

DRAFT – Preliminary Results

Supplemental information for Document 7 behind Tab 7 –**Additional impacts analysis related to sea scallop resource and fishery in the form of a memo from the Scallop PDT to the Habitat PDT****1.0 POTENTIAL IMPACTS OF EFH CLOSED AREA ALTERNATIVES****1.1 METHODS**

The Scallop PDT has assessed these potential impacts two major ways. First the long term potential yield from an area has been calculated as well as the short term yield based on recent survey results from 2013 (In Document #7). Second, the SAMS model will be run for several scenarios to project the future short term and longer term biomass and scallop catches and associated impacts.

1.1.1 Estimates of long-term yield and short-term yield in relevant areas

(In Document #7)

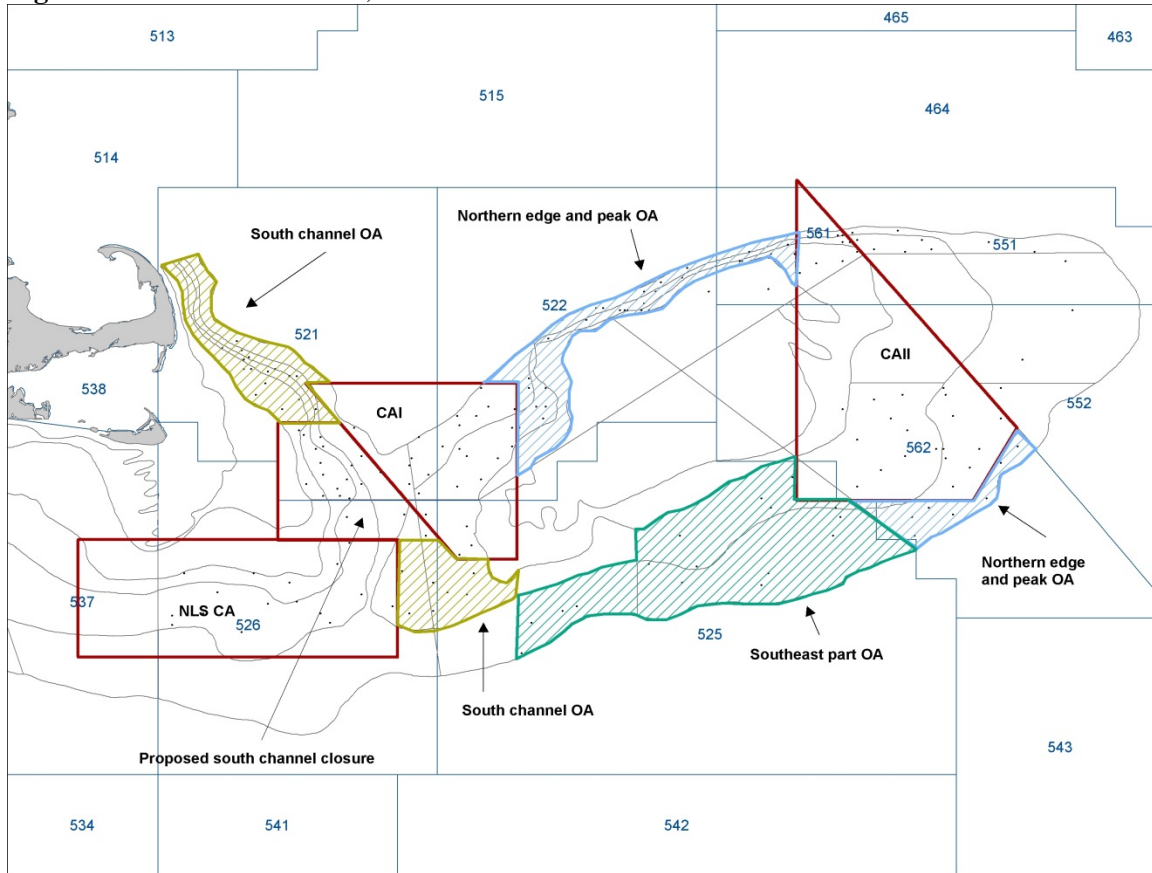
1.1.2 Projected impacts on scallop biomass and catch

The projected impacts on scallop biomass and catch are based on results from an updated version of the SAMS (Scallop Area Management Simulator) model. This model has been used to project scallop biomass and catch to aid management decisions since 1999. SAMS is a size-structured model that forecasts scallop populations in a number of areas. In this version of the model, the PDT modified the boundaries of the typical areas to include a handful of the alternatives under consideration (Figure 1). This allows the model to estimate the long term biomass inside and outside of various Habitat Management Areas. Modifying boundaries in the SAMS model is difficult and time consuming, so the PDT identified a feasible number of areas to assess, and did not run a separate SAMS projection for all groupings of Habitat Management Areas under consideration.

