REQUEST FOR

LETTER OF AUTHORIZATION

FOR THE INCIDENTAL HARASSMENT OF MARINE MAMMALS
RESULTING FROM

OFFICE OF COAST SURVEY

HYDROGRAPHIC SURVEY PROJECTS

JANUARY 2013

Prepared by:
National Oceanic and Atmospheric Administration
National Ocean Service
Office of Coast Survey
1315 East-West Highway
Silver Spring, Maryland 20910

For additional information, contact:
Jeffrey Ferguson
Chief, Hydrographic Surveys Division
Office of Coast Survey
1315 East-West Highway
Silver Spring, Maryland 20910
Phone: (301) 713-2700
Email: Jeffrey.Ferguson@noaa.gov

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. DESCRIPTION OF ACTIVITIES

A detailed description of the specific activity or class of activities that can be expected to result in incidental taking of marine mammals

Coast Survey will survey approximately 3,000 square nautical miles of selected "navigationally significant" areas in U.S. coastal and Great Lakes waters each year. Navigationally significant waters are areas in greatest need of modern hydrographic surveys. These waters are defined in *Hydrographic Survey Priorities*, a document that is updated annually. Over the course of five years (2013-18), Coast Survey will conduct bathymetric surveys of the seafloor (Figure 1) over a combined area of 15,000 square nautical miles within 500,000 square nautical miles of navigationally significant waters. Using four NOAA ships (Figure 2), six 28-foot survey boats, a 54-foot research vessel, and private contractors, Coast Survey will acquire hydrographic data to update the nation's nautical charts with the accuracy and precision that is essential to maintain the public trust in navigational products. The public can access survey data at NOAA's National Geophysical Data Center, and nautical charts are available from a variety of sources, including Coast Survey's website.

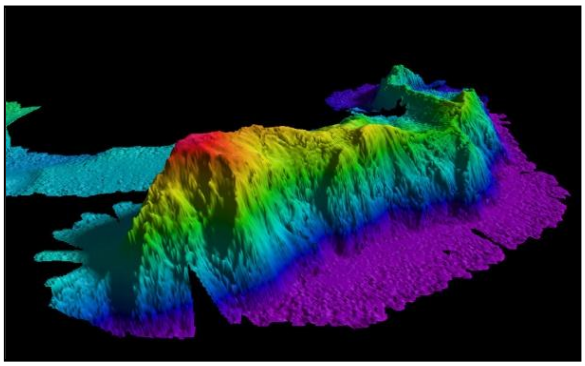


Figure 1. Bathymetric survey of an Arctic seamount

Figure 2. NOAA Ship *Thomas Jefferson*

Actual time surveying averages approximately 15 days per month over the course of a survey project, although larger ships can often survey 20-25 days per month under good conditions. Bad weather or equipment repairs are the most common reasons for a non-survey day. Smaller boats operate 8-12 hours per day. (Sometimes, the large vessels carry the small boats to the survey area, and those small boats conduct the surveys.) When the large ships are surveying, they often operate 24 hours per day. The total time required for a project can vary from a few days to several months over multiple years.

The actions listed below include survey-related field activities in support of the Coast Survey mandate to survey and chart navigationally significant waters. Only those field activities that might affect marine mammals, including actions that produce underwater sound or involve a moving vessel, are included in the discussion. Activities unlikely to result in take include light detection and ranging surveys, anchoring, bottom sample collection, and tide gauge installation,

maintenance, and removal. For a detailed discussion of activities unlikely to affect marine mammals please refer to the Coast Survey Programmatic Environmental Assessment, which will be finalized and publicly available in 2013.

1.1 Hydrographic surveys

Coast Survey conducts hydrographic surveys with high-frequency side scan sonar, and with single beam and multibeam echosounders, which use sound waves to find and identify objects in the water and to determine water depth. During a survey, a vessel equipped with one or more echosounders "mows the lawn" at a slow speed to ensonify (or visualize) the seafloor bottom and ensure full coverage of the seafloor within each project area (Figure 3). Single beam and multibeam echosounders (Figure 4) are mounted either underneath the vessel or on a pole to the side of the vessel, while side scan sonars (Figure 5) are either mounted underneath or towed behind the vessel on a cable.

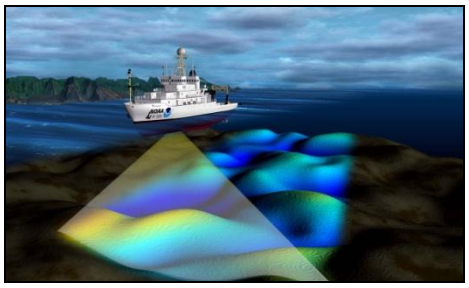


Figure 3. Multibeam swath ensonifying the seafloor

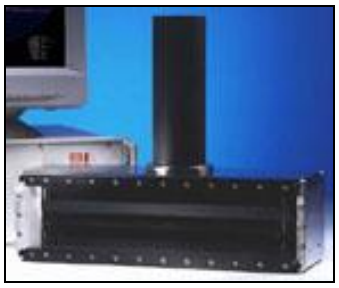


Figure 4. Reson Seabat 8125 multibeam echosounder

Figure 5. L-3 Klein 5000 side scan sonar

An echosounder transmits and receives acoustic pulses by sending a sound pulse through the water column until it reaches the seafloor, at which point the pulse reflects off the seafloor and returns to the echosounder's receiver. The time elapsed during the two-way trip is converted to a distance by multiplying this number by the speed of sound in water. Sound speed is measured independently throughout a survey in order to provide the multiplier.

An echosounder that measures water depths during a typical hydrographic survey is optimized for surveying in a specific range of environmental conditions. Echosounders that transmit low frequency sound can travel a longer distance in the water (good range) but have a lower resolution and are less precise. Sound from high-frequency echosounders cannot travel long distances in water but the data have a higher resolution and are more precise. Coast Survey conducts surveys primarily in shallow waters critical for safe navigation, where depths are low (approximately 4 – 200 meters) and the need for precision is high. As a result, Coast Survey uses primarily high frequency (50-500 kHz) echosounders during survey operations.

Table 1. 2012 Coast Survey Echosounders

Geographic Region	Water Depths	Vessel (NOAA and contractor)	Echosounder Model	Echosounder Type	Frequency	Peak Source Level	Ping Rate (duty cycle)	Max Pulse Width (duration)	Max Swath Width (directionality)
Alaska	4 – 444 meters	*Fairweather* (231'), *Rainier* (231'), *Pacific Star* (162'), *Dream Catcher* (85'), and up to twelve 28' small vessels	L3 Klein 5000	Side Scan	455 kHz	249 dB	15 Hz	200 µsec	80°
			Reson Seabat 7111	Multibeam	100 kHz	233 dB	20 Hz	304 µsec	150°
			Reson Seabat 7125	Multibeam	200/400 kHz	223 dB	50 Hz	300 µsec	128°
			Reson Seabat 8101	Multibeam	240 kHz	224 dB	40 Hz	225 µsec	150°
			Reson Seabat 8125	Multibeam	455 kHz	224 dB	40 Hz	300 µsec	120°
			Reson Seabat 8160	Multibeam	50 kHz	223 dB	15 Hz	1 ms	130°
			Kongsberg Simrad EM710	Multibeam	70-100 kHz	231 dB	30 Hz	2 ms	140°
			Odom Echotrac CVM	Single Beam	24-340 kHz	203 dB	20 Hz	5 ms	8°
			Odom Echotrac CV200	Single Beam	24-340 kHz	203 dB	20 Hz	5 ms	8°
Pacific Coast	4 – 270 meters	*Rainier* (231') and six 28' small vessels	Reson Seabat 7125	Multibeam	200/400 kHz	223 dB	50 Hz	300 µsec	128°
			Reson Seabat 8125	Multibeam	455 kHz	224 dB	40 Hz	300 µsec	120°
			Kongsberg Simrad EM710	Multibeam	70-100 kHz	231 dB	30 Hz	2 ms	140°
			Odom Echotrac CV200	Single Beam	24-340 kHz	203 dB	20 Hz	5 ms	8°
Atlantic Coast	4 – 95 meters	*Thomas Jefferson* (208'), *Ferdinand Hassler* (120'), *Bay Hydro II* (54'), *Atlantic Surveyor* (110'), *R&R* (48'), and two 28' small vessels	L3 Klein 3000	Side Scan	100/500 kHz	237 dB	30 Hz	400 µsec	80°
			L3 Klein 5000	Side Scan	455 kHz	249 dB	15 Hz	200 µsec	80°
			Reson Seabat 7111	Multibeam	100 kHz	233 dB	20 Hz	304 µsec	150°
			Reson Seabat 7125	Multibeam	200/400 kHz	223 dB	50 Hz	300 µsec	128°
			Kongsberg Simrad EM1002	Multibeam	95 kHz	228 dB	10 Hz	2 ms	150°
			Kongsberg Simrad EM3002D	Multibeam	300 kHz	219 dB	40 Hz	150 µsec	130°
			Odom Echotrac CV200	Single Beam	24-340 kHz	203 dB	20 Hz	5 ms	8°
			Knudsen 320B	Single Beam	12 kHz	222 dB	20 Hz	120 µsec	15°
Gulf of Mexico	4 – 58 meters	*Sea Scout* (108'), *Ferrel* (146'), *Westerly* (43'), and *Chinook* (28')	L3 Klein 5000	Side Scan	455 kHz	249 dB	15 Hz	200 µsec	80°
			EdgeTech 4200	Side Scan	100-600 kHz	213 dB	30 Hz	1.6 ms	100°
			Reson Seabat 7125	Multibeam	200/400 kHz	223 dB	50 Hz	300 µsec	128°
			Reson Seabat 8101	Multibeam	240 kHz	224 dB	40 Hz	225 µsec	150°
			Reson Seabat 8125	Multibeam	455 kHz	224 dB	40 Hz	300 µsec	120°
			Kongsberg Simrad EM3002D	Multibeam	300 kHz	219 dB	40 Hz	150 µsec	130°
			Odom Echotrac MKIII	Single Beam	10-1000 kHz	203 dB	20 Hz	5 ms	8°

