Chapter 4
Figures

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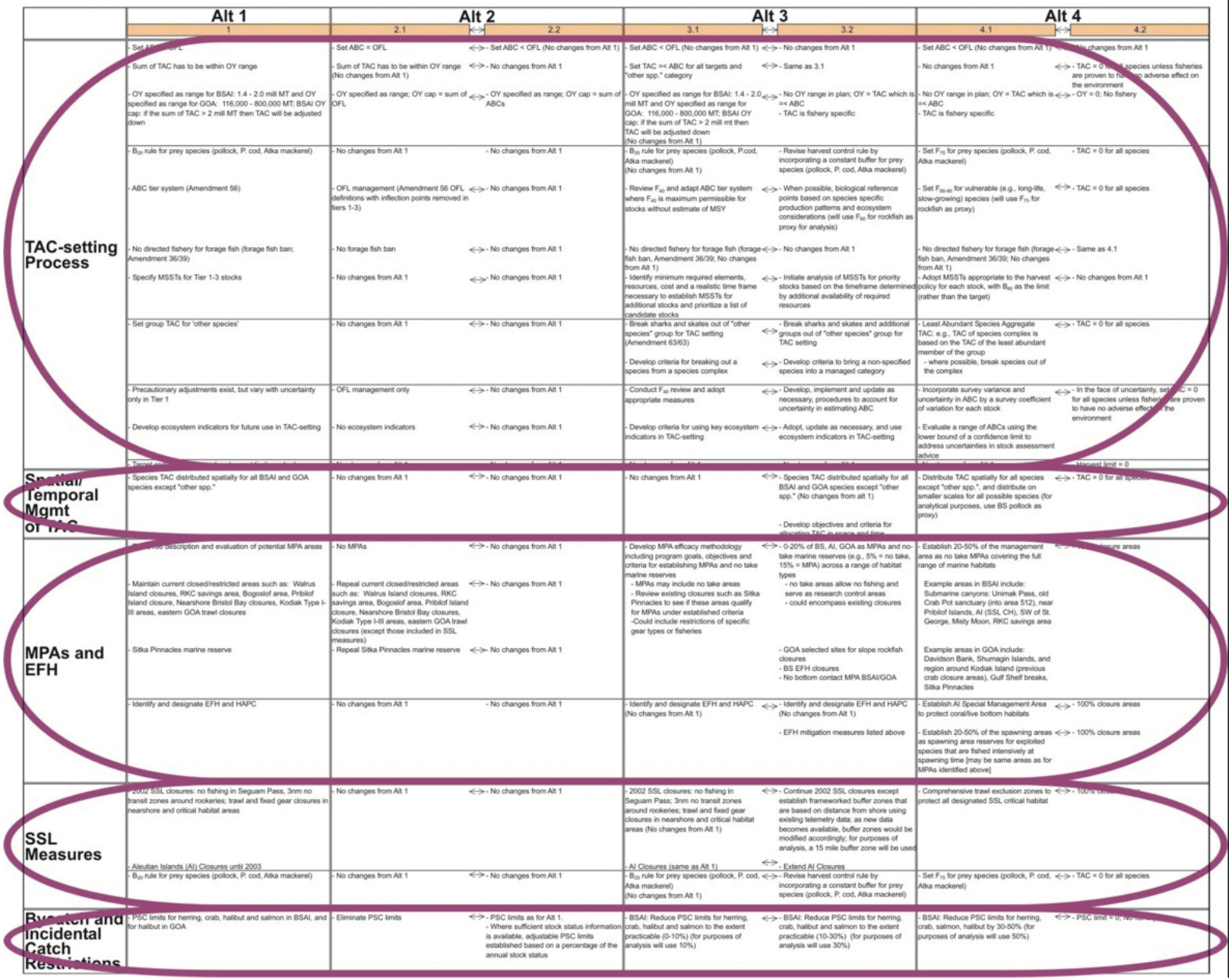
COMPARISON OF FMP FRAMEWORKS FOR SECOND DRAFT ALTERNATIVES



	Alt 1	Alt 2		Alt 3		Alt 4	
	1	2.1	2.2	3.1	3.2	4.1	4.2
TAC-setting Process	- Set ABC = OFL	- Set ABC = OFL	<↔> - Set ABC < OFL (No changes from Alt 1)	- Set ABC < OFL (No changes from Alt 1)	<↔> - No changes from Alt 1	- Set ABC < OFL (No changes from Alt 1)	<↔> - No changes from Alt 1
	- Sum of TAC has to be within OY range	- Sum of TAC has to be within OY range (No changes from Alt 1)	<↔> - No changes from Alt 1	- Set TAC =< ABC for all targets and "other spp." category	<↔> - Same as 3.1	- No changes from Alt 1	<↔> - TAC = 0 for all species unless fisheries are proven to have no adverse effect on the environment
	- OY specified as range for BSAI: 1.4 - 2.0 mill MT and OY specified as range for GOA: 116,000 - 800,000 MT; BSAI OY cap: if the sum of TAC > 2 mill MT then TAC will be adjusted down	- OY specified as range; OY cap = sum of OFL	<↔> - OY specified as range; OY cap = sum of ABCs	- OY specified as range for BSAI: 1.4 - 2.0 mill MT and OY specified as range for GOA: 116,000 - 800,000 MT; BSAI OY cap: if the sum of TAC > 2 mill mt then TAC will be adjusted down (No changes from Alt 1)	<↔> - No OY range in plan; OY = TAC which is =< ABC - TAC is fishery specific	- No OY range in plan; OY = TAC which is =< ABC - TAC is fishery specific	<↔> - OY = 0; No fishery
	- B_{20} rule for prey species (pollock, P. cod, Atka mackerel)	- No changes from Alt 1	- No changes from Alt 1	- B_{20} rule for prey species (pollock, P.cod, Atka mackerel) (No changes from Alt 1)	- Revise harvest control rule by incorporating a constant buffer for prey species (pollock, P. cod, Atka mackerel)	- Set F_{75} for prey species (pollock, P. cod, Atka mackerel)	- TAC = 0 for all species
	- ABC tier system (Amendment 56)	- OFL management (Amendment 56 OFL definitions with inflection points removed in tiers 1-3)	- No changes from Alt 1	- Review F_{40} and adapt ABC tier system where F_{40} is maximum permissible for stocks without estimate of MSY	- When possible, biological reference points based on species specific production patterns and ecosystem considerations (will use F_{50} for rockfish as proxy for analysis)	- Set F_{50-60} for vulnerable (e.g., long-life, slow-growing) species (will use F_{75} for rockfish as proxy)	- TAC = 0 for all species
	- No directed fishery for forage fish (forage fish ban; Amendment 36/39)	- No forage fish ban	- No changes from Alt 1	- No directed fishery for forage fish (forage fish ban, Amendment 36/39; No changes from Alt 1)	- No changes from Alt 1	- No directed fishery for forage fish (forage fish ban, Amendment 36/39; No changes from Alt 1)	- Same as 4.1
	- Specify MSSTs for Tier 1-3 stocks	- No changes from Alt 1	- No changes from Alt 1	- Identify minimum required elements, resources, cost and a realistic time frame necessary to establish MSSTs for additional stocks and prioritize a list of candidate stocks	- Initiate analysis of MSSTs for priority stocks based on the timeframe determined by additional availability of required resources	- Adopt MSSTs appropriate to the harvest policy for each stock, with B_{40} as the limit (rather than the target)	- No changes from Alt 1
	- Set group TAC for 'other species'	- No changes from Alt 1	- No changes from Alt 1	- Break sharks and skates out of "other species" group for TAC setting (Amendment 63/63)	- Break sharks and skates and additional groups out of "other species" group for TAC setting	- Least Abundant Species Aggregate TAC: e.g., TAC of species complex is based on the TAC of the least abundant member of the group - where possible, break species out of the complex	- TAC = 0 for all species
	- Precautionary adjustments exist, but vary with uncertainty only in Tier 1	- OFL management only	- No changes from Alt 1	- Conduct F_{40} review and adopt appropriate measures	- Develop, implement and update as necessary, procedures to account for uncertainty in estimating ABC	- Incorporate survey variance and uncertainty in ABC by a survey coefficient of variation for each stock	- In the face of uncertainty, set TAC = 0 for all species unless fisheries are proven to have no adverse effects on the environment
	- Develop ecosystem indicators for future use in TAC-setting	- No ecosystem indicators	- No changes from Alt 1	- Develop criteria for using key ecosystem indicators in TAC-setting	- Adopt, update as necessary, and use ecosystem indicators in TAC-setting	- Evaluate a range of ABCs using the lower bound of a confidence limit to address uncertainties in stock assessment advice	
Spatial/ Temporal Mgmt of TAC	- Species TAC distributed spatially for all BSAI and GOA species except "other spp."	- No changes from Alt 1	- No changes from Alt 1	- No changes from Alt 1	- Species TAC distributed spatially for all BSAI and GOA species except "other spp." (No changes from alt 1) - Develop objectives and criteria for	- Distribute TAC spatially for all species except "other spp.", and distribute on smaller scales for all possible species (for analytical purposes, use BS pollock as proxy)	- TAC = 0 for all species
MPAs and EFH	- Detailed description and evaluation of potential MPA areas	- No MPAs	- No changes from Alt 1	- Develop MPA efficacy methodology including program goals, objectives and criteria for establishing MPAs and no take marine reserves - MPAs may include no take areas - Review existing closures such as Sitka Pinnacles to see if these areas qualify for MPAs under established criteria -Could include restrictions of specific gear types or fisheries	- 0-20% of BS, AI, GOA as MPAs and no-take marine reserves (e.g., 5% = no take, 15% = MPA) across a range of habitat types - no take areas allow no fishing and serve as research control areas - could encompass existing closures	- Establish 20-50% of the management area as no take MPAs covering the full range of marine habitats Example areas in BSAI include: Submarine canyons: Unimak Pass, old Crab Pot sanctuary (into area 512), near Pribilof Islands, AI (SSL CH), SW of St. George, Misty Moon, RKC savings area	- 100% closure areas
	- Maintain current closed/restricted areas such as: Walrus Island closures, RKC savings area, Bogoslof area, Pribilof Island closure, Nearshore Bristol Bay closures, Kodiak Type I-III areas, eastern GOA trawl closures	- Repeal current closed/restricted areas such as: Walrus Island closures, RKC savings area, Bogoslof area, Pribilof Island closure, Nearshore Bristol Bay closures, Kodiak Type I-III areas, eastern GOA trawl closures (except those included in SSL measures)	- No changes from Alt 1				
	- Sitka Pinnacles marine reserve	- Repeal Sitka Pinnacles marine reserve	- No changes from Alt 1		- GOA selected sites for slope rockfish closures - BS EFH closures - No bottom contact MPA BSAI/GOA	Example areas in GOA include: Davidson Bank, Shumagin Islands, and region around Kodiak Island (previous crab closure areas), Gulf Shelf breaks, Sitka Pinnacles	
	- Identify and designate EFH and HAPC	- No changes from Alt 1	- No changes from Alt 1	- Identify and designate EFH and HAPC (No changes from Alt 1)	<↔> - Identify and designate EFH and HAPC (No changes from Alt 1) - EFH mitigation measures listed above	- Establish AI Special Management Area to protect coral/live bottom habitats	<↔> - 100% closure areas
						- Establish 20-50% of the spawning areas as spawning area reserves for exploited species that are fished intensively at spawning time [may be same areas as for MPAs identified above]	<↔> - 100% closure areas
SSL Measures	- 2002 SSL closures: no fishing in Seguam Pass, 3nm no transit zones around rookeries; trawl and fixed gear closures in nearshore and critical habitat areas	- No changes from Alt 1	<↔> - No changes from Alt 1	- 2002 SSL closures: no fishing in Seguam Pass; 3nm no transit zones around rookeries; trawl and fixed gear closures in nearshore and critical habitat areas (No changes from Alt 1)	<↔> - Continue 2002 SSL closures except establish frameworked buffer zones that are based on distance from shore using existing telemetry data; as new data becomes available, buffer zones would be modified accordingly; for purposes of analysis, a 15 mile buffer zone will be used	- Comprehensive trawl exclusion zones to protect all designated SSL critical habitat	<↔> - 100% Closure
	- Aleutian Islands (AI) Closures until 2003			- AI Closures (same as Alt 1)	<↔> - Extend AI Closures		
	- B_{20} rule for prey species (pollock, P. cod, Atka mackerel)	- No changes from Alt 1	<↔> - No changes from Alt 1	- B_{20} rule for prey species (pollock, P. cod, Atka mackerel) (No changes from Alt 1)	<↔> - Revise harvest control rule by incorporating a constant buffer for prey species (pollock, P. cod, Atka mackerel)	- Set F_{75} for prey species (pollock, P. cod, Atka mackerel)	<↔> - TAC = 0 for all species
Bycatch and Incidental Catch Restrictions	- PSC limits for herring, crab, halibut and salmon in BSAI, and for halibut in GOA	- Eliminate PSC limits	<↔> - PSC limits as for Alt 1. - Where sufficient stock status information is available, adjustable PSC limits established based on a percentage of the annual stock status	- BSAI: Reduce PSC limits for herring, crab, halibut and salmon to the extent practicable (0-10%) (for purposes of analysis will use 10%)	<↔> - BSAI: Reduce PSC limits for herring, crab, halibut and salmon to the extent practicable (10-30%) (for purposes of analysis will use 30%)	- BSAI: Reduce PSC limits for herring, crab, salmon, halibut by 30-50% (for purposes of analysis will use 50%)	<↔> - PSC limit = 0; No fishery

Figure 4.0-1. Comparison of Fishery Management Plan frameworks for second draft alternatives; the row look.

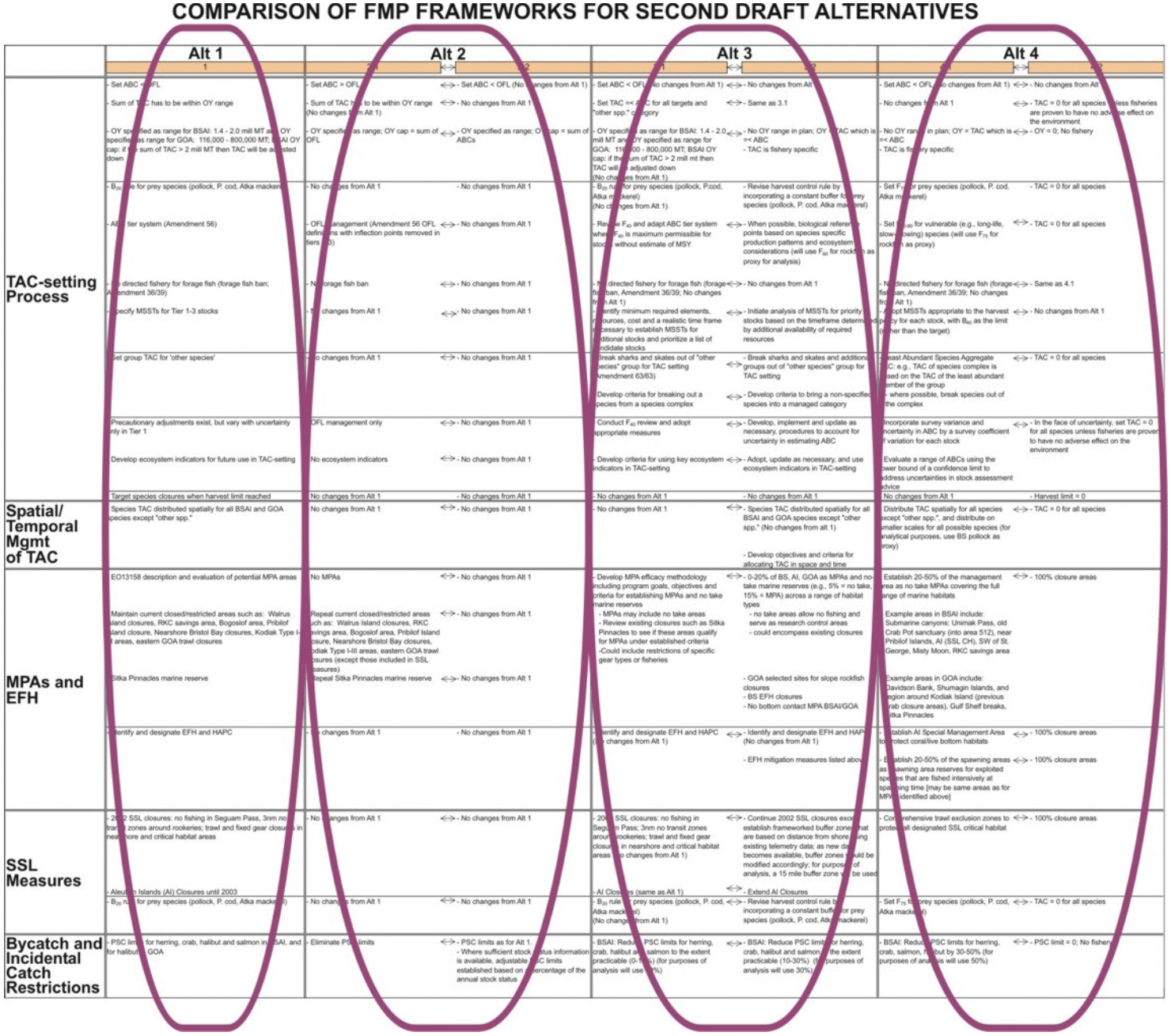


Figure 4.0-2. Comparison of Fishery Management Plan frameworks for second draft alternatives; the column look.

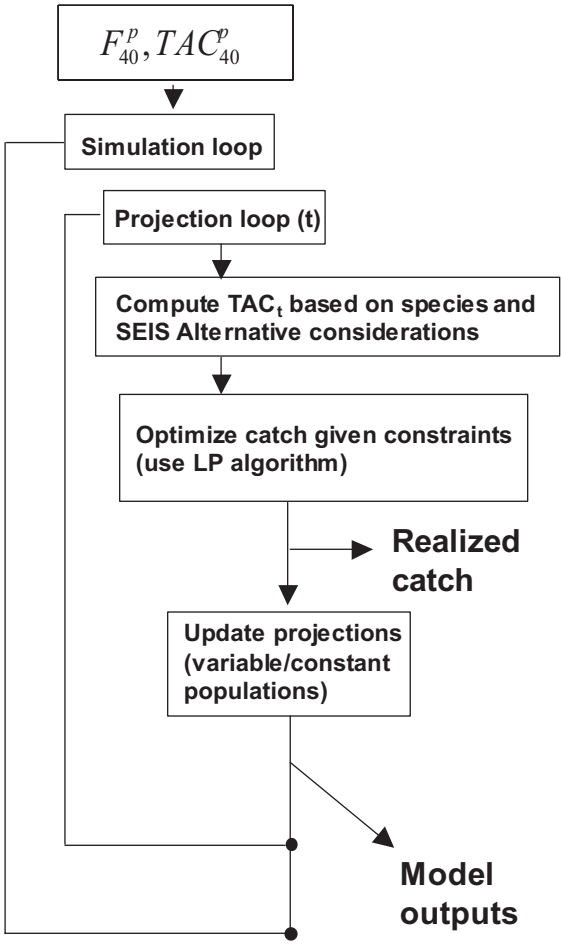


Figure 4.1-1. General description of the PSEIS simulation model that optimizes catch for different fisheries subject to a set of linear constraints based on historical catch-composition datasets.

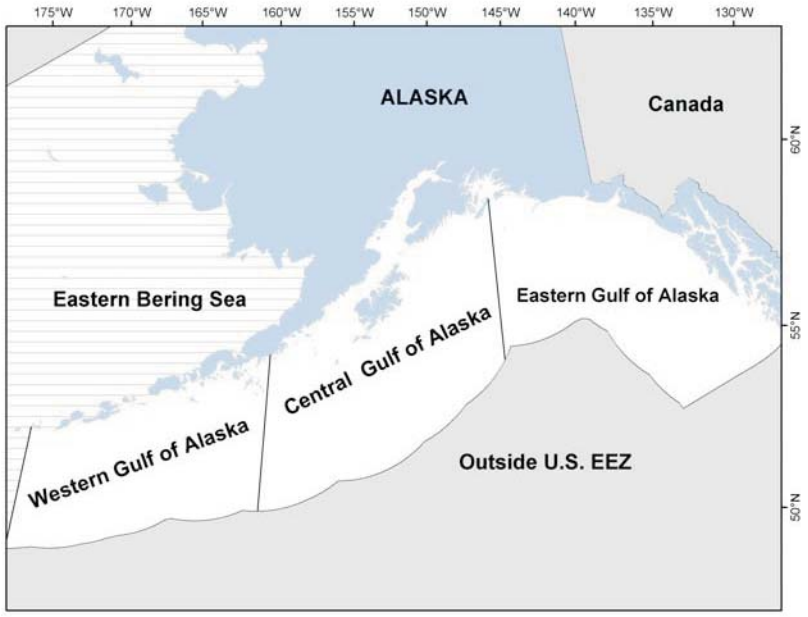


Figure 4.1-2. Map showing the definition of areas defined as eastern (E), central (C) and western (W) Gulf of Alaska.