The final runs will include:

1. No Action – The EFH areas closed by Amendment 13 remain closed to the scallop fishery (areas without colored hatching in Figure 1. Note that for No Action – all of CA2 north is considered closed to the scallop fishery because the area north of 41° 30' (outside the CA2 access area) is closed to the scallop fishery under the GF FMP.
2. No Habitat Management Area closures – Open all A13 EFH areas. The model run assumes that all existing EFH areas would be fished at a fishing mortality rate similar to an access area for several years (0.4), and then be fished at a more controlled level of access just below Fmsy for GB for the remainder of the time period. (Please note that this run is slightly different than what is described in Document 7).
3. New Habitat Management Area closure on Northern Edge (GB Alt3, light blue outline in Figure 1 in Document 7) and other A13 EFH areas open
4. New Habitat Management Area closure area in Channel (GSC – Alt4, dark green outline area in Figure 1 in Document 7) and A13 EFH areas open
5. Combination of Northern Edge EFH area (GB Alt3) and GSC Alt4 closing

Figure 1 - SAMS model areas, with statistical areas and NEFSC shellfish stratum boundaries on Georges Bank



1.2 RESULTS AND FINDINGS

1.2.1 Estimate of long-term scallop yield potential and short-term yield

(In Document #7)

1.2.2 Projected impacts on scallop biomass and landings

These analyses are more dynamic than the results presented in the previous section because they do not simply focus on the area being assessed, rather these analyses simulate fishing activity and associated impacts to the fishery overall. The SAMS model was reconfigured to include several of the specific HMAs under consideration in OA2. The model makes assumptions about where effort will be displaced based on fleet dynamics observed in the fishery and estimated catch rates in various areas. When reviewing the results it is important to keep in mind that there are a handful of constraints placed on the model in terms of how much effort is allowed in a certain area. Mainly, the principles used in the Scallop FMP to set target catches (total F cannot exceed 0.28 in all areas and open area F cannot exceed 0.38) are maintained in these simulations. Therefore, these results show the potential impacts of the HMAs under consideration, but as constrained by the area management principles in the Scallop FMP.

For example, if the EFH areas are removed in OA2, the SAMS model would not simply keep open area effort as it has been, and add effort into newly opened EFH at an uncontrolled level. The FMP would still constrain the overall limit at 0.28; the F associated with ACT, or the F rate that has a 25%

chance of exceeding ACL. Since the overall catch for the fishery would still need to be within these limits, open area DAS would need to be reduced to keep overall F under 0.28. Thus, some of the trends in the results, especially the first few years, are an artifact of F_{target} limits used in the FMP. However, since those limits are how specifications are set in the scallop fishery, these results are more realistic than if effort simply adjusted based on available resource, without consideration for spatial and overall limits.

These analyses include five overall scenarios. It is possible after the public hearing process to run more scenarios based on additional input received. For example, different combinations can be run to help describe the potential cumulative impacts of several HMA alternatives together. FY 2015 is the first year that OA2 is expected to be implemented; therefore, that is the first fishing year that is included in the results. SAMS is run through 2027 to capture long-term impacts. The PDT discussed that this time period is the length of time used to assess the impacts of specification alternatives in the Scallop FMP, but an even longer time period may be more appropriate for assessing the potential impacts on long-term EFH closures. If time permits, the Scallop PDT may run these scenarios even longer to further assess the long-term impacts of these closures.

1.2.2.1 Short-Term Impacts

Table 1 is a summary of the short-term impacts (FY2015) for the five scenarios assessed to date. The No Action alternative, keeping the current EFH areas closed to the scallop fishery, has the lowest 2015 projected landings. Open area DAS and associated F in open areas are higher, compared to alternatives that open current EFH areas. The overall constraint on effort in 2015 for the No Action Alternative is the open area F limit of 0.38. That is the same for Run 3 and Run 5, the runs that close the Northern Edge HMA. Because the current CA2N EFH area and the new Northern Edge HMA have such similar levels of biomass and potential yield, those runs overall are very similar. Run 3 and Run 5 provide higher landings with lower bottom area swept in 2015 primarily because the CA1N EFH area is available to the scallop fishery, which has a substantial amount of exploitable biomass in 2015.

The overall constraint on effort in Run 2 and Run 4 is that total F cannot exceed 0.28. When more areas become open to the scallop fishery the main constraint becomes the total F limit of 0.28, and not the open area F limit of 0.38, which is the main constraint when scallop biomass is within closed areas. For example, in Run 2 with no EFH closures, most catch is estimated to come from MA access areas and newly opened EFH areas. That represents a large portion of the total F for the fishery, leaving less F available for open areas. F Run 2 open area F falls to 0.27 and 19 DAS in areas outside of MA access areas and newly opened EFH areas. Furthermore, in 2016 open area F would need to be reduced further to keep total F below 0.28. Specifically, the model projects open area F would need to be 0.13, or 11 DAS per FT vessel in 2016 since F will be higher in MA access areas and newly opened EFH areas. While these DAS allocations are much lower than present values, the total landings for this scenario is higher than current levels because substantial catches are expected in both MA access areas and newly opened EFH areas. This run has the lowest bottom area swept because more effort is in MA access areas and newly opened EFH areas that have higher LPUEs.

Run 3 and Run 5 have very similar short-term results again because the GSC HMA does not impact the analyses very much, so adding the area in Run 5 is not very different than Run 3, which is NE HMA only. Run 3 has the highest ST landings because of the windfall catch available in the southern portion of the CA2N EFH area and CA1N EFH area. This could provide more landings in 2015 (about 3,600 mt or 8 million pounds). This “additional catch” does not impact open area DAS like it did in Run 2

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because in Run 3 NE HMA is still closed and contains a large amount of biomass. So total F is below 0.28 and therefore DAS would not need to be reduced to keep total F below 0.28, as was necessary under Run 2 (DAS reduced from 25 to 19).