Nationwide	4 – 78 meters	Navigation Response Teams (up to six 28' small vessels)	L3 Klein 3000	Side Scan	100/500 kHz	237 dB	30 Hz	400 µsec	80°
			Edgetech 4125	Side Scan	400/900 kHz	215 dB	75 Hz	2.8 ms	100°
			Reson Seabat 8125	Multibeam	455 kHz	224 dB	40 Hz	300 µsec	120°
			Kongsberg Simrad EM3000	Multibeam	300 kHz	221 dB	40 Hz	200 µsec	114°
			Kongsberg Simrad EM3002D	Multibeam	300 kHz	219 dB	40 Hz	150 µsec	130°
			R2Sonic 2024	Multibeam	200-400 kHz	221 dB	60 Hz	500 µsec	160°
			Odom Echotrac CV200	Single Beam	24-340 kHz	203 dB	20 Hz	5 ms	8°

Pulse width and power also affect data quality and are adjusted in the field to accommodate a variety of environmental conditions such as depth and bottom type. Sound from an echosounder with a long pulse width (typically measured in microseconds, or μsec) travels further in the water and can be "heard" better by the transducer (good signal-to-noise ratio), but has a lower range resolution. A shorter pulse cannot travel as far in the water and has a weaker signal-to-noise ratio, but has a higher range resolution and can detect smaller and more closely spaced objects in the water. Echosounders have a maximum power setting associated with a peak sound source level (measured in dB re: 1 μPa); however, when the power is too high, the amount of bad, unusable data increases. Power is typically set to the lowest level possible in order to receive a clear return with the best data. Power level is also adjusted according to bottom type, as some bottom types have a stronger return and require less power to produce quality data.

In-house and contractor vessels may be equipped with more than one type of echosounder; side scan sonar, single beam echosounders, and multibeam echosounders each have different advantages. Survey vessels can also be equipped with echosounders that can be adjusted between one of two frequencies, or with multiple echosounders of varying frequencies. In 2013, for example, Coast Survey anticipates performing survey operations using up to 20 sound sources (side scan sonar, single beam echosounders, and multibeam echosounders). Coast Survey anticipates acquiring new echosounders and discontinuing the use of others over the next few years. While Coast Survey cannot provide a complete list for the future, the 2012 table of echosounders (by vessel) in Table 1 provides a typical list of echosounders used each year. Although the specific brand or model of the listed echosounders may change on board each vessel, the frequency or power of the systems is unlikely to change significantly over the next few years. A new, updated list will be posted on the Coast Survey environmental website at the beginning of each field season.

1.2 Sound Speed Data Collection

Surveyors must collect sound speed data throughout the survey to determine the speed of sound in the water column at a given location and time and to correct for refraction errors in the echosounder data. Taken together, the two-way travel time of the acoustic pulse from a single beam or multibeam echosounder and the speed of sound in water determine seafloor depths.

Sound speed data is collected periodically in one of two ways. In the first scenario, every one to four hours, a survey technician slowly lowers a sound speed profiler – known as a "conductivity, temperature and depth" instrument (Figure 6) – from a stationary vessel, down to the seafloor and back. The second method involves a moving vessel profiler (Figure 7), which is automatically lowered and raised through the water column at regular intervals while the vessel is in motion.

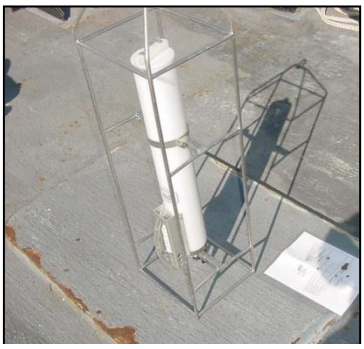


Figure 6. Conductivity, temperature and depth instrument inside cage

Figure 7. Moving vessel profiler mounted on fantail

2. DURATION AND LOCATION

The date(s) and duration of such activity and the specific geographical region where it will occur.

2.1 Duration

Each year, Coast Survey will survey approximately 30 discrete locations. Many survey projects carry over from year to year, although some surveys require only one year's effort. Based on past experience, Coast Survey anticipates surveying approximately 75 discrete locations from 2013 to 2018, with some projects taking place in a single calendar year and some larger projects carrying over from year to year and lasting several years. Table 2 includes a list of 2013 projects and locations – providing a good example of a typical Coast Survey survey project calendar. Hydrographic survey plans are available on the Coast Survey compliance website before each field season (approximately mid-March).

Hydrographic surveying occurs year-round, although projects are limited by environmental windows. Typically, Alaska projects in the Arctic or Bering Sea operate between June and September to avoid dangerous, icy conditions. Projects in Southeast, Central, and Southwest Alaska take place between March and November. West Coast, Northeast, and Mid-Atlantic projects are also conducted between March and November. Projects in the Southeast or Gulf of Mexico are conducted-year round. The total time required for a project can vary from a few days to several months over multiple years.

Table 2. 2013 Projects by Geographic Region

*Please note these are only preliminary estimates and actual projects will depend upon appropriations and allotted days at sea. Survey areas for estimates are much higher than what will actually be surveyed as project areas become fine-tuned before the start of the 2013 field season.