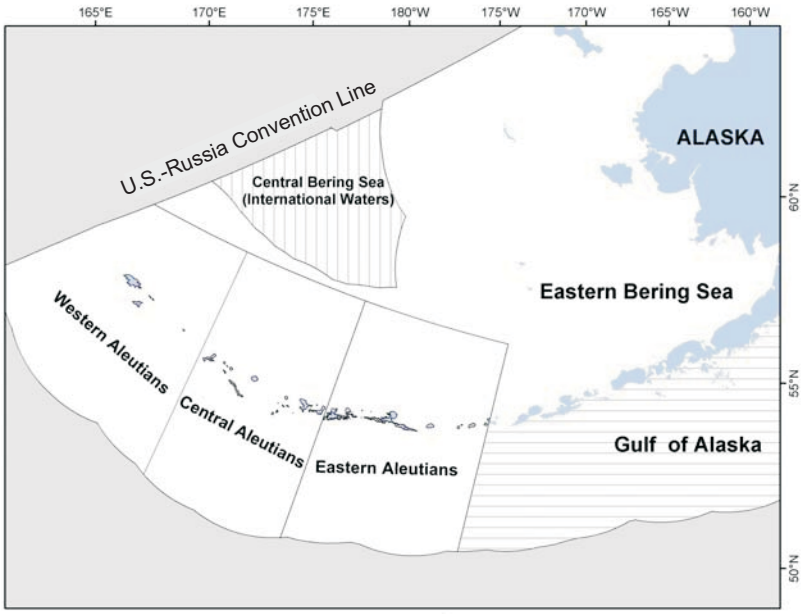


Figure 4.1-3. Map showing the definition of areas defined as eastern (E), central (C), and western (W) Aleutian Islands region and the eastern Bering Sea (B).

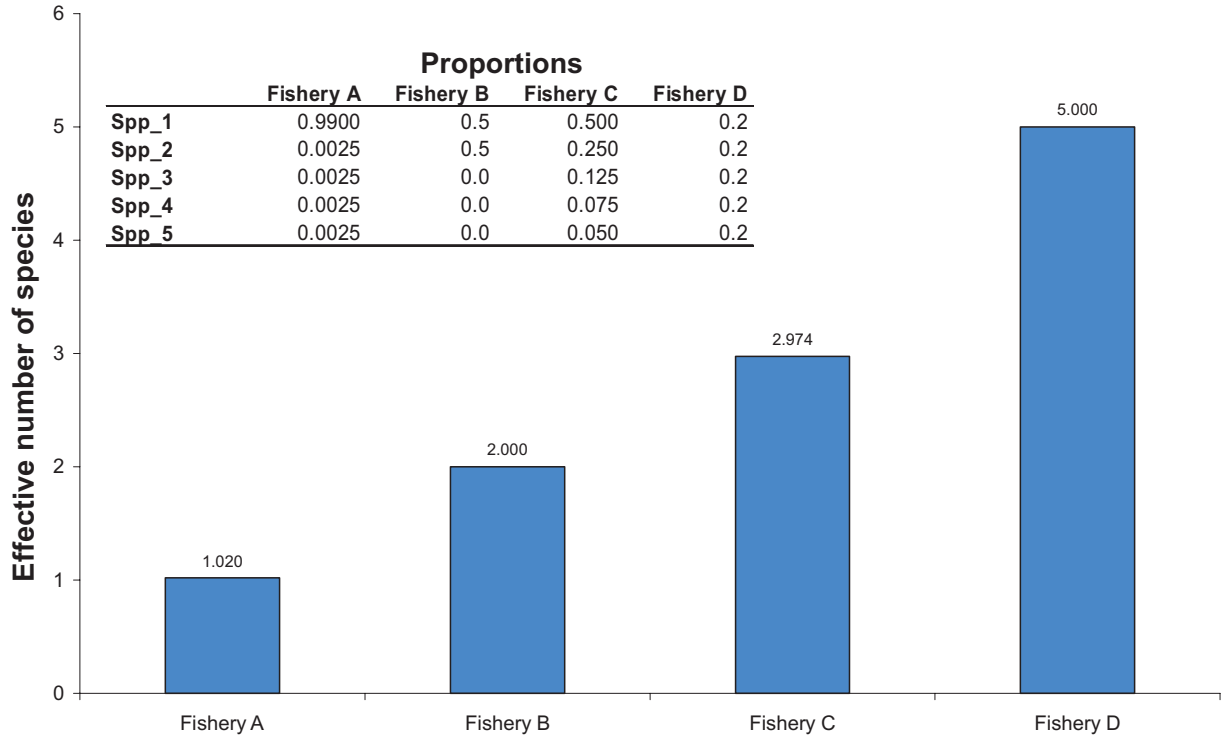


Figure 4.1-4. Results showing the "effective number of species" exemplified in 4 hypothetical Fisheries (Fisheries A-D) catching different proportions of 5 hypothetical species.

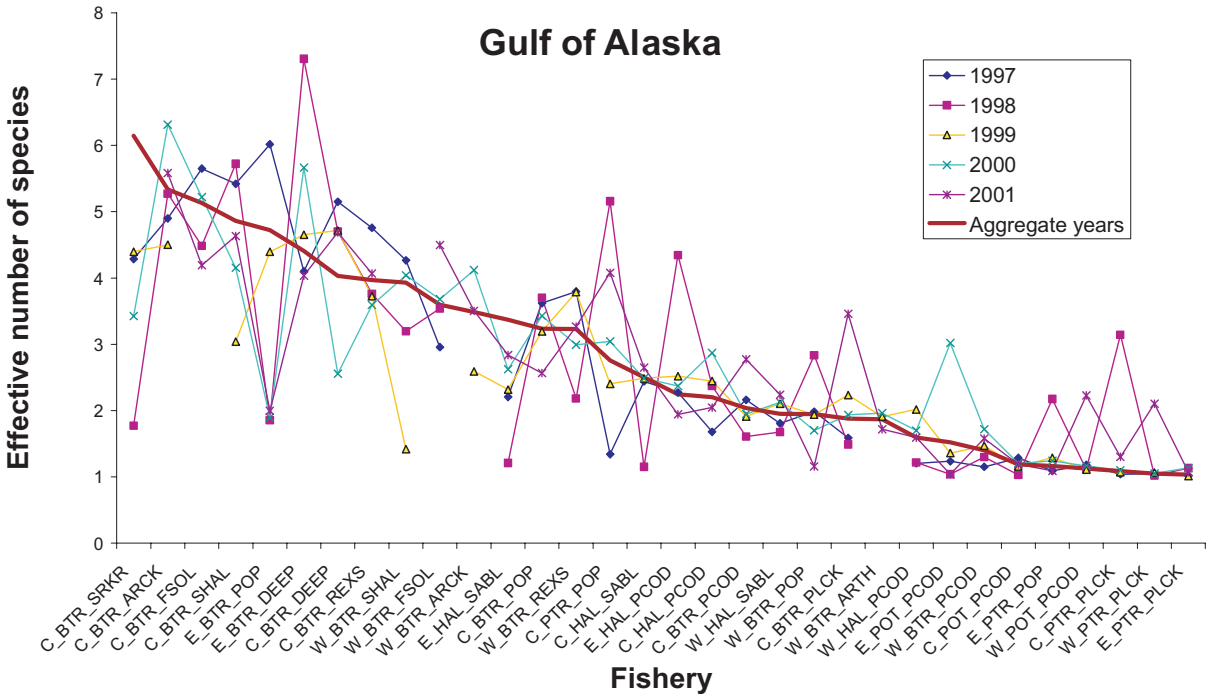


Figure 4.1-5. Relative effective number of species for the Gulf of Alaska fisheries sorted by the aggregate data (1997-2001 data as used in the model) compared with annual Estimates of effective number of species (i.e., Species diversity in the catch).

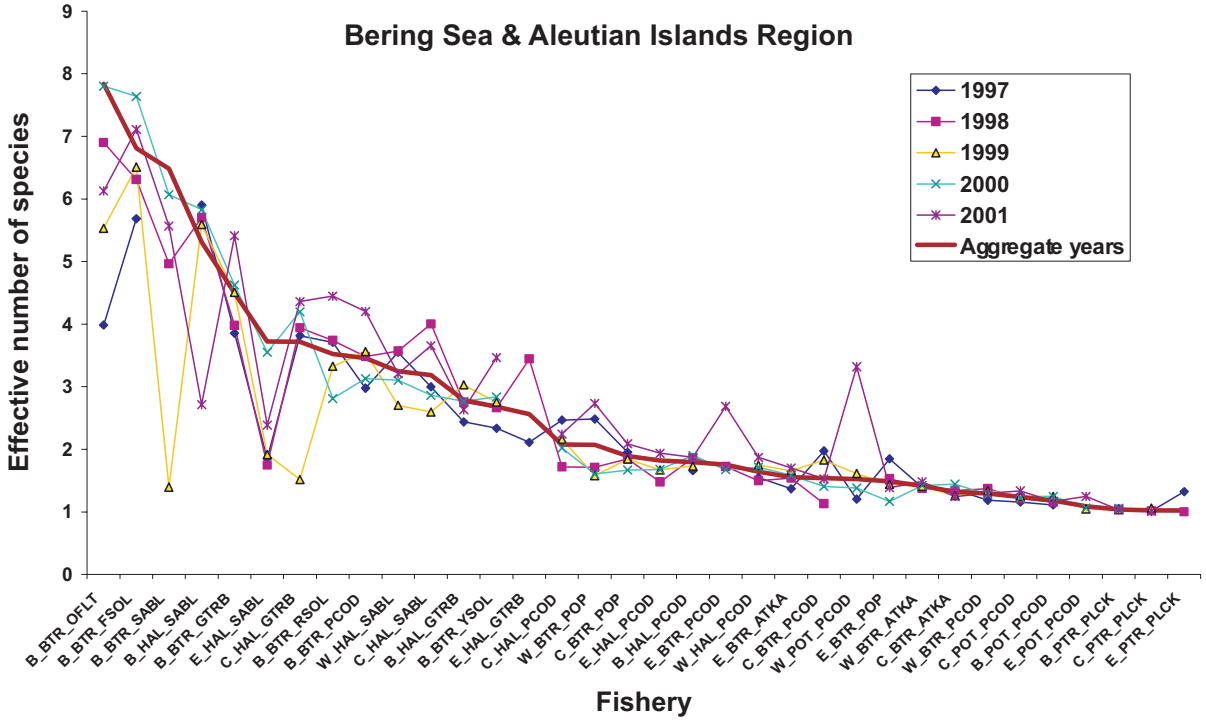


Figure 4.1-6. **Relative effective number of species for the Bering Sea and Aleutian Islands fisheries sorted by the aggregate data (1997-2001 data as used in the model) compared with annual estimates of effective number of species (i.e., species diversity in the catch).**

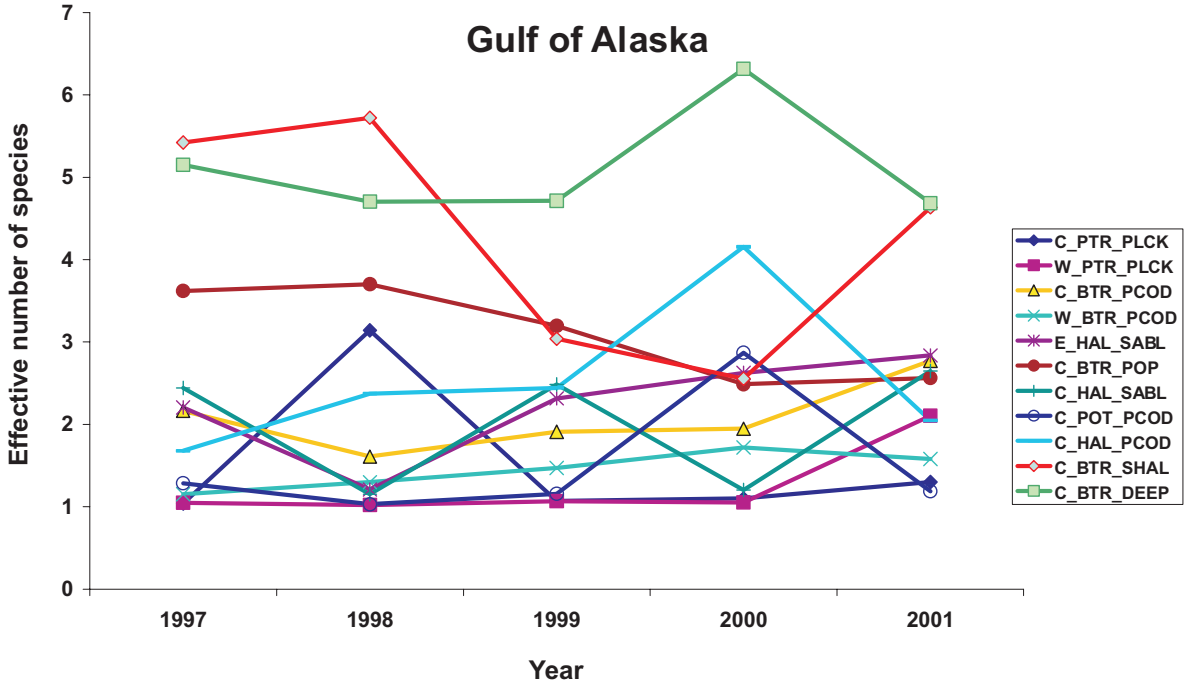


Figure 4.1-7. **Relative effective number of species over time for the Gulf of Alaska fisheries that caught 80 percent of the total from 1997-2001.**

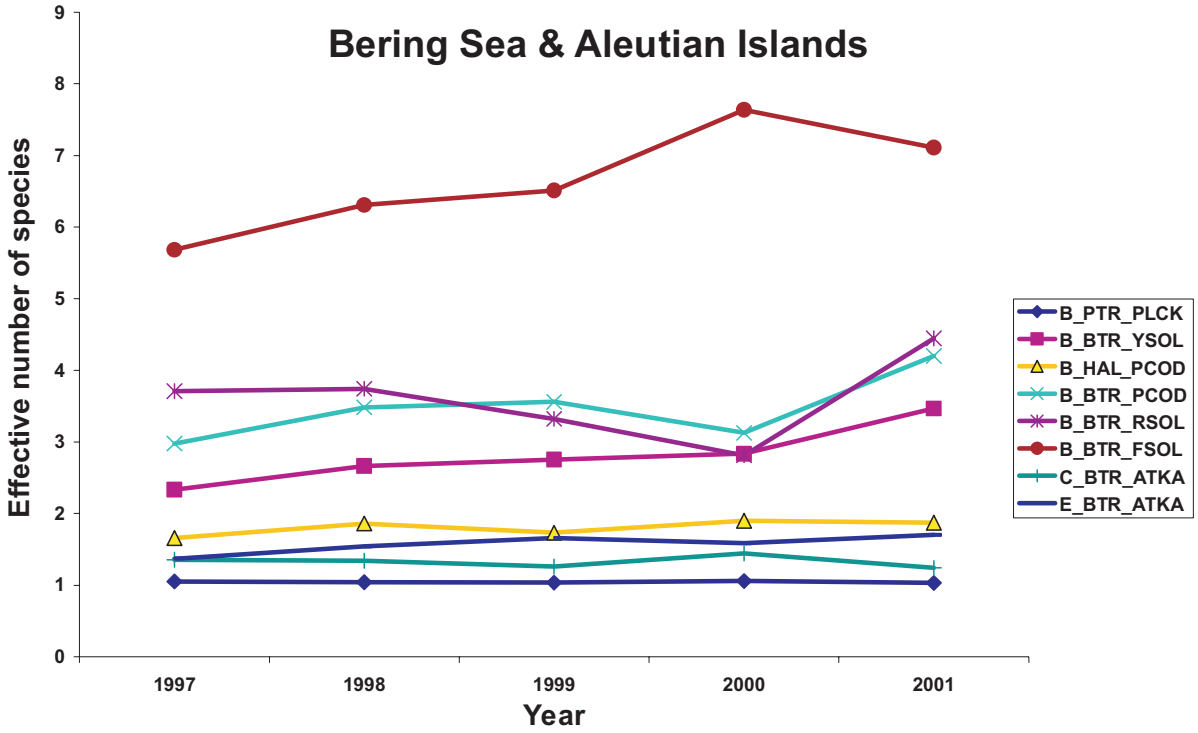


Figure 4.1-8. Relative effective number of species over time for the Bering Sea and Aleutian Islands fisheries that caught 91 percent of the total from 1997-2001.

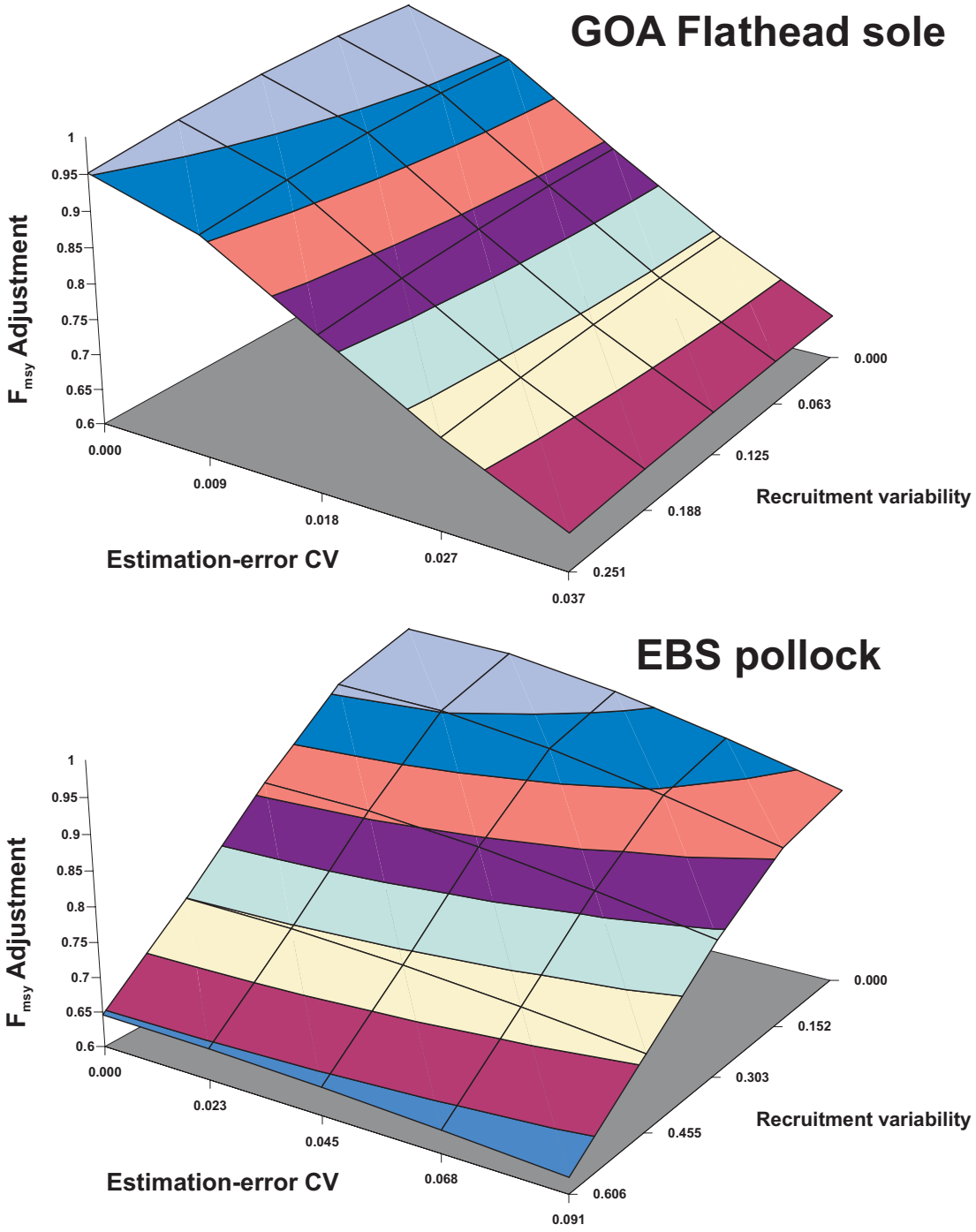


Figure 4.1-9. Two example sensitivity analyses contrasting the effect of different levels of variability in estimation error (left axis) and recruitment variability (right axis). Note that as recruitment variability and estimate error are zero, the risk-averse harvest rate is equal to F_{msy}. Note also that the relationship between growth, maturation, And age-specific culnerability additionally affects these patterns.