Table 1 – Summary of 2015 results for several scenarios under consideration in OA2 based on SAMS

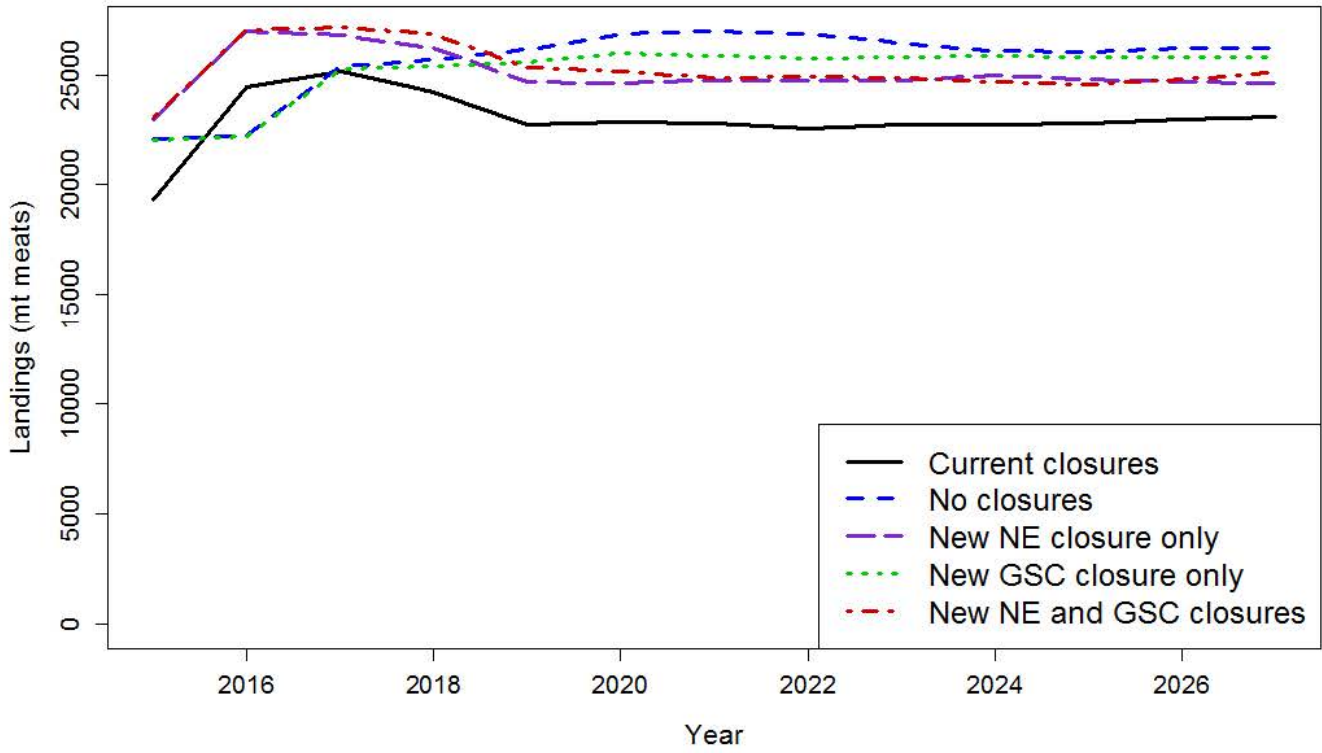
	OverallF	OpenF	Land	OpenDAS	FTDAS	BotAreaSwept
Run 1 No Action	0.2	0.38	19,347	9,228	25	2,022
Run 2 No EFH Closures	0.28	0.27	22,081	6,826	19	1,853
Run 3 NE HMA only	0.24	0.38	22,978	9,142	25	2,331
Run 4 GSC HMA only	0.28	0.27	22,047	6,793	19	1,840
Run 5 NE and GSC HMAs combined	0.24	0.38	23,003	9,255	26	2,324

1.2.2.2 Long-Term Impacts

The SAMS model is even more useful for assessing the potential long-term impacts. Figure 2 - Figure 4 compare the projected landings, biomass, and bottom area swept results for the 5 EFH runs. The No Action run has the lowest projected landings at first, landings increase in 2016-2018 when the MA access areas open, and long-term landings are lower. This scenario is mostly limited by the open are F constraint (max of 0.38) in all years except when the MA access areas open. Because so much biomass is contained in those areas, when they reopen to the fishery in 2015 less biomass is closed to the fishery, so the limit becomes the overall F of 0.28 instead.

The results for Run 2 (no EFH closures) and Run 4 (GSC HMA only) are very similar because there is very little potential yield in the GSC HMA. Run 4 is only slightly below Run 2 because there is some scallop biomass in GSC, but not a substantial amount. For Run 2 the total F limit of 0.28 is already the constraining factor because no areas are closed to the fishery. Therefore, DAS and landings are lower for this run in the first few years because relatively little scallop biomass is in closed areas. However, long-term the projected landings for these two alternatives are the highest. This is evident after 2018 when the high biomass that is presently in the MA access areas is fished during 2015-2018. Not surprisingly, these results suggest that long-term landings would be higher if long-term closed areas did NOT overlap productive scallop grounds. Run 1 has the lowest LT landings since it closes more area, and Run 3 and 5 have similar LT landings because they both close NE HMA. LT landings are between Run 1 (No Action) and Run 2 (No EFH closed areas).