Geographic Region	Project	Locality	Platform*	Vessel Size	Acquisition Window	Survey Area (sq naut mi)
Alaska	OPR-S327-FA-13	Pt Barrow, AK	FA	231' ship + four 28' launches	Aug 1 – Sep 30, 2013	257
	OPR-S325-FA-13	Approaches to Red Dog Mine, AK	FA	231' ship + four 28' launches	Jul 1 – Sep 15, 2013	342
	M-S974-FA-13	North Arctic Reconnaissance, AK	FA	231' ship + four 28' launches	Jul 8 – Oct 15, 2013	200
	OPR-R365-FA-13	Port Clarence, AK	FA	231' ship + four 28' launches	Jun 8 – Sep 13, 2013	98
	M-R976-FA-13	South Arctic Reconnaissance, AK	FA	231' ship + four 28' launches	Jul 8 – Oct 15, 2013	250
	OPR-R341-KR-13	Approaches to Kuskokwim River, AK	KR	unk	Jun 1 – Sept 30, 2013	151
	OPR-Q328-FA-13	North Coast of Unalaska Island, AK	FA	231' ship + four 28' launches	Jun 1 – Sep 30, 2013	113
	OPR-Q191-KR-13	Krenitzin Islands, AK	KR	unk	Jun 1 – Sep 30, 2013	246
	OPR-P183-RA-13	Shumagin Islands, AK	RA	231' ship + six 28' launches	May 15 – Sep 30, 2013	333
	OPR-P377-RA-13	Southern Alaska Peninsula, AK	RA	231' ship + six 28' launches	Jun 15 – Sep 30, 2013	178
	OPR-P135-RA-12	Southeast Coast of Kodiak Island, AK	RA	231' ship + six 28' launches	May 21 – Sep 15, 2012	206
	OPR-P385-KR-13	Northern Cook Inlet, AK	KR	unk	Jun 6 – Sep 30, 2013	420
	OPR-O322-RA-13	Chatham Strait, AK	RA	231' ship + six 28' launches	Apr 1 – May 15, 2013	222
	OPR-O373-FA-13	Sumner Strait & Affleck Canal, AK	FA	231' ship + four 28' launches	Sep 15 – Nov 15, 2013	199
	OPR-O193-FA-13	Behm Canal, AK	FA	231' ship + four 28' launches	Mar 15 – Jun 15, 2013	71
	OPR-O392-FA-13	Approaches to Revillagigedo Channel	FA	231' ship + four 28' launches	Mar 15 – Jun 15, 2013	189
Pacific Coast	OPR-N305-RA-13	Strait of Juan de Fuca, WA	RA	231' ship + six 28' launches	Oct 1 – Nov 15, 2013	45
	S-M921-FARA-13	Offshore Washington & Oregon	RA	231' ship + six 28' launches	Mar 18 – Nov 20, 2013	50
	OPR-L430-NRT6-13	San Francisco Bay, CA	NRT-6	28' vessel	Jan 1 – Dec 31, 2013	20
	OPR-L414-NRT6-13	LA and Long Beach, CA	NRT-6	28' vessel	Apr 1 – Sep 1, 2013	44
	S-L904-NRT6-13	Port Hueneme, CA	NRT-6	28' vessel	Jun 1 – Aug 1, 2013	2
Atlantic Coast	OPR-A366-TJ-13	Penobscot Bay and Approaches, ME	TJ	208' ship + two 28' launches	Mar 15 – Jun 15, 2013	253
	OPR-A321-FH-13	Approaches to Portsmouth, NH	FH	120' ship	Mar 15 – May 15, 2013	171
	OPR-B3887-TJ-13	Cross Rip & Pollack Rip Channels	TJ	208' ship + two 28' launches	Jul 8 – Jul 18, 2013	13
	OPR-B310-TJ-13	Approaches to New York, NY	TJ	208' ship + two 28' launches	May 15 – Jul 15, 2013	118
	OPR-B370-NRT5-13	Eastern Long Island Sound, CT	NRT-5	28' vessel	Jan 1 – Dec 31, 2013	50

	OPR-D302-KR-113	Virginia Coast, VA	KR	unk	Jun 1 – Sep 30, 2013	138
	OPR-D304-FH-13	Approaches to Chesapeake Bay, VA	FH	120’ ship	Jul 1 – Sep 30, 2013	693
	OPR-E350-TJ-13	Southern Chesapeake Bay, VA	TJ	208’ ship + two 28’ launches	Mar 11 – Mar 12, 2013	9
	OPR-E349-BH-13	Central Chesapeake Bay, MD	BH2	54’ vessel	Jan 1 – Dec 31, 2013	56
	OPR-G443-NRT2-13	Brunswick, GA	NRT-2	28’ vessel	Aug 1 – Dec 31, 2013	18
	S-G901-NRT2-13	St. Johns River, FL	NRT-2	28’ vessel	Jan 1 – Aug 1, 2013	14
Gulf of Mexico	S-J910-NRT1-13	Panama City, FL	NRT-1	28’ vessel	Jan 1 – Aug 1, 2013	15
	OPR-J357-KR-13	Approaches to Panama City, FL	KR	unk	Jun 1 – Sep 30, 2013	80
	OPR-J348-KR-13	Approaches to Mississippi Sound, MS	KR	unk	Jun 1 – Sep 30, 2013	284
	OPR-K339-KR-13	Approaches to Barataria Bay, LA	KR	unk	Jun 1 – Sep 30, 2013	114
	OPR-K908-NRT1-13	Port Fourchon, LA	NRT-1	28’ vessel	Aug 1 – Dec 31, 2013	5
	OPR-K909-NRT1-13	Grand Isle, LA	NRT-1	28’ vessel	Aug 1 – Dec 31, 2013	15
	OPR-K911-NRT1-13	Houma, LA	NRT-1	28’ vessel	Aug 1 – Dec 31, 2013	18
	OPR-K354-KR-13	Louisiana Coast, LA	KR	unk	Jun 1 – Sep 30, 2013	243
	S-K912-NRT1-13	Port of Iberia, LA	NRT-1	28’ vessel	Aug 1 – Dec 31, 2013	19
	S-K907-NRT4-13	Sabine Pass and Vicinity, TX	NRT-4	28’ vessel	May 1 – Sep 1, 2013	10
	OPR-K414-NRT4-13	Galveston Bay and Vicinity, TX	NRT-4	28’ vessel	Jan 1 – May 1, 2013	16

*Platform Abbreviations

FA	NOAA Ship *Fairweather*
RA	NOAA Ship *Rainier*
TJ	NOAA Ship *Thomas Jefferson*
FH	NOAA Ship *Ferdinand Hassler*
BH	*Bay Hydro II* (Coast Survey)
NRT-X	Navigation Response Teams (Coast Survey)
KR	Contractor (firm TBA)

2.2 Location

Coast Survey could potentially survey in any "navigationally significant" areas of U.S. coastal and continental shelf waters as defined in the Hydrographic Survey Priorities document over the next five years. Although Coast Survey has developed plans to survey 15,000 square nautical miles from 2013 to 2018, the discussion of location includes all 500,000 square nautical miles of navigationally significant waters.

Coast Survey operates in coastal and nearshore waters, primarily in depths greater than four meters and over the continental shelf. Each year, Coast Survey surveys approximately 3,000 square nautical miles of navigationally significant waters around the coast and in the Great Lakes. Water depths vary for each survey, although the survey vessel would rarely move into waters shallower than four meters. Most Coast Survey projects occur in nearshore, coastal and continental shelf areas with depth ranges from 4-200 meters, although some projects, particularly in the "steep and deep" waters of Alaska, extend into deeper waters at the shelf break. Temporal constraints (i.e., the best time of year to survey in a given location) also dictate the marine physical environment of hydrographic surveys. Physical characteristics of the seafloor vary for each survey, from flat and sandy in the Gulf of Mexico to steep and rocky in much of Alaska. Wrecks, oil and gas platforms, pipelines, and other man-made obstructions are also located in many of the survey areas, particularly on the east coast and in the Gulf of Mexico.

3. MARINE MAMMAL SPECIES

The species and numbers of marine mammals likely to be found within the activity area.

All marine mammals located in U.S. waters are included in this discussion. As of 2012, there are 68 distinct marine mammal species located within the EEZ, including 14 pinniped and 51 cetacean species, the West Indian manatee, polar bear, and sea otter. The National Marine Fisheries Service manages 64 of these species, including all cetaceans and all pinnipeds except the walrus.

For the purpose of this application, Coast Survey assumes that it could potentially operate anywhere within navigationally significant waters. Marine mammals are listed with their listed status and population estimates in Table 3 below.

Marine mammal population stocks and population estimates (N_{est}) are derived from the National Marine Fisheries Service (NMFS) 2011 Draft Stock Assessment Reports (Allen and Angliss 2011, Carretta et al. 2011, Waring et al. 2011).

