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Results of the Steller Sea Lion (*Eumetopias jubatus*) Surveys in Alaska, June–July 2023

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Results of the Steller Sea Lion Surveys in Alaska, June–July 2023

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ABSTRACT

The Alaska Fisheries Science Center's Marine Mammal Laboratory (MML) conducts annual crewed aircraft and vessel surveys to known terrestrial Steller sea lion (*Eumetopias jubatus*) rookery and haulout sites in Alaska to collect visual counts and high-resolution imagery. In 2023, MML survey teams collected counts from 82 sites in the Aleutian Islands, totaling 11,522 non-pups and 3,868 pups. We used agTrend (R package) to model all raw count data through 2023 to estimate modeled counts (as an index of abundance) and annual rates of change since 2008. Between 2008 and 2023, non-pups and pups in the western distinct population segment (DPS) of Alaska increased 1.09 and 0.64% y^{-1}, respectively; however, there was high variability among regions. The estimated model count for non-pups and pups for the population in 2023 was 39,051 and 12,539, respectively. Non-pups and pups in the western Aleutian Islands region declined significantly (-5.69 and -3.98% y^{-1}, respectively), along with pups in the neighboring central Aleutian Islands region (-1.97% y^{-1}). Non-pups in the central Aleutian Islands region were stable (-0.11% y^{-1}, confidence intervals -1.75-1.81% y^{-1}) over the last 15 years; however, model uncertainty was high in the eastern portion of this region due to low survey coverage in recent years (due to inclement weather, survey logistics, and mechanical issues). In the eastern Aleutian Islands region, non-pups and pups increased significantly (2.14 and 1.48% y^{-1}, respectively) between 2008 and 2023. For the Aleutian Islands regions combined, declines in the western and central Aleutian Islands regions were largely offset by the increasing eastern Aleutian Islands; non-pups increased 0.91% y^{-1} while pups were stable. It is evident that the status of the western Steller sea lion DPS in Alaska remains variable, and support for regular surveys of this challenging and large geographic area is critically important to the monitoring and recovery of this population.

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INTRODUCTION

National Marine Fisheries Service is charged with monitoring and managing the two distinct population segments (DPS) of the Steller sea lion (*Eumetopias jubatus*) under the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA) (Muto et al. 2020, 2021). The species ranges throughout the North Pacific Ocean and the western DPS in the United States extends west from Cape Suckling (144° W) through the western Aleutian Islands (172° E). The eastern DPS extends east of Cape Suckling (144° W) and south through California (117° W; United States).

In 1990, the Steller sea lion was listed as threatened under the ESA and in 1997, the western DPS listing status was elevated to endangered. After over 30 years of monitoring, the eastern DPS was determined to have recovered and was subsequently delisted under the ESA in 2013 (NMFS 2013).

The Marine Mammal Laboratory (MML) conducts an annual crewed aircraft survey and a vessel survey of Steller sea lions at known terrestrial rookery and haulout sites in Alaska (AFSC 2016) to collect visual counts and high-resolution aerial imagery to count Steller sea lions. Generally, MML alternates crewed aircraft surveys annually between the Gulf of Alaska (Southeast Alaska region and west through the western Gulf of Alaska region) and the Aleutian Islands (eastern to western Aleutian Islands regions). Challenges associated with operating a crewed aircraft in the western and central Aleutian Islands (e.g., inclement weather and remote airfields) led to the implementation of vessel surveys to collect ship-, skiff-, and land-based visual counts, and camera imagery to count sea lions using an uncrewed aircraft system (UAS) since 2014. There are several research priorities on the vessel trips and collecting counts is the highest priority during years when the crewed aircraft team is also surveying the Aleutian Islands. Due to the COVID-19 pandemic, MML canceled all surveys in 2020, and conducted only a crewed aircraft survey (no vessel survey) in 2021 in the Gulf of Alaska. In 2022, both crewed aircraft and vessel surveys resumed in the Aleutian Islands. Unfortunately, inclement weather and staffing issues impeded the crewed aircraft survey team and their coverage of the central and eastern Aleutian Islands was significantly reduced (Sweeney et al. 2023).

MML's objective in 2023 was to conduct a redundant survey in the Aleutian Islands. Many of the sites in this region (especially in the central Aleutian Islands region) had not been surveyed

since 2018 or earlier, while the Gulf of Alaska regions had been surveyed on schedule and with near-complete coverage in 2021 and in most survey years prior.

METHODS

MML conducts count surveys of Steller sea lions during the peak of the breeding season from late June through mid-July (typically 24 June – 11 July) when Steller sea lions aggregate onshore to pup and breed. Surveys begin about 10 days after the mean pup birth dates in the survey area (4–14 June) by which time approximately 95% of all pups are born (Pitcher et al. 2001; Kuhn et al. 2017b). Surveys are targeted to occur between 1000 and 1800 Alaska time when Steller sea lions are more likely to have returned from foraging. Non-pup counts do not account for Steller sea lions at sea during the survey. Pup counts are considered a census because pups tend to not leave the rookery until they are older than one month old; however, pup counts are not corrected for those that are born or die after the survey.

Steller Sea Lion Surveys and Raw Counts

The crewed aircraft survey team operated from a NOAA Twin Otter fixed-wing aircraft mounted with a vertically oriented camera mount (as used since 2009; see Fritz et al. 2016) to collect imagery from which to count sea lions, as well as visual counts (at sites with less than ten sea lions hauled out). The planned survey area extended from Amak Island (163° W) in the eastern Aleutian Islands region to Amlia Island (173° W) in rookery cluster areas (RCAs) 4 and 5 of the central Aleutian Islands region (Fig. 1).

The vessel survey team operated aboard the U.S. Fish and Wildlife Service Research Vessel (RV) *Tiĝlâx* conducting visual counts from land, ship, and small boats, and collecting UAS imagery from which to count sea lions. The survey area for this team extended from Attu Island (172° E) in the western Aleutian Islands region through the Delarof Islands (178° W) in RCAs 2 and 3 of the central Aleutian Islands region.

Two MML biologists independently processed and counted sea lions from imagery as in previous years (see Fritz et al. 2016).

AgTrend Modeled Steller Sea Lion Counts and Trends

Our method for modeling raw count data produces estimated counts and annual rates of change (i.e., trends) for regional and temporal aggregations, which National Marine Fisheries

Service uses for monitoring the Steller sea lion population. The agTrend model (R package; Johnson and Fritz 2014, Gaos et al. 2021) augments missing counts from raw data collected at all sites (must have at least two non-zero counts), rather than relying solely on counts at "trend" sites (see Fritz et al. 2013, 2016). The agTrend model uses the penalized spline model to reduce variance for years where missing data are interpolated. This model employs a logarithmic linear regression model to fit the data and is not informed by population dynamics or biological constraints, which means the estimates derived for the most recent year in the data series (i.e., 2023) could change with the addition of new information collected in subsequent survey years.

The agTrend model produces two types of count estimates: realized counts and predicted counts. Realized counts use the standardized variance of raw counts at each site throughout the time series to estimate survey counts we would expect to collect if we had surveyed all sites. Therefore, the more complete the survey, the more similar raw counts are to the realized counts, which is evident by smaller credible intervals. Predicted counts are smoothed and account for both observation and process errors, which we use to estimate annual rates of change.

Steller sea lion raw counts were summarized for the western DPS in Alaska, the Aleutian Islands (ALEU) regions combined, the western, central, and eastern ALEU regions, and the central ALEU region further delineated into RCAs 2 through 5. We did not provide an update for the Gulf of Alaska regions (including Southeast Alaska in the eastern DPS) because these areas were not surveyed in 2023. We used predicted count estimates to summarize total counts for regions and realized counts for temporal comparison to highlight fine-scale changes.

We modeled raw counts since 1978 for non-pups (NMFS 2015) and 1973 for pups (NMFS 2019). In order to be consistent with the Recovery Criteria identified in the Steller sea lion Recovery Plan (NMFS 2008), we reported trends over a 15-year period (2008–2023) and generated figures of modeled counts beginning in 2002, the year with the lowest non-pup and pup counts for the total western DPS. Count trends with two positive 95% CI values were considered to be a statistically significant increase, two negative values statistically significant decrease, and a negative and positive value were considered to be statistically stable.

RESULTS

Steller Sea Lion Surveys

In total, MML surveyed 78 sites in 2023. The crewed aircraft team conducted surveys between 24 June and 13 July 2023 and surveyed 57 sites in the eastern ALEU (missing 11 lower

priority sites; Table 1 and Fig. 1). Visual counts were conducted at 22 sites and camera imagery was captured at 35 sites. The team was unable to survey any of the 51 sites in RCAs 4 or 5 in the central ALEU. The crewed aircraft team missed sites because of inclement weather, survey logistics, and aircraft mechanical issues.

The RV *Tiĝlâx* crew conducted surveys between 23 June and 6 July 2023 and surveyed 21 sites: six sites in the western ALEU (9 sites not surveyed) and 15 in RCAs 2 and 3 in the central ALEU (36 sites not surveyed; Table 1). Observers conducted visual counts at nine sites and UAS surveys at 12 sites. The vessel-based team missed sites due to time constraints, inclement weather, and survey logistics.

The crewed aircraft survey team discovered two 'new' (to MML) sites in the eastern ALEU region at Tigalda/Kelp Bay (54.13°N, 165.13°W) and Unalaska/Koriga Point (53.94°N, 167.03°W). The latter could not be surveyed because of low fog and the team visually estimated approximately 40 Steller sea lions on 9 July (estimated count not included in analysis). In this region, the survey team also noted an additional location within the Ugamak rookery historical extent that we named Ugamak/East (54.22°N, 164.76°W). We added these locations to the Steller sea lion site list to include in future surveys.

Steller Sea Lion Raw Counts

Non-Pups

We counted 11,522 live non-pups on 61 sites that had at least one non-pup present (Table 1). Raw non-pup counts totaled 368 in the western ALEU, 785 in the central ALEU, and 10,369 in the eastern ALEU.

Several sites were surveyed in 2022 (Sweeney et al. 2023) and 2023 allowing for interannual raw count comparisons. Among western ALEU sites surveyed in both years, we observed a decrease of 28 non-pups (36%) at haulout sites and an increase of 52 non-pups (18%) at rookery sites, for a 7% net increase. In the central ALEU, haulout sites' counts were similar between years while rookery sites decreased by 218 non-pups (33%) in RCAs 2 and 3. In the eastern ALEU, we observed an increase of 988 non-pups (32%) across six major haulout sites (Akutan/Reef-Lava, Amak+Rocks, Unalaska/Makushin Bay, Unalaska/Priest Rock, Unimak/Cape Sarichef, and Unimak/Oksenof Point) and an increase across five rookery sites totaling 428 non-pups (15%; Adugak, Akun/Billingshead, Bogoslof/Fire Island, Ogchul, and Sea Lion Rock [Amak]). Unalaska/Cape Izigan rookery was also surveyed both years and counts were relatively similar.