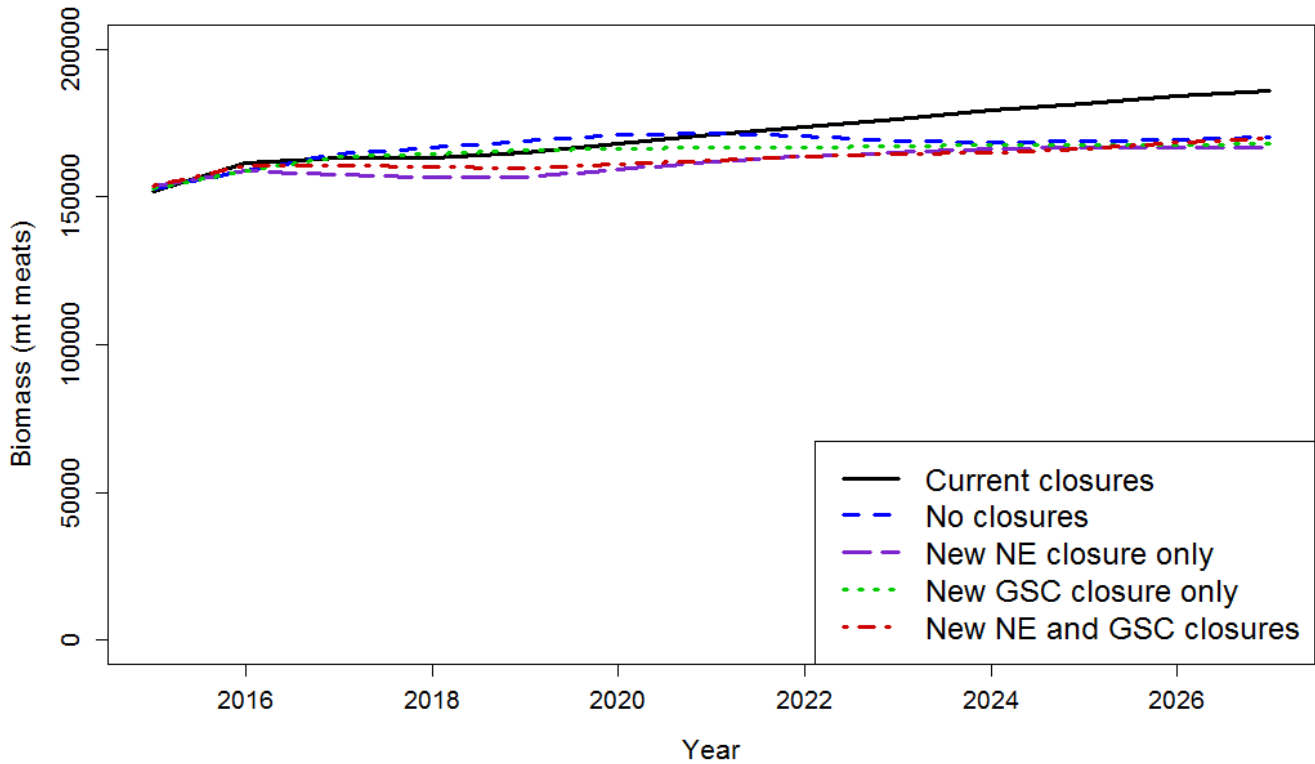
Figure 2 – Projected scallop landings (mt) for 2015-2027 for the 5 EFH runs



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In terms of long-term biomass, No Action would provide the highest LT biomass (Figure 3). Based on years provided through 2027, it does seem that the runs with the NE HMA included (Runs 3 and 5) will provide higher biomass than the runs with no EFH closed areas (Runs 2 and 4) over time. The Scallop PDT hopes to run these scenarios out even farther to further assess the impacts of long-term closures on scallop biomass.