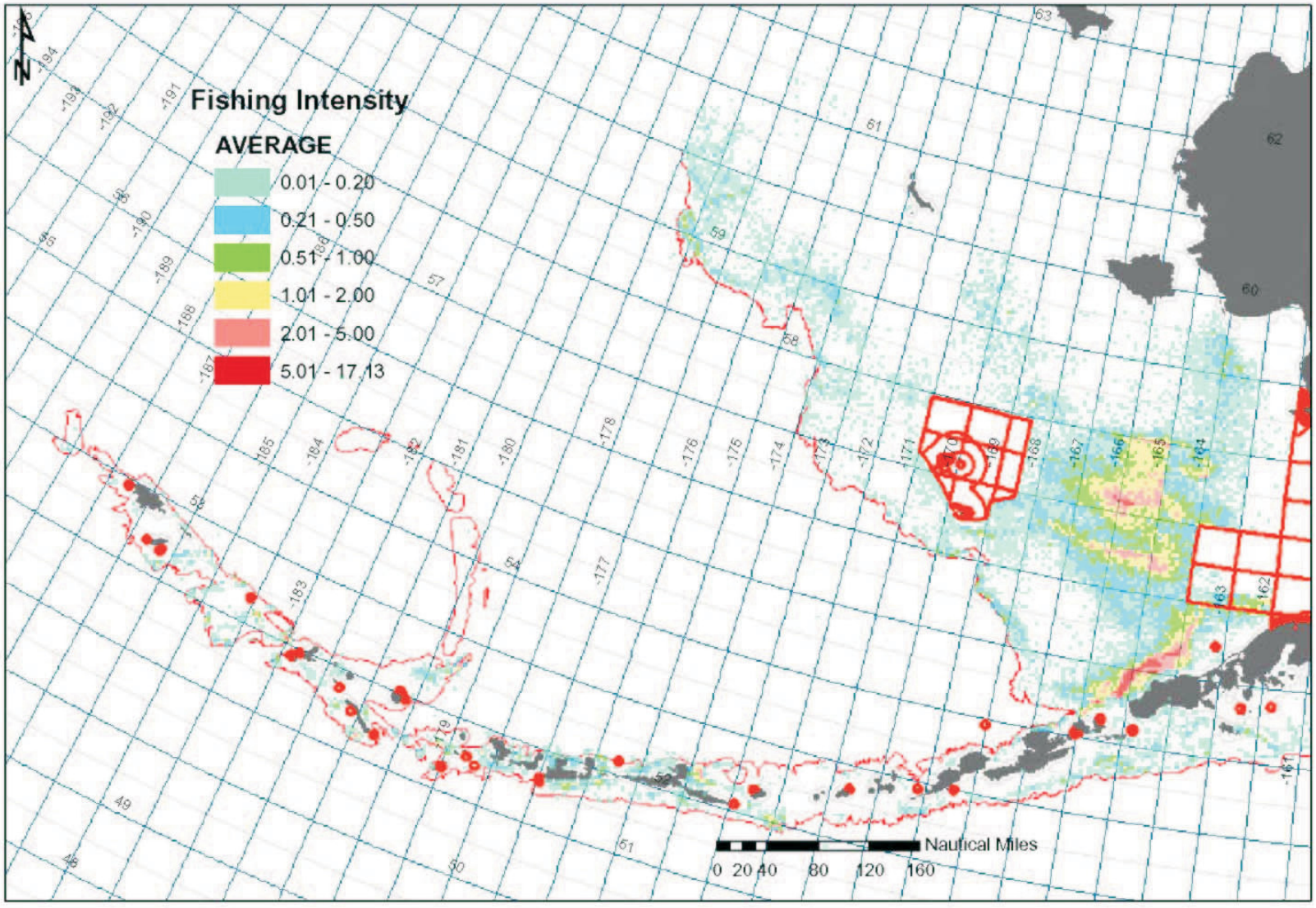


Figure 4.1-10. Bottom trawl fishing intensity and all species closures under example Fishery Management Plans 1, 2.2 and 3.1 in Bering Sea and Aleutian Islands.

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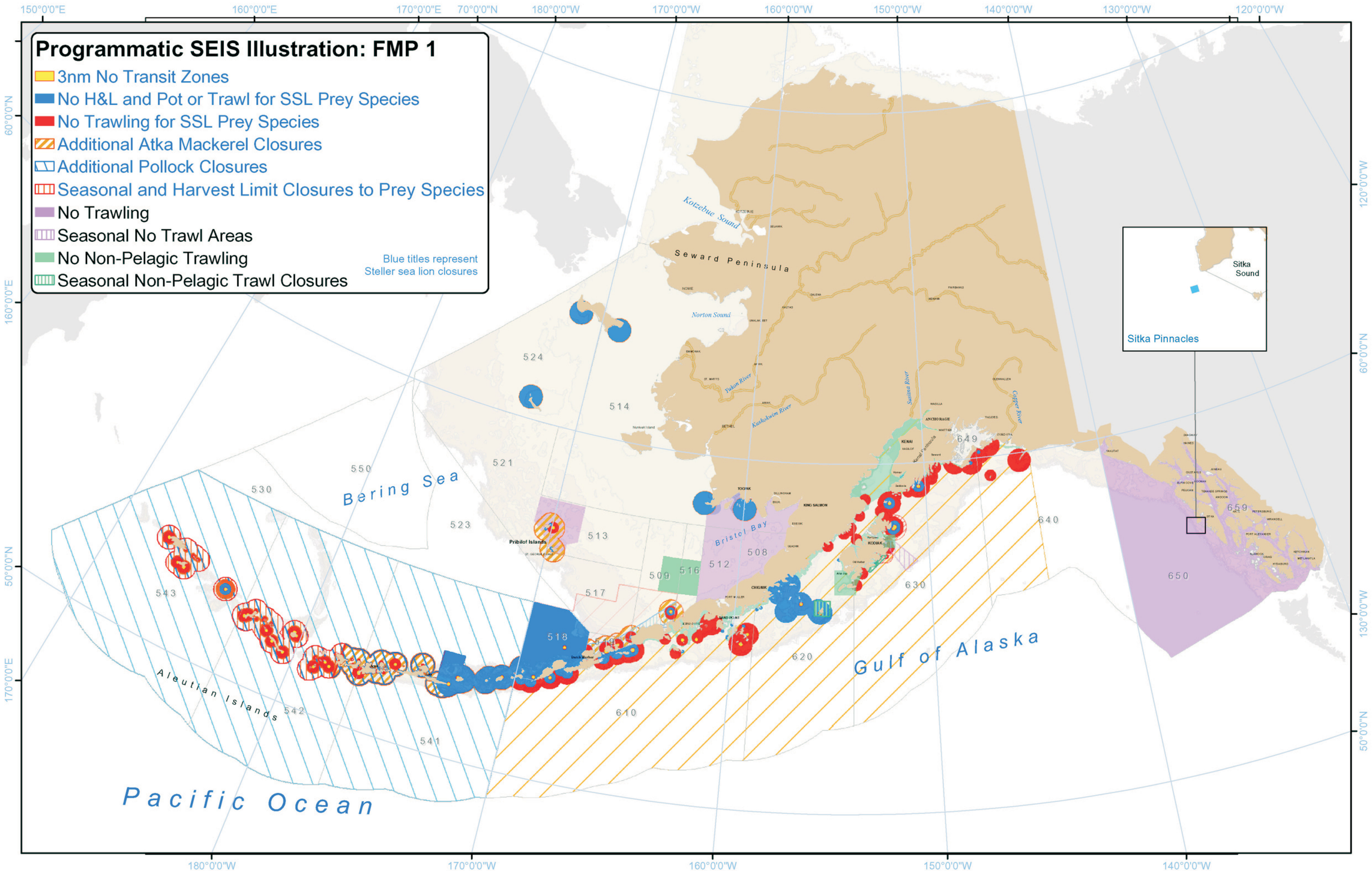


Figure 4.2-1. Programmatic Supplemental Environmental Impact Statement illustration of closure areas included in Fishery Management Plan 1.

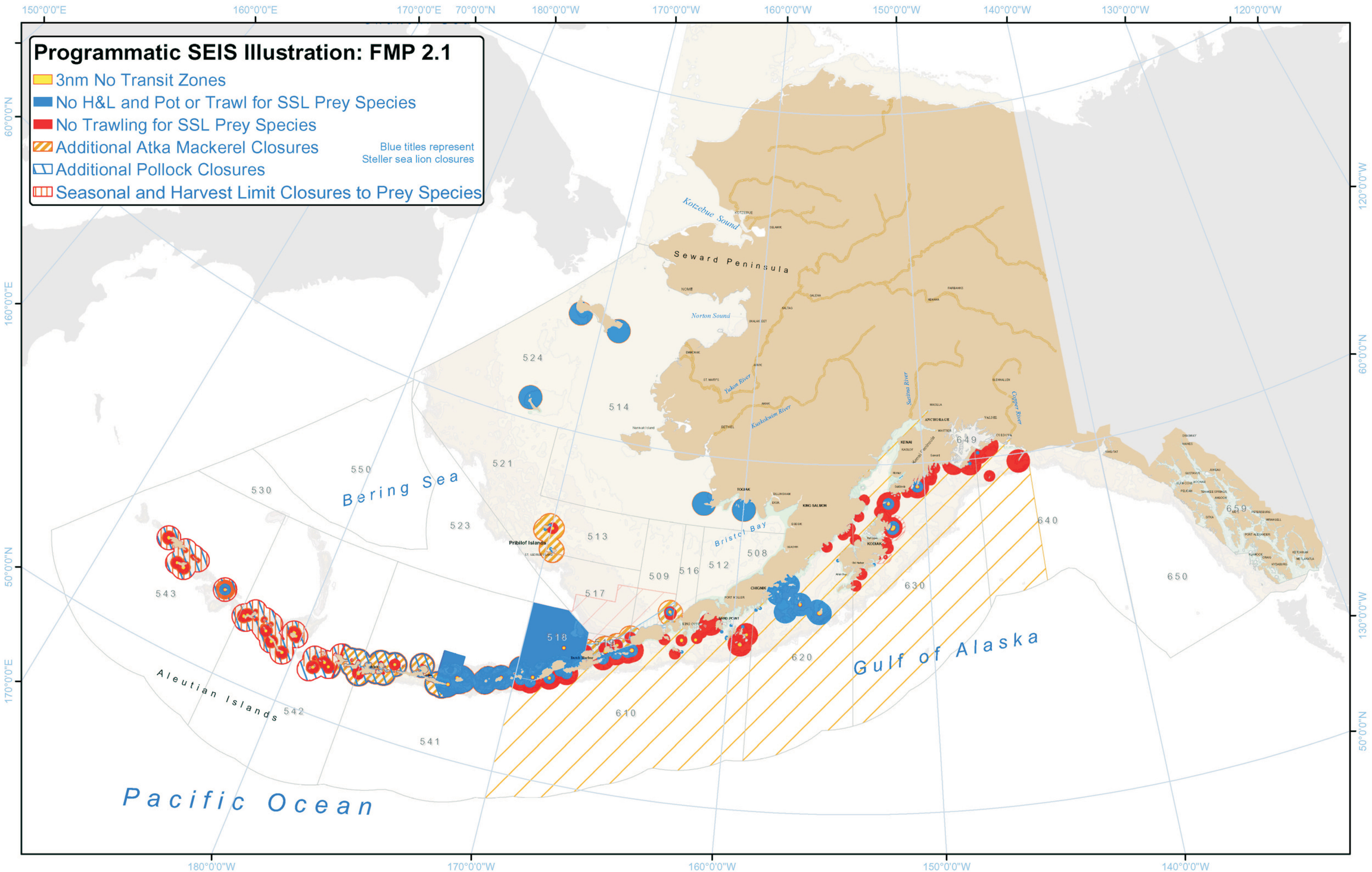


Figure 4.2-2. Programmatic Supplemental Environmental Impact Statement illustration of closure areas included in Fishery Management Plan 2.1.

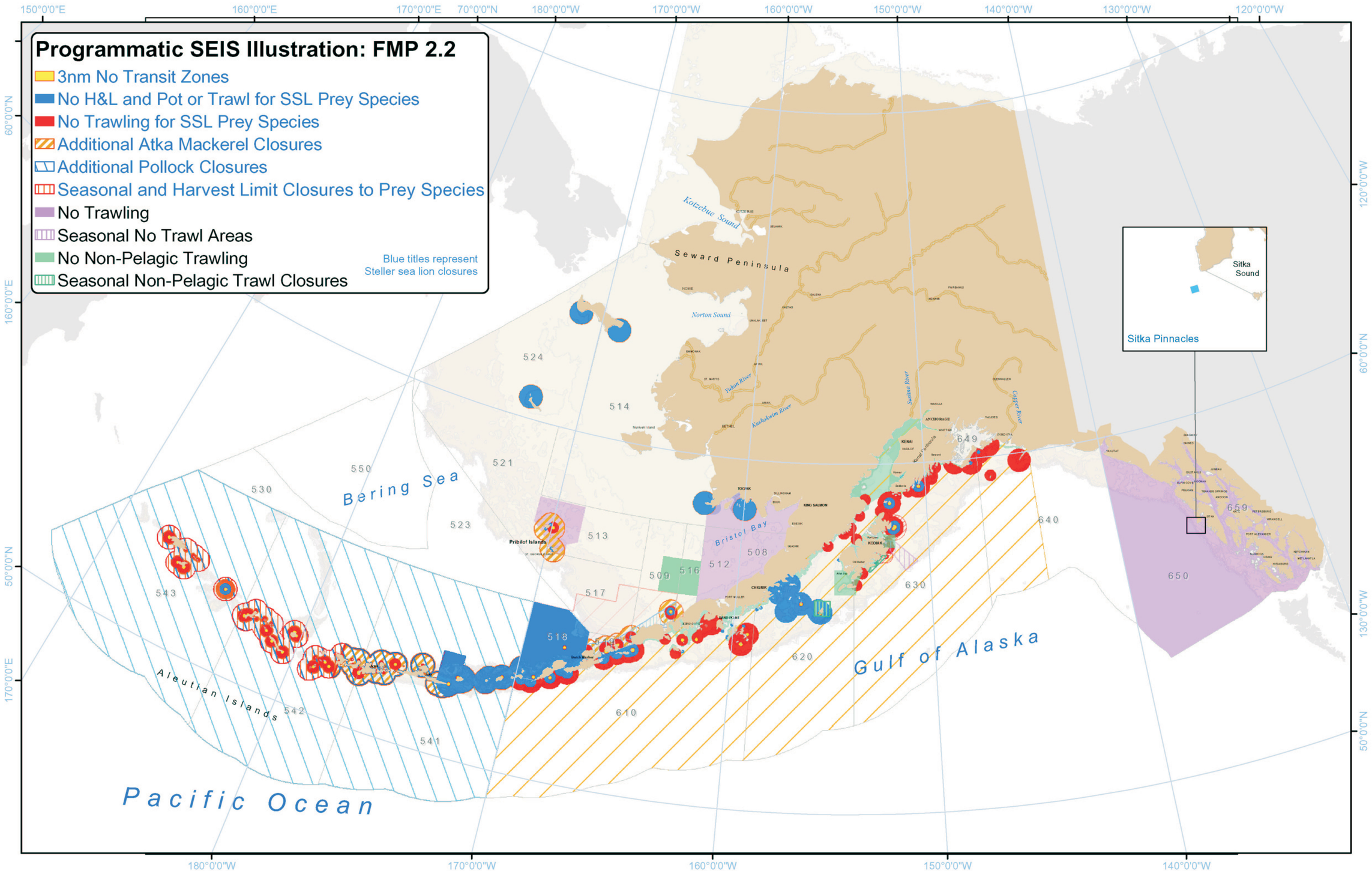


Figure 4.2-3. Programmatic Supplemental Environmental Impact Statement illustration of closure areas included in Fishery Management Plan 2.2.

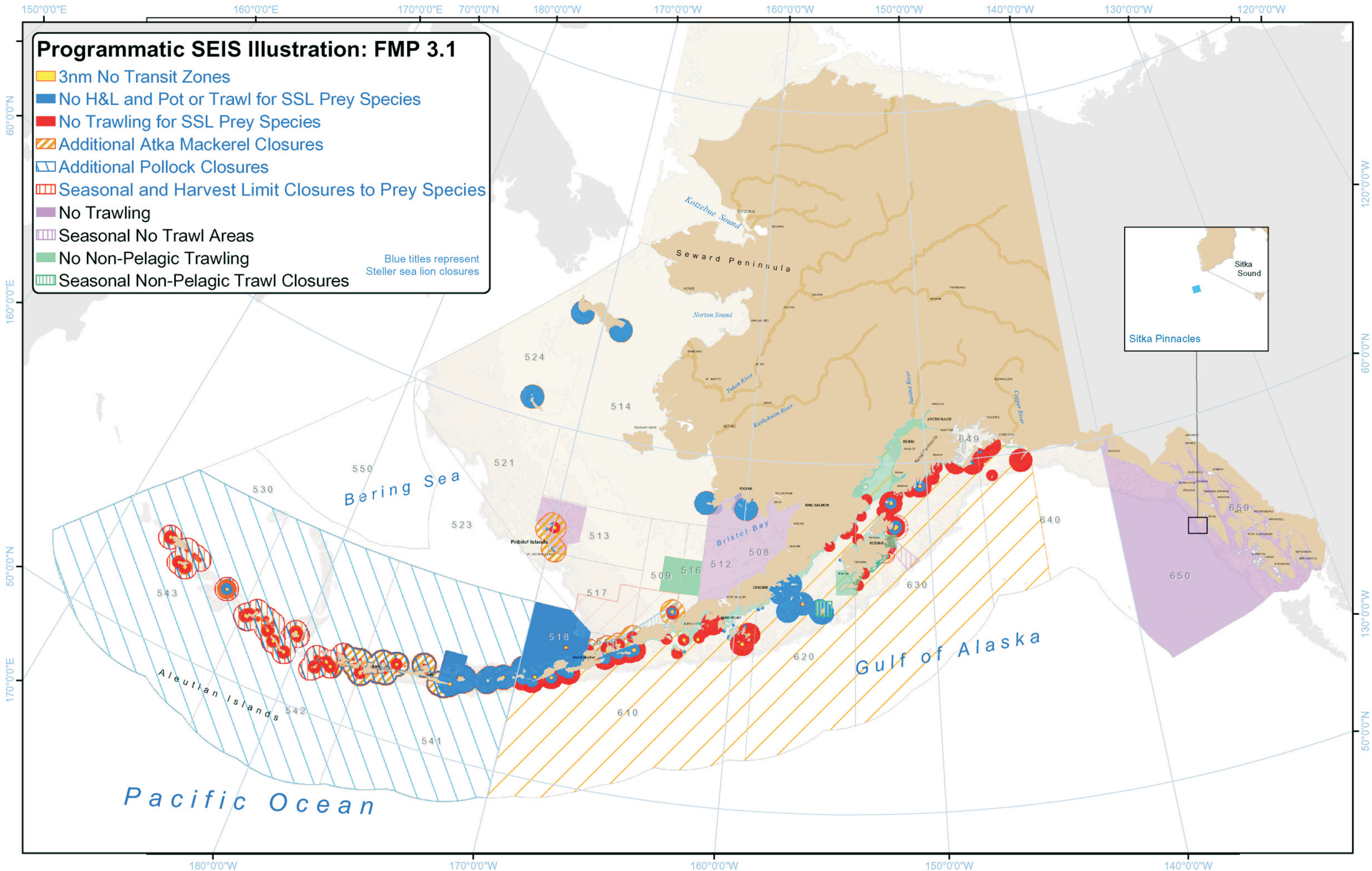


Figure 4.2-4. Programmatic Supplemental Environmental Impact Statement illustration of closure areas included in Fishery Management Plan 3.1.