Pups

We counted 3,868 live pups at 26 sites that had at least one pup present (Table 1). We counted 126 pups in the western ALEU, 376 pups in the central ALEU, and 3,366 pups in the eastern ALEU.

Comparing pup counts between the 2022 (Sweeney et al. 2023) and 2023 surveys, we observed a decrease of 14 pups (11%) among the three rookery sites in the western ALEU (Agattu/Cape Sabak, Agattu/Gillon Point, and Attu/Cape Wrangell). In RCAs 2 and 3 in the central ALEU, we observed an increase of 25 pups (7%) among six rookery sites (Amchitka/Column Rock, Kiska/Cape St. Stephen, Kiska/Lief Cove, Gramp Rock, Ulak/Hasgox Point, and Tag). At the same five major rookeries in the eastern ALEU where we observed a 15% increase in non-pups, we observed an increase of 150 pups (11%).

AgTrend Modeled Steller Sea Lion Counts and Trends

Non-Pups

Steller sea lion non-pups in the western DPS increased 1.09% y^{-1} (95% credible interval [CI] 0.46–1.74% y^{-1}) between 2008 and 2023, and the predicted count estimate for 2023 was 39,051 (95% CI 35,955–42,340; Table 2, Fig. 2, and APPENDIX Table 1).

In the western ALEU, Steller sea lions significantly declined from 2008 to 2023 (-5.69% y^{-1}, 95% CI -7.98– -3.47% y^{-1}) and there was an estimated 418 (95% CI 290–552) non-pups in 2023 (Table 2, Fig. 3, and APPENDIX Table 2). There was an estimated count of 6,777 (95% CI 5,328–8,586) non-pups in the central ALEU region and the count trend was stable (-0.11% y^{-1}). Within this region, RCAs 2 and 3 significantly declined (-2.56 and -3.20% y^{-1}, respectively) while RCAs 4 and 5 were stable (-0.21 and 2.44% y^{-1}, respectively; Fig. 4). However, RCAs 4 and 5 continued to be a challenge to survey resulting in wider credible intervals, and therefore, higher uncertainty in predicted counts compared to RCAs 2 and 3. The eastern ALEU non-pups increased 2.14% y^{-1} and there was an estimated non-pup count of 10,420 (95% CI 8,997–11,961; Table 2, Fig. 3, and APPENDIX Table 2). Non-pups in the combined Aleutian Islands regions did statistically significantly increase by 0.91% y^{-1}, though appear to be trending towards statistically stable (95% CI 0.03–1.98% y^{-1}; Fig. 5). Among all regions, the non-pup (realized) counts were all lower in 2022 than in 2023 (APPENDIX Table 2).

Pups

Steller sea lion pups in the western DPS increased 0.64% y^{-1} (95% CI 0.20–1.08% y^{-1}) between 2008 and 2023, and the predicted count estimated for 2023 was 12,539 (95% CI 11,865–13,233; Table 2, Fig. 6, and APPENDIX Table 1).

Pups in the western ALEU region significantly declined from 2008 to 2023 (-3.98% y^{-1}, 95% CI -4.94– -3.00% y^{-1}) and there was an estimated count of 133 (95% CI 115–152) pups in 2023 (Table 2, Fig. 7, and APPENDIX Table 2). The central ALEU had an estimated 2,087 (95% CI 1,846–2,359) pups, and the region RCAs 2 and 3 (-4.44 and -5.31% y^{-1}, respectively; Fig. 8). Only RCA 5 was stable, though credible intervals were wide due to a lack of recent count data for this RCA. In the eastern ALEU region, pups increased 1.48% y^{-1} between 2008 and 2023 and in 2023 there was an estimated pup count of 3,346 (95% CI 3,095–3,594; Table 2, Fig. 7 and APPENDIX Table 2). Pups in the combined Aleutian Islands region were stable (-0.23% y^{-1}; 95% CI -0.78–0.30% y^{-1}; Fig. 9). Pup realized counts reflected regional trends from 2022 to 2023 (APPENDIX Table 2).

DISCUSSION

MML's objective for the 2023 Steller sea lion count surveys was to conduct a redundant survey of the Aleutian Islands regions after a relatively incomplete survey in 2022 (Sweeney et al. 2023). The MML survey teams were able to survey a majority of the major haulout and rookery sites in the western ALEU, RCAs 2 and 3 in the central ALEU, and the eastern ALEU regions. Sites in RCAs 4 and 5 were not surveyed. Using the latest survey data, we reported 4.2% (change in realized counts) more Steller sea lions than in 2022 and a significant increase for the total western DPS from 2008 to 2023. It is important to note that, while the overall population trend was positive, indices of abundance (i.e., modeled count estimates) and trends were highly variable across regions.

As we have reported in previous years (e.g., Sweeney et al. 2023), non-pups and pups in the western ALEU region significantly declined over the last 15 years. We also continued to observe variability in trends among the RCAs in the central ALEU region and high uncertainty in estimated counts for RCAs 4 and 5 because of a lack of recent data. The central ALEU region is especially challenging to survey due to inclement weather (e.g., persistent low fog) and aircraft safety requirements for alternate, neighboring airfields to be forecasted to remain clear. This area remains a priority for future MML surveys.

More complete survey coverage in the eastern ALEU in 2023 indicated that this region increased between 2008 and 2023, reaching its highest modeled non-pup and pup counts since 1985 and 1988, respectively. In contrast, after the 2022 survey, non-pup and pup counts trends were reported as stable with high uncertainty because 43% of sites were missed (Sweeney et al. 2023). The high uncertainty and change in trend contributed to MML's decision to conduct a redundant survey in this area, as this is the only region in the western DPS (in Alaska) that has continued to consistently increase, and largely impacts the trend of this population as it accounts for nearly 60% of the combined Aleutian Island non-pup count, and 27% of the western DPS. MML was also interested in a redundant survey as much of this area had not been surveyed since 2018, or earlier, while the Gulf of Alaska had consistent and near complete recent surveys in 2019 and 2021.

Similar to 2022 (Sweeney et al. 2023), we observed anomalously high non-pup counts at Unimak/Cape Sarichef and Unimak/Oksenof Point, as well as several other major haulout sites around the easternmost part of the eastern ALEU region (i.e., northern sites from Unalaska Island to Amak Island). Within the 10-year period prior to these anomalously high counts, Cape Sarichef had an average count of 39 non-pups (n = 5, range: 0-167), and in 2018, 2022, and 2023, we observed 565, 440, and 856 non-pups, respectively (Sweeney et al. 2018). Oksenof Point had an average non-pup count of 393 sea lions (n = 4, range: 188-594), and in 2022 and 2023, we observed 848 and 999 non-pups, respectively. While counts often fluctuate temporally at haulout sites—they are attended by mostly juveniles and sub-adult males with lower site fidelity during the breeding season (Fritz et al. 2013)—this large fluctuation could indicate that this area was of some particular importance (e.g., better prey availability) to Steller sea lions. Additionally, we observed a 30% increase in non-pup realized counts at eastern ALEU haulout sites between 2022 (Sweeney et al. 2023) and 2023, while rookery sites increased 13%. This could indicate high juvenile recruitment (given the steady increase in pups in this region) and potentially movement of non-breeding animals from other areas.

We observed higher than average counts of non-pups and pups at Aiktak, a haulout site near Ugamak rookery (Sweeney et al. 2016, 2018). MML's cutoff for designating a site as a rookery is >50 pups historically and though we observed 56 pups at this site in 2023, it seems more likely that mother and pup pairs moved to Aiktak from Ugamak (distance at least 2 miles). Movement of mother and pup pairs occurs during the pupping and breeding seasons (< 5% in June and >10% by the end of the survey window; Kuhn et al. 2017a). Earlier movement of mother and pup pairs could

indicate that there was an earlier pupping window in 2023 given pups do not typically start to swim until they are two to four weeks old, and do not typically swim longer distances until one or two months old (Pitcher et al 2001, Kuhn et al. 2017a). MML will monitor this site in order to discern whether this is a result of post-parturition movement or a true increase in pups born at Aiktak and therefore the site should be categorized as a rookery.

National Marine Fisheries Service first reported trends and counts of Steller sea lions in Alaska in the mid-1950s, with initial declines observed in the 1970s and continuing into the 1980s (Braham et al. 1980, Merrick et al. 1987, and Byrd 1989). The lowest non-pup count for the western DPS was in 2002, after which population trends began to diverge west (decreasing) and east (increasing) of Samalga Pass. The 2023 Steller sea lion surveys found little to no sign of population recovery in the western and central ALEU (i.e., west of Samalga Pass) while the eastern ALEU region continued to increase. Given the persistence of these trends (Sweeney et al. 2016-2019, 2022) and the greater frequency and magnitude of marine heatwaves in the North Pacific Ocean (Litzow et al. 2020, Suryan et al. 2021), surveying the Aleutian Islands continues to be vital for monitoring the endangered western DPS in Alaska.

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TABLES and FIGURES

Table 1. -- Raw counts of live Steller sea lion non-pups and pups from sites surveyed in the western (W), central (C), and eastern (E) Aleutian Islands (ALEU) regions in 2023. The C ALEU region is further broken down into rookery cluster areas (RCA) 2-5. ROOK indicates whether the site was a rookery (≥ 50 pups historically; 1) or haulout (0) site. SURVEY indicates whether the data were a Twin Otter visual (TO-V) or image (TO-I) count, RV *Tiĝlâx* visual (RV-V), or UAS image (RV-I) count. Asterisks (*) denote new sites.