Figure 3 – Projected scallop biomass (mt) for 2015-2027 for the 5 EFH runs

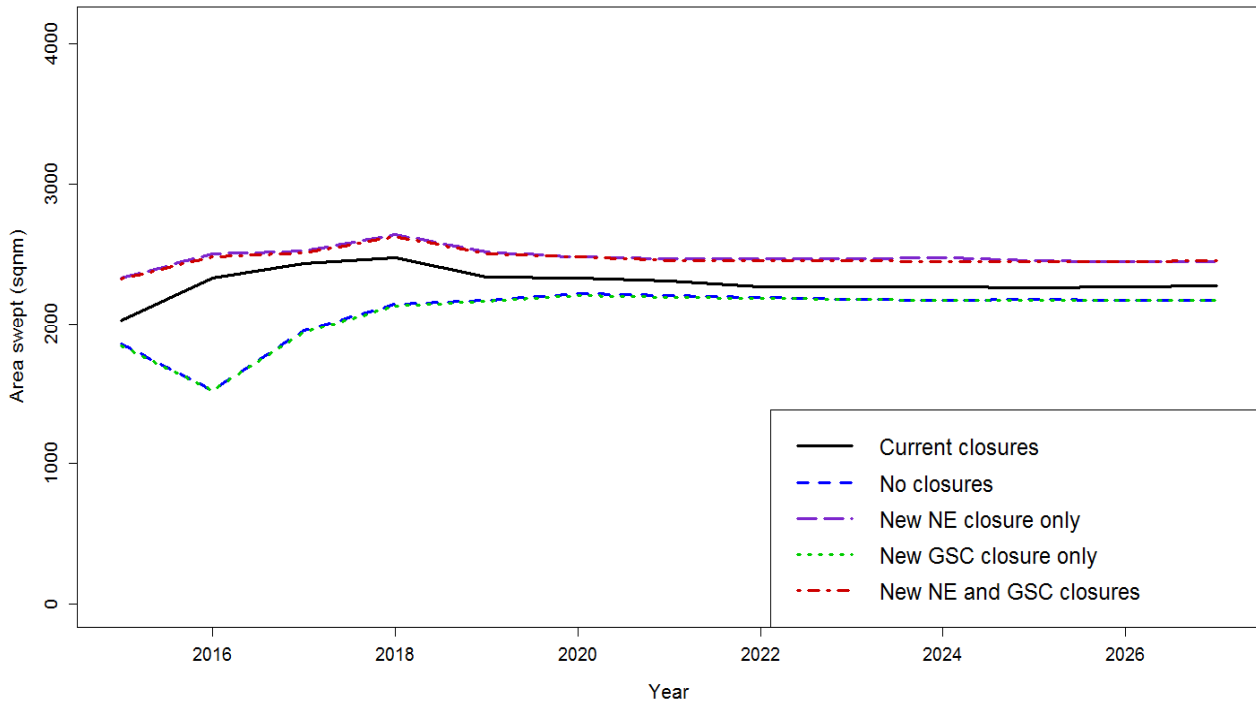


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The projections of area swept are quite different for the EFH runs in the first few years (Figure 4). But again some of these trends are an artifact of how F_{target} is set in the Scallop FMP and the fact that a large proportion of total biomass is in the MA access areas that are expected to open in 2015. These factors have a large impact on landings and F , regardless of how EFH areas are potentially modified in OA2. In a nutshell, runs that have no EFH closures have lower ST and LT bottom area swept because the fishery has access to all areas, so catch would be concentrated in areas with highest catch rates.

Runs that close NE HMA have the highest ST and LT area swept estimates because these areas close a relatively productive scallop biomass area. When more area is closed to the fishery effort is higher in open areas (up to max of 0.38); higher DAS increases overall bottom area swept. The model suggests that closing the NE HMA (Run 3 and Run 5) would increase overall bottom time long-term compared to all the No Action EFH areas combined (No Action – Run1).

Figure 4 – Projected area swept (nm²) for 2015-2027 for the 5 EFH runs



1.2.2.3 Preliminary Economic Impacts

The following sections use the output results from SAMS to estimate both ST and LT economic impacts. The Scallop PDT has developed a price model that estimates revenues. The EFH runs in this section are generally described with the same nomenclature as the above section, but Table 2 shows the meaning of the terms used in the economic tables below.

Table 2. Names used in analysis sections for various EFH scenarios

Run 1 – No Action	No Action
Run 2 – NOC	No EFH Closures
Run 3 – NE	NE HMA only
Run 4 - SCHCL	GSC HMA only
Run 5 - NESCH	NE and GSC HMAs combined

1.2.2.3.1 Landings and open area effort

- The landings for scenarios that open current EFH areas (Run 2 to Run 5) are projected to exceed the landings for No Action scenario (that keeps those areas closed to the scallop fishery) both in 2015 and over the long-term from 2015 to 2027 (Table 3). The scenarios that include Northern Edge HMA (Run 3 and Run 5) results in higher landings (50.7 million lb.) in 2015 compared to other scenarios. The difference in the projected landings from the No Action levels ranges from 6 million lb. (for Run 2 and Run 4) to about 8 million lb. (for Run 3 to Run 5) for 2015 fishing year (Table 5).
- Over the long-term, Run 2 (no EFH closures) results in the highest landings (734.9 million lb.) followed by Run 5(NESCH) and Run 4(SCHCL)(Table 3). Overall, the total landings are projected to exceed the no action landings by 59.9 million lb. (for Run 3- NE) or more (for Run 2, 4, and 5) (Table 5).
- Projected open area DAS per limited access vessel in 2015 (19 days) is lower for Run 4 (SCHCL) and Run 2 (NOC) compared to No Action (25) and Run 3 and Run 5 for reasons explained in Section 1.2.2 above. That is, because these runs have more areas open to the scallop fishery (or less biomass is closed to the fishery), the open area F limit of 0.28 becomes the constraining factor. For the same reason, over the long-term as well, total open area DAS per FT vessel is lower for Run 4 and Run 2 compared to other scenarios.