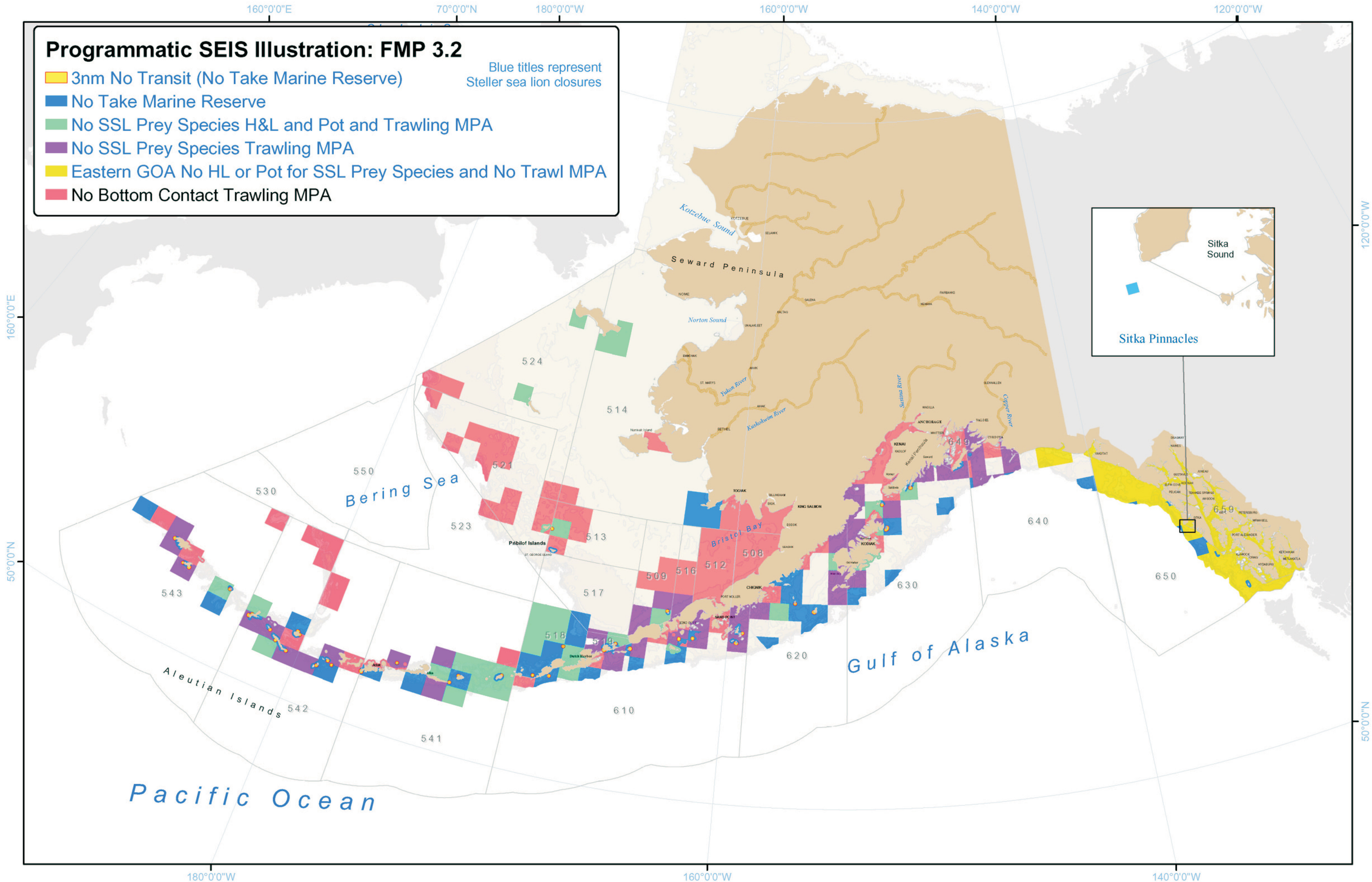
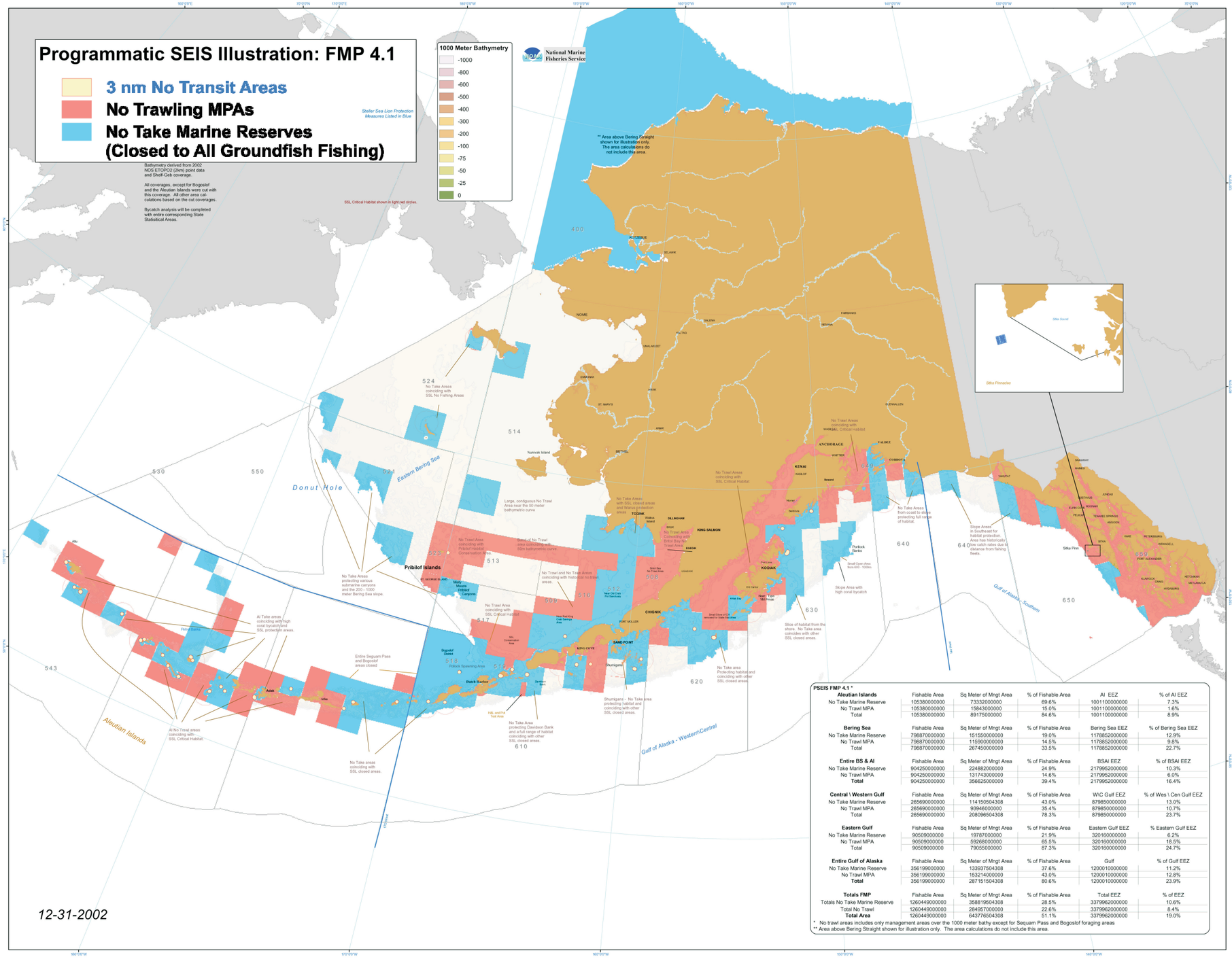


Figure 4.2-5. Programmatic Supplemental Environmental Impact Statement illustration of closure areas included in Fishery Management Plan 3.2.



PSEIS FMP 4.1 *

Aleutian Islands	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	AI EEZ	% of AI EEZ
No Take Marine Reserve	105380000000	73332000000	69.6%	1001100000000	7.3%
No Trawl MPA	105380000000	15843000000	15.0%	1001100000000	1.6%
Total	105380000000	89175000000	84.6%	1001100000000	8.9%
Bering Sea	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	Bering Sea EEZ	% of Bering Sea EEZ
No Take Marine Reserve	798870000000	151550000000	19.0%	1178852000000	12.9%
No Trawl MPA	798870000000	115900000000	14.5%	1178852000000	9.8%
Total	798870000000	267450000000	33.5%	1178852000000	22.7%
Entire BS & AI	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	BSAI EEZ	% of BSAI EEZ
No Take Marine Reserve	904250000000	224682000000	24.9%	2179952000000	10.3%
No Trawl MPA	904250000000	131743000000	14.6%	2179952000000	6.0%
Total	904250000000	356625000000	39.4%	2179952000000	16.4%
Central \ Western Gulf	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	W\C Gulf EEZ	% of Wes \ Cen Gulf EEZ
No Take Marine Reserve	265690000000	114150504308	43.0%	879850000000	13.0%
No Trawl MPA	265690000000	93946000000	35.4%	879850000000	10.7%
Total	265690000000	208096504308	78.3%	879850000000	23.7%
Eastern Gulf	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	Eastern Gulf EEZ	% Eastern Gulf EEZ
No Take Marine Reserve	90509000000	19787000000	21.9%	320160000000	6.2%
No Trawl MPA	90509000000	59268000000	65.5%	320160000000	18.5%
Total	90509000000	79055000000	87.3%	320160000000	24.7%
Entire Gulf of Alaska	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	Gulf	% of Gulf EEZ
No Take Marine Reserve	356199000000	133937504308	37.6%	1200010000000	11.2%
No Trawl MPA	356199000000	153214000000	43.0%	1200010000000	12.8%
Total	356199000000	287151504308	80.6%	1200010000000	23.9%
Totals FMP	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	Total EEZ	% of EEZ
Totals No Take Marine Reserve	1260449000000	358819504308	28.5%	3379962000000	10.6%
Total No Trawl	1260449000000	284957000000	22.6%	3379962000000	8.4%
Total Area	1260449000000	643776504308	51.1%	3379962000000	19.0%

* No trawl areas includes only management areas over the 1000 meter bathy except for Sequam Pass and Bogoslof foraging areas
** Area above Bering Straight shown for illustration only. The area calculations do not include this area.

Figure 4.2-6. Programmatic Supplemental Environmental Impact Statement illustration of closure areas included in Fishery Management Plan 4.1 all colors used.

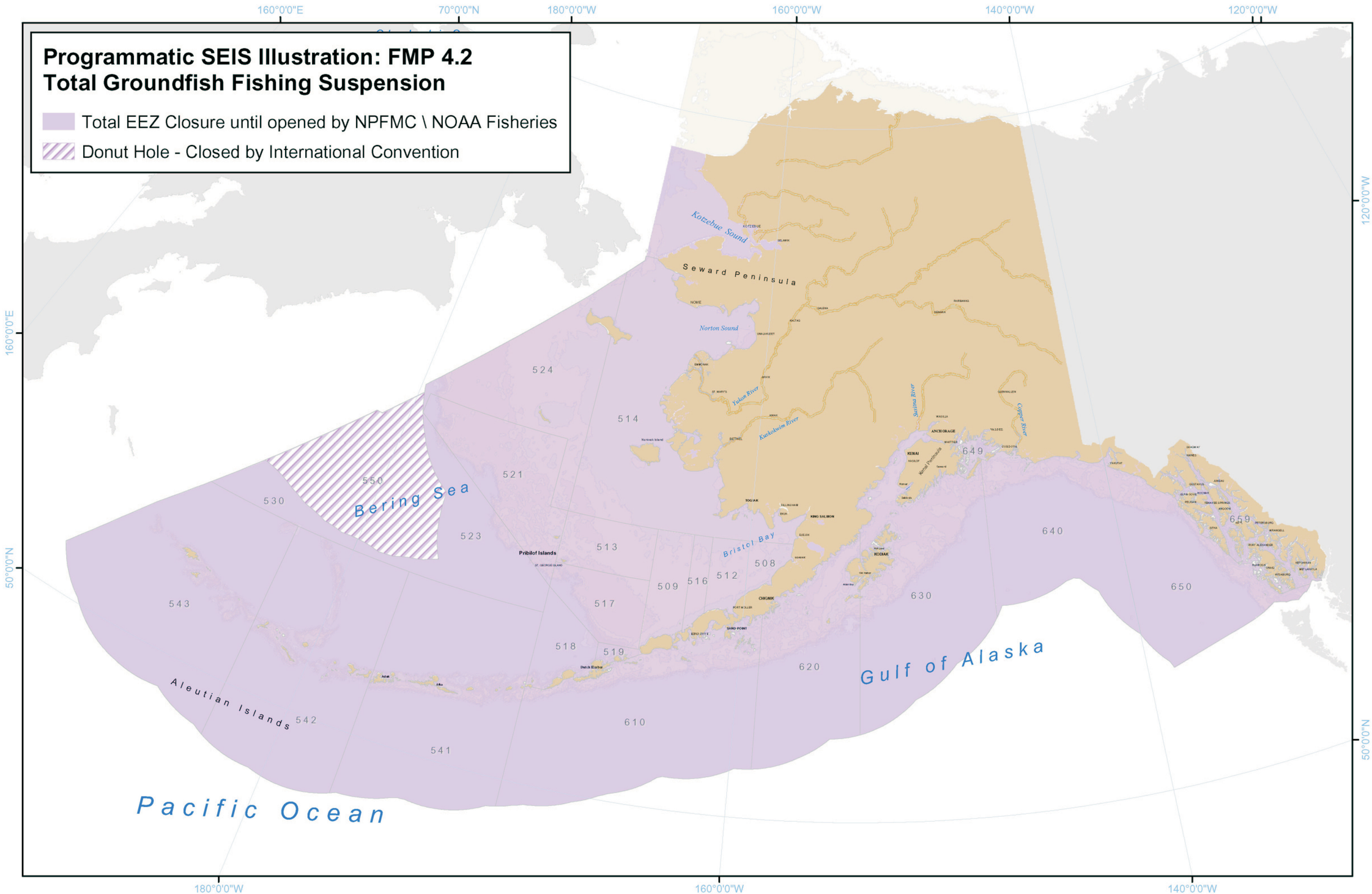


Figure 4.2-7. Programmatic Supplemental Environmental Impact Statement illustration of closure areas included in Fishery Management Plan 4.2.

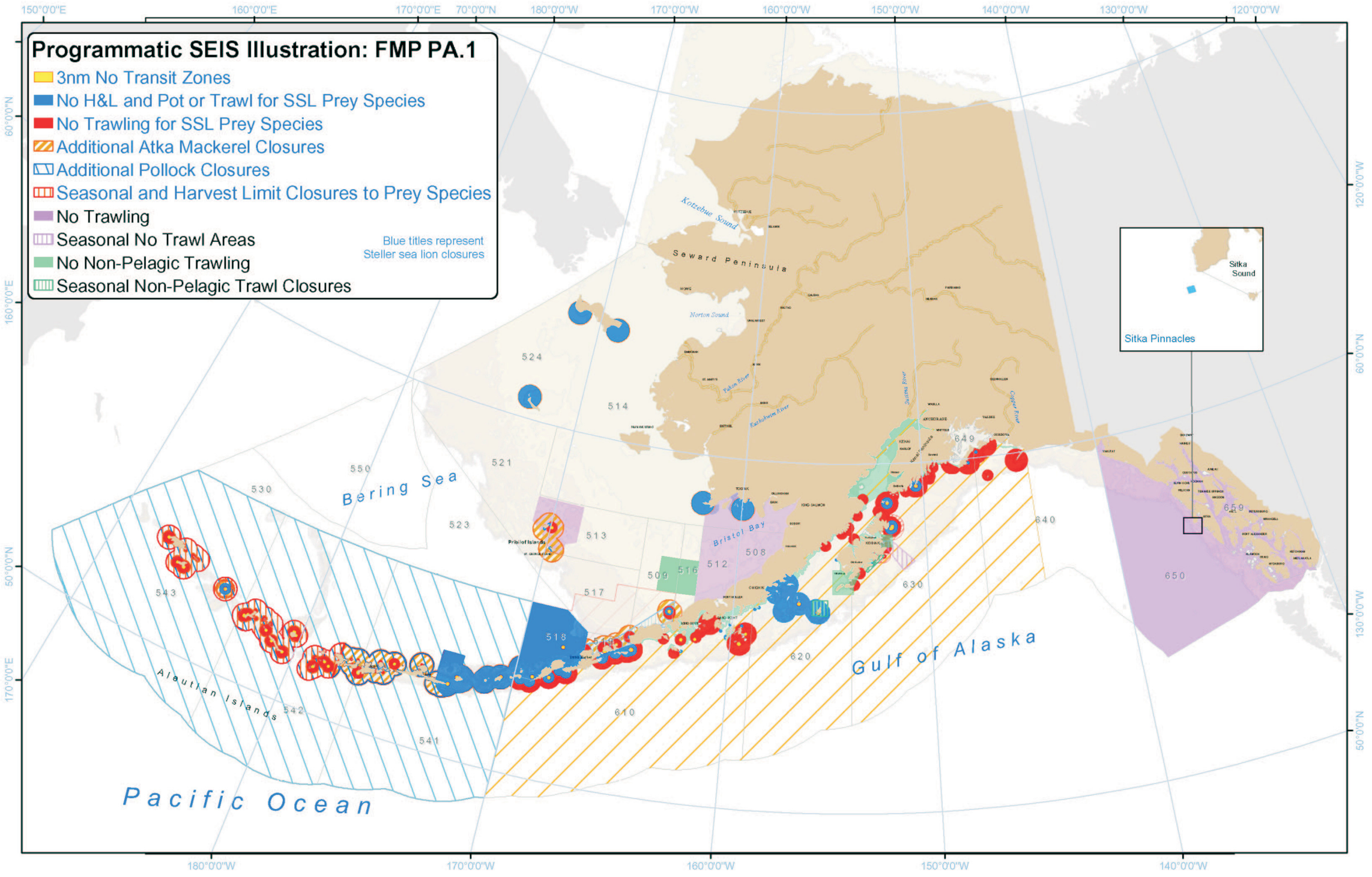


Figure 4.2-8. Programmatic Supplemental Environmental Impact Statement illustration of closure areas included in Preferred Alternative FMP PA.1.

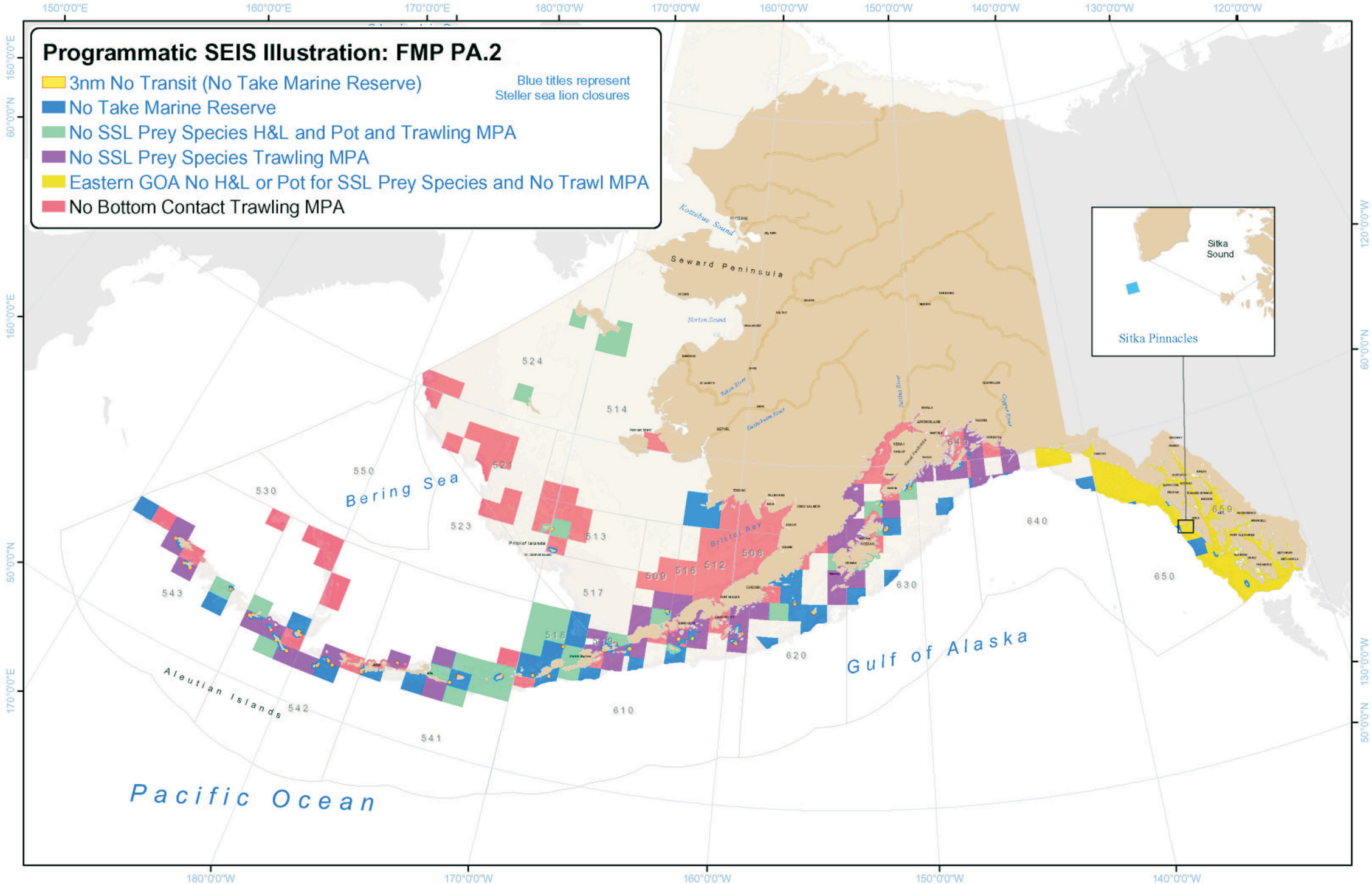


Figure 4.2-9. Programmatic Supplemental Environmental Impact Statement illustration of closure areas included in Preferred Alternative FMP PA.2.