SITE	REGION	RCA	ROOK	NON-PUP	PUP	SURVEY
AGATTU/CAPE SABAK	W ALEU		1	80	19	RV-I
AGATTU/GILLON POINT	W ALEU		1	107	77	RV-I
ALAID	W ALEU		0	40	2	RV-I
ATTU/CAPE WRANGELL	W ALEU		1	103	28	RV-I
ATTU/CHICHAGOF POINT	W ALEU		0	16	0	RV-I
ATTU/CHIRIKOF POINT	W ALEU		0	22	0	RV-V
AMCHITKA/COLUMN ROCK	C ALEU	2	1	40	24	RV-I
AMCHITKA/EAST CAPE	C ALEU	2	0	76	23	RV-I
AMCHITKA/ST. MAKARIUS	C ALEU	2	0	0	0	RV-V
HAWADAX (RAT)	C ALEU	2	0	10		RV-V
KISKA/CAPE ST STEPHEN	C ALEU	2	1	100	52	RV-I
KISKA/LIEF COVE	C ALEU	2	1	35	14	RV-I
KISKA/SOBAKA-VEGA	C ALEU	2	0	17	0	RV-V
AMATIGNAK/KNOB POINT	C ALEU	3	0	0		RV-V
AMATIGNAK/NITROF POINT	C ALEU	3	0	0		RV-V
BOBROF	C ALEU	3	0	0		RV-V
GRAMP ROCK	C ALEU	3	1	206	119	RV-I
TAG	C ALEU	3	1	122	62	RV-I
TANAGA/CAPE SASMIK	C ALEU	3	0	23	1	RV-V
UGIDAK	C ALEU	3	0	7		RV-V
ULAK/HASGOX POINT	C ALEU	3	1	149	81	RV-I
ADUGAK	E ALEU		1	680	360	TO-I
AKUN/AKUN BAY	E ALEU		0	0		TO-V
AKUN/AKUN HEAD	E ALEU		0	4		TO-V
AKUN/BILLINGS HEAD	E ALEU		1	885	210	TO-I
AKUN/JACKASS POINT	E ALEU		0	0		TO-V
AKUTAN/BATTERY POINT	E ALEU		0	0		TO-V
AKUTAN/CAPE MORGAN	E ALEU		1	1316	794	TO-I
AKUTAN/NORTH HEAD	E ALEU		0	0		TO-V
AKUTAN/REEF-LAVA	E ALEU		0	204	16	TO-I

SITE	REGION	RCA	ROOK	NON-PUP	PUP	SURVEY
AMAK+ROCKS	E ALEU		0	776	6	TO-I
AVATANAK/NE	E ALEU		0	5		TO-V
AVATANAK/S	E ALEU		0	0		TO-V
AVATANAK/SE	E ALEU		0	11	0	TO-I
BABY	E ALEU		0	0		TO-V
BASALT ROCK	E ALEU		0	0		TO-V
BOGOSLOF/FIRE ISLAND	E ALEU		1	392	319	TO-I
EGG	E ALEU		0	26	0	TO-I
EGG/SE TIP	E ALEU		0	7		TO-V
EGG/WEST	E ALEU		0	0		TO-V
EMERALD	E ALEU		0	0		TO-V
INNER SIGNAL	E ALEU		0	120	0	TO-I
OGCHUL	E ALEU		1	200	89	TO-I
OLD MAN ROCKS	E ALEU		0	18	0	TO-I
OUTER SIGNAL	E ALEU		0	3		TO-V
POLIVNOI ROCK	E ALEU		0	144	0	TO-I
ROOTOK/EAST	E ALEU		0	2		TO-V
ROOTOK/NORTH	E ALEU		0	90	2	TO-I
SEA LION ROCK (AMAK)	E ALEU		1	754	368	TO-I
TANGINAK	E ALEU		0	36	0	TO-I
THE PILLARS	E ALEU		0	27	0	TO-I
UMNAK/CAPE IDAK	E ALEU		0	1		TO-V
UNALASKA/BISHOP POINT	E ALEU		0	196	0	TO-I
UNALASKA/BRUNDAGE HEAD	E ALEU		0	0		TO-V
UNALASKA/CAPE IZIGAN	E ALEU		1	237	62	TO-I
UNALASKA/CAPE SEDANKA	E ALEU		0	0		TO-V
UNALASKA/CAPE STARICHKOF	E ALEU		0	0		TO-V
UNALASKA/CAPE WISLOW	E ALEU		0	0		TO-V
UNALASKA/KOVRIZHKA	E ALEU		0	0		TO-V
UNALASKA/MAKUSHIN BAY	E ALEU		0	139	0	TO-I
UNALASKA/POINT KADIN	E ALEU		0	16	0	TO-I
UNALASKA/PRIEST ROCK	E ALEU		0	111	0	TO-I
UNALASKA/SPRAY CAPE	E ALEU		0	72	0	TO-I
UNALASKA/WHALEBONE CAPE	E ALEU		0	60	0	TO-I
UNIMAK/CAPE SARICHEF	E ALEU		0	846	0	TO-V
UNIMAK/CAVE POINT	E ALEU		0	21	0	TO-I
UNIMAK/OKSENOF POINT	E ALEU		0	999	0	TO-I
VSEVIDOF	E ALEU		0	93	0	TO-I
AIKTAK	E ALEU		0	84	56	TO-I

SITE	REGION	RCA	ROOK	NON-PUP	PUP	SURVEY
KALIGAGAN	E ALEU		0	0		TO-V
TIGALDA/KELP BAY*	E ALEU		0	53	0	TO-I
TIGALDA/ROCKS NE	E ALEU		0	250	0	TO-I
TIGALDA/SOUTH SIDE	E ALEU		0	48	0	TO-I
UGAMAK/EAST*	E ALEU		1	28	0	TO-I
UGAMAK/NORTH	E ALEU		1	726	635	TO-I
UGAMAK/ROUND	E ALEU		1	270	171	TO-I
UGAMAK/SW	E ALEU		1	11	0	TO-I
UGAMAK/UGAMAK BAY	E ALEU		1	408	278	TO-I

Table 2. -- Annual rates of change (% y^{-1} with ±95% credible intervals [CI]) of counts of Steller sea lion non-pups and pups modeled with agTrend. We modeled the total western DPS in Alaska and spatial areas therein for the 15-year period, 2008–2023: Aleutian Islands (ALEU) regions combined; western (W), central (C), and eastern (E) ALEU regions; and rookery cluster areas (RCA) 2–5 within the C ALEU region.

	NON-PUP			PUP		
AREA/REGION	**RATE**	**-95% CI**	**+95% CI**	**RATE**	**-95% CI**	**+95% CI**
Aleutian Islands	0.91	0.03	1.98	-0.23	-0.78	0.30
W ALEU	-5.69	-7.98	-3.47	-3.98	-4.94	-3.00
C ALEU	-0.11	-1.75	1.81	-1.97	-2.88	-1.04
RCA 2	-2.56	-4.78	0.08	-4.44	-6.24	-2.77
RCA 3	-3.20	-4.71	-1.65	-5.31	-5.97	-4.64
RCA 4	-0.21	-2.44	2.26	-2.21	-3.94	-0.49
RCA 5	2.44	-0.96	6.70	1.29	-0.73	3.30
E ALEU	2.14	1.00	3.28	1.48	0.78	2.17
Western DPS (Alaska)	1.09	0.46	1.74	0.64	0.20	1.08

Figure 1. -- Steller sea lion terrestrial haulout and rookery sites surveyed in June–July 2023. Steller sea lion management regions and areas are shown: eastern, central, and western Aleutian Islands and Gulf of Alaska regions; rookery cluster areas 2–5 within the central Aleutian Islands region; and the boundary between the eastern and western distinct population segment.

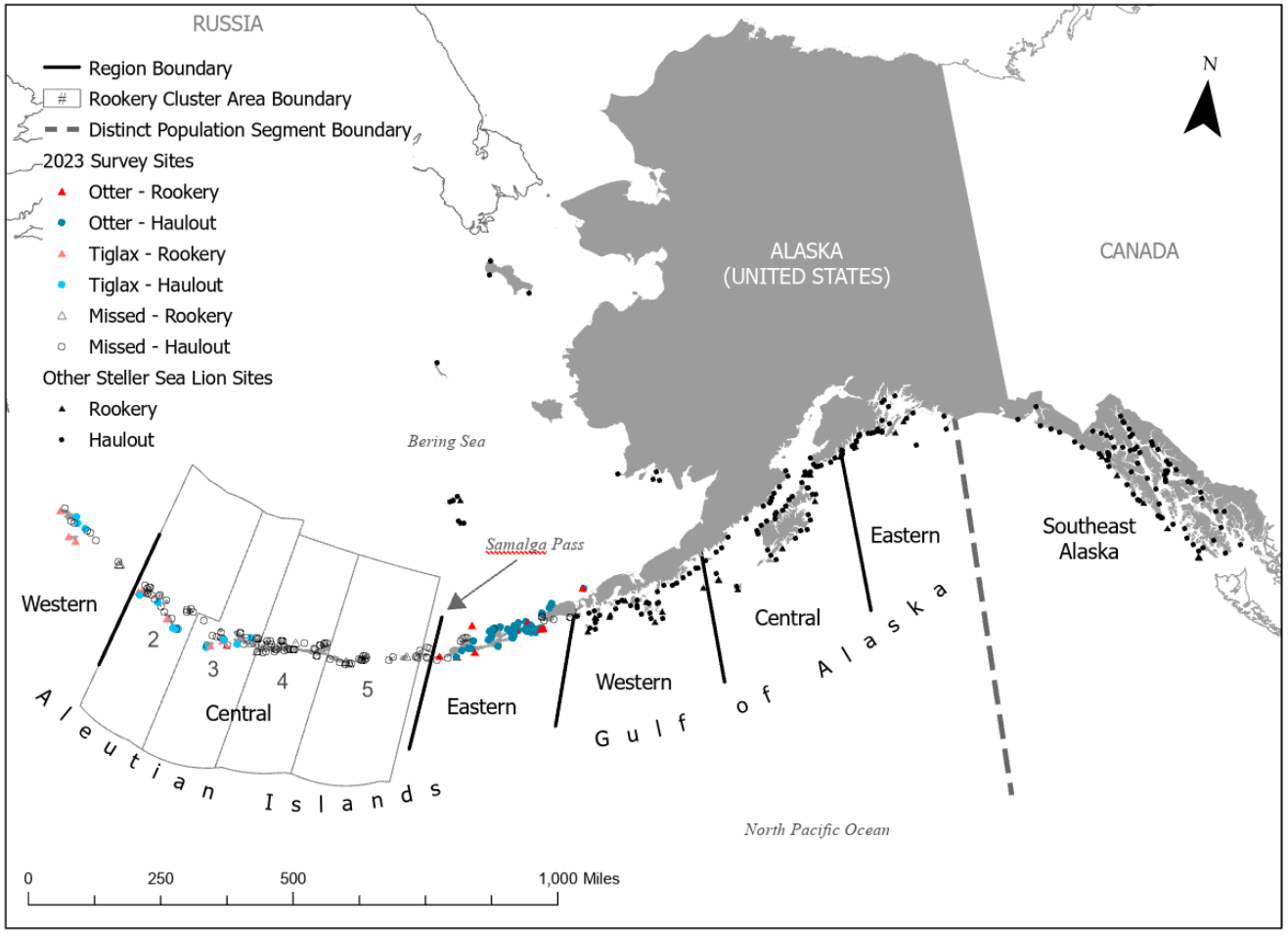


Figure 2. -- Steller sea lion modeled non-pup counts in the total western distinct population segment in Alaska, 2002–2023. Realized counts are represented by points and vertical lines (±95% credible intervals). Predicted counts are represented by the gray line and shaded area (±95% credible intervals).