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Table 3. Estimated Landings (Million lb.)

subperiod	Fishing year	Run 1 No Action	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2015	2015	42.7	48.6	50.7	50.7	48.7
2016-2018	2016	53.9	49.0	59.5	59.7	49.0
	2017	55.4	55.6	59.1	59.9	55.9
	2018	53.3	56.0	57.8	59.2	56.7
2016-2018 Total		162.6	160.6	176.4	178.7	161.6
2019-2027	2019	50.1	56.3	54.5	55.9	57.7
	2020	50.4	57.2	54.2	55.4	59.3
	2021	50.3	56.9	54.5	54.8	59.5
	2022	49.7	56.7	54.6	54.9	59.3
	2023	50.1	56.8	54.6	54.9	58.3
	2024	50.2	57.0	55.0	54.4	57.5
	2025	50.3	56.9	54.7	54.2	57.5
	2026	50.7	56.9	54.4	54.7	57.8
2027	50.8	56.9	54.3	55.4	57.8	
2019-2027 Total		452.7	511.6	490.8	494.5	524.6
Grand Total		657.9	720.8	717.8	724.0	734.9

Table 4 - Estimated Landings net of No Action landings (Million lb.)

subperiod	Fishing year	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2014-2015	2015	6.0	8.0	8.1	6.0
2014-2015 Total		6.0	8.0	8.1	6.0
2016-2018	2016	-4.9	5.5	5.7	-4.9
	2017	0.2	3.7	4.5	0.5
	2018	2.7	4.5	5.9	3.4
2016-2018 Total		-2.0	13.7	16.1	-1.0
2019-2027	2019	6.2	4.3	5.7	7.6
	2020	6.8	3.8	5.0	8.9
	2021	6.6	4.2	4.5	9.2
	2022	7.0	4.9	5.2	9.6
	2023	6.7	4.5	4.8	8.2
	2024	6.8	4.8	4.2	7.3
	2025	6.6	4.4	3.8	7.1
	2026	6.2	3.8	4.0	7.1
2027	6.1	3.4	4.5	6.9	
2019-2027 Total		59.0	38.2	41.8	72.0
Grand Total		62.9	59.9	66.0	77.0

Table 5. Estimated Open Area DAS per Limited Access Vessel (not including effort in newly opened EFH areas – catch from those areas is not considered in these DAS estimates)

subperiod	Fishing year	Run 1 No Action	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2015	2015	25	19	25	26	19
2016-2018	2016	27	11	25	26	11
	2017	28	22	27	28	23
	2018	28	26	29	30	27
2016-2018 Total		83	59	81	84	61
2019-2027	2019	29	29	29	30	30
	2020	29	29	29	30	31
	2021	29	29	29	29	31
	2022	29	29	29	29	31
	2023	29	28	29	29	30
	2024	29	28	29	29	29
	2025	29	28	29	29	29
	2026	29	28	29	29	29
2027	29	28	29	30	29	
2019-2027 Total		261	256	261	264	269
Grand Total		369	334	367	374	349

Price and Revenue

- The annual scallop revenues expressed in 2013 constant prices (undiscounted values) show that the revenues will be considerably higher for scenarios that open current EFH areas (Run 2 to Run 5) compared to No Action scenario both in the short- and the long-term (Table 7).
- The present value of revenues are projected to exceed the no action values by about \$54 million for scenarios with either no EFH closures (RUN 2 –NOC) or with a new closure in South Channel (RUN 4 – SCHL) and by close to \$66 million for the scenarios that include a new closure on the Northern Edge in 2015 fishing year using a 3% discount rate. These values are slightly lower if the present values were calculated using a 7% discount rate, ranging from about \$50 million (for RUN 2 - SCHCL and RUN 4 - NOC) and about \$61 million for scenarios that include a new EFH Closure on the Northern Edge (RUN 3 and RUN 5).
- From 2015 to 20127, Run 2 (no EFH closures) would result in the largest cumulative revenues (\$5,926 million) followed by Run 5 (NESCH, \$5864.7 million) and Run 4 (SCHCL, \$5843.5 million) estimated using a 3% discount rate (Table 8). Present value of cumulative revenues will be lower when estimated using a 7% discount rate (Table 10).
- Over the long-term from 2015 to 2027, the present value of the projected revenues for the no closure scenario will exceed the no action values by \$519.7 million (\$374.1 million) using a 3% discount rate (7% discount rate). The scenario that includes both a Northern Edge and South Channel closure (RUN 5 – NESCH) are estimated to increase the present value of scallop revenues by \$458.4 million (\$354.3 million) using a 3% discount rate (7 % discount rate) at the 2013 inflation adjusted constant values. The revenues for other scenarios with new

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EFH closures, the present value of the revenues will exceed the no action values by \$418.5 million or more compared to levels for No Action (Table 9 and Table 11). Thus all these new EFH scenarios will have significant positive economic impacts on the scallop fishery over the long-term.

Table 6. Preliminary projections for price (in 2013 inflation adjusted prices, Avg. Price in 2012=\$9.77)

subperiod	Fishing year	Run 1 No Action	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2015	2015	10.7	10.5	10.4	10.4	10.5
2016-2018	2016	10.1	10.5	10.0	9.9	10.5
	2017	10.0	10.1	9.9	9.9	10.1
	2018	10.2	10.2	10.0	10.0	10.1
2016-2018 Total		10.1	10.3	10.0	9.9	10.3
2019-2027	2019	10.3	10.2	10.2	10.1	10.1
	2020	10.4	10.1	10.3	10.2	10.0
	2021	10.4	10.2	10.3	10.3	10.1
	2022	10.4	10.2	10.3	10.3	10.1
	2023	10.4	10.2	10.3	10.3	10.2
	2024	10.5	10.2	10.3	10.3	10.2
	2025	10.5	10.2	10.3	10.3	10.2
	2026	10.5	10.3	10.3	10.3	10.2
2027	10.4	10.3	10.4	10.3	10.2	
2019-2027 Total		10.4	10.2	10.3	10.3	10.1
Grand Total		10.4	10.3	10.2	10.2	10.2