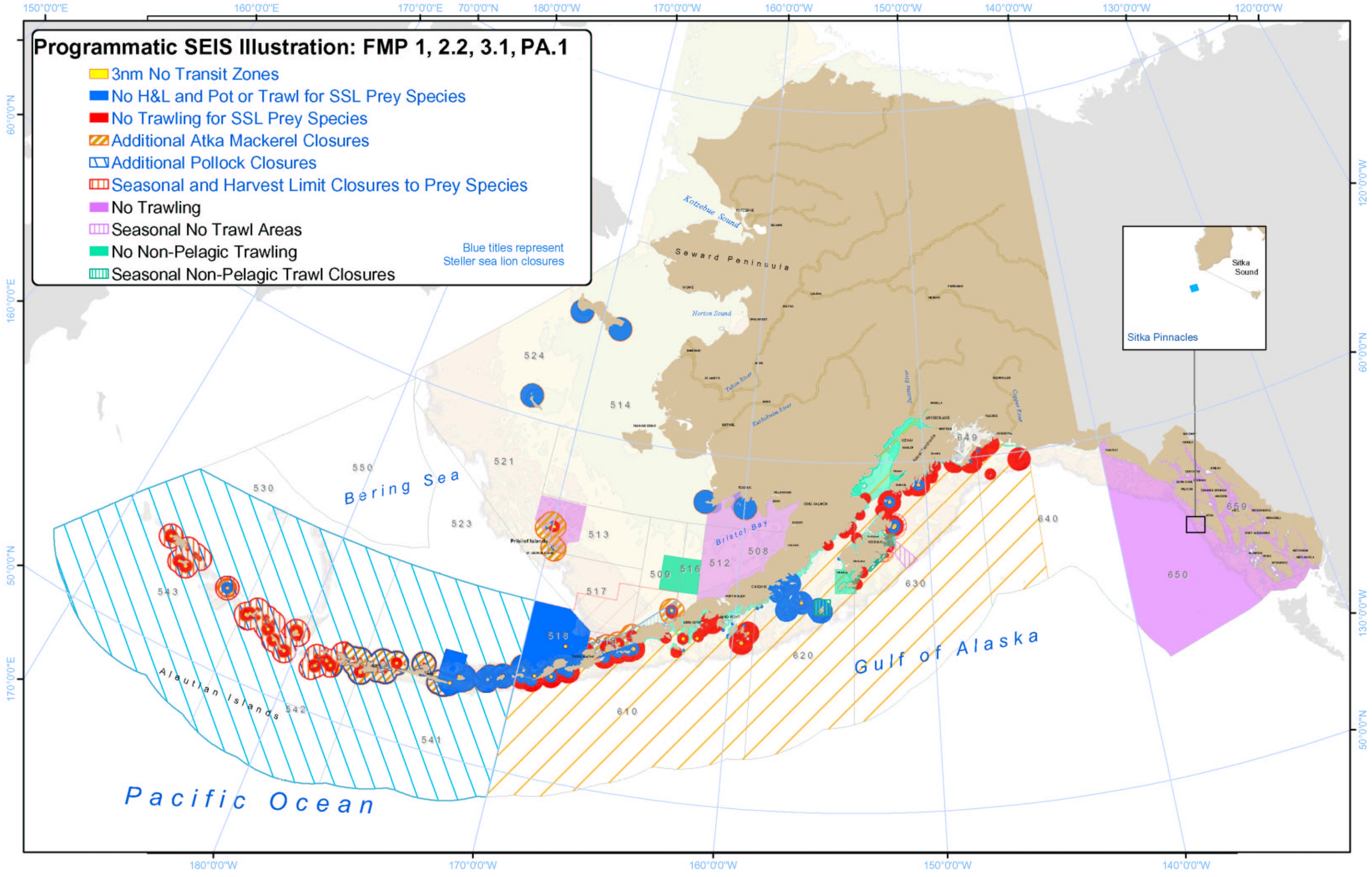
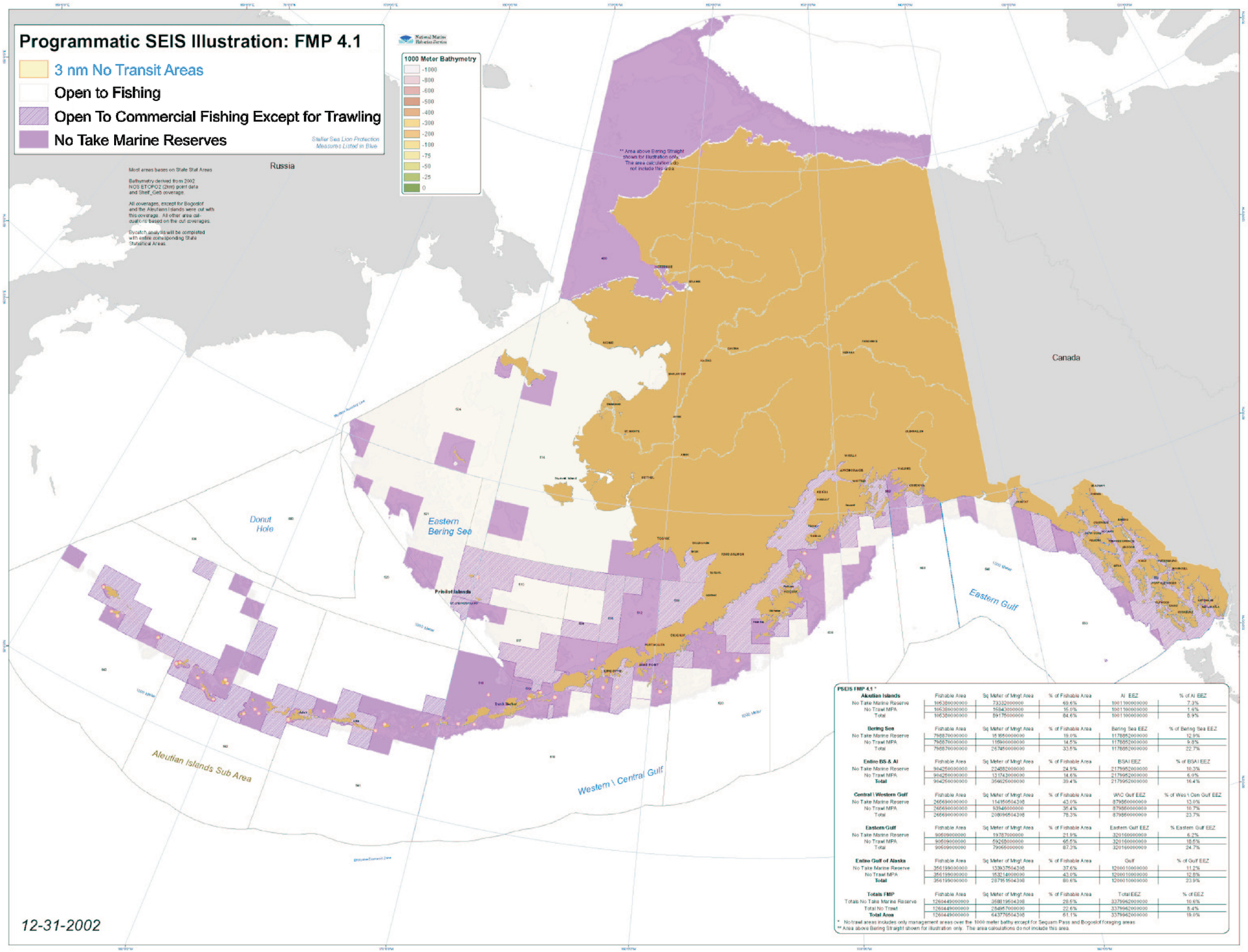


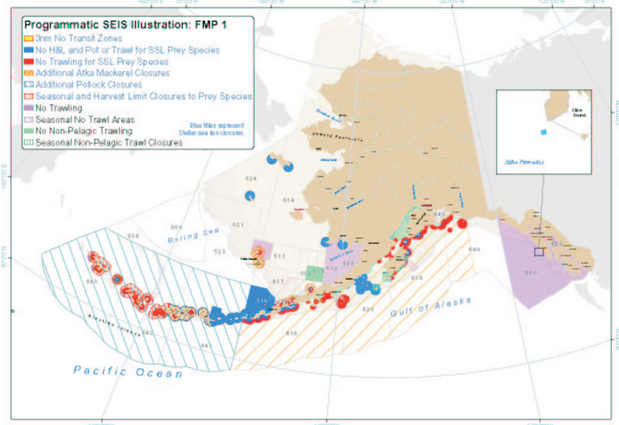
Figure 4.2-10. Programmatic Supplemental Environmental Impact Statement illustration of closure areas included in Fishery Management Plans 1, 2.2, 3.1, and Preferred Alternative FMP PA.1.

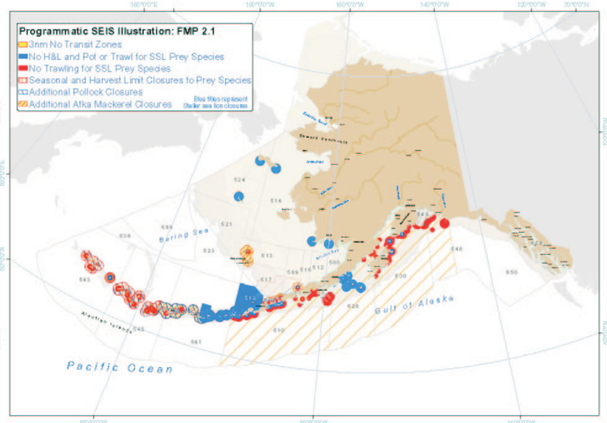


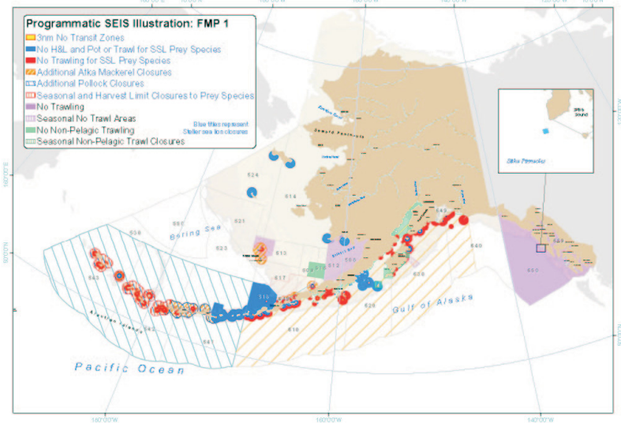
PSEIS FMP 4.1 *					
Aleutian Islands	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	AI EEZ	% of AI EEZ
No Take Marine Reserve	1663800900000	73332000000	69.6%	1001100000000	7.3%
No Trawl MPA	1663800900000	15843000000	15.0%	1001100000000	1.6%
Total	1663800900000	89175000000	84.6%	1001100000000	8.9%
Bering Sea	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	Bering Sea EEZ	% of Bering Sea EEZ
No Take Marine Reserve	796870900000	151950000000	19.0%	1178852000000	12.9%
No Trawl MPA	796870900000	115900000000	14.5%	1178852000000	9.8%
Total	796870900000	267450000000	33.5%	1178852000000	22.7%
Entire BS & AI	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	BSAI EEZ	% of BSAI EEZ
No Take Marine Reserve	904250900000	224082000000	24.8%	2179952000000	10.3%
No Trawl MPA	904250900000	131743000000	14.6%	2179952000000	6.0%
Total	904250900000	356925000000	39.4%	2179952000000	16.4%
Central \ Western Gulf	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	WC Gulf EEZ	% of Wes \ Cen Gulf EEZ
No Take Marine Reserve	266569000000	114956504306	43.0%	879860000000	13.0%
No Trawl MPA	266569000000	53546000000	20.4%	879860000000	10.7%
Total	266569000000	208096504306	78.3%	879860000000	23.7%
Eastern Gulf	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	Eastern Gulf EEZ	% Eastern Gulf EEZ
No Take Marine Reserve	90609900000	19787000000	21.9%	320160000000	6.2%
No Trawl MPA	90609900000	59265000000	65.5%	320160000000	18.5%
Total	90609900000	79065000000	87.3%	320160000000	24.7%
Entire Gulf of Alaska	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	Gulf	% of Gulf EEZ
No Take Marine Reserve	356199900000	153937504306	37.6%	1200010000000	11.2%
No Trawl MPA	356199900000	153214000000	43.0%	1200010000000	12.5%
Total	356199900000	287151504306	80.6%	1200010000000	23.9%
Totals FMP	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	Total EEZ	% of EEZ
Totals No Take Marine Reserve	1260449000000	368819504306	29.6%	3379962000000	10.6%
Total No Trawl	1260449000000	284957000000	22.6%	3379962000000	8.4%
Total Area	1260449000000	643776504306	51.1%	3379962000000	19.0%

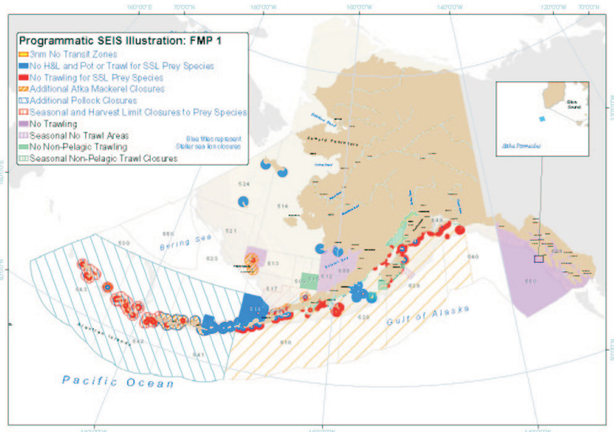
* No trawl areas includes only management areas over the 1000 meter bathy except for Sequam Pass and Bogoslof foraging areas
** Area above Bering Straight shown for illustration only. The area calculations do not include this area.

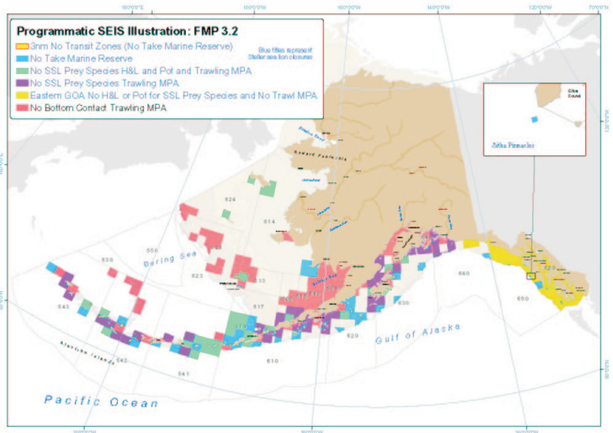
Figure 4.2-11. Programmatic Supplemental Environmental Impact Statement Illustration of closure areas included in Fishery Management Plan 4.1 all colors used.

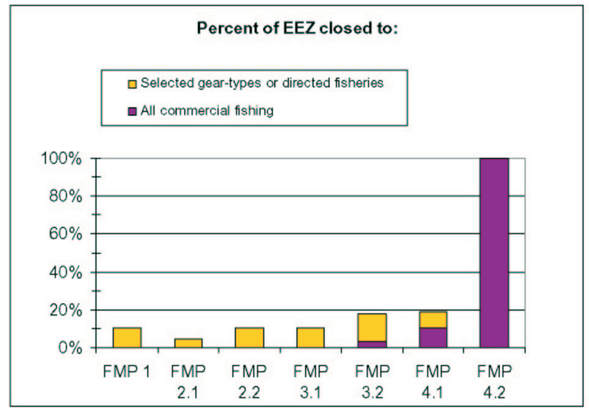


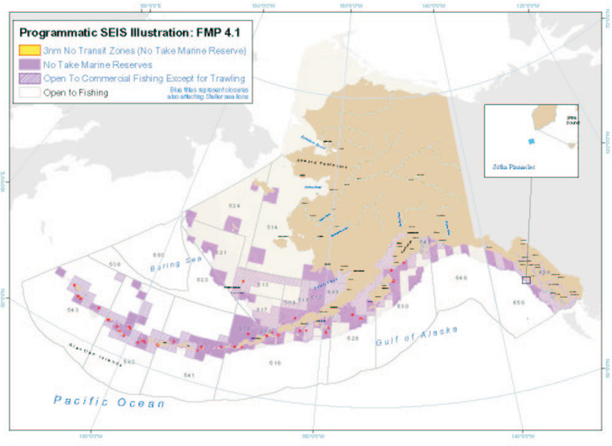


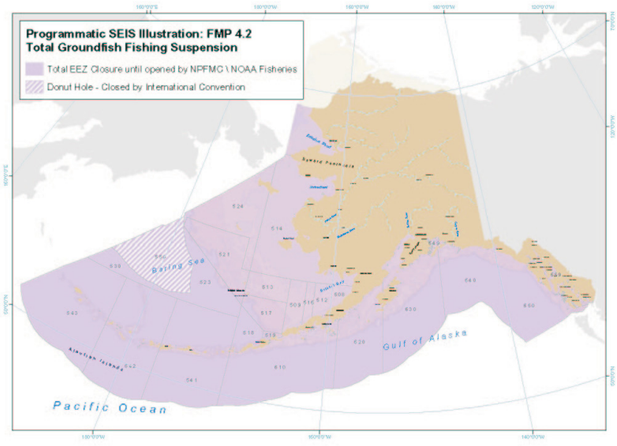


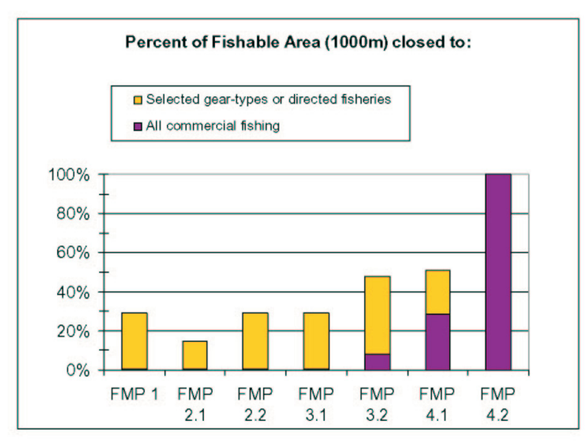












Programmatic FMP Bookends

Figure 4.2-12. Programmatic Supplemental Environmental Impact Statement illustration of closure areas in all Fishery Management Plan bookends; depictions of percent economic exclusion zone closed and fishable areas.

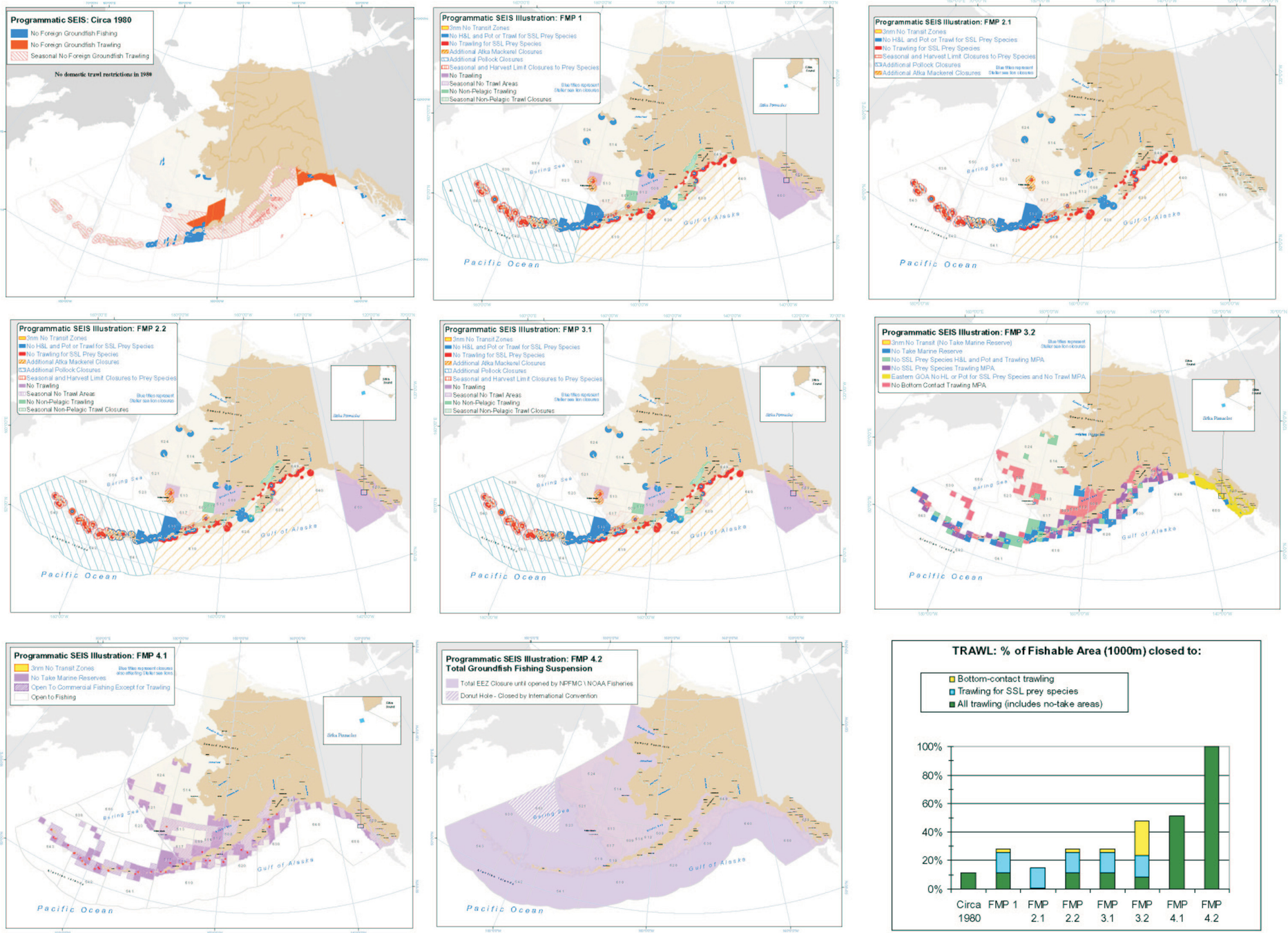


Figure 4.2-13. Programmatic Supplemental Environmental Impact Statement illustration of closure areas in all Fishery Management Plan bookends (contains 1980 Circa map); depictions of percent fishable areas closed to trawl.