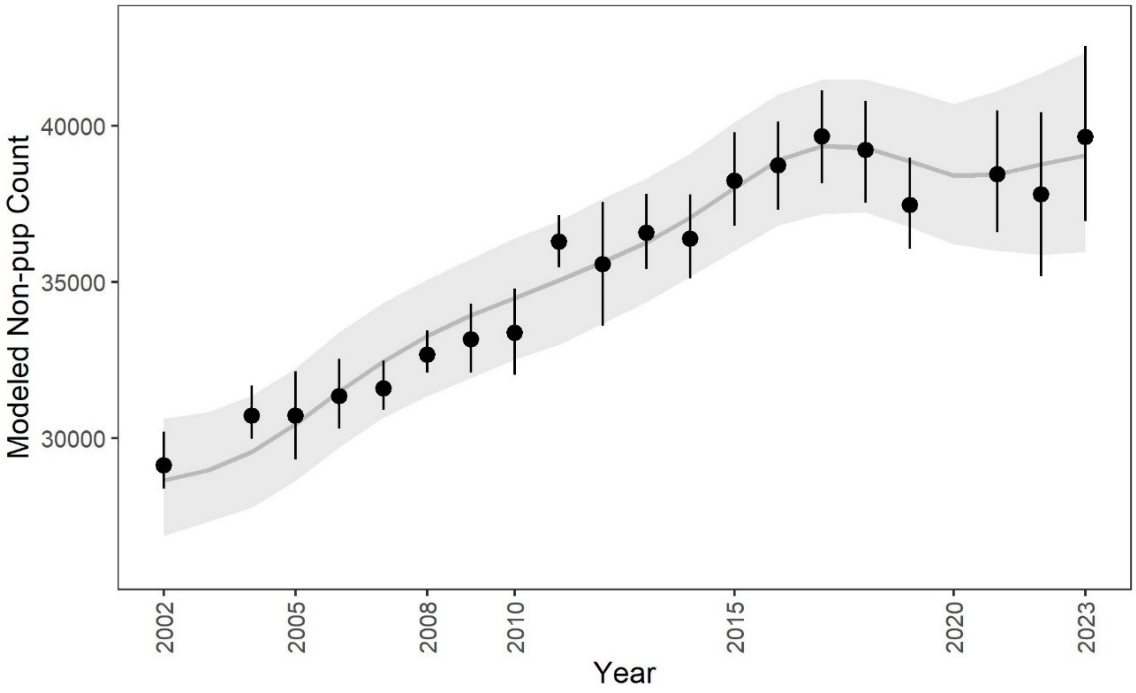


Figure 3. -- Steller sea lion modeled non-pup counts in the western (W), central (C), and eastern (E) Aleutian Islands (ALEU) regions, 2002–2023. Realized counts are represented by points and vertical lines (±95% credible intervals). Predicted counts are represented by the gray line and shaded area (±95% credible intervals).

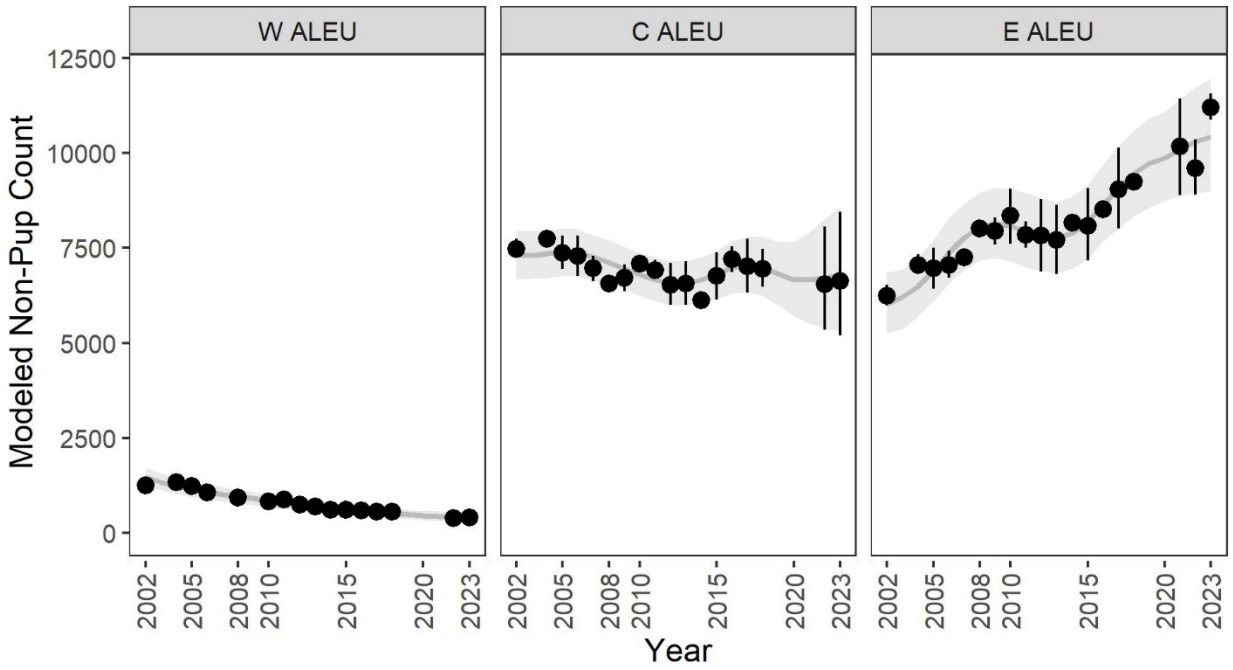


Figure 4. -- Steller sea lion modeled non-pup counts in rookery cluster areas 2-5 (Fig. 1) within the central Aleutian Islands region, 2002–2023. Realized counts are represented by points and vertical lines (±95% credible intervals). Predicted counts are represented by the gray line and shaded area (±95% credible intervals).

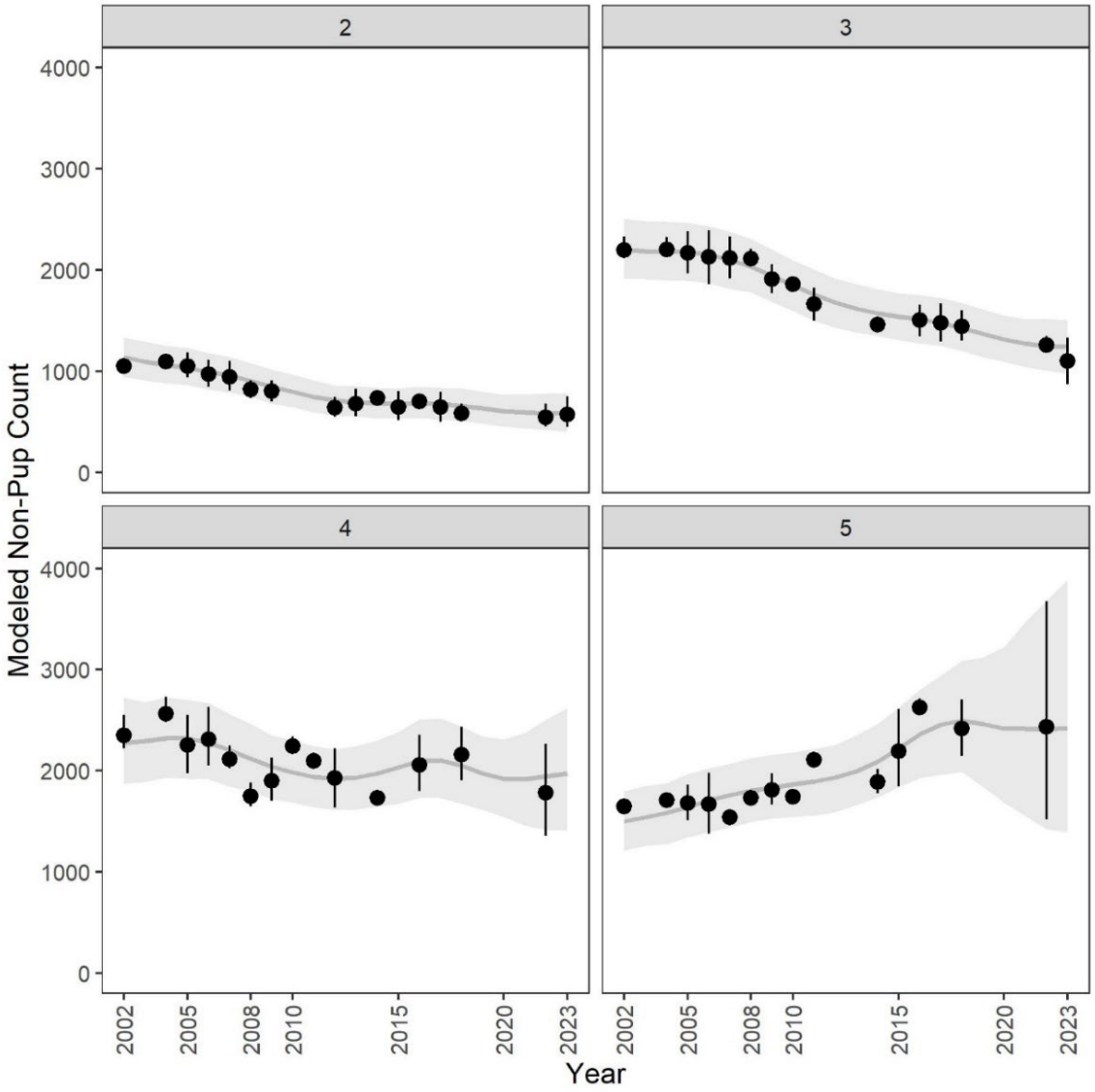


Figure 5. -- Steller sea lion modeled non-pup counts of the combined regions within the Aleutian Islands (ALEU), 2002–2023. Realized counts are represented by points and vertical lines (±95% credible intervals). Predicted counts are represented by the gray line and shaded area (±95% credible intervals).