Table 7. Preliminary Revenue Projections (In 2013 inflation adjusted values prices, undiscounted)

subperiod	Fishing year	Run 1 No Action	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2015	2015	455.3	512.1	524.7	525.1	512.8
2016-2018	2016	544.4	515.3	591.7	593.2	515.6
	2017	555.3	563.7	586.8	593.0	566.1
	2018	541.4	568.5	580.0	589.8	573.8
2016-2018 Total		1641.1	1647.4	1758.5	1775.9	1655.5
2019-2027	2019	518.3	572.0	556.5	566.8	582.5
	2020	521.9	580.3	556.2	565.2	595.5
	2021	522.5	579.8	559.6	562.5	598.6
	2022	519.3	579.3	560.5	564.5	597.9
	2023	523.5	581.3	562.0	564.6	592.2
	2024	524.6	582.7	566.2	561.5	587.4
	2025	526.5	583.0	564.1	560.4	588.3
	2026	529.7	583.2	562.5	565.1	590.7
2027	531.0	583.8	561.9	569.8	589.9	
2019-2027 Total		4717.3	5225.4	5049.4	5080.4	5323.1
Grand Total		6813.8	7384.9	7332.6	7381.5	7491.4

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Table 8. Present value of total scallop revenue (using 3% discount rate)

subperiod	Run 1 No Action	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2015	429.2	482.7	494.6	494.9	483.4
2016-2018	1458.6	1462.7	1563.1	1578.5	1469.8
2019-2027	3518.5	3898.0	3767.0	3791.3	3972.7
Grand Total	5406.3	5843.5	5824.7	5864.7	5925.9

Table 9. Present value of total scallop revenue net of no action revenue (using 3% discount rate)

subperiod	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2015	53.5	65.4	65.7	54.2
2016-2018	4.2	104.6	119.9	11.2
2019-2027	379.6	248.5	272.8	454.3
Grand Total	437.3	418.5	458.4	519.7

Table 10. Present value of total scallop revenue (using 7% discount rate)

subperiod	Run 1 No Action	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2015	403.8	458.0	469.7	470.1	458.6
2016-2018	1296.1	1298.5	1395.9	1410.7	1304.9
2019-2027	2497.6	2794.9	2686.7	2706.9	2855.8
Grand Total	4197.5	4551.3	4552.2	4587.6	4619.4

Table 11. Present value of total scallop revenue net of no action revenue (using 7% discount rate)

subperiod	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2015	49.6	60.6	60.9	50.2
2016-2018	1.9	90.1	103.1	7.8
2019-2027	262.9	172.4	190.4	316.0
Grand Total	314.4	323.1	354.3	374.1

1.2.2.3.2 LPUE and Area Swept

- LPUE for all areas are estimated to exceed 2700 lb. per DAS and to be slightly higher for RUN 2 (NOC) and RUN 4 (SCHCL) compared to other scenarios both in the short- and the long-term (Table 12).
- The same scenarios also result in the lowest values for area swept by providing access to a larger open area but allocating lower open area DAS compared to the other scenarios (Table 13).

Table 12. Average LPUE for all areas

subperiod	Fishing year	Run 1 No Action	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2015	2015	2730	2837	2740	2740	2835
2016-2018	2016	2805	2920	2812	2814	2917
	2017	2816	2930	2827	2833	2926
	2018	2796	2927	2811	2825	2925
2016-2018 Total		2806	2926	2817	2824	2923
2019-2027	2019	2824	2965	2833	2850	2964
	2020	2836	2962	2840	2855	2964
	2021	2848	2964	2852	2860	2971
	2022	2853	2963	2861	2863	2981
	2023	2861	2964	2857	2867	2984
	2024	2866	2967	2863	2868	2977
	2025	2865	2969	2870	2861	2967
	2026	2869	2969	2871	2860	2971
	2027	2869	2967	2871	2869	2973
2019-2027 Total		2855	2966	2858	2861	2972
Grand Total		2834	2946	2839	2843	2950

Table 13. Area Swept

subperiod	Fishing year	Run 1 No Action	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2015	2015	2022	1840	2331	2324	1853
2016-2018	2016	2327	1517	2499	2480	1522
	2017	2431	1938	2526	2510	1949
	2018	2478	2131	2643	2629	2141
2016-2018 Total		7236	5586	7668	7619	5612
2019-2027	2019	2334	2161	2515	2505	2170
	2020	2328	2205	2481	2484	2216
	2021	2310	2193	2471	2452	2204
	2022	2267	2183	2470	2455	2193
	2023	2266	2174	2469	2454	2180
	2024	2264	2170	2474	2449	2173
	2025	2262	2168	2452	2444	2174
	2026	2266	2169	2450	2445	2173
	2027	2274	2168	2447	2453	2172
2019-2027 Total		20571	19591	22229	22141	19655
Grand Total		29829	27017	32228	32084	27120