Table 3. Marine Mammal Species - Status and Population Estimates

CETACEANS **Mysticetes (Baleen Whales)**					
Species	**Scientific Name**	**ESA Status**	**MMPA Status**	**Stock**	**Est Pop (N_{est})**
Blue Whale	*Balaenoptera musculus*	Endangered	Depleted	Eastern North Pacific	2,497
				Western North Atlantic	unk
				Central North Pacific	unk
Bryde's Whale	*Balaenoptera edeni*	-	-	Hawaii	469
				Gulf of Mexico	15
Bowhead Whale	*Balaena mysticetus*	Endangered	Depleted	Western Arctic	10,545
Fin Whale	*Balaenoptera physalus*	Endangered	Depleted	Northeast Pacific	5,700
				CA/OR/WA	3,044
				Hawaii	174
				Western North Atlantic	3,985
Gray Whale	*Eschrictius robustus*	-	-	Eastern North Pacific	19,126
Humpback Whale	*Megaptera novaengliae*	Endangered	Depleted	Western North Pacific	938
				Central North Pacific	7,469
				CA/OR/WA	2,043
				American Samoa	unk
				Gulf of Maine	847
Minke Whale	*Balaenoptera acutorostrata*	-	-	Alaska	unk
				CA/OR/WA	478
				Hawaii	unk
				Canadian East Coast	8,987
North Atlantic Right Whale	*Eubalaena glacialis*	Endangered	Depleted	Western North Atlantic	396
North Pacific Right Whale	*Eubalaena japonica*	Endangered	Depleted	Eastern North Pacific	31
Sei Whale	*Balaenoptera borealis*	Endangered	Depleted	Eastern North Pacific	126
				Hawaii	77
				Nova Scotia	386
CETACEANS **Odontocetes (Toothed Whales)**					

Atlantic Spotted Dolphin	*Stenella frontalis*	-	-	Western North Atlantic	50,978
				Gulf of Mexico (Continental Shelf and Oceanic)	unk
				Puerto Rico and U.S. Virgin Islands	unk
Atlantic White-Sided Dolphin	*Lagenorhynchus acutus*	-	-	Western North Atlantic	23,390
Baird's Beaked Whale	*Berardius bairdii*	-	-	Alaska	unk
				CA/OR/WA	907
Beluga Whale	*Delphinapterus leucas*	-	-	Beaufort Sea	39,258
				Eastern Chukchi Sea	3,710
				Eastern Bering Sea	28,406
				Bristol Bay	2,877
		Endangered	Depleted	Cook Inlet	345
Bottlenose Dolphin	*Turisops truncatus*	-	-	California Coastal	323
				CA/OR/WA Offshore	1,006
				Hawaii Pelagic	3.178
				Kaua'I and Ni'ihau	147
				O'ahu	594
				4 Islands Region	153
				Hawaii Island	102
				Western North Atlantic Offshore	81,588
			Depleted	Western North Atlantic Coastal, Northern Migratory	9,604
				Western North Atlantic Coastal, Southern Migratory	12,482
				Western North Atlantic Coastal, South Carolina/ Georgia	7,738
				Western North Atlantic Coastal, Northern Florida	3,064
				Western North Atlantic Coastal, Central Florida	6,318
			-	Northern North Carolina Estuarine System	unk
				Southern North Carolina Estuarine System	2,454
				Charleston Estuarine System	unk
				Northern Georgia/Southern South Carolina Estuarine System	unk
				Southern Georgia Estuarine System	unk
				Jacksonville Estuarine System	unk
				Indian River Lagoon Estuarine System	unk
				Biscayne Bay	unk
				Florida Bay	514

				Gulf of Mexico Continental Shelf	unk
				Gulf of Mexico, Eastern Coastal	7,702
				Gulf of Mexico, Northern Coastal	2,473
				Gulf of Mexico, Western Coastal	unk
				Gulf of Mexico Oceanic	3,708
				Gulf of Mexico bay, sound, and estuary	unk
				Barataria Bay	unk
				St. Joseph Bay	146
				Choctawhatchee Bay	179
				Puerto Rico and U.S. Virgin Islands	unk
				St. Vincent Sound-Apalachicola Bay-St. George sound	537
				Sarasota Bay-Little Sarasota Bay	160
Clymene Dolphin	*Stenella clymene*	-	-	Western North Atlantic	unk
				Gulf of Mexico Oceanic	6,575
Cuvier's Beaked Whale	*Ziphius cavirostris*	-	-	Alaska	unk
				CA/OR/WA	2,143
				Hawaii	15,242
				Western Northern Atlantic (also includes all Mesoplonont beaked whales)	3,513
				Gulf of Mexico Oceanic	65
				Puerto Rico and U.S. Virgin Islands	unk
Dall's Porpoise	*Phocoenoides dalli*	-	-	Alaska	83,400
				CA/OR/WA	42,000
Dwarf Sperm Whale	*Kogia sima*	-	-	CA/OR/WA	unk
				Hawaii	17,519
				Western North Atlantic (includes pygmy sperm whale)	395
				Gulf of Mexico Oceanic (includes pygmy sperm whale)	453
False Killer Whale	*Pseudorca crassidens*	-	-	Hawaii Pelagic	484
				Palmyra Atoll	1,329
		Proposed		Hawaii Insular	170
		-		American Samoa	unk
				Gulf of Mexico Oceanic	777
Fraser's Dolphin	*Lagenodelphis hosei*	-	-	Hawaii	10,226
				Western North Atlantic	unk

				Gulf of Mexico Oceanic	unk
Harbor Porpoise	*Phocoena phocoena*	-	-	Bering Sea	48,215
				Gulf of Alaska	31,046
				Southeast Alaska	11,146
				Washington Inland Waters	10,682
				Northern Oregon/ Washington Coast	15,674
				Northern CA/Southern OR	39,581
				Morro Bay	2,044
				Monterey Bay	1,492
				San Francisco-Russian River	9,189
				Gulf of Maine/Bay of Fundy	89,054
Killer Whale	*Orcinus orca*	-	-	Alaska Resident	2,084
				Northern Resident (British Columbia)	216
			Depleted	AT1 Transient	7
			-	Gulf of Alaska, Aleutian Islands and Bering Sea Transient	552
				West Coast Transient	354
				Eastern North Pacific Offshore	240
		Endangered	Depleted	Eastern North Pacific Southern Resident	86
		-	-	Hawaii	349
				Western North Atlantic	unk
				Gulf of Mexico Oceanic	49
Long-Beaked Common Dolphin	*Delphinus capensis*	-	-	California	27,046
Long-finned Pilot Whale	*Globicephala melas*	-	-	Western North Atlantic	12,619
Longman's Beaked Whale	*Indopacetus pacificus*	-	-	Hawaii	1,007
Melon-Headed Whale	*Peponocephala electra*	-	-	Hawaii	2,950
				Western North Atlantic	unk
				Gulf of Mexico Oceanic	2,283
Mesoplodont Beaked Whales (Blainville's, Gervais', Gingko-toothed, Hubbs, Lesser, Perrin's, Sowerby's, Stejneger,	*Mesoplodon* spp (Genus)	-	-	CA/OR/WA	1,024
				Hawaii (Blainville's only)	2,872
				Western North Atlantic (also includes Cuvier's beaked whales)	3,513
				Gulf of Mexico Oceanic (Blaineville's and Gervais' only)	57

True's species)					
Narwhal	*Monodon monoceros*	-	-	Unidentified stock	unk
Northern Bottlenose Whale	*Hyperoodon ampullatus*	-	-	Western North Atlantic	unk
Northern Right Whale Dolphin	*Lissodelphis borealis*	-	-	CA/OR/WA	8,334
Pacific white-sided Dolphin	*Lagenorhynchus obliquidens*	-	-	Central North Pacific	26,880
				CA/OR/WA	26,930
Pantropical Spotted Dolphin	*Stenella attenuate*	-	-	Hawaii	8,978
				Western North Atlantic	4,439
				Gulf of Mexico Oceanic	34,067
Pygmy Killer Whale	*Feresa attenuata*	-	-	Hawaii	956
				Western North Atlantic	unk
				Gulf of Mexico Oceanic	323
Pygmy Sperm Whale	*Kogia breviceps*	-	-	CA/OR/WA	579
				Hawaii	7,138
				Western North Atlantic (includes dwarf sperm whale)	395
				Gulf of Mexico Oceanic (includes dwarf sperm whale)	453
Risso's Dolphin	*Grampus griseus*	-	-	CA/OR/WA	6,272
				Hawaii	2,372
				Western North Atlantic	20,479
				Gulf of Mexico Oceanic	1,589
Rough-Toothed Dolphin	*Steno bredanensis*	-	-	Hawaii	8,709
				American Samoa	unk
				Western North Atlantic	unk
				Gulf of Mexico (Outer Continental Shelf and Oceanic)	unk
Short-Beaked Common Dolphin	*Delphinus delphis*	-	-	CA/OR/WA	411,211
				Western North Atlantic	120,743
Short-Finned Pilot Whale	*Globicephala macrorhynchus*	-	-	CA/OR/WA	760
				Hawaii	8,846
				Western North Atlantic	24,674
				Gulf of Mexico Oceanic	716
				Puerto Rico and U.S. Virgin Islands	unk