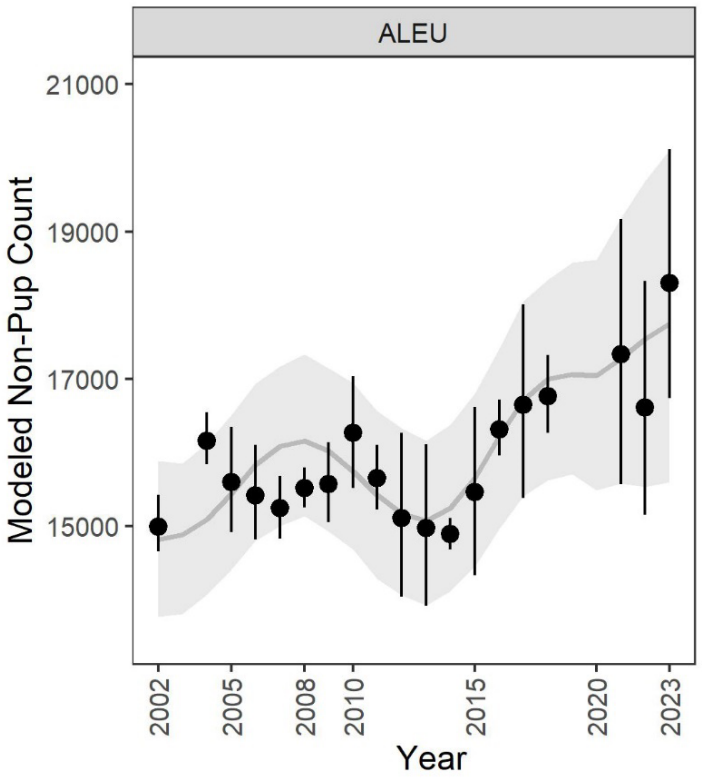


Figure 6. -- Steller sea lion modeled pup counts in the total western distinct population segment in Alaska, 2002–2023. Realized counts are represented by points and vertical lines (±95% credible intervals). Predicted counts are represented by the gray line and shaded area (±95% credible intervals).

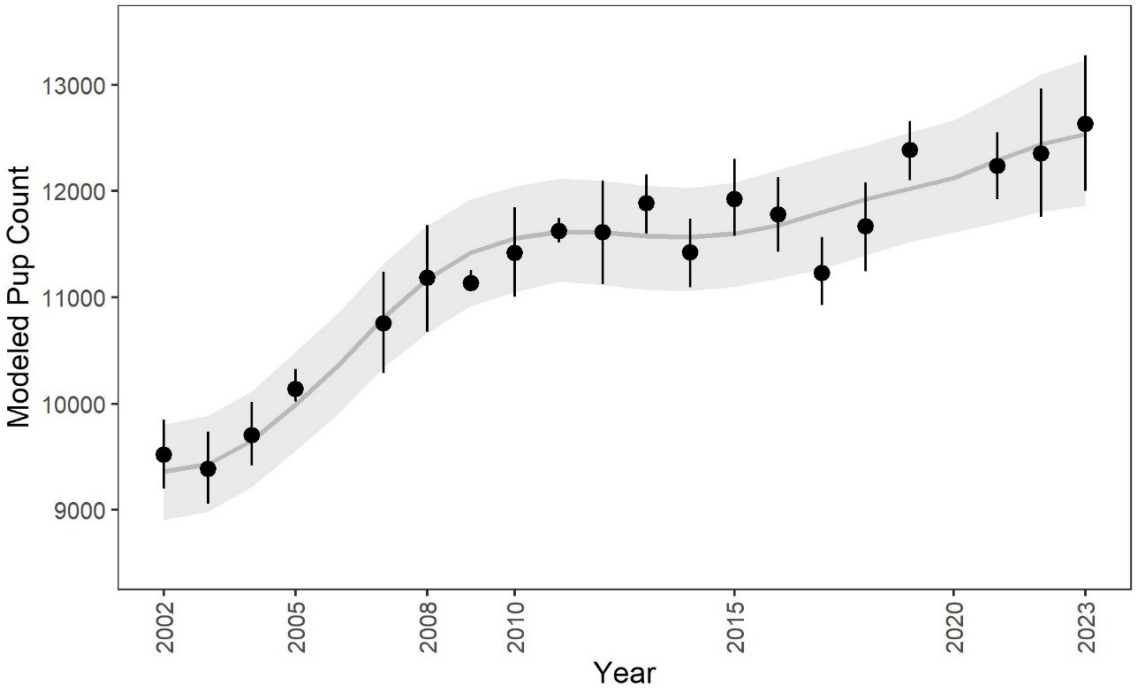


Figure 7. -- Steller sea lion modeled pup counts in the western (W), central (C), and eastern (E) Aleutian Islands (ALEU) regions, 2002–2023. Realized counts are represented by points and vertical lines (±95% credible intervals). Predicted counts are represented by the gray line and shaded area (±95% credible intervals).

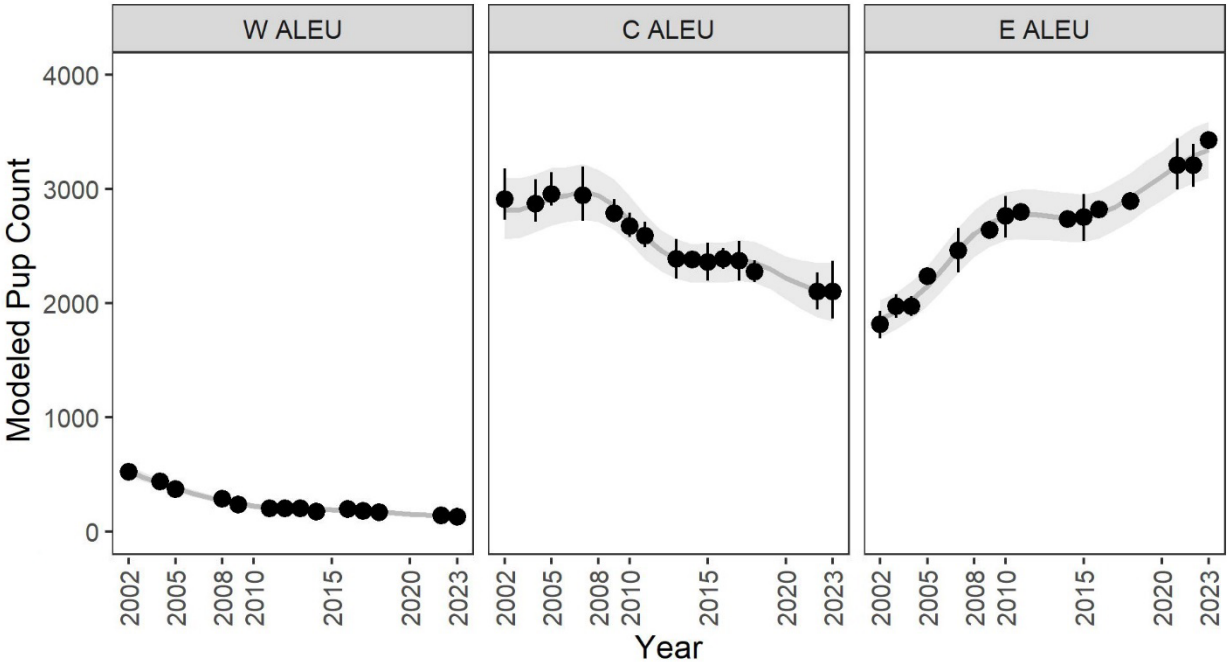


Figure 8. -- Steller sea lion modeled pup counts in rookery cluster areas 2-5 (Fig. 1) within the central Aleutian Islands region, 2002-2023. Realized counts are represented by points and vertical lines (±95% credible intervals). Predicted counts are represented by the gray line and shaded area (±95% credible intervals).