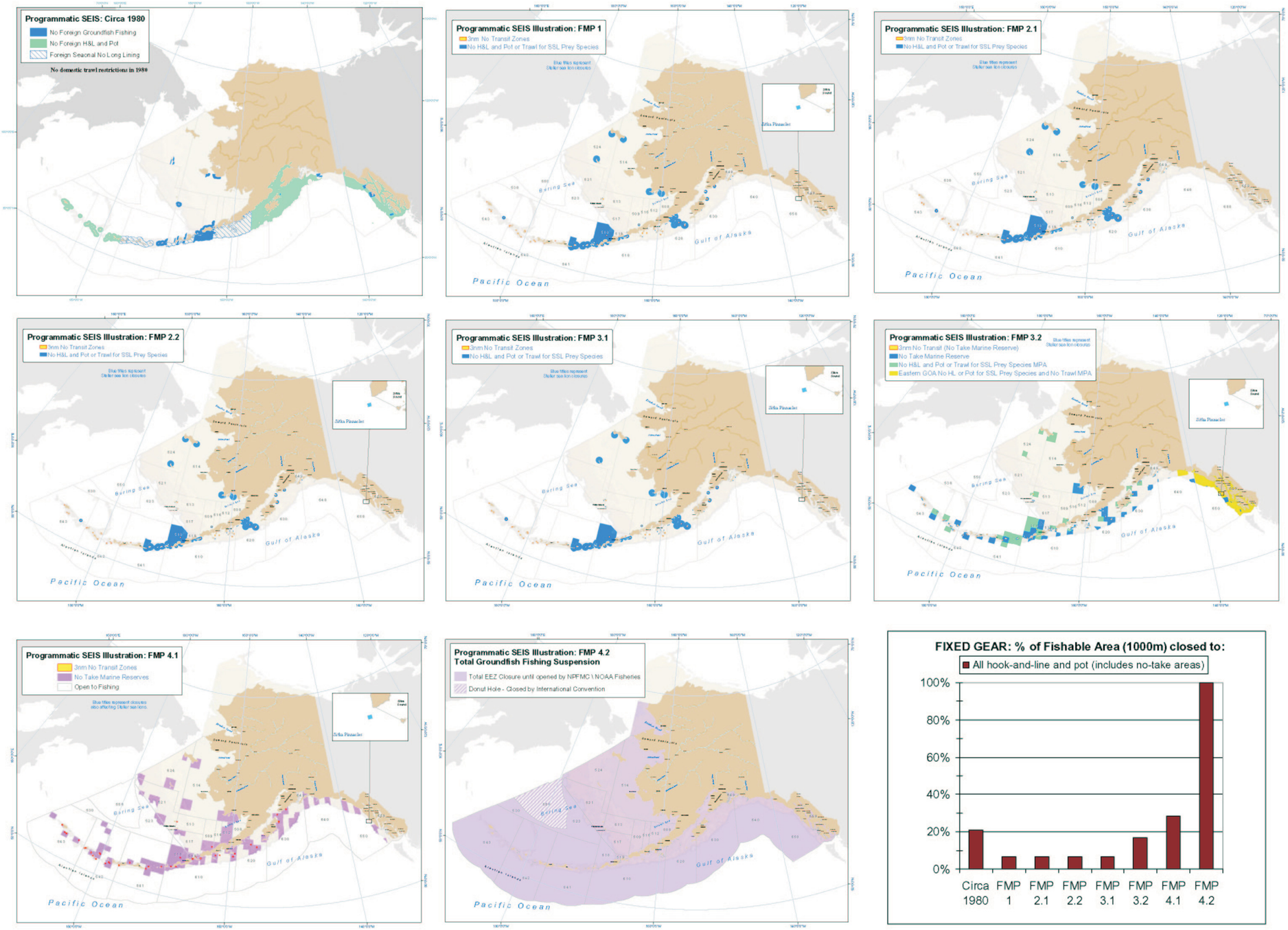


Figure 4.2-14. Programmatic Supplemental Environmental Impact Statement illustrations of closure areas in all Fishery Management Plan bookends (contains Circa 1980 map); depictions of percent fishable areas closed to fixed gear (Hook-and-Line and Pot).

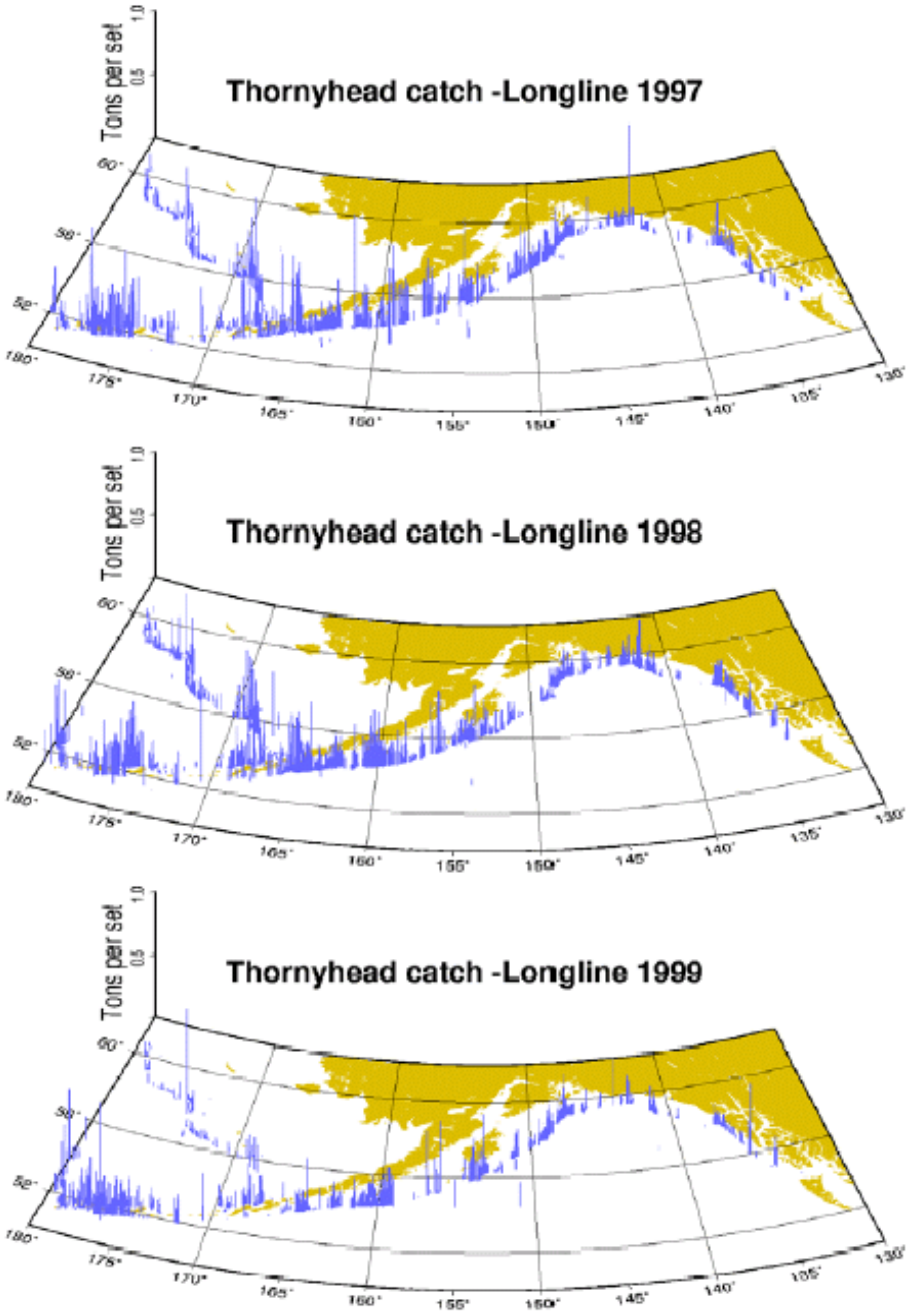


Figure 4.5-1. Distribution of thornyhead catches by commercial longline gear, 1997-1999. Source: Ianelli and Gaichas 2002.

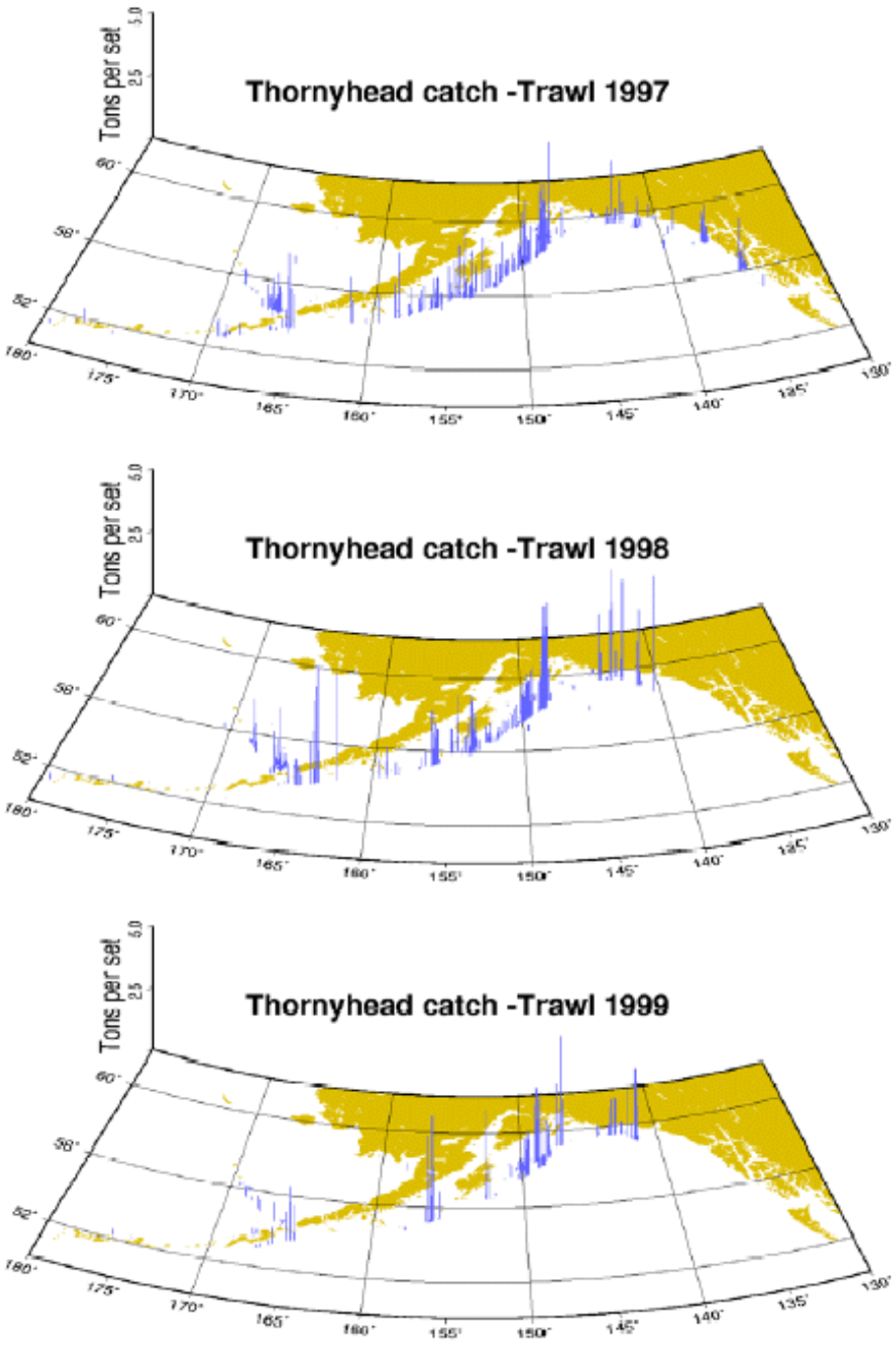
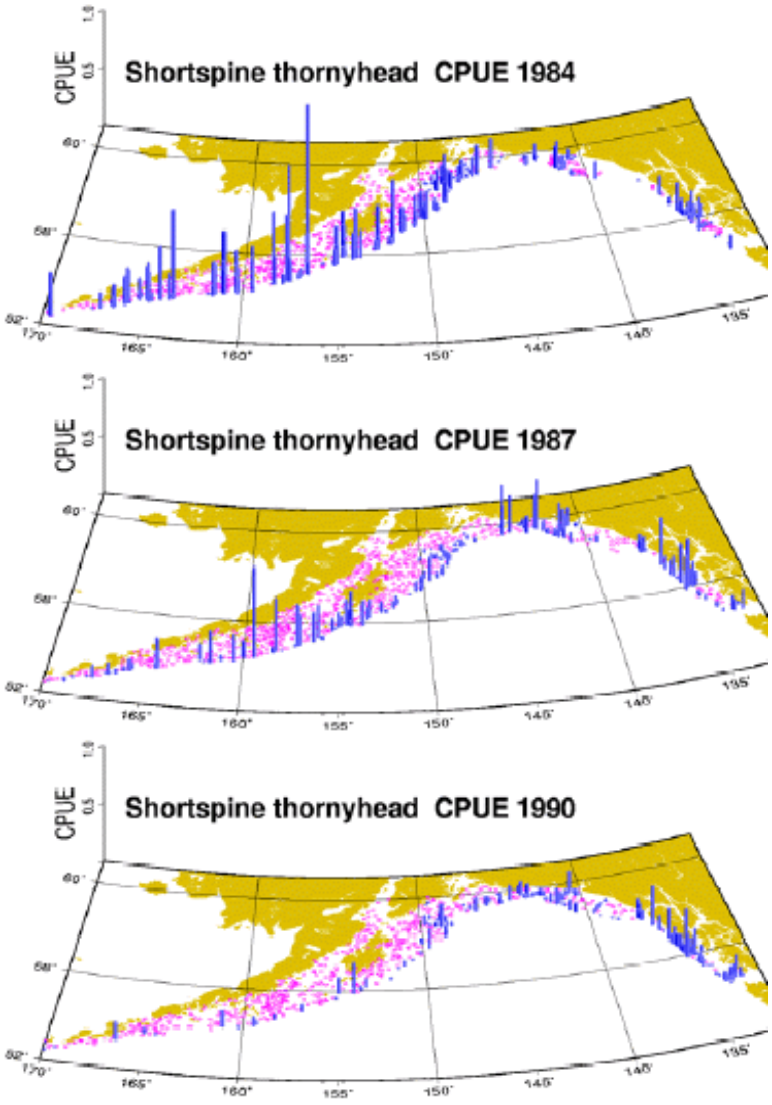


Figure 4.5-2. Distribution of thornyhead catches by commercial trawl gear, 1997-1999. Source: Ianelli and Gaichas 2002.



Notes: Height of vertical bars is proportional to CPUE by weight. Circles represent stations where no shortspine thornyheads were captured.

Figure 4.5-3. Distribution of thornyhead CPUE from recent triennial trawl surveys. Source: Ianelli and Gaichas 2002.

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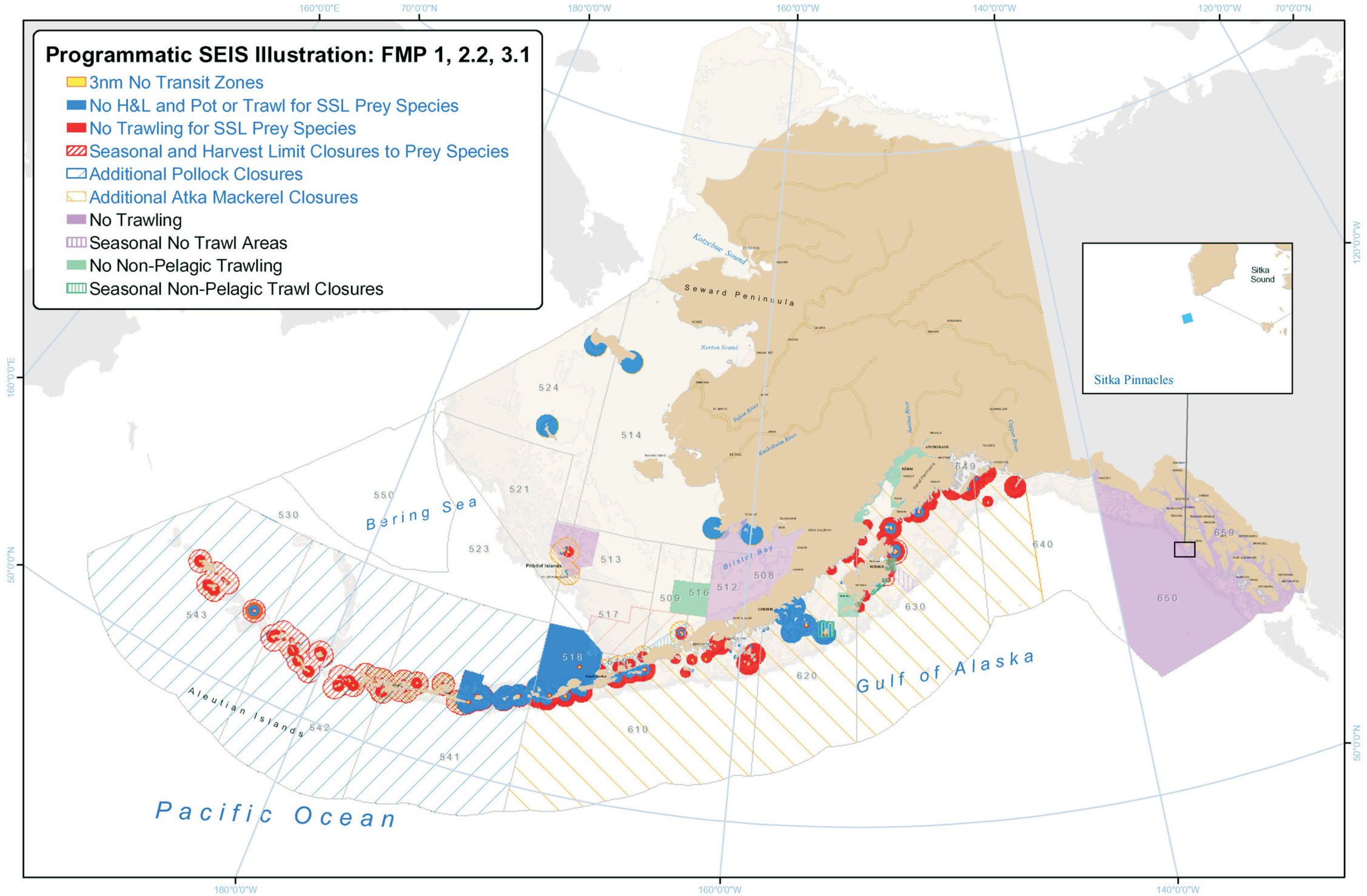

Figure 4.5-4. Areas closed to trawling only at various times of the year Fishery Management Plans 1, 2.2, and 3.1.

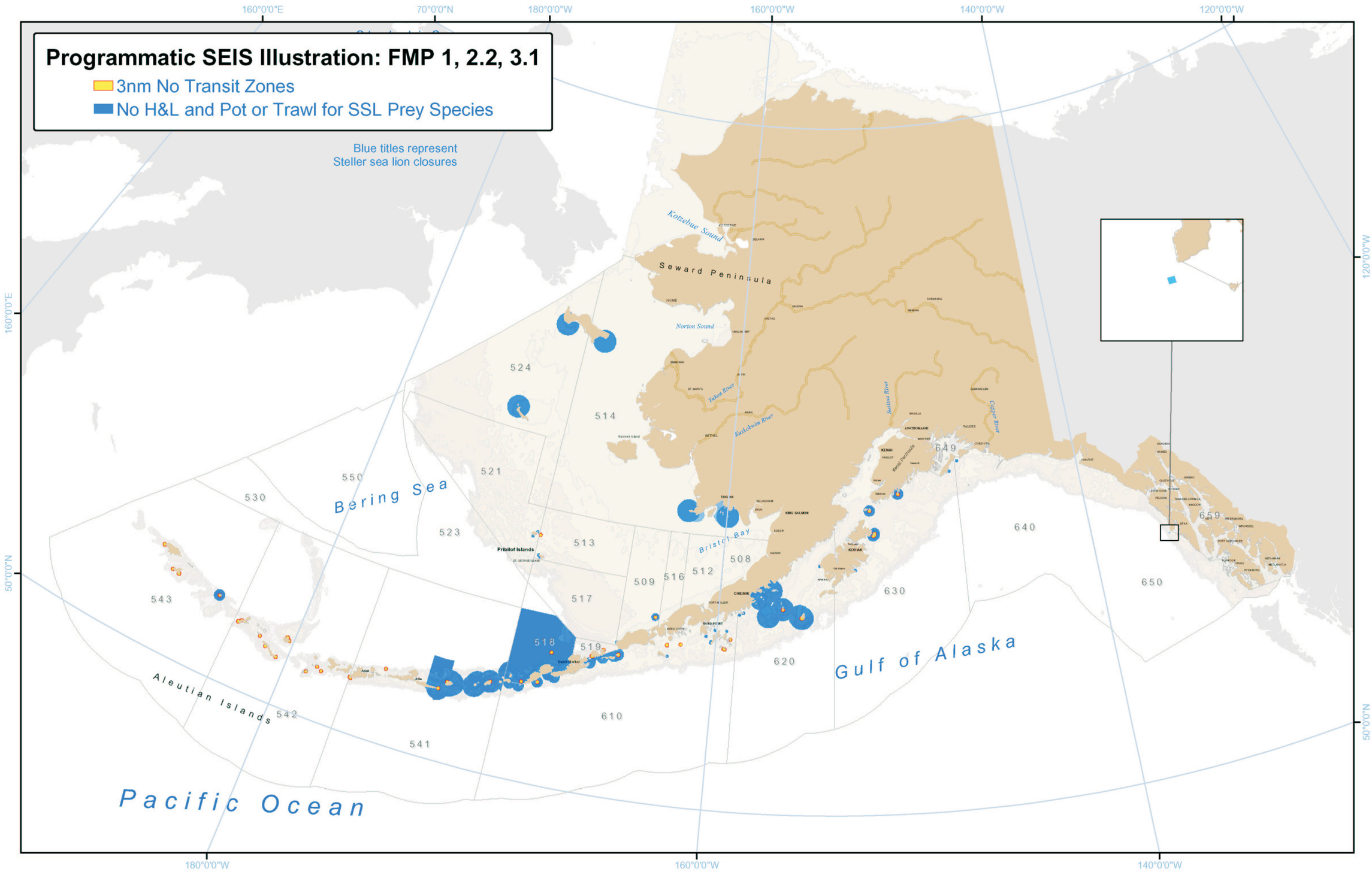

Figure 4.5-5. Areas closed to fixed gear at various times of the year Fishery Management Plans 1, 2.2, and 3.1.