Sperm Whale	*Physeter macrocephalus*	Endangered	Depleted	North Pacific	unk
				CA/OR/WA	971
				Hawaii	6,919
				North Atlantic	4,804
				Gulf of Mexico	1,665
				Puerto Rico and U.S. Virgin Islands	unk
Spinner Dolphin	*Stenella longirostris*	-	-	Hawaii Pelagic	3,351
				Hawaii Island	unk
				Oahu/4 Islands	unk
				Kauai/Ni'ihau	unk
				Kure/Midway	unk
				Pearl and Hermes Reef	unk
				American Samoa	unk
				Western North Atlantic	unk
				Gulf of Mexico Oceanic	1,989
				Puerto Rico and U.S. Virgin Islands	unk
Striped Dolphin	*Stenella coeruleoalba*	-	-	Hawaii Pelagic	13,143
				Western North Atlantic	94,462
				Gulf of Mexico Oceanic	3,325
				CA/OR/WA	10,908
White-Beaked Dolphin	*Lagenorhynchus albirostris*	-	-	Western North Atlantic	2,003
PINNIPEDS **Otariids (Eared Seals)**					
Steller Sea Lion	*Eumetopias jubatus*	Endangered	Depleted	Western U.S.	42,286
		Threatened	Depleted	Eastern U.S.	58,334 – 72,223
Northern Fur Seal	*Callorhinus ursinus*	-	Depleted	Pribilof Island/Eastern Pacific	653,171
			-	San Miguel Island	9,968
Guadalupe Fur Seal	*Arctocephalus townsendi*	Threatened	-	Mexico to California	7,408
California Sea Lion	*Zalophus californianus*	-	-	United States	296,750
PINNIPEDS **Phocids (True Seals)**					
Bearded Seal	*Erignathus*	Proposed	-	Alaska	unk

	barbatus				
Gray Seal	*Halichoerus grypus*	-	-	Western North Atlantic	unk
Harbor (common) Seal	*Phoca vitulina*	-	-	Aleutian Islands	3,579
				Pribilof Islands	232
				Bristol Bay	18,577
				North Kodiak	4,509
				South Kodiak	11,117
				Prince William Sound	31,503
				Cook Inlet/Shelikof	22,900
				Glacier Bay/Icy Strait	5,042
				Lynn Canal/Stephens	8,870
				Sitka/Chatham	8,586
				Dixon/Cape Decision	14,388
				Clarence Strait	23,289
				Washington Inland	unk
				OR/WA Coast	unk
				California	30,196
				Western North Atlantic	unk
Harp Seal	*Pagophilus groenlandicus*			Western North Atlantic	unk
Hawaiian Monk Seal	*Monachus schauinslandi*	Endangered	Depleted	Hawaii	1,125
Hooded Seal	*Cystophora cristata*			Western North Atlantic	unk
Northern Elephant Seal	*Mirounga angustirostris*	-	-	California Breeding	124,000
Ribbon Seal	*Histriophoca fasciata*	-	-	Alaska	49,000
Ringed Seal	*Phoca hispida*	Proposed	-	Alaska	unk
Spotted Seal	*Phoca largha*	-	-	Alaska	unk

4. MARINE MAMMAL DESCRIPTIONS

A description of the status, distribution, and seasonal distribution (when applicable) of the affected species or stocks of marine mammals likely to be affected by such activities

All marine mammals are protected under the Marine Mammal Protection Act (MMPA). Endangered Species Act (ESA) listed marine mammals are also listed as "depleted" under the

MMPA. Table 4 below includes an abbreviated list of marine mammals listed under the ESA (and are therefore also listed as "depleted" under the MMPA) that are likely to occur within project areas.

Table 4. Listed Marine Mammals in Navigationally Significant Waters

ESA- and MMPA-Listed Marine Mammals in Navigationally Significant Waters			
Endangered	**Threatened**	**Proposed/Candidate**	**Depleted**
Blue Whale Bowhead Whale Fin Whale Humpback Whale North Atlantic Right Whale North Pacific Right Whale Sei Whale Beluga Whale (Cook Inlet) Killer Whale (Southern Resident) Sperm Whale Steller Sea Lion (W) Hawaiian Monk Seal	Steller Sea Lion (E) Guadalupe Fur Seal	False Killer Whale (HI Insular) Bearded Seal Ringed Seal	Killer Whale (AT1 Trans) Coastal Bottlenose Dolphin (WNA) Eastern NP Fur Seal

Descriptions of each marine mammal likely to occur within a hydrographic survey area, including the species' status, distribution, and habitat, are described below in Section 4.1. Marine mammals unlikely to be found within survey areas because of their preference for deeper (i.e., non-navigationally significant) waters are described briefly in Section 4.2. Descriptions of marine mammal species listed below are condensed versions of more detailed characterizations found on the NMFS/Office of Protected Resources website.

4.1 Marine Mammals Likely To Be Located in Project Areas

CETACEANS - MYSTICETES

Blue Whale

Blue whales are found in all oceans around the world, in coastal and oceanic waters, although they are primarily a deep water species. Blue whales are rarely seen in U.S. Atlantic waters. In the summer and fall, the Eastern North Pacific stock of whales feed along the continental shelf break, slope, and upwelling regions from California to Alaska. Most animals migrate south to Mexico and Central America in the winter for breeding and calving, although some blue whales are residential and remain off the coast of California year round. Blue whales are an ESA-listed Endangered and MMPA-listed Depleted species.

Bowhead Whale

Bowhead whales are distributed in seasonally ice-covered waters of the Arctic and near-Arctic between 60° N and 70° N. The Western Arctic population is the only stock found within U.S waters. Bowhead whales are closely associated with the sea ice. The majority of the Western Arctic stock migrates annually from wintering areas (November to March) in the northern Bering Sea, through the Chukchi Sea in the spring (March through June), to the Beaufort Sea, where they spend much of the summer (mid-May through September) before returning again to the Bering Sea in the fall (September through November) to overwinter. Bowhead whales are an ESA-listed Endangered and MMPA-listed Depleted species.

Bryde's Whale

Bryde's whales are distributed in tropical and subtropical waters worldwide. The Northern Gulf of Mexico stock is located in coastal, shelf, slope, and oceanic waters, and is believed to be a resident population.

Gray Whale

The Eastern North Pacific stock of gray whale is distributed between the Arctic Alaskan waters to California, primarily in harbors, lagoons, and nearshore, shallow shelf waters within two kilometers of the shore. In the summer, most animals feed near the polar ice break in the Beaufort and Chukchi Seas, although some gray whales feed in the Gulf of Alaska and Pacific Northwest. In the fall, animals migrate south to breeding and calving grounds off the coast of Baja California, returning north to feeding grounds in the spring.

Humpback Whale

Humpback whales are found in all oceans around the world, in coastal and oceanic waters. Animals prefer to feed on the shelf break and continental slope, and travel along specific migration routes in deep water along coasts or submarine mountains. North Pacific stocks of humpback whales feed along the entire Pacific and Alaska Coast into the Bering Sea in the summer and breed in the winter in Hawaii. The Gulf of Maine stock of whales feed in the Gulf of Maine in the summer. Most humpback whales in the Western North Atlantic migrate to the West Indies to breed in winter, although some animals will continue feeding in the mid-Atlantic area in the winter. Humpback whales are an ESA-listed Endangered and MMPA-listed Depleted species.

Minke Whale

Minke whales in U.S. waters are found in the Pacific Ocean from the Chukchi Sea to California, and in the Atlantic Ocean from New England to the Gulf of Mexico, primarily in bays, estuaries, and continental shelf waters. This abundant species of baleen whale is highly migratory, feeding primarily in polar and subpolar waters in the spring and summer, and heading south to warmer waters in the winter, although minke whales can be found in all waters at all times of the year.