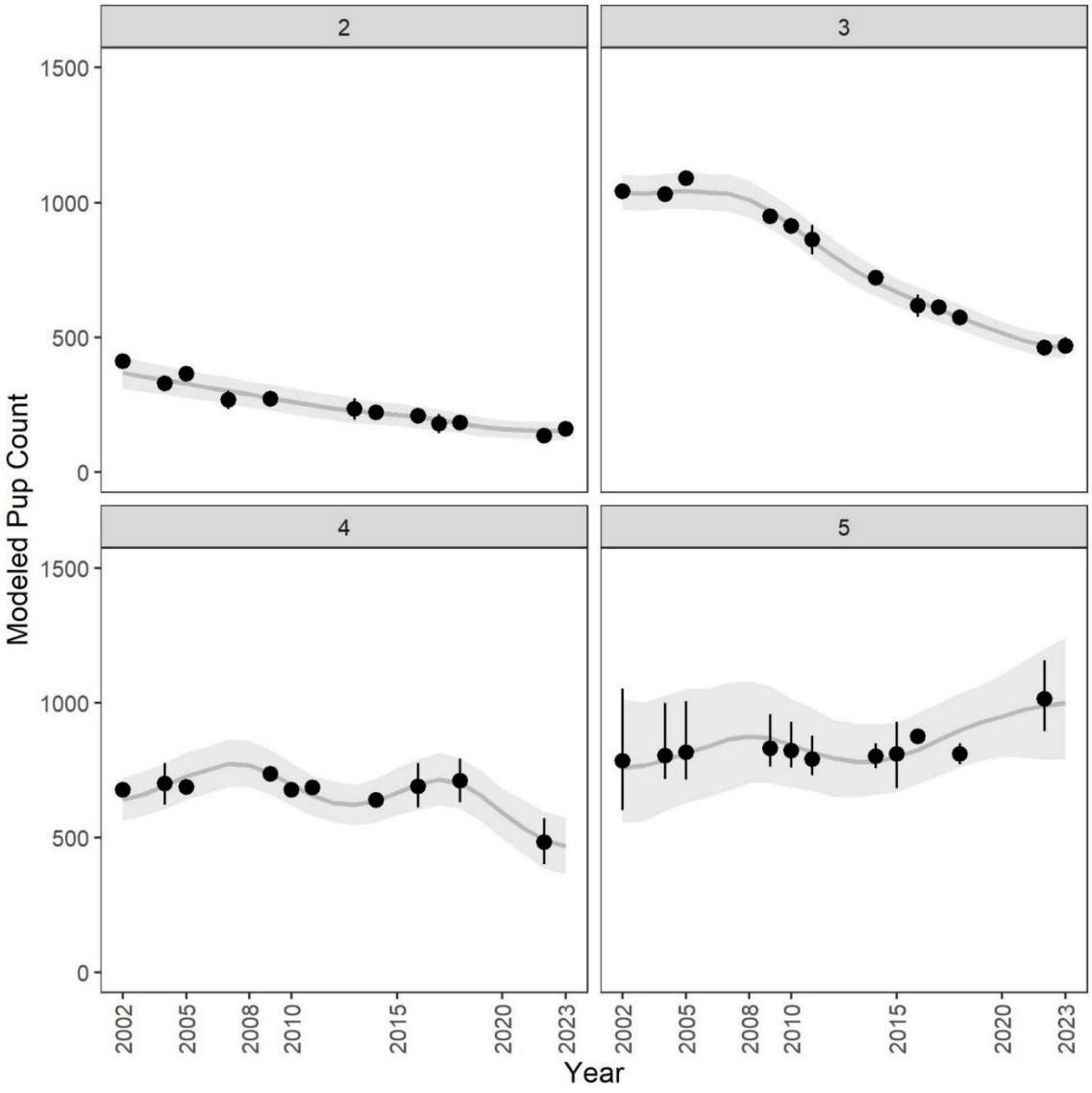
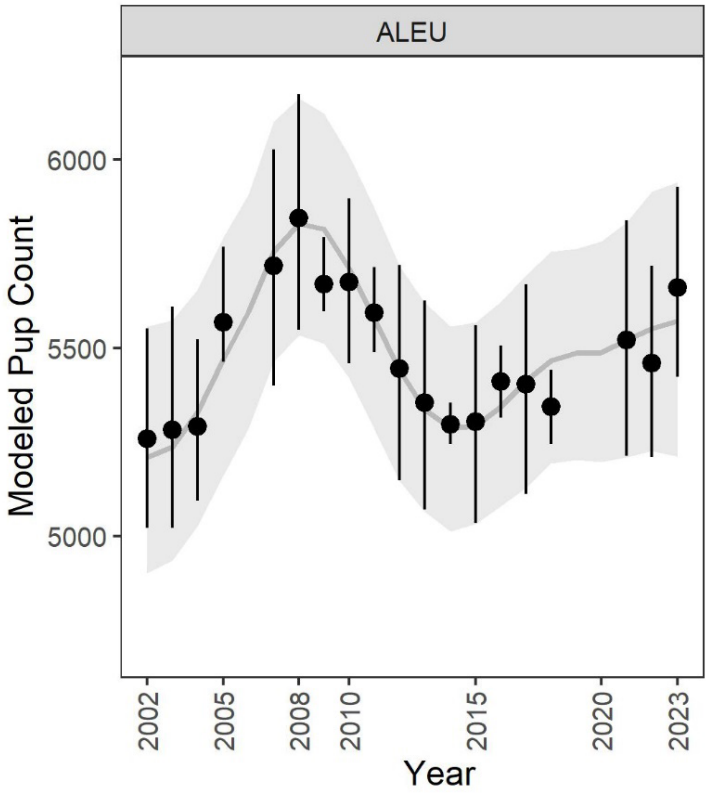


Figure 9. -- Steller sea lion modeled pup counts of the combined regions within the Aleutian Islands (ALEU), 2002–2023. Realized counts are represented by points and vertical lines (±95% credible intervals). Predicted counts are represented by the gray line and shaded area (±95% credible intervals).



APPENDIX

Table 1. -- Predicted (PRED) and realized (REAL) counts with ±95% credible intervals (CI) of the western distinct population segment of Steller sea lions in Alaska. Modeled counts of non-pups (1978-2023) and pups (1973-2023) are listed separately.

	Non-Pup						Pup					
YEAR	PRED	-95% CI	95% CI	REAL	-95% CI	95% CI	PRED	-95% CI	95% CI	REAL	-95% CI	95% CI
1973							49,084	36,207	65,186	49,215	36,474	65,310
1974							48,837	37,356	62,964	48,837	37,356	62,964
1975							48,846	38,764	61,104	48,846	38,764	61,104
1976							49,315	40,164	60,003	49,315	40,164	60,003
1977							50,095	41,840	59,535	50,095	41,840	59,535
1978	169,288	151,474	190,052	173,403	156,338	194,351	51,371	44,214	59,968	50,040	42,907	58,126
1979	162,364	146,590	180,709	165,190	150,128	183,135	51,330	45,128	58,026	52,422	46,386	59,008
1980	151,428	138,601	166,042	151,428	138,601	166,042	49,644	45,072	55,173	49,644	45,072	55,173
1981	143,163	131,771	155,236	143,163	131,771	155,236	48,653	44,767	52,828	48,653	44,767	52,828
1982	137,570	127,636	149,180	137,600	127,731	149,301	48,257	44,840	52,069	48,259	44,829	52,063
1983	128,356	118,589	138,362	128,381	118,588	138,319	45,615	42,421	48,824	45,615	42,421	48,824
1984	115,324	106,803	124,186	116,025	107,239	124,462	43,557	40,671	46,874	43,521	40,509	46,560
1985	99,980	93,087	107,847	104,929	98,823	111,867	39,434	36,777	42,145	40,029	37,553	42,805
1986	84,648	78,780	90,635	89,270	83,758	94,998	34,055	31,867	36,348	34,190	32,311	36,455
1987	71,114	66,753	76,340	71,008	66,450	75,893	28,495	26,810	30,306	28,495	26,810	30,306
1988	60,342	56,419	64,479	60,515	56,913	64,578	24,168	22,756	25,787	24,168	22,756	25,787
1989	52,145	48,987	55,744	48,528	46,442	51,683	20,803	19,481	22,264	20,290	19,107	21,545
1990	46,224	43,133	49,366	45,992	43,950	48,867	18,190	16,972	19,559	17,571	16,575	18,859
1991	42,163	39,491	45,124	43,724	42,104	46,259	16,186	15,046	17,413	16,552	15,508	17,716
1992	39,421	37,028	42,278	40,783	39,410	43,015	14,712	13,746	15,783	14,678	13,751	15,697
1993	37,615	35,232	40,292	37,552	35,178	40,224	13,616	12,761	14,590	13,712	12,948	14,680
1994	36,269	33,761	38,561	37,910	36,619	39,795	12,815	12,087	13,696	13,057	12,506	13,725
1995	34,949	32,763	37,274	34,949	32,763	37,274	12,190	11,500	12,955	12,209	11,510	12,950
1996	33,989	31,888	36,288	34,494	33,354	36,036	11,658	10,972	12,298	11,550	10,946	12,167

	Non-Pup						Pup					
YEAR	**PRED**	**-95% CI**	**95% CI**	**REAL**	**-95% CI**	**95% CI**	**PRED**	**-95% CI**	**95% CI**	**REAL**	**-95% CI**	**95% CI**
1997	32,830	30,714	34,997	32,834	31,332	34,686	11,131	10,548	11,742	11,164	10,676	11,716
1998	31,543	29,630	33,778	32,928	31,898	34,348	10,607	10,076	11,186	10,225	9,976	10,574
1999	30,342	28,375	32,377	30,338	28,399	32,401	10,125	9,630	10,647	10,127	9,631	10,646
2000	29,420	27,482	31,454	28,068	27,181	29,348	9,730	9,268	10,242	9,866	9,468	10,269
2001	28,832	27,047	30,791	28,841	27,063	30,807	9,465	9,018	9,938	9,074	8,903	9,343
2002	28,654	26,873	30,609	29,116	28,390	30,196	9,362	8,908	9,803	9,516	9,199	9,849
2003	28,971	27,314	30,826	28,971	27,314	30,826	9,430	8,985	9,888	9,386	9,058	9,733
2004	29,560	27,783	31,362	30,711	29,966	31,673	9,652	9,217	10,113	9,704	9,420	10,017
2005	30,454	28,633	32,235	30,720	29,319	32,132	9,989	9,555	10,489	10,134	10,018	10,329
2006	31,483	29,705	33,382	31,344	30,296	32,527	10,372	9,914	10,859	10,372	9,914	10,859
2007	32,452	30,665	34,331	31,583	30,900	32,467	10,809	10,343	11,316	10,755	10,289	11,241
2008	33,262	31,335	35,069	32,669	32,089	33,435	11,174	10,668	11,672	11,186	10,676	11,680
2009	33,930	31,924	35,729	33,165	32,095	34,299	11,425	10,922	11,924	11,135	11,060	11,257
2010	34,487	32,511	36,394	33,371	32,029	34,787	11,557	11,052	12,043	11,418	11,004	11,848
2011	35,047	32,993	36,940	36,287	35,468	37,137	11,616	11,149	12,120	11,624	11,519	11,745
2012	35,630	33,668	37,662	35,559	33,586	37,549	11,610	11,117	12,096	11,611	11,120	12,099
2013	36,261	34,358	38,314	36,570	35,408	37,811	11,579	11,071	12,054	11,886	11,604	12,159
2014	37,054	35,162	39,105	36,372	35,105	37,795	11,566	11,064	12,033	11,422	11,097	11,742
2015	38,010	36,000	40,114	38,232	36,786	39,778	11,602	11,102	12,081	11,925	11,579	12,302
2016	38,891	36,809	40,993	38,723	37,309	40,122	11,682	11,179	12,199	11,781	11,431	12,129
2017	39,353	37,162	41,478	39,643	38,154	41,138	11,802	11,268	12,321	11,228	10,929	11,567
2018	39,289	37,230	41,464	39,207	37,530	40,788	11,923	11,394	12,429	11,667	11,247	12,079
2019	38,859	36,755	41,106	37,446	36,050	38,963	12,025	11,522	12,555	12,385	12,102	12,662
2020	38,399	36,211	40,689	38,399	36,211	40,689	12,126	11,613	12,665	12,126	11,613	12,665
2021	38,441	36,003	41,103	38,439	36,587	40,477	12,295	11,703	12,874	12,238	11,927	12,553
2022	38,765	35,863	41,676	37,790	35,175	40,420	12,443	11,808	13,101	12,353	11,756	12,967
2023	39,051	35,955	42,340	39,630	36,935	42,540	12,539	11,865	13,233	12,632	12,004	13,277

Table 2. -- Predicted (PRED) and realized (REAL) counts with ±95% credible intervals (CI) of Steller sea lions in the western (W), central (C), and eastern (E) Aleutian Islands regions (ALEU). Modeled counts of non-pups (1978-2023) and pups (1973-2023) are listed separately.

