public comments in support**
	• It leaves the inshore waters for other smaller fishermen like purse seines, small-mesh bottom trawls, and fishing weirs. • I have seen the decline first hand. I can't understand the logic in shutting down the Borndale herring run to anglers while allowing these boats to operate right in our fishery. • It would also have the important effect of protecting severely depleted populations of anadromous river herring. • We'll never get there unless you be highly aggressive, do as much as possible. • People aren't gonna be left in this industry they're aren't going to be children to go in it, there are going to be a bunch of permits and rusted old boats and a bunch of big midwater trawlers barely making any money.
Alternative 7	• All similar to comments for Alternatives 2-6.
Alternative 8	• No comments in support.
Alternative 9	• Returning to a winter fishery there, and thereby increasing opportunities for the mackerel fishery, will reduce congestion on the water in the spring. • In retrospect, changing the access to that area to May was a mistake. Not only did it reduce our access to mackerel, but it put us on the ground while everybody else is out in the water and that probably wasn't a very strategically sound decision. • I believe the user conflicts got worse when Area IB closure put it place January-April, it put us right in that area in May when other vessels are there. • We're forced into other areas to fish for mackerel where maybe we could catch them cleaner or maybe we could have less interaction of bycatch elsewhere, but we can't, our hands are tied.
Recommendation for modified alternatives	
	• Protect the Great South Channel from localized depletion. For example, add area blocks in Alternative 7 to the east and south. • Revise Alternative 6 (50 nm buffer) by setting "the southwestern boundary of the 50 nm buffer as the New England/mid-Atlantic jurisdictional line, and 2) set the northern boundary east of the New Hampshire/Maine border (eliminate the upper "sliver" adjacent to herring management area IA by drawing a boundary line from 69.533326W, 42.946723N to 69.471637W, 42.896404N). These slight modifications will focus conservation to the area most important to herring, its predators, and the user communities that rely upon it." • Anticipating effort shifts, add scale restrictions for converting to purse seining.

5.0 GLOSSARY

Acceptable biological catch: The maximum catch that is recommended for harvest, consistent with meeting the biological objectives of the management plan. The MSA interpretation of ABC includes consideration of biological uncertainty (stock structure, stock mixing, other biological/ecological issues), and recommendations for ABC should come from the NEFMC SSC.

Assessment model: Method for determining stock status, the results of which are used by the control rule.

Harvest control rule: Relationship describing how the results of the assessment are translated into advice for management (i.e. turns the assessment result into an allowable biological catch).

Management Objective: Desirable outcomes from management. Objectives can include ecological, economic, societal goals. High level goals/objectives (e.g. what would like) can be unpacked into operational objectives (e.g. how much?).

Management Strategy Evaluation (MSE): Analytical framework for testing and comparing the performance of management options.

Maximum sustainable yield (MSY): Maximum catch that can be removed from a population over an indefinite period. **Fmsy** – measurement of the rate of removal of fish from fishing that if applied constantly would result in MSY. **Bmsy** – long-term average biomass that would be achieved if fishing at a constant F equal to Fmsy.

Operating model (OM): model which represents the real world resource and fishery dynamics, used as the basis for testing management options. Multiple operating models can be considered, each representing a possible state of nature.

Performance metric: Specific quantitative measure that represents a management objective and can be used to evaluate progress towards that objective.

Spawning stock biomass: total weights of fish in a stock that are old enough to spawn. **SSBmsy** is the level of spawning biomass capable of producing maximum sustainable yield.

Trade-off: Degree to which performance against a set of management objectives are related. A strong tradeoff between two objectives implies that gaining on one means forgoing the other.

Valued Ecosystem Component: an element of the environment that has scientific, economic, social or cultural significance. Example valued ecosystem components are: the species targeted by a particular fishery; the non-target or bycatch species caught incidentally; impacts on predator species.

6.0 ACRONYMNS

ABC	Acceptable Biological Catch
ACL	Annual Catch Limit
ASMFC	Atlantic States Marine Fisheries Commission or Commission
DEIS	Draft Environmental Impact Statement
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
F	Fishing Mortality Rate
FMP	Fishery Management Plan
FW	Framework
FY	Fishing Year
GB	Georges Bank
GOM	Gulf of Maine
IAV	Interannual variation in yield
MAFMC	Mid-Atlantic Fishery Management Council
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSE	Management Strategy Evaluation
MSY	Maximum Sustainable Yield
mt	Metric Tons
MWT	Mid-water trawl fishing gear
NEFMC	New England Fishery Management Council
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OY	Optimum Yield
PDT	Plan Development Team
PS	Purse seine fishing gear
SSB	Spawning Stock Biomass
SSC	Scientific and Statistical Committee
VEC	Valued Ecosystem Component
VTR	Vessel Trip Report