North Atlantic Right Whale

Right whales prefer temperate and subpolar latitudes in coastal and shallow shelf waters, with the North Atlantic species ranging from calving and breeding grounds in North Florida and

Southern Georgia to feeding grounds in New England. Whales migrate between the feeding and breeding grounds, primarily in nearshore waters. North Atlantic right whales feed primarily on zooplankton, and their population numbers are concentrated around high food source locations year-round. There are ESA-designated Critical Habitat areas in Cape Cod Bay, Stellwagen Bank, and off the coast of North Florida and Southern Georgia. North Atlantic Right Whales are an ESA-listed Endangered and MMPA-listed Depleted species.

North Pacific Right Whale

The eastern stock of the North Pacific right whale is typically observed in the south Bering Sea, Aleutian Islands, and Gulf of Alaska in waters over the mid to outer continental shelf, with ESA-designated Critical Habitat areas in the southeast Bering Sea and in the Gulf of Alaska off the coast of Kodiak Island. Very little is known about breeding and calving locations. Abundance estimates are numbered in the tens for the eastern stock. North Pacific right whales are an ESA-listed Endangered and MMPA-listed Depleted species.

CETACEANS – ODONTOCETES

Atlantic Spotted Dolphin

Atlantic spotted dolphins are found along the U.S. Atlantic coast south of southern New England and in the northern Gulf of Mexico, primarily in continental shelf waters between 20 and 200 meters, and occasionally in slope waters less than 500 meters. Inshore and coastal pods typically include 5-15 animals and are often seen bowriding along moving vessels.

Atlantic White-Sided Dolphin

Atlantic white-sided dolphins are found along the U.S. Atlantic coast in temperate waters north of North Carolina, primarily in continental shelf and slope waters, moving closer inshore in the summer and offshore and south in the winter. This highly social species travels in groups of up to 500 animals. Breeding season is from May to August, and most calves are born in June and July.

Beluga Whale

Beluga whales are found in shallow coastal waters, often in waters barely deep enough to cover their bodies, but have also been seen in deep waters. Beluga whales are distributed throughout seasonally ice-covered arctic and subarctic waters of the Northern Hemisphere. The Eastern Chukchi Sea stock's summer distribution extends south into the waters near Kotzebue, AK. The Cook Inlet stock of Beluga whales is listed as ESA Endangered and MMPA Depleted.

Bottlenose Dolphin

Bottlenose dolphins are found in all U.S. Atlantic and Gulf of Mexico coastal and oceanic waters, and in Pacific coastal and oceanic waters south of Washington. Some coastal stocks migrate inshore into bays and estuaries. The Western North Atlantic Coastal stock of bottlenose dolphins is listed as Depleted under the MMPA.

Dall's Porpoise

Dall's Porpoises occur throughout the North Pacific Ocean, and are found in U.S. waters along the Pacific coast, from the Bering Sea in Alaska to California. Dall's porpoises prefer shelf break, slope, and oceanic waters deeper than 180 meters.

Dwarf Sperm Whale

Dwarf sperm whales are a cosmopolitan species and can be found in the Atlantic and Pacific Oceans, including the Caribbean Sea and Gulf of Mexico. The species prefers continental shelf break and slope waters, but is occasionally found in waters over the continental shelf.

Harbor Porpoise

Harbor porpoises are found in coastal and inland waters, primarily over shelf waters in depths shallower than 150 meters, from Point Barrow and the Bering Strait in Alaska to southern California on the Pacific coast, and from Maine to North Carolina on the Atlantic coast. Pacific harbor porpoises typically do not migrate extensively. In the Atlantic, the Bay of Fundy stock is concentrated off the coast of Maine from July to September, between Maine and New Jersey from October to December and April to June, and between New Jersey and North Carolina from January to March, although some animals remain in Maine and Canadian waters year-round.

Killer Whale

Killer whales are one of the most abundant and highly distributed marine mammal species in U.S waters, with population stocks located in Alaska from the Beaufort, Chukchi, and Bering Seas to Southeast Alaska, in Washington intracoastal waterways, along the Pacific and Atlantic coasts, and in the Gulf of Mexico. Animals are found on shelf, break, slope, and oceanic waters, except for the northern Gulf of Mexico stock, where killer whales are primarily observed in shelf break or slope waters. Killer whale stocks can be resident, transient or offshore. The Southern Resident stock of killer whales is listed as Endangered under the ESA and Depleted under the MMPA, with Critical Habitat located in the Puget Sound. The Alaska AT1 Transient population is also listed as Depleted under the MMPA.

Long-Beaked Common Dolphin

Long-beaked common dolphins prefer shallow, tropical, subtropical and warmer temperate waters closer to the coast and on the continental shelf. Within U.S. waters, the California stock of long-beaked common dolphins is typically found within 50 nautical miles of the coast, from central to southern California. Long-beaked dolphins are usually found in large social groups averaging from 100-500 animals, and will often approach ships to bow ride for long periods of time.

Pacific White-Sided Dolphin

Pacific white-sided dolphins are found in temperate waters of the North Pacific, from the continental shelf to deep oceanic waters. In U.S. waters, the species extends from Bristol Bay and the Aleutian Islands in Alaska to California. Pacific white-sided dolphins are extremely playful and highly social animals, and are often observed bow riding and doing acrobatic somersaults.

Pantropical Spotted Dolphin
The pantropical spotted dolphin is distributed worldwide in tropical and some sub-tropical oceans. Although specific migratory patterns have not been clearly described, the animals appear to move inshore in the fall and winter months and offshore in the spring. Spotted dolphins spend the majority of their day in waters100-300 meters. At night they dive into deeper waters to search for prey.

Short-Beaked Common Dolphin
In U.S. waters, this species is typically found in warm tropical to cool temperate slope and oceanic waters off the Pacific and Atlantic coasts, although animals have been known to frequent shallower waters.

Short-Finned Pilot Whale
Short-finned pilot whales are found off the Pacific and Atlantic coasts of the United States and in the Gulf of Mexico. Animals typically remain in deeper areas of sharp relief, such as shelf break or slope waters, but have been known to swim onto continental shelf waters in the Gulf of Mexico. Pilot whales tend to occupy areas of high relief or submerged banks. Because of the difficulty in distinguishing short-finned and long-finned pilot whales, the two species are often mistaken for one another.

White-Beaked Dolphin
In U.S. waters, white-beaked dolphins are found in cold temperate and subpolar waters in New England north of Massachusetts, both in inshore and offshore waters. Groups of white-beaked dolphins are usually found in groups from 5-50 animals, and are often seen bowriding along vessels.

PINNIPEDS

Bearded Seal
As the largest species of ice seal, bearded seals reside in Arctic waters and are commonly found with drifting sea ice. In Alaska waters, bearded seals are distributed over the continental shelf of the Bering, Chukchi, and Beaufort Seas. Many of the seals that winter in the Bering Sea move north through the Bering Strait from late April through June, and spend the summer along the ice edge in the Chukchi Sea. The overall summer distribution is quite broad, with seals rarely hauled out on land, and some seals may not follow the ice northward but remain in open-water areas of the Bering and Chukchi Seas. Bearded seals are proposed to be listed as Threatened under the ESA.

California Sea Lion
The U.S. stock of California sea lions is distributed from the United States-Mexico border to southwestern Canada, with breeding areas and rookeries located on islands off the coast of southern California. California sea lions typically reside in shallow coastal and estuarine waters and haul out on sandy beaches and marina docks.

Gray Seal

Gray seals are found in coastal waters. The Western North Atlantic stock ranges from New York to Labrador, although stranded gray seals have been sighted as far south as North Carolina. On land, gray seals inhabit rocky coasts and islands, sandbars, and ice shelves and icebergs. During mating, pupping, and molting, the animals gather into large groups. At sea, they are usually found alone or in small dispersed groups. Pups are born January-February in the western Atlantic Ocean.

Guadalupe Fur Seal

Guadalupe fur seals reside in the tropical waters of Southern California and Mexico. During breeding season, the seals are found in coastal rocky habitats and caves. Little is known about their whereabouts during the non-breeding season (May to September). Guadalupe fur seals are an ESA-listed Threatened and MMPA-listed Depleted species.

Harbor (Common) Seal

Harbor seals are found in nearshore and estuarine waters in Atlantic and Pacific waters, from Maine to North Carolina in the western Atlantic, and from the Bering Sea to southern California in the eastern Pacific. Harbor Seals are typically non-migratory, although animals south of New England off the Atlantic coast are observed only in fall, winter and spring, primarily in very shallow waters.