1.2.2.3.3 Present Value of Producer Surplus

- Producer surplus (benefits) for a particular fishery shows the net benefits to harvesters, including vessel owners and crew, and is measured by the difference between total revenue and operating costs.
- Present values of the producer surplus for scenarios other than No Action are expected to range from \$451.2 million (RUN 4 - SCHCL) to \$460.9 million (RUN 5 - NESCH), and to be about \$50 - \$60 million higher than the producer surplus for no action (\$400.4 million) values for 2015 fishing year using a 3% discount rate (Table 14 and Table 15). Present value of the producer surplus estimated using a 7% discount rate are shown in Table 16 and Table 17. Although using a higher discount rate lower the present values of the producer surplus, the ranking of the scenarios are not affected by the discount rate.
- Over the long-term from 2015 to 2027, the present value of the projected producer for the no closure scenario (RUN 2) will exceed the no action values by \$495.3 million (\$ 357.4 million) using a 3% discount rate (7% discount rate). The scenario that includes both a Northern Edge and South Channel closure (RUN 5 – NESCH) are estimated to increase the present value of the producer surplus by \$423.0 million (\$326.9 million) using a 3% discount rate (7 % discount rate) at the 2013 inflation adjusted constant values. For other scenarios with new EFH closures, the present value of the producer surplus will exceed the no action values by \$419.6 million or more compared to levels for No Action (**Table 15**) using a 3% discount rate and by a lower amount (\$297.6 million or higher) using a 7% discount rate (**Table 17**). In short, all the new EFH scenarios (other than No Action) will have significant positive economic impacts on the producer surplus over the long-term.

Table 14. Present value of producer surplus (using 3% discount rate)

subperiod	Run 1 No Action	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2015	400.4	451.2	460.6	460.9	451.8
2016-2018	1358.0	1367.6	1454.4	1468.6	1373.9
2019-2027	3287.3	3646.6	3516.6	3539.3	3715.4
Grand Total	5045.7	5465.4	5431.6	5468.7	5541.1

Table 15. Present value of producer surplus net of no action values (using 3% discount rate)

subperiod	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2015	50.7	60.1	60.4	51.3
2016-2018	9.6	96.5	110.6	16.0
2019-2027	359.3	229.2	252.0	428.0
Grand Total	419.6	385.8	423.0	495.3

Table 16. Present value of producer surplus (using 7% discount rate)

subperiod	Run 1 No Action	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2015	371.1	418.1	426.8	427.1	418.6
2016-2018	1167.5	1174.3	1250.7	1262.6	1179.6
2019-2027	2271.9	2520.8	2431.0	2447.8	2569.7
Grand Total	3810.5	4113.2	4108.4	4137.5	4168.0

Table 17. Present value of producer surplus net of no action values(using 7% discount rate)

subperiod	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2015	47.0	55.7	56.0	47.6
2016-2018	6.8	83.2	95.1	12.1
2019-2027	248.9	159.0	175.8	297.8
Grand Total	302.6	297.9	326.9	357.4

1.2.2.3.4 Present Value of Total Economic Benefits

- Economic benefits include the benefits both to the consumers and to the fishing industry and equal the sum of benefits to the consumers and producers. The cumulative present value of the total economic benefits are summarized in Table 18 (3% discount rate) and Table 20 (7% discount rate).
- The estimated present value of total economic benefits will be about \$586.6 million higher in 2015-2027 with RUN 4 (No EFH closures) compared to the no action (Table 19, 3% discount rate). Similarly, total economic benefits for RUN 5 (NESCH) would exceed no action levels by \$504.6 million in 2015-2027. RUN 3 (NE) would result in lower total economic benefits compared to all the other scenarios in the long-term when a 3% discount rate is used (**Error! Reference source not found.**). Table 21 shows the corresponding values by using a 7% discount rate to calculate the cumulative present value of the total economic benefits with slightly different comparative results.

Table 18. Present value of total economic benefits (using 3% discount rate)

subperiod	Run 1 No Action	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2015	435.7	494.3	506.9	507.3	495.0
2016-2018	1507.5	1512.4	1623.2	1640.8	1520.1
2019-2027	3613.6	4042.7	3886.1	3913.3	4128.4
Grand Total	5556.8	6049.4	6016.2	6061.4	6143.4

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Table 19. Present value of total economic benefits net of no action values (using 3% discount rate)

subperiod	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2015	58.5	71.2	71.5	59.2
2016-2018	4.9	115.7	133.3	12.6
2019-2027	429.1	272.5	299.7	514.8
Grand Total	492.6	459.4	504.6	586.6

Table 20. Present value of total economic benefits (using 7% discount rate)

subperiod	Run 1 No Action	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2015	403.8	458.0	469.7	470.1	458.6
2016-2018	1296.1	1298.5	1395.9	1410.7	1304.9
2019-2027	2497.6	2794.9	2686.7	2706.9	2855.8
Grand Total	4197.5	4551.3	4552.2	4587.6	4619.4

Table 21. Present value of total economic benefits net of no action values (using 7% discount rate)

subperiod	Run 4 SCHCL	Run 3 NE	Run 5 NESCH	Run 2 NOC
2015	54.2	65.9	66.3	54.9
2016-2018	2.4	99.8	114.6	8.8
2019-2027	297.2	189.0	209.2	358.2
Grand Total	353.9	354.7	390.2	421.9