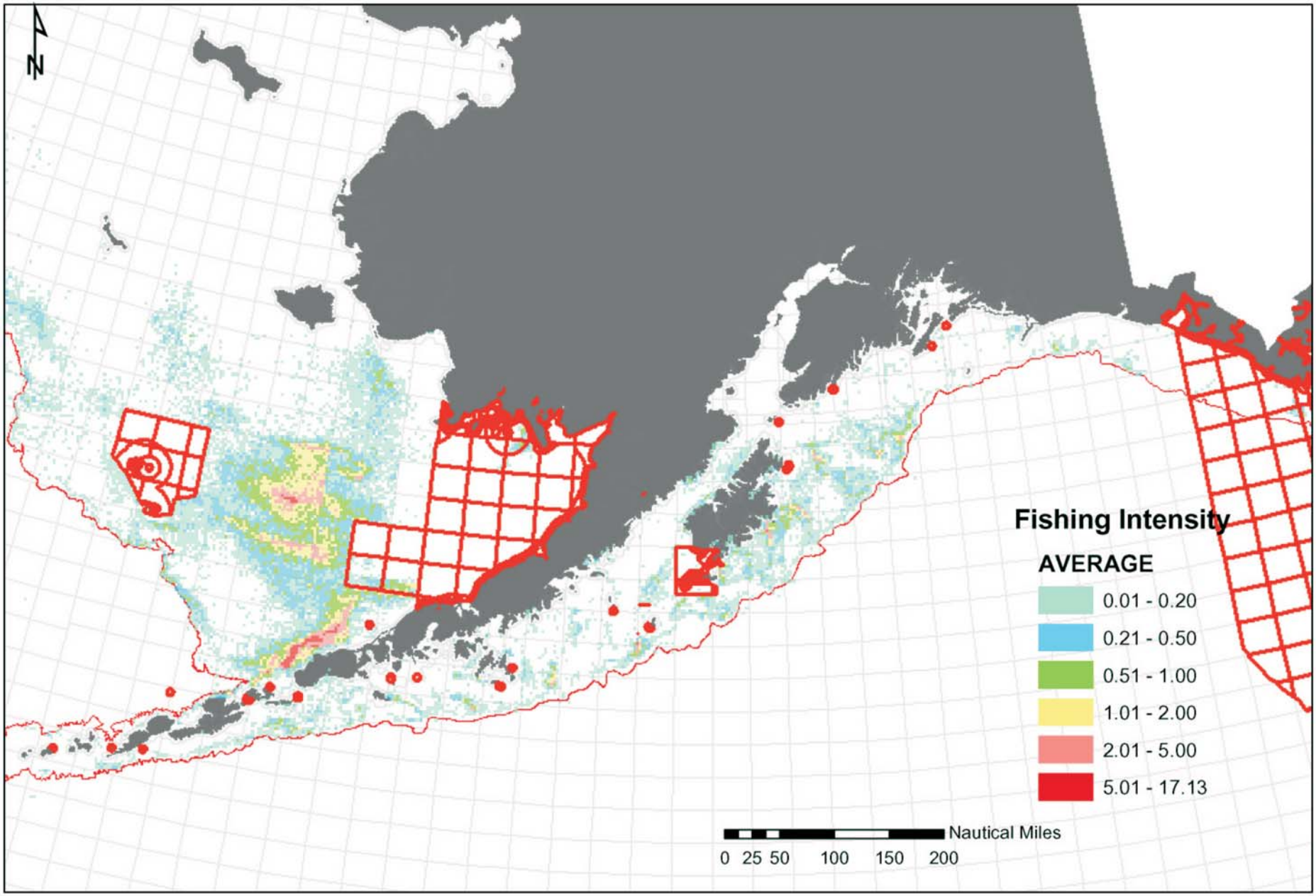

Figure 4.5-6. Bottom trawl fishing intensity and all species closures under FMPs 1, 2.2, and 3.1 in Gulf of Alaska and Bering Sea.

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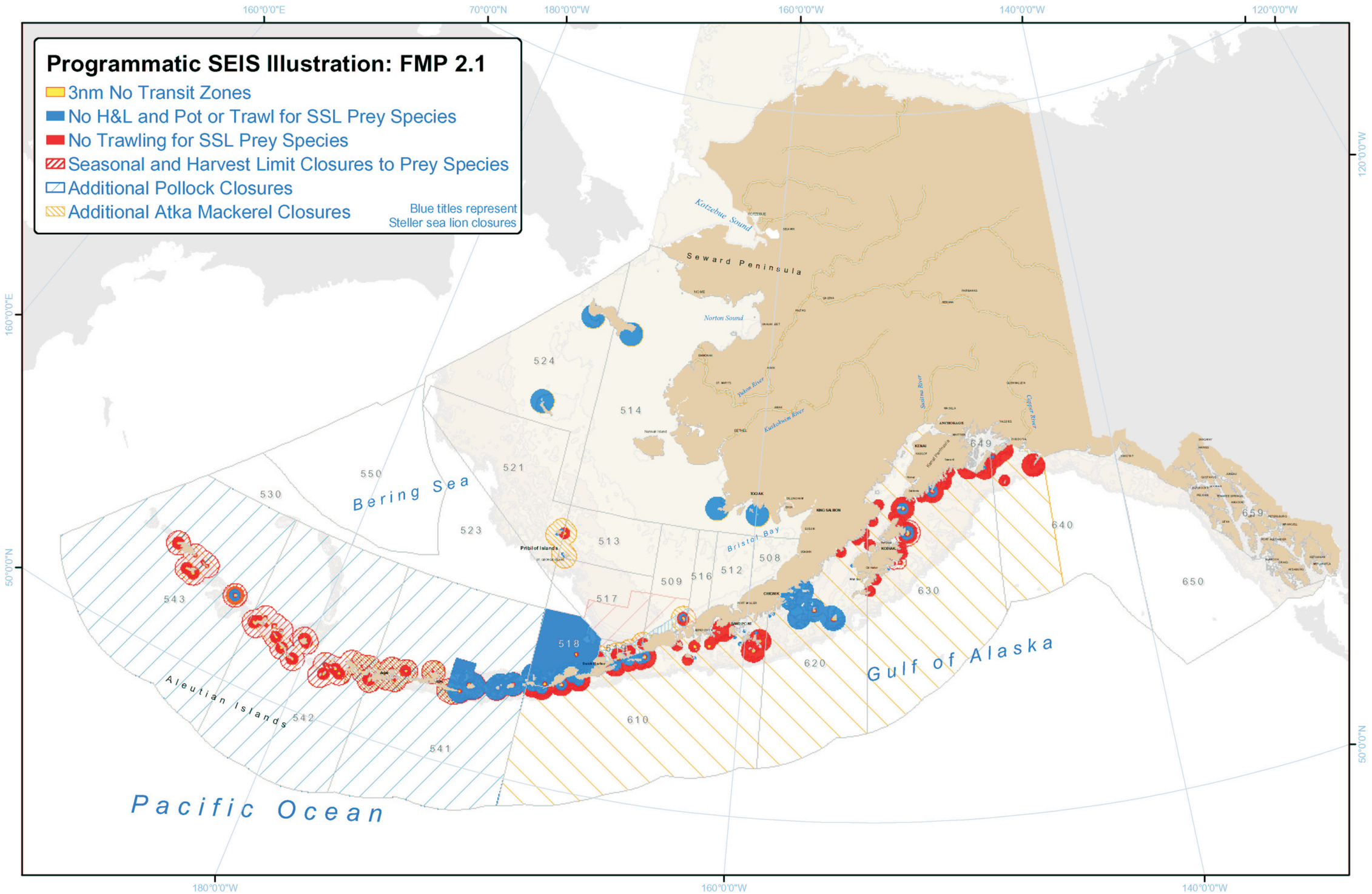

Figure 4.6-1. Areas closed to trawling only at various times of the year under Fishery Management Plan 2.1.

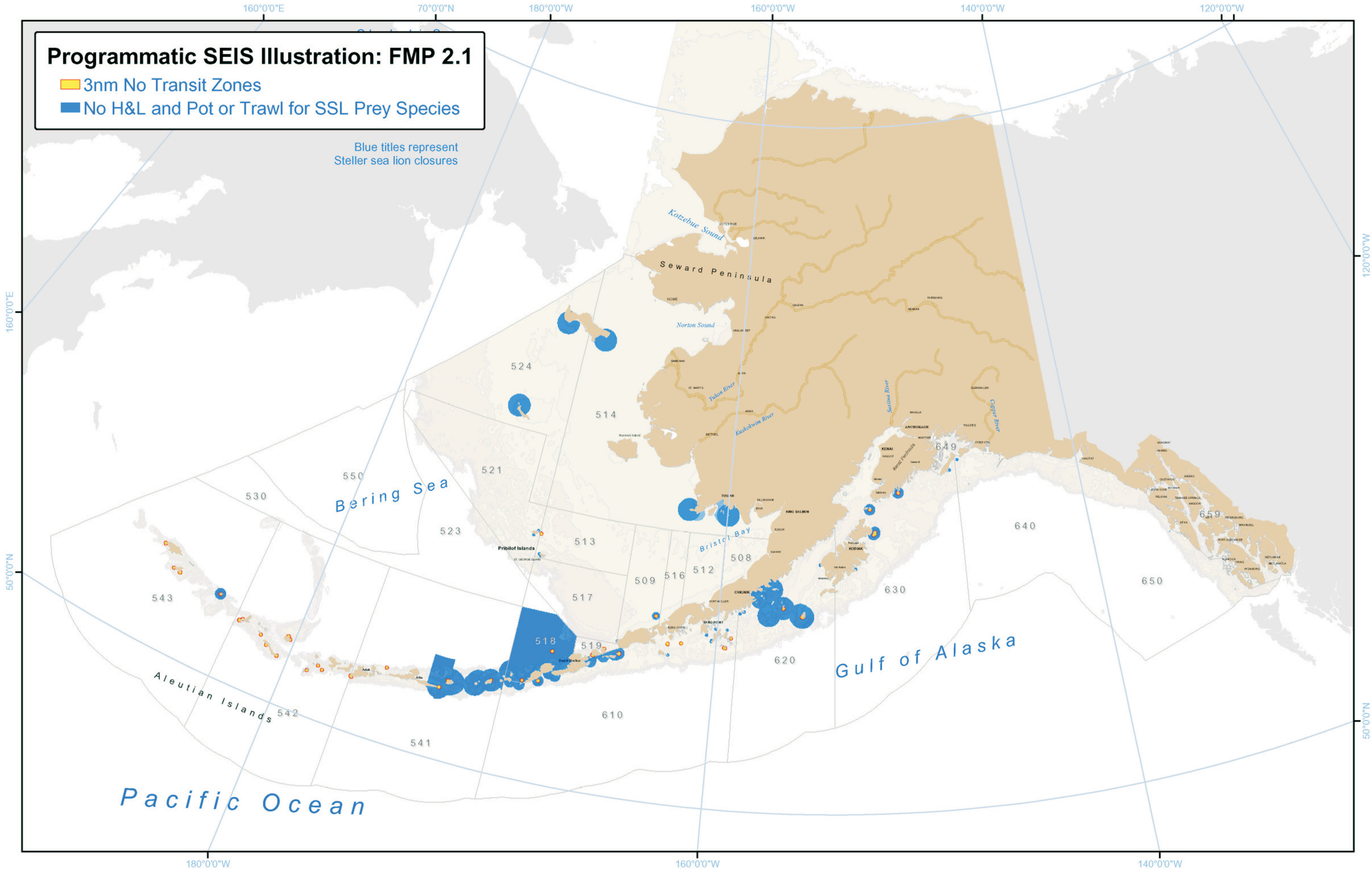

Figure 4.6-2. Areas closed to fixed gear only at various times of the year under Fishery Management Plan 2.1.

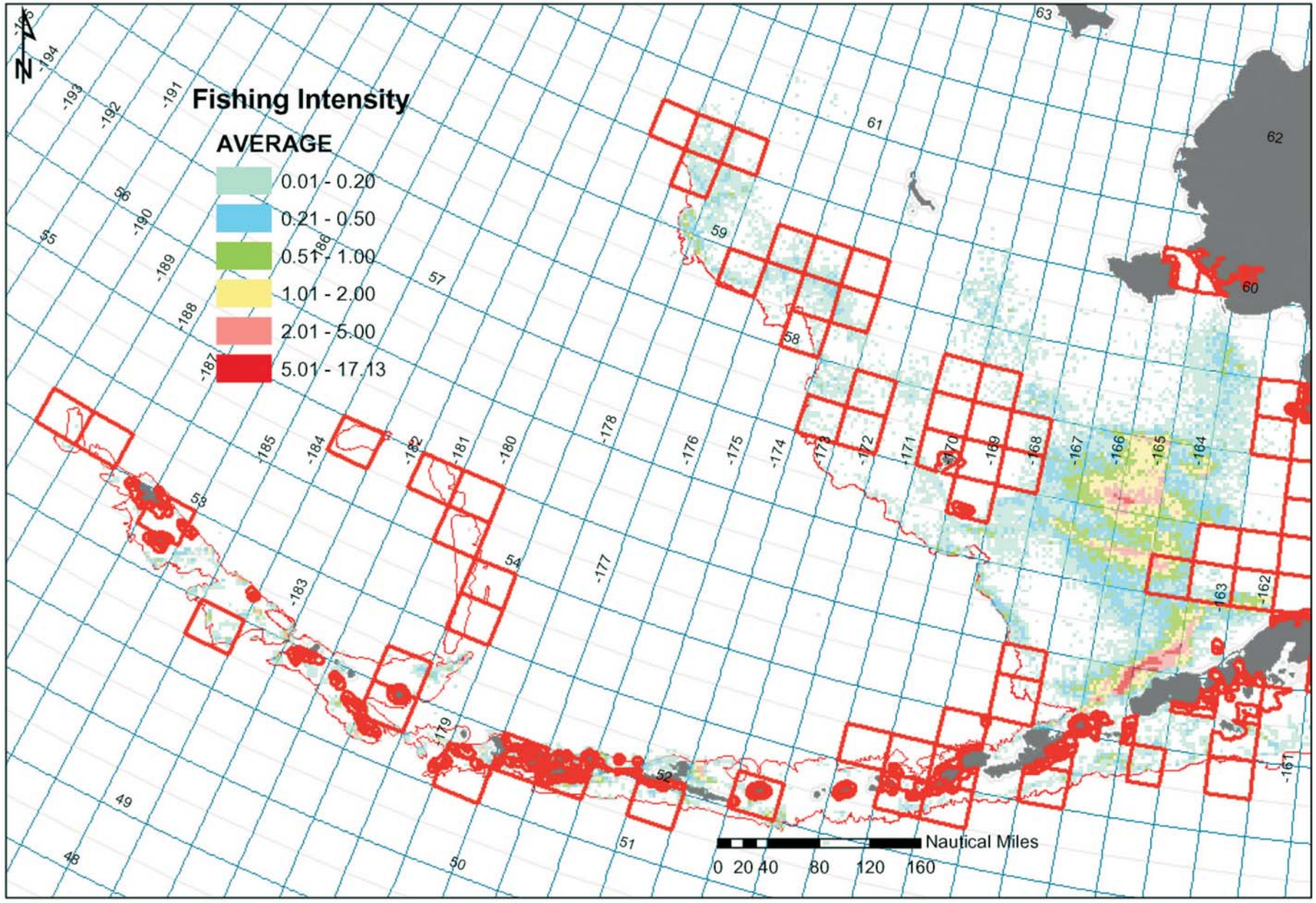

Figure 4.7-1. Bottom trawl fishing intensity and all species closures under FMP 3.2 in Bering Sea and Aleutian Islands.

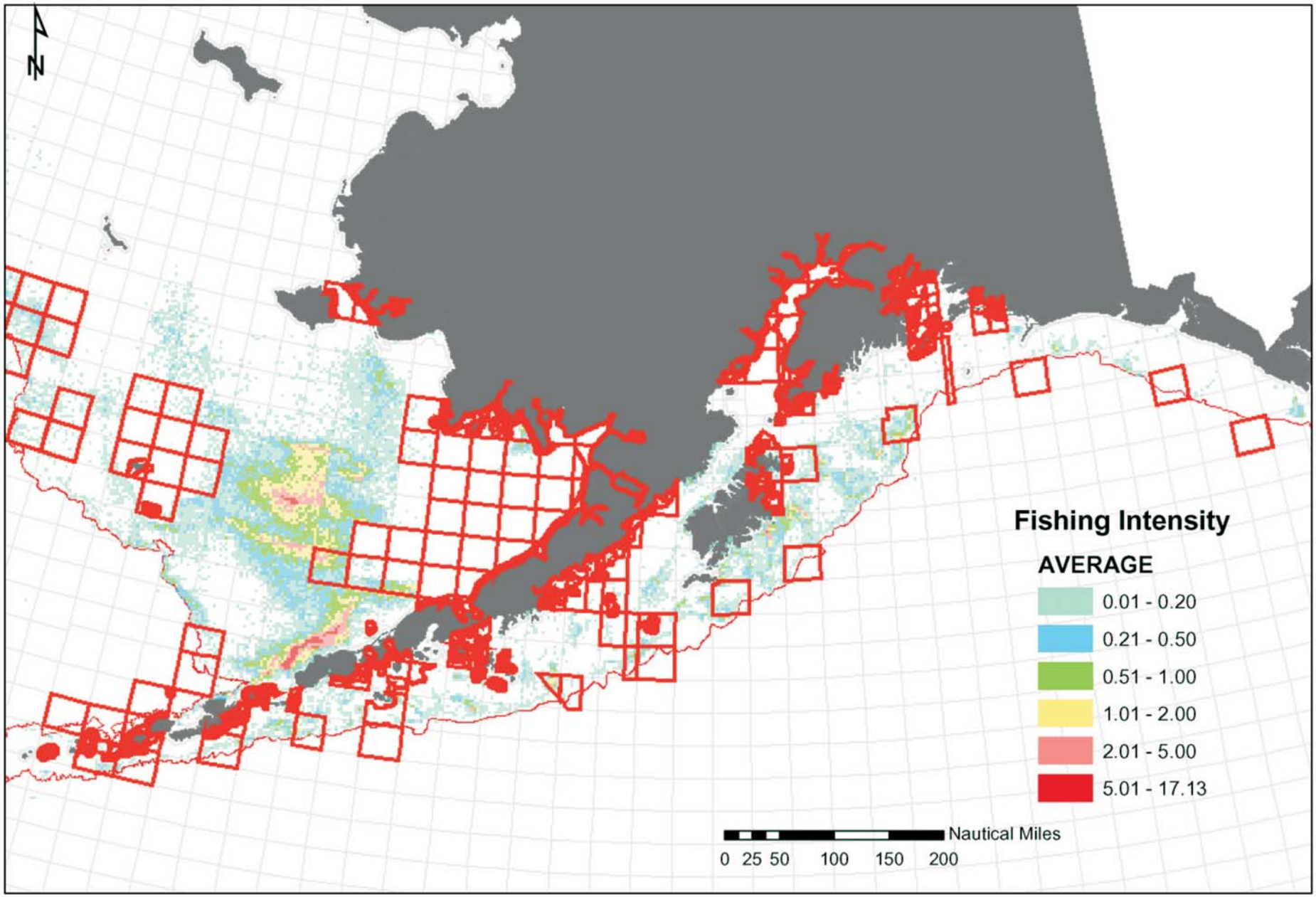

Figure 4.7-2. Bottom trawl fishing intensity and all species closures under FMP 3.2 in Gulf of Alaska and Bering Sea.