Northern Elephant Seal

Northern elephant seals are distributed along the Pacific coast, from the Aleutian Islands to southern California. Animals breed and give birth primarily on the sandy beaches of California offshore islands in the winter, and migrate north to Alaska, Washington, Oregon, and northern California waters to feed during the summer. When animals are not on land for breeding, giving birth, and molting, northern elephant seals spend most of their time underwater during dives in shelf, slope, and oceanic waters.

Northern Fur Seal

The eastern Pacific stock of Northern fur seals is distributed from the Bering Sea to the coast of southern California. The seals spend most of the year at sea in shelf, slope, and high-relief waters, coming to shore only in the summer to haulout sites and rookeries on the Pribilof Islands in the Bering Sea. For the rest of the year, females and pups migrate south to the coasts of Washington, Oregon, and California, while males remain in colder waters in the Gulf of Alaska. Northern fur seals are not ESA-listed, although the eastern Pacific stock is considered Depleted under the MMPA.

Ribbon Seal

Ribbon seals inhabit the North Pacific Ocean and parts of the Arctic Ocean, including the Chukchi, eastern Siberian, and western Beaufort Seas. In Alaskan waters, ribbon seals are found primarily in the open sea and on the pack ice. Recent sightings suggest that many ribbon seals migrate into the Chukchi Sea for the summer. When the ice recedes and the breeding and molting seasons come to an end, ribbon seals move northward until the ice gets too thick and

then remain in the water for the rest of the year. Little is known about the distribution of ribbon seals while they are pelagic.

Ringed Seal
Ringed seals reside in Arctic waters and are commonly associated with ice floes and pack ice. In Alaska, ringed seals are found throughout the Beaufort, Chukchi, and Bering Seas, as far south as Bristol Bay in years of extensive ice coverage. Animals prefer large floes, remaining in contact with sea ice most of the years, and pup on the ice in late winter and early spring. Ringed seals are an ESA Proposed Threatened species.

Spotted Seal
Spotted seals are distributed over continental shelf waters. Although primarily located in Arctic waters near the ice break, spotted seals are also found south of the Bering Strait, particularly in coastal haulout areas near the Pribilof Islands, Bristol Bay, and the eastern Aleutian Islands.

Steller Sea Lion
Steller sea lions are found in U.S. waters from the Aleutian Islands to California, with major rookeries and haulout sites in Southwest Alaska, the Gulf of Alaska, and off the coasts of Oregon and California. Steller sea lions are non-migratory, but will forage up to 15 nautical miles from land in nearshore and continental shelf waters up to 500 meter water depths. The Western U.S. population stock (west of 144° West) is listed as Endangered, and the Eastern U.S. population stock (east of 144° West) is listed as Threatened under the ESA. All Steller sea lions are listed as Depleted under the MMPA. ESA-designated Critical Habitat areas are defined for Steller sea lions as a 20 nautical mile buffer around all major haulouts and rookeries, associated terrestrial aquatic zones, and three offshore foraging areas.

4.2 Marine Mammals Unlikely To Be Located in Project Areas

The marine mammal species listed below are unlikely to be found within Coast Survey project areas due to their preference for deeper waters far offshore from Coast Survey project areas (NOAA 2011, Perrin, Würsig and Thewissen 2009). Additionally, some species below are located in Hawaii or in portions of the non-U.S. Arctic Ocean; Coast Survey does not plan to survey these areas over the next few years. The brief descriptions of the species below are condensed versions of more detailed characterizations found on the NMFS/Office of Protected Resources website.

CETACEANS

Baird's Beaked Whale
Baird's beaked whales are found in U.S. waters off the Pacific coast from California to Alaska as far north as the Bering Sea, migrating north and closer to shore during the summer, returning south and further offshore during winter.

Clymene Dolphin
In U.S. waters, Clymene dolphins are found in offshore deep waters of the Atlantic Ocean in depths of 250 – 5,000 meters from New Jersey to the Caribbean Sea.

Cuvier's Beaked Whale
Cuvier's beaked whales are a cosmopolitan species and can be found in the Atlantic and Pacific Oceans, including the Caribbean Sea, Gulf of Mexico, and Gulf of Alaska. The species prefers slope waters deeper than 1,000 meters.

False Killer Whale
In U.S. waters, false killer whales occur in Hawaii, the Pacific coast, southeast Atlantic coast, Gulf of Mexico, and Caribbean Sea. The species prefers tropical and temperate waters deeper than 1,000 meters. The Hawaii Insular stock of false killer whale is ESA Proposed Endangered.

Fin Whale
Fin whales are found primarily in oceanic waters. Fin whales are the most common large whale observed off the Atlantic coast of the United States, yet are rarely seen in the Gulf of Mexico. Pacific fin whale stocks in U.S. waters are distributed between the Bering Strait and California. Fin whales are an ESA-listed Endangered and MMPA-listed Depleted species.

Fraser's Dolphin
Fraser's dolphins occur off the coast of Florida and in the Gulf of Mexico and Caribbean Sea. The species prefers waters deeper than 1,000 meters, particularly in areas of upwelling.

Long-Finned Pilot Whale
Long-finned pilot whales prefer deep pelagic temperate to subpolar oceanic waters. The portion of the Western North Atlantic stock located in U.S. waters is found from North Carolina to Maine. Pilot whales tend to occupy areas of high relief or submerged banks.

Longman's Beaked Whale
In U.S. waters, this rare whale species is located throughout the Hawaiian Islands. The species prefers to inhabit pelagic waters deeper than 1,000 meters, and are often seen in groups of 10-20 animals.

Melon-Headed Whale
Melon-headed whales are located in tropical areas throughout the world. In U.S. waters, the species is located in Hawaii, Gulf of Mexico, and the Atlantic Coast, primarily in deep waters, and often are seen in groups of over 1,000 animals.

Mesoplodont Beaked Whales (Blaineville's, Gervais', Gingko-toothed, Hubbs, Lesser, Perrin's, Sowerby's, Stejneger)
As beaked whales often appear similar, these species of the genus *mesoplodon* are grouped together for characterization. Mesoplodont beaked whales are cosmopolitan and occur in all oceans around the world, primarily in deeper, offshore waters.

Narwhal
Narwhals are located in the Arctic Ocean. Although rare, narwhals are occasionally found in the Bering, Chukchi, and Beaufort Seas.

Northern Bottlenose Whale
In U.S. waters, northern bottlenose whales are found in deep, cold oceanic waters greater than 2,000 meters off the coast of New England.

Northern Right Whale Dolphin
Northern right whale dolphins are found primarily in slope waters off the Pacific Coast, from Washington to California, with some seasonal north-south migrations along the coast.

Pygmy Killer Whale
Pygmy killer whales prefer deep, tropical and subtropical waters. In U.S. waters, this species is found in Hawaii, Gulf of Mexico, and off the Atlantic coast.

Pygmy Sperm Whale
In U.S. waters, this species is most often found in slope and oceanic waters off the Pacific coast, Atlantic coast, and the Gulf of Mexico, often in small groups.

Risso's Dolphin
Risso's dolphins are found throughout the world in temperate, subtropical, and tropical waters on the continental slope and in depths greater than 1,000 meters.

Rough-Toothed Dolphin
Rough-toothed dolphins are found throughout the world in deep, warmer temperate waters. In U.S. waters, this species includes two stocks, Hawaii and Northern Gulf of Mexico. Animals are often seen in groups of 10-20 and associate with other dolphin species.

Sei Whale
Sei whales in the eastern North Pacific Ocean are located off the coasts of Washington, Oregon, and California and primarily feed in waters near steep slopes, such as the continental shelf break or oceanic canyons. Very little is known about sei whale breeding and calving location preferences. Sei whales are an ESA-listed Endangered and MMPA-listed Depleted species.

Sperm Whale
Sperm whales are a widely distributed large whale species, and can be found in all U.S. waters in the Gulf of Mexico, Atlantic coast, and the Pacific Coast from the Bering Sea to California, primarily in shelf break, slope, and deep oceanic waters. Sperm whales are an ESA-listed Endangered and MMPA-listed Depleted species.

Spinner Dolphin
Spinner dolphins are typically found in deep waters; however, the Hawaii population is found in coastal waters, where they rest in bays and protected areas, during the day. The species is often

seen leaping above water, and often occurs in groups of several hundred to several thousand animals. The eastern spinner dolphin stock is listed as Depleted under the MMPA.