		NON-PUP						PUP					
REGION	**YEAR**	**PRED**	**-95% CI**	**95% CI**	**REAL**	**-95% CI**	**95% CI**	**PRED**	**-95% CI**	**95% CI**	**REAL**	**-95% CI**	**95% CI**
W ALEU	1973							3,613	1,257	8,026	3,613	1,257	8,026
W ALEU	1974							3,502	1,386	7,417	3,502	1,386	7,417
W ALEU	1975							3,399	1,525	6,926	3,399	1,525	6,926
W ALEU	1976							3,321	1,718	6,553	3,321	1,718	6,553
W ALEU	1977							3,275	1,781	6,101	3,275	1,781	6,101
W ALEU	1978	24,957	23,123	26,769	27,233	26,136	28,327	3,244	1,941	5,832	3,244	1,941	5,832
W ALEU	1979	23,211	21,531	24,813	22,440	22,437	22,463	3,240	2,016	5,381	3,239	2,027	5,365
W ALEU	1980	20,512	18,838	22,370	20,512	18,838	22,370	3,249	2,151	4,964	3,249	2,151	4,964
W ALEU	1981	18,375	16,174	20,609	18,375	16,174	20,609	3,275	2,257	4,674	3,275	2,257	4,674
W ALEU	1982	16,733	13,866	19,631	16,733	13,866	19,631	3,319	2,336	4,468	3,319	2,336	4,468
W ALEU	1983	14,787	11,812	18,247	14,787	11,812	18,247	3,287	2,407	4,303	3,287	2,407	4,303
W ALEU	1984	12,589	9,714	15,574	12,589	9,714	15,574	3,256	2,414	4,185	3,256	2,414	4,185
W ALEU	1985	10,416	8,197	12,756	10,663	8,636	12,969	3,119	2,332	3,961	3,119	2,332	3,961
W ALEU	1986	8,478	6,905	10,063	8,478	6,905	10,063	2,897	2,231	3,658	2,897	2,231	3,658
W ALEU	1987	6,983	5,943	8,044	6,983	5,943	8,044	2,636	2,097	3,317	2,636	2,097	3,317
W ALEU	1988	5,990	5,212	6,788	5,695	5,153	6,252	2,435	1,961	3,104	2,435	1,961	3,104
W ALEU	1989	5,357	4,696	6,003	5,913	5,491	6,375	2,284	1,808	2,953	2,282	1,821	2,932
W ALEU	1990	4,985	4,407	5,559	4,985	4,407	5,559	2,143	1,676	2,787	2,146	1,683	2,771
W ALEU	1991	4,754	4,237	5,287	5,122	5,122	5,122	2,007	1,554	2,574	2,007	1,554	2,574
W ALEU	1992	4,550	4,041	5,048	4,714	4,711	4,723	1,857	1,477	2,325	1,857	1,477	2,325
W ALEU	1993	4,307	3,836	4,825	4,307	3,836	4,825	1,691	1,395	2,038	1,691	1,395	2,038
W ALEU	1994	3,966	3,489	4,421	3,504	3,502	3,512	1,510	1,305	1,744	1,491	1,291	1,726
W ALEU	1995	3,559	3,133	3,980	3,559	3,133	3,980	1,320	1,178	1,467	1,320	1,178	1,467
W ALEU	1996	3,190	2,778	3,581	3,543	3,543	3,551	1,142	1,054	1,253	1,142	1,054	1,253

		NON-PUP						PUP					
REGION	**YEAR**	**PRED**	**-95% CI**	**95% CI**	**REAL**	**-95% CI**	**95% CI**	**PRED**	**-95% CI**	**95% CI**	**REAL**	**-95% CI**	**95% CI**
W ALEU	1997	2,803	2,431	3,173	2,803	2,431	3,173	985	915	1,072	1,010	981	1,066
W ALEU	1998	2,432	2,104	2,779	2,979	2,979	2,979	856	787	927	834	806	885
W ALEU	1999	2,099	1,793	2,416	2,099	1,793	2,416	750	686	816	750	686	816
W ALEU	2000	1,830	1,541	2,113	1,716	1,716	1,716	662	601	723	662	601	723
W ALEU	2001	1,618	1,348	1,877	1,618	1,348	1,877	589	536	642	589	536	642
W ALEU	2002	1,460	1,219	1,703	1,247	1,247	1,247	527	480	572	522	504	545
W ALEU	2003	1,340	1,123	1,565	1,340	1,123	1,565	474	436	515	474	436	515
W ALEU	2004	1,234	1,021	1,455	1,335	1,335	1,335	425	391	459	436	421	452
W ALEU	2005	1,150	942	1,358	1,238	1,168	1,306	381	351	413	370	370	370
W ALEU	2006	1,078	882	1,275	1,057	1,022	1,095	340	312	369	340	312	369
W ALEU	2007	1,017	834	1,212	1,017	834	1,212	304	277	333	304	277	333
W ALEU	2008	959	783	1,151	929	929	929	272	247	298	286	278	293
W ALEU	2009	904	725	1,086	904	725	1,086	245	221	269	234	234	234
W ALEU	2010	851	673	1,017	821	760	880	223	201	245	223	201	245
W ALEU	2011	798	639	964	869	817	924	208	187	230	201	195	206
W ALEU	2012	754	604	911	745	745	745	198	177	218	200	200	200
W ALEU	2013	705	561	857	689	563	815	192	172	213	203	203	203
W ALEU	2014	662	524	800	603	597	620	190	170	209	174	174	174
W ALEU	2015	623	486	758	614	491	744	190	170	210	190	170	210
W ALEU	2016	586	456	719	587	587	587	188	168	210	199	199	199
W ALEU	2017	549	427	678	556	433	671	183	162	205	181	161	203
W ALEU	2018	515	400	638	556	532	583	175	156	196	171	170	173
W ALEU	2019	485	375	605	485	375	605	165	146	184	165	146	184
W ALEU	2020	460	346	575	460	346	575	154	137	173	154	137	173
W ALEU	2021	439	326	566	439	326	566	144	127	163	144	127	163
W ALEU	2022	425	301	554	382	344	455	137	118	155	141	140	145
W ALEU	2023	418	290	552	408	368	488	133	115	152	127	126	131
C ALEU	1973							5,938	2,359	11,521	5,938	2,359	11,521
C ALEU	1974							6,200	2,975	11,378	6,200	2,975	11,378

		NON-PUP						PUP					
REGION	**YEAR**	**PRED**	**-95% CI**	**95% CI**	**REAL**	**-95% CI**	**95% CI**	**PRED**	**-95% CI**	**95% CI**	**REAL**	**-95% CI**	**95% CI**
C ALEU	1975							6,556	3,466	11,225	6,556	3,466	11,225
C ALEU	1976							6,986	4,053	11,201	6,986	4,053	11,201
C ALEU	1977							7,541	4,837	11,388	7,541	4,837	11,388
C ALEU	1978	42,290	38,724	46,067	42,288	38,762	46,110	8,276	5,638	11,680	8,276	5,638	11,680
C ALEU	1979	41,181	37,831	44,624	42,898	41,341	45,793	8,900	6,580	11,678	8,806	6,589	11,550
C ALEU	1980	39,238	36,465	42,447	39,238	36,465	42,447	9,190	7,304	11,247	9,190	7,304	11,247
C ALEU	1981	37,885	35,165	40,884	37,885	35,165	40,884	9,712	8,291	11,385	9,712	8,291	11,385
C ALEU	1982	37,082	34,397	40,040	37,082	34,397	40,040	10,502	9,335	11,823	10,502	9,335	11,823
C ALEU	1983	34,868	32,130	37,734	34,868	32,130	37,734	10,409	9,432	11,490	10,409	9,432	11,490
C ALEU	1984	31,171	28,639	33,756	31,171	28,639	33,756	10,518	9,662	11,518	10,518	9,662	11,518
C ALEU	1985	26,565	24,488	28,874	29,004	27,719	30,641	9,689	8,894	10,567	9,905	9,558	10,589
C ALEU	1986	21,840	20,137	23,973	21,840	20,137	23,973	8,261	7,568	9,074	8,261	7,568	9,074
C ALEU	1987	17,742	16,206	19,411	18,024	16,582	19,749	6,698	6,120	7,389	6,698	6,120	7,389
C ALEU	1988	14,556	13,235	16,018	14,556	13,235	16,018	5,501	5,027	6,181	5,501	5,027	6,181
C ALEU	1989	12,228	11,059	13,540	10,274	9,457	11,350	4,579	4,134	5,171	4,345	3,999	4,953
C ALEU	1990	10,643	9,606	11,792	10,901	10,151	11,925	3,945	3,503	4,506	3,890	3,670	4,388
C ALEU	1991	9,643	8,685	10,686	10,513	9,895	11,381	3,532	3,176	4,077	3,532	3,176	4,077
C ALEU	1992	9,050	8,171	10,060	9,421	8,899	10,156	3,314	2,966	3,822	3,314	2,966	3,822
C ALEU	1993	8,747	7,919	9,700	8,747	7,919	9,700	3,233	2,902	3,706	3,233	2,902	3,706
C ALEU	1994	8,564	7,792	9,471	8,570	8,153	9,208	3,238	2,908	3,684	3,367	3,201	3,739
C ALEU	1995	8,394	7,602	9,202	8,394	7,602	9,202	3,281	2,961	3,696	3,281	2,961	3,696
C ALEU	1996	8,301	7,528	9,112	8,185	7,841	8,702	3,304	2,988	3,708	3,304	2,988	3,708
C ALEU	1997	8,146	7,383	8,917	8,146	7,383	8,917	3,281	2,971	3,660	3,269	3,017	3,631
C ALEU	1998	7,928	7,179	8,631	8,412	8,149	8,809	3,192	2,898	3,548	3,047	2,926	3,329
C ALEU	1999	7,702	7,006	8,419	7,702	7,006	8,419	3,066	2,769	3,391	3,067	2,781	3,400
C ALEU	2000	7,507	6,807	8,192	7,482	7,299	7,807	2,947	2,675	3,261	2,949	2,678	3,264
C ALEU	2001	7,387	6,739	8,068	7,387	6,739	8,068	2,857	2,588	3,147	2,748	2,606	2,989
C ALEU	2002	7,319	6,674	7,967	7,477	7,304	7,746	2,817	2,562	3,105	2,914	2,731	3,183
C ALEU	2003	7,307	6,701	7,938	7,307	6,701	7,938	2,824	2,574	3,099	2,824	2,574	3,099