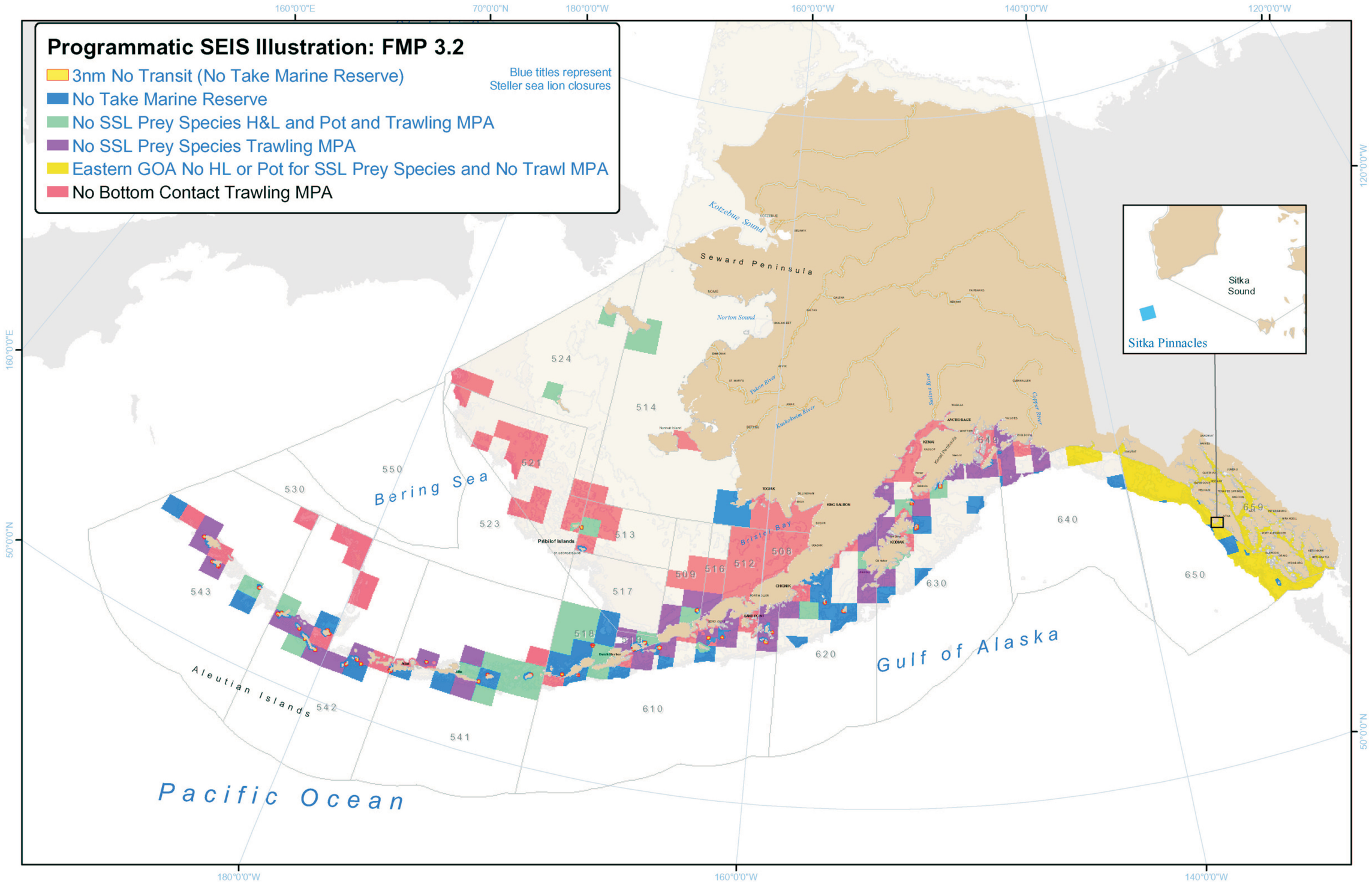

Figure 4.7-3. Areas closed to trawling only at various times of the year under Fishery Management Plan 3.2.

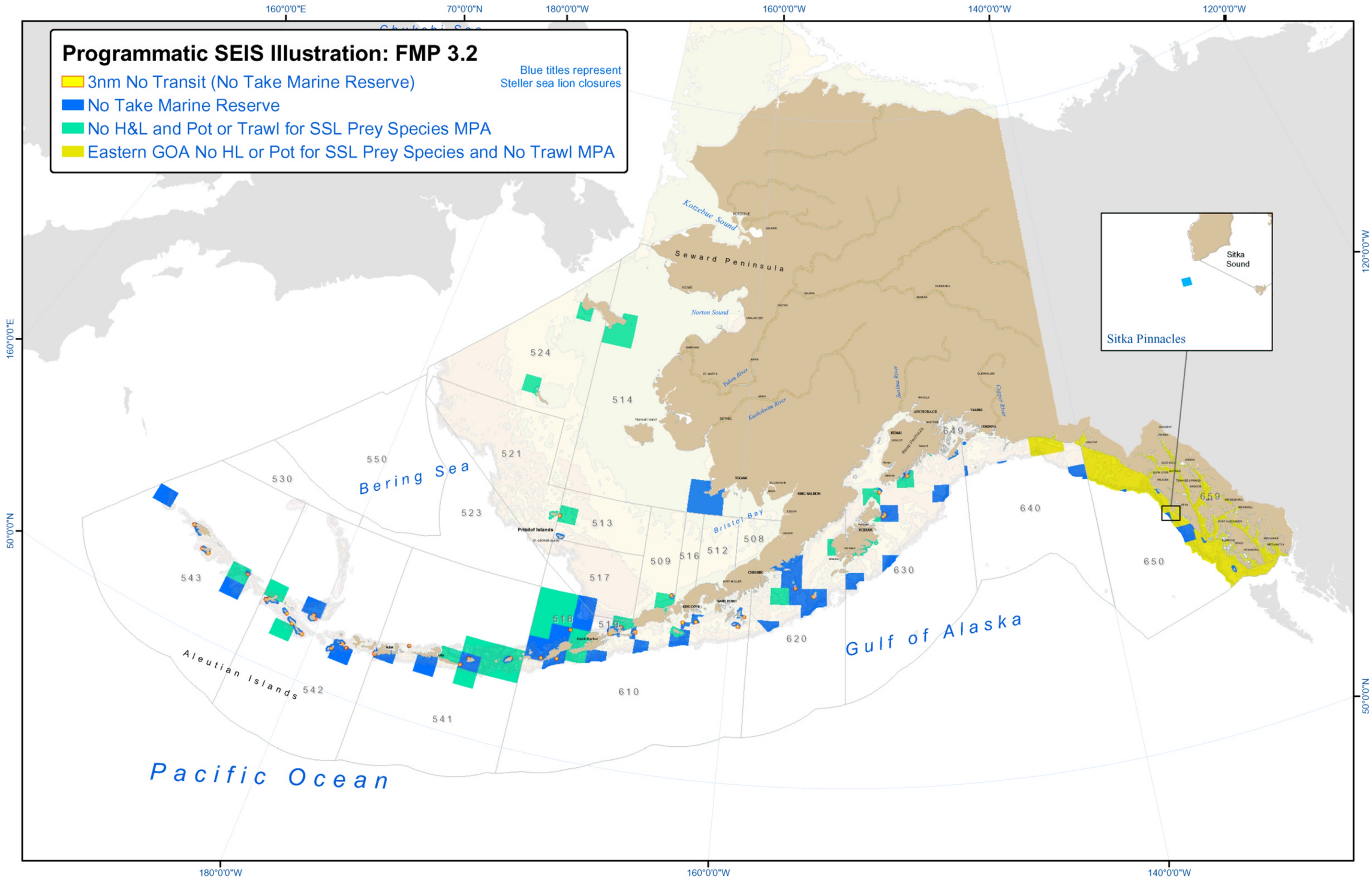

Figure 4.7-4. Areas closed to fixed gear only at various times of the year under Fishery Management Plan 3.2.

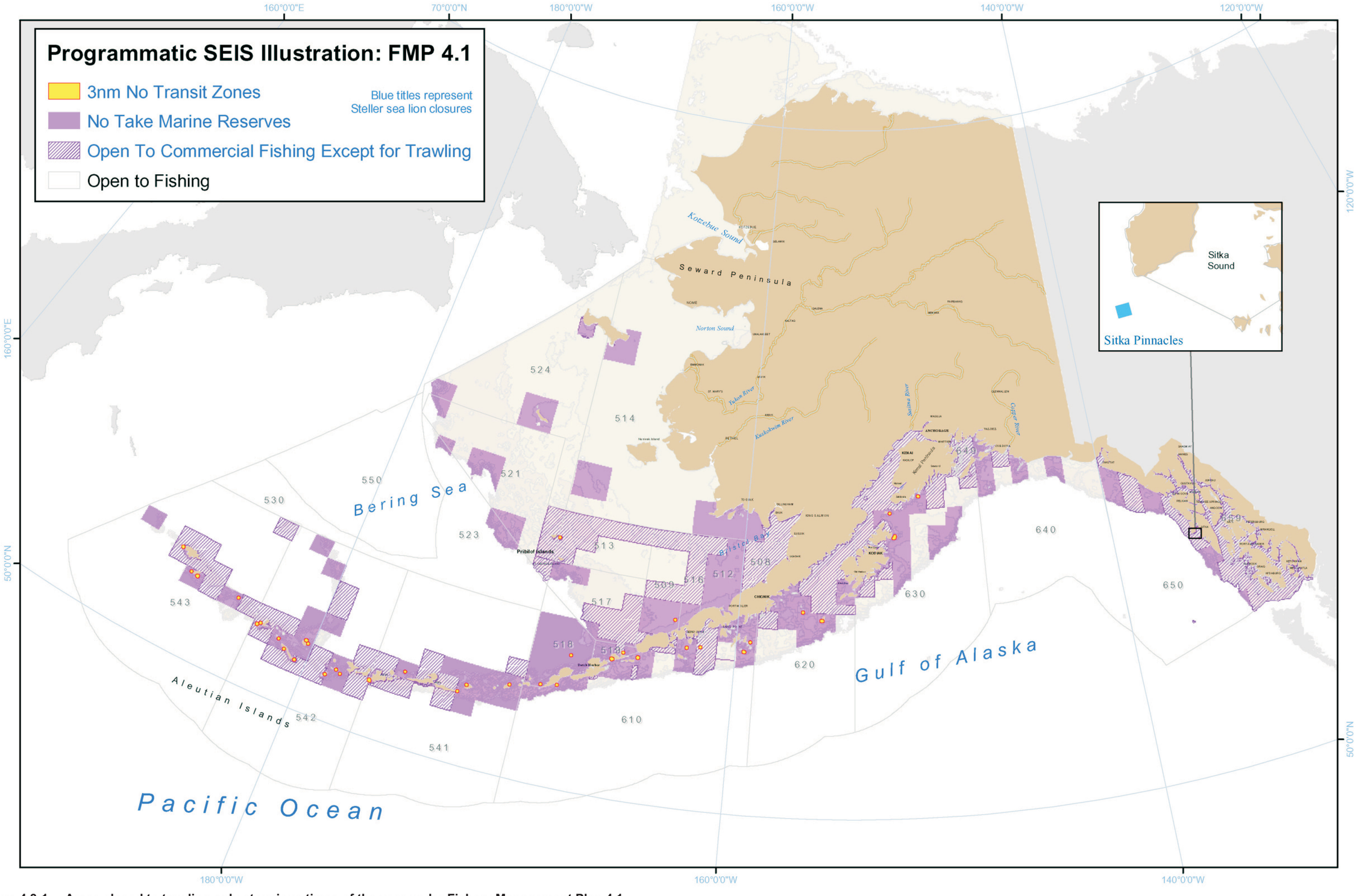

Figure 4.8-1. Areas closed to trawling only at various times of the year under Fishery Management Plan 4.1.

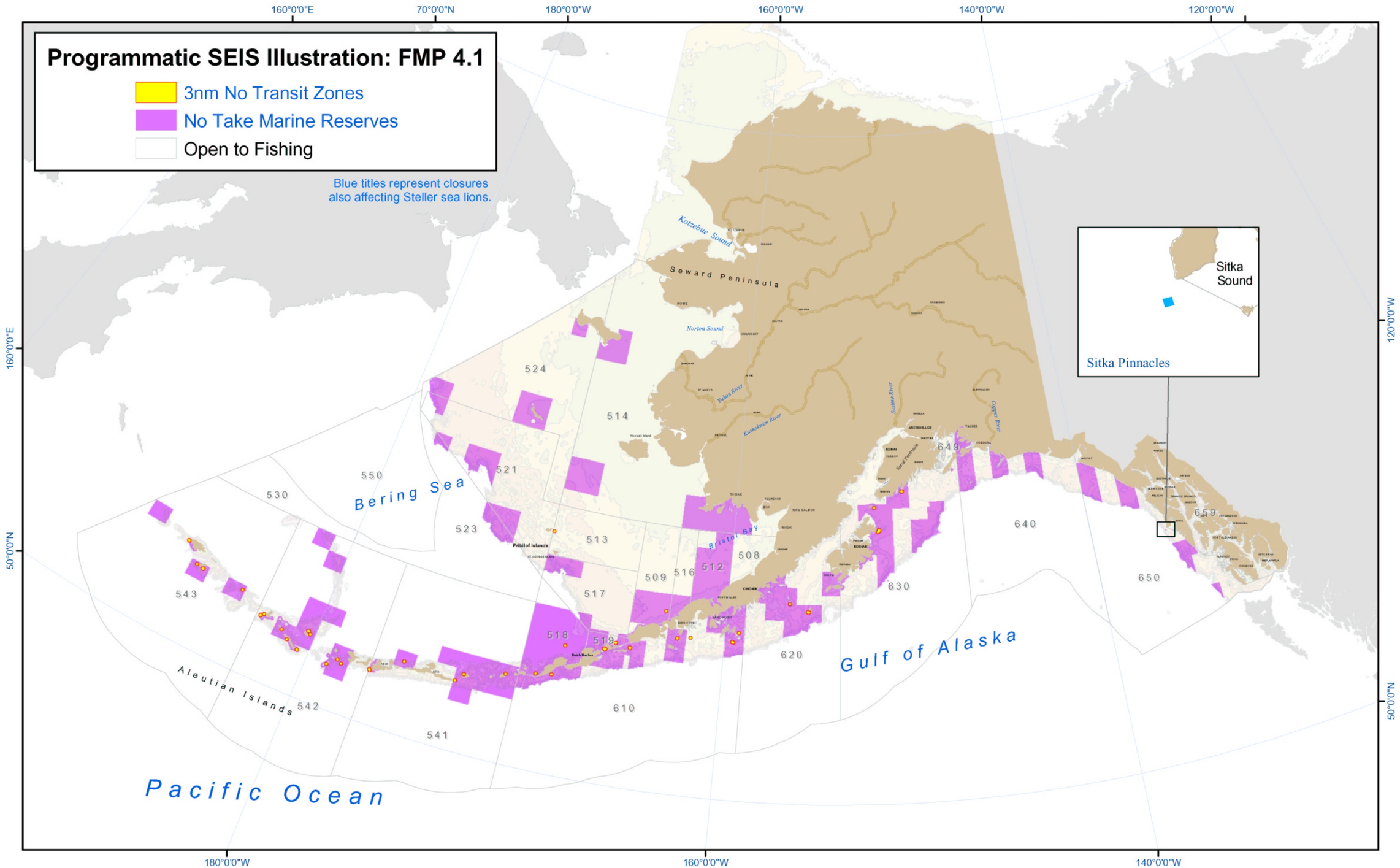

Figure 4.8-2. Areas closed to fixed gear only at various times of the year under Fishery Management Plan 4.1.

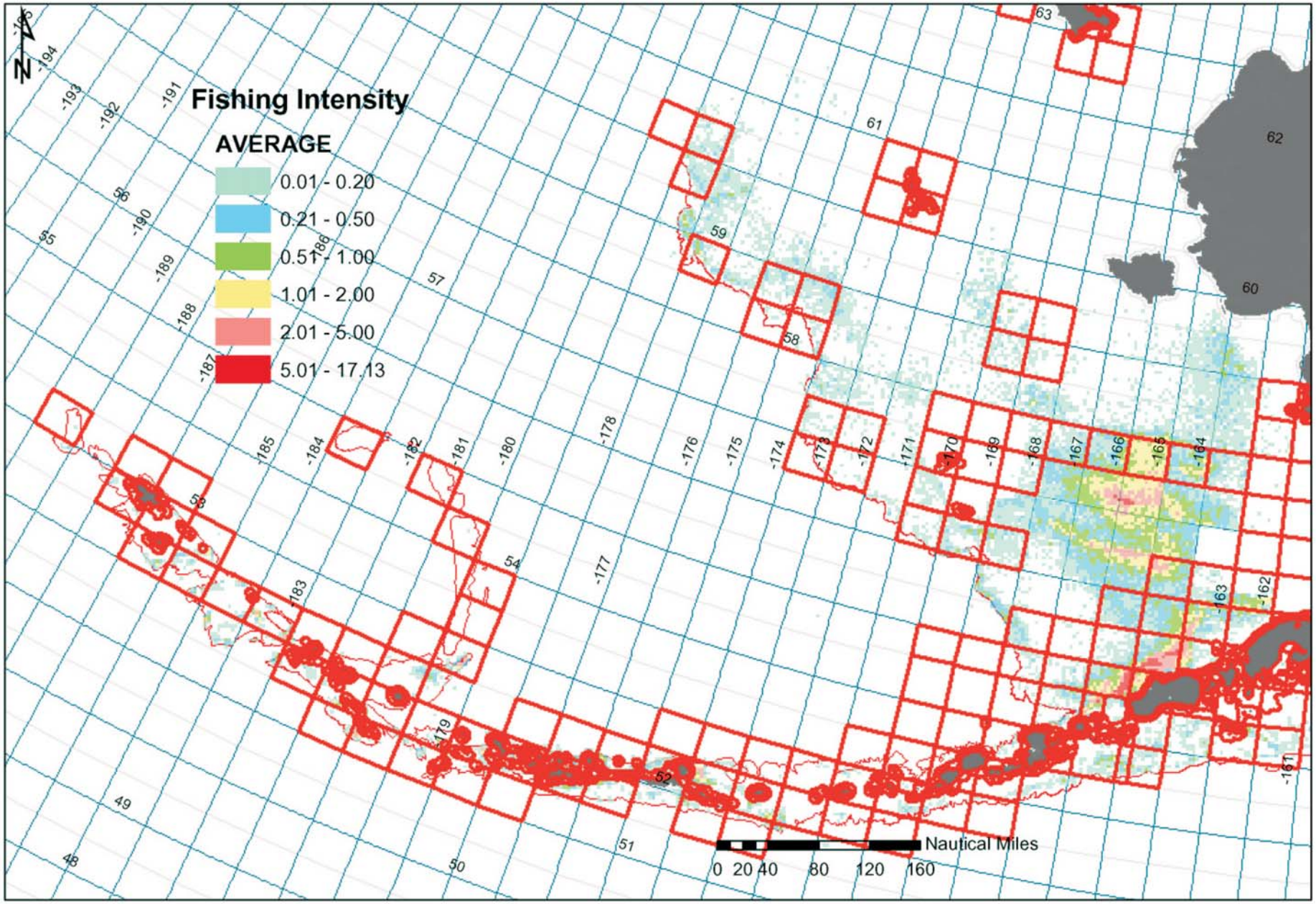

Figure 4.8-3. Bottom trawl fishing intensity and all species closures under FMP 4.1 in Bering Sea and Aleutian Islands.

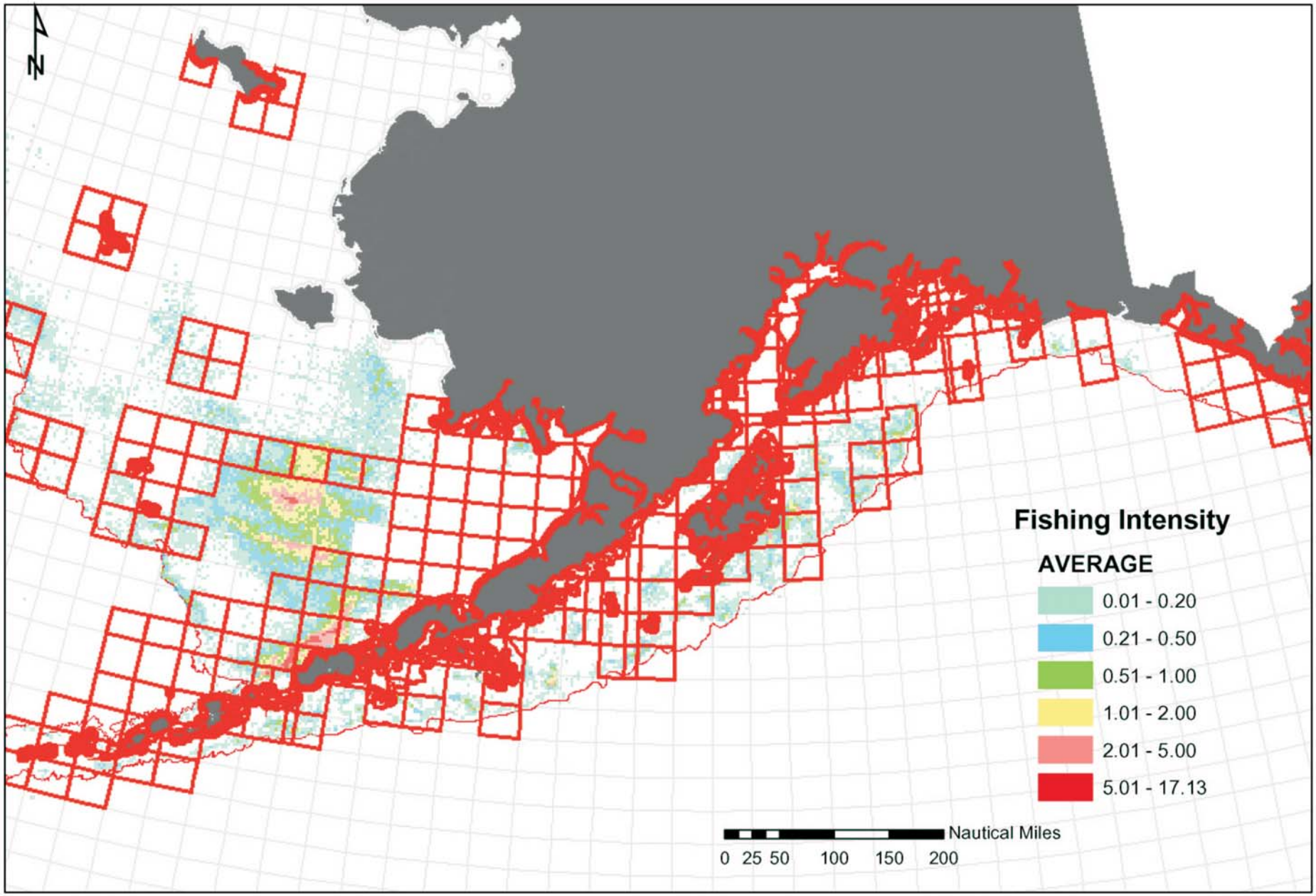

Figure 4.8-4. Bottom trawl fishing intensity and all species closures under FMP 4.1 in Gulf of Alaska and Bering Sea.