Striped Dolphin
Striped dolphins are a cosmopolitan species found in tropical to warm temperate oceanic waters off the Pacific and Atlantic coasts and in the Gulf of Mexico.

PINNIPEDS

Harp Seal
Harp seals are found primarily near pack ice in Arctic waters, with a range extending south to New Brunswick in the North Atlantic Ocean, although in recent years harp seals have been spotted in the winter further south in U.S. waters.

Hawaiian Monk Seal
Hawaiian monk seals live in the warm subtropical waters of Hawaii, with breeding populations throughout the Northwest Hawaiian Islands.

Hooded Seal
Hooded seals are found primarily in Arctic waters, with a range extending south to New Brunswick in the Atlantic Ocean, although hooded seals occasionally are spotted further south in U.S. waters. The seals are typically associated with the pack ice.

5. REQUESTED HARASSMENT AUTHORIZATION

The type of incidental taking authorization that is being requested (i.e., takes by harassment only; takes by harassment, injury and/or death) and the method of incidental taking

Coast Survey is requesting a five-year letter of authorization for Level B harassment from underwater sound potentially within the hearing range of some marine mammals. While vessel strikes pose a direct threat to marine mammals, Coast Survey does not anticipate a vessel strike during survey operations. Excessive speed is an important factor in determining the severity of injury during a vessel strike. Survey vessels typically operate at 4-8 knots during a survey, rendering them unlikely to strike a marine mammal. Therefore, Coast Survey is not requesting an authorization for take by vessel strike because any such unlikely event would not be reasonably anticipated under normal circumstances.

While the immediate and cumulative effects of sound from high frequency echosounders on marine mammals are uncertain, high frequency underwater noise could lead to avoidance behavior in those species whose hearing range overlaps the frequency range of the sound source (Wartzok and Ketten 1999). To acquire bathymetric data, Coast Survey uses side scan sonar and multibeam echosounders ranging from 50 – 500 kHz, and single beam echosounders ranging from 10 – 100 kHz. Mysticetes and otariids cannot typically hear in the 50 – 500 kHz frequency

range underwater, and are not at risk for acoustic harassment from side scan sonar and multibeam echosounders. Coast Survey's single beam echosounders can operate as low as 10 kHz, but due to their narrow, downward-facing orientation, these echosounders are unlikely to cause injury to marine mammals. Many odontocetes and phocids can hear in frequencies greater than 50 kHz, putting these marine mammal groups at risk for exhibiting avoidance behavior in the presence of high frequency sound from Coast Survey operational side scan sonar and multibeam echosounders (Richardson et al. 1995, Southall et al. 2007).

Coast Survey's multibeam and side scan sonar systems have a high peak source level (~215-235 dB) at a one meter distance from the echosounder. The sound intensity level decreases rapidly, however, as the energy per unit area is reduced ("transmission loss") through spreading loss and absorbed as sound is converted to heat through attenuation (Urick 1983, Au and Hastings 2008). The sound from high frequency echosounders used by Coast Survey for typical coastal surveys attenuates quickly and decreases in intensity as it moves away from the sound source. To overcome the effects of absorption, shallow water bathymetric echosounders use a high output power in order to visualize a clear return and accurately measure water depths with high precision.

Take estimates below are based on the assumption of spherical spreading from an acoustic source. In practice, propagation of the acoustic energy of hydrographic echosounders and side scan sonars is limited by the downward-facing orientation of the transmit beam (Weber 2008) in shallow water depths, resulting in the majority of the energy lost to interaction with the seabed before reaching the maximum range possible in the water column.

6. TAKE ESTIMATES

By age, sex, and reproductive condition (if possible), the number of marine mammals (by species) that may be taken by each type of taking identified in paragraph (a)(5) of this section, and the number of times such takings by each type of taking are likely to occur

Marine mammals can vocalize and hear in a variety of frequency ranges under water, although most have a peak frequency range, even at lower decibel levels (Richardson et al. 1995, Southall et al. 2007). Southall, et al. (2007) report that large mysticete, "or baleen whale" cetaceans typically hear on the low end of that range, from 7 Hz - 22 kHz, while odontocetes, or "toothed whales," can hear sounds from 150 Hz – 160 kHz, with some porpoises and dolphins able to hear frequencies up to 180 kHz. The final report of the NOAA International Symposium, "Shipping Noise and Marine Mammals: A Forum for Science, Management, and Technology" (NOAA 2004) states that otariids, or "eared seals" hear in the 1 – 30 kHz range underwater, while phocids, or "true seals," can hear in the 200 Hz - 50 kHz range underwater, although Southall, et al. (2007) state that some phocids can hear frequencies as low as 75 Hz and up to 75 kHz. The functional hearing ranges of marine mammal groups are summarized in Table 5 below.

Table 5. Marine Mammal Functional Hearing Frequency Ranges

Marine Mammal Functional Hearing Frequency Ranges		
Scientific Name	**Common Name**	**Functional Hearing Range**
Mysticete	Baleen Whale	7 Hz – 22 kHz
Odontocete	Toothed Whale	150 Hz – 180 Hz
Otariid	Eared Seal	1 kHz – 30 kHz
Phocid	True Seal	200 Hz – 75 kHz

Coast Survey estimated take based on animal density and the total ensonified area of each survey. This method, although simplistic, produces conservative estimates based on the assumption of spherical spreading and assumes the entire seafloor within each survey area to be ensonified twice ("200 percent coverage") during each survey.

Acoustic take estimations were grouped by major geographic region as required under the Marine Mammal Protection Act and included the following regions: Alaska (Beaufort/Chukchi Seas, Bering Sea, and Gulf of Alaska estimated separately), Pacific Coast, Atlantic Coast, and Gulf of Mexico. Coast Survey did not calculate take estimates for marine mammals in the Pacific Islands and Caribbean geographic regions, since no hydrographic survey projects are planned for those areas in the next five years. Animal densities were derived from several different sources, which are listed for each species in Tables 6-11. In cases where a source provided densities for more than one season, Coast Survey chose the season with the highest density. When Coast Survey could not locate species-specific animal densities, a proxy or surrogate species' density was used to derive a population-adjusted density. The method for estimating take included the following steps:

1. Total planned survey area (in square nautical miles) per year for all projects in each major geographic region was estimated based on the average percentage of surveys occurring in that region (completed and planned projects) 2010-13.

2. For each region, this value was multiplied by two (each area is assumed to be ensonified at least twice during a survey to meet Coast Survey's "full bottom coverage" standards for hydrographic surveys).

3. For each region, take estimates were calculated by multiplying this value by the animal density for each non-deep water marine mammal species.

Tables 6-11 summarize Level B take estimations for affected marine mammal species in each major geographic region calculated from the steps listed above. Estimates were made for one year based on the assumption that Coast Survey would survey approximately 3,000 square nautical miles per year based on a typical appropriations year. Of that number, approximately 1,700 square nautical miles would be surveyed in Alaska waters (300 in Beaufort/Chukchi Seas, 400 in Bering Sea, and 1,000 in the Gulf of Alaska), 100 in Pacific coastal waters, 800 in Atlantic coastal waters, and 400 in Gulf of Mexico waters.

For example, killer whales in Alaska have a mean density of 0.034299 animals per square nautical mile (Zerbini et al. 2007). Each year, Coast Survey would survey approximately 300 square nautical miles in the Beaufort and Chukchi Seas. The annual take estimate for killer whales in the Beaufort and Chuckchi Seas (21 animals/year) was calculated using the steps outlined above:

Beaufort/Chukchi annual survey area = 300 square nautical miles/year

300 square nautical miles/year x 2 = 600 square nautical miles/year ensonified

600 square nautical miles/year x 0.034299 killer whales/square nautical mile = 21 killer whales/year

In some cases there were no density values for a particular species and Coast Survey used proxy or surrogate values that were then adjusted for population values, when known. For example, when estimating bowhead whale densities in the Beaufort and Chukchi Seas, Coast Survey used density values for killer whales based on the predator/prey relationship between bowheads and killer whales. The mean killer whale density of 0.034299 animals per square nautical mile was multiplied by the ratio between the latest bowhead population estimate (10,545) and killer whale population estimate (3,213) for an estimated bowhead whale density of 0.112569 animals per square nautical mile. The annual take estimate (68 