		NON-PUP						PUP					
REGION	**YEAR**	**PRED**	**-95% CI**	**95% CI**	**REAL**	**-95% CI**	**95% CI**	**PRED**	**-95% CI**	**95% CI**	**REAL**	**-95% CI**	**95% CI**
C ALEU	2004	7,350	6,707	7,956	7,737	7,581	7,969	2,869	2,623	3,134	2,873	2,717	3,088
C ALEU	2005	7,386	6,763	8,017	7,377	6,943	7,826	2,924	2,682	3,187	2,959	2,856	3,149
C ALEU	2006	7,361	6,761	7,989	7,291	6,768	7,820	2,946	2,715	3,194	2,946	2,715	3,194
C ALEU	2007	7,266	6,626	7,824	6,957	6,633	7,283	2,980	2,734	3,219	2,947	2,723	3,200
C ALEU	2008	7,121	6,553	7,713	6,566	6,379	6,773	2,946	2,715	3,172	2,946	2,715	3,172
C ALEU	2009	6,949	6,410	7,524	6,711	6,360	7,072	2,855	2,643	3,084	2,790	2,717	2,913
C ALEU	2010	6,803	6,242	7,374	7,091	6,904	7,276	2,719	2,529	2,938	2,677	2,581	2,793
C ALEU	2011	6,667	6,098	7,246	6,922	6,688	7,180	2,581	2,383	2,774	2,593	2,492	2,716
C ALEU	2012	6,583	6,001	7,148	6,523	5,996	7,100	2,465	2,280	2,645	2,465	2,280	2,645
C ALEU	2013	6,576	5,988	7,145	6,566	5,996	7,146	2,385	2,214	2,565	2,391	2,213	2,564
C ALEU	2014	6,665	6,073	7,245	6,123	5,978	6,268	2,348	2,180	2,520	2,382	2,336	2,430
C ALEU	2015	6,821	6,149	7,419	6,754	6,145	7,379	2,351	2,189	2,528	2,360	2,195	2,531
C ALEU	2016	6,987	6,304	7,677	7,198	6,856	7,538	2,367	2,180	2,532	2,391	2,300	2,487
C ALEU	2017	7,050	6,343	7,791	7,017	6,321	7,733	2,379	2,199	2,556	2,373	2,197	2,546
C ALEU	2018	6,984	6,232	7,793	6,950	6,472	7,471	2,358	2,184	2,540	2,280	2,187	2,376
C ALEU	2019	6,812	5,980	7,660	6,812	5,980	7,660	2,298	2,123	2,477	2,298	2,123	2,477
C ALEU	2020	6,659	5,699	7,662	6,659	5,699	7,662	2,221	2,034	2,411	2,221	2,034	2,411
C ALEU	2021	6,657	5,509	7,916	6,657	5,509	7,916	2,162	1,951	2,377	2,162	1,951	2,377
C ALEU	2022	6,711	5,372	8,267	6,552	5,343	8,053	2,114	1,880	2,356	2,101	1,943	2,269
C ALEU	2023	6,777	5,328	8,586	6,634	5,202	8,445	2,087	1,846	2,359	2,105	1,866	2,371
E ALEU	1973							11,886	4,752	23,814	12,080	4,918	23,874
E ALEU	1974							11,449	4,683	21,855	11,449	4,683	21,855
E ALEU	1975							11,036	4,934	20,299	11,036	4,934	20,299
E ALEU	1976							10,730	5,156	18,880	10,730	5,156	18,880
E ALEU	1977							10,447	5,316	17,549	10,447	5,316	17,549
E ALEU	1978	19,699	14,665	25,777	19,775	14,852	25,735	10,251	5,518	16,472	10,251	5,518	16,472
E ALEU	1979	19,071	14,670	24,344	19,124	14,749	24,486	9,624	5,678	14,365	9,342	5,302	13,924
E ALEU	1980	17,976	14,477	22,048	17,976	14,477	22,048	8,637	5,618	11,867	8,637	5,618	11,867
E ALEU	1981	17,181	14,224	20,285	17,181	14,224	20,285	7,845	5,765	10,167	7,845	5,765	10,167

		NON-PUP						PUP					
REGION	**YEAR**	**PRED**	**-95% CI**	**95% CI**	**REAL**	**-95% CI**	**95% CI**	**PRED**	**-95% CI**	**95% CI**	**REAL**	**-95% CI**	**95% CI**
E ALEU	1982	16,645	14,176	19,189	16,668	14,254	19,268	7,157	5,702	8,628	7,160	5,716	8,643
E ALEU	1983	15,555	13,618	17,740	15,572	13,639	17,762	6,369	5,419	7,369	6,369	5,419	7,369
E ALEU	1984	13,975	12,312	15,756	14,647	13,439	16,083	5,731	5,104	6,407	5,731	5,104	6,407
E ALEU	1985	12,112	10,690	13,652	13,090	12,312	14,190	5,079	4,581	5,643	5,373	5,150	5,795
E ALEU	1986	10,277	9,092	11,631	11,286	10,304	12,493	4,464	4,012	4,966	4,413	4,019	4,902
E ALEU	1987	8,739	7,604	9,854	8,718	7,603	9,846	3,905	3,518	4,356	3,905	3,518	4,356
E ALEU	1988	7,589	6,620	8,590	7,587	6,622	8,582	3,439	3,085	3,849	3,439	3,085	3,849
E ALEU	1989	6,816	6,005	7,712	4,718	4,233	5,263	3,049	2,705	3,430	2,831	2,540	3,173
E ALEU	1990	6,387	5,661	7,269	6,340	6,059	6,747	2,731	2,418	3,081	2,592	2,405	2,855
E ALEU	1991	6,237	5,514	7,048	6,730	6,482	7,081	2,479	2,194	2,781	2,580	2,375	2,829
E ALEU	1992	6,286	5,554	7,074	7,051	6,820	7,372	2,298	2,052	2,567	2,332	2,101	2,592
E ALEU	1993	6,470	5,716	7,268	6,411	5,657	7,179	2,173	1,941	2,407	2,164	1,953	2,366
E ALEU	1994	6,647	5,826	7,439	6,996	6,662	7,338	2,097	1,886	2,309	2,103	2,002	2,224
E ALEU	1995	6,736	5,867	7,515	6,736	5,867	7,515	2,044	1,844	2,238	2,063	1,897	2,248
E ALEU	1996	6,862	6,038	7,763	7,037	6,695	7,431	1,996	1,810	2,183	2,084	1,921	2,243
E ALEU	1997	6,817	5,970	7,763	6,681	6,306	7,124	1,945	1,774	2,128	1,951	1,829	2,073
E ALEU	1998	6,641	5,745	7,523	6,829	6,466	7,271	1,892	1,715	2,062	1,749	1,711	1,795
E ALEU	1999	6,392	5,517	7,268	6,385	5,530	7,276	1,852	1,687	2,024	1,852	1,687	2,024
E ALEU	2000	6,173	5,327	7,087	5,933	5,582	6,348	1,827	1,657	1,989	1,804	1,669	1,939
E ALEU	2001	6,020	5,202	6,868	6,026	5,230	6,892	1,827	1,663	1,989	1,868	1,845	1,894
E ALEU	2002	6,019	5,268	6,842	6,241	5,980	6,526	1,859	1,706	2,028	1,813	1,692	1,934
E ALEU	2003	6,209	5,371	6,937	6,209	5,371	6,937	1,928	1,768	2,093	1,975	1,872	2,083
E ALEU	2004	6,494	5,703	7,260	7,057	6,811	7,330	2,029	1,858	2,194	1,975	1,892	2,060
E ALEU	2005	6,901	6,111	7,714	6,972	6,420	7,502	2,156	1,978	2,329	2,238	2,215	2,261
E ALEU	2006	7,367	6,579	8,290	7,047	6,715	7,427	2,305	2,121	2,494	2,305	2,121	2,494
E ALEU	2007	7,782	6,909	8,662	7,255	7,066	7,447	2,465	2,268	2,665	2,462	2,270	2,661
E ALEU	2008	8,058	7,174	8,950	8,006	7,832	8,193	2,606	2,407	2,817	2,606	2,407	2,817
E ALEU	2009	8,147	7,233	9,084	7,939	7,590	8,297	2,706	2,497	2,918	2,644	2,642	2,650
E ALEU	2010	8,087	7,146	9,048	8,341	7,608	9,050	2,765	2,553	2,973	2,765	2,574	2,943

		NON-PUP						PUP					
REGION	**YEAR**	**PRED**	**-95% CI**	**95% CI**	**REAL**	**-95% CI**	**95% CI**	**PRED**	**-95% CI**	**95% CI**	**REAL**	**-95% CI**	**95% CI**
E ALEU	2011	7,947	6,991	8,941	7,845	7,505	8,193	2,784	2,562	2,995	2,798	2,790	2,807
E ALEU	2012	7,817	6,894	8,819	7,827	6,883	8,790	2,777	2,555	2,998	2,777	2,555	2,998
E ALEU	2013	7,778	6,834	8,706	7,703	6,807	8,634	2,758	2,552	2,981	2,758	2,552	2,981
E ALEU	2014	7,899	6,970	8,850	8,160	8,016	8,320	2,746	2,541	2,965	2,740	2,713	2,766
E ALEU	2015	8,193	7,204	9,159	8,079	7,174	9,071	2,749	2,538	2,952	2,752	2,549	2,956
E ALEU	2016	8,637	7,687	9,693	8,515	8,389	8,649	2,786	2,572	2,985	2,821	2,804	2,837
E ALEU	2017	9,092	8,004	10,162	9,045	8,016	10,142	2,847	2,640	3,065	2,847	2,640	3,065
E ALEU	2018	9,463	8,325	10,585	9,237	9,083	9,405	2,930	2,715	3,143	2,892	2,870	2,919
E ALEU	2019	9,730	8,573	10,908	9,730	8,573	10,908	3,021	2,819	3,247	3,021	2,819	3,247
E ALEU	2020	9,872	8,741	11,083	9,872	8,741	11,083	3,114	2,899	3,335	3,114	2,899	3,335
E ALEU	2021	10,107	8,864	11,418	10,171	8,890	11,438	3,211	2,992	3,444	3,211	2,996	3,447
E ALEU	2022	10,297	8,944	11,729	9,598	8,905	10,357	3,295	3,051	3,540	3,210	3,017	3,397
E ALEU	2023	10,420	8,997	11,961	11,199	10,870	11,572	3,346	3,095	3,594	3,427	3,411	3,445

U.S. Secretary of Commerce
Gina M. Raimondo

Under Secretary of Commerce for
Oceans and Atmosphere
Dr. Richard W. Spinrad

Assistant Administrator,
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Janet Coit

December 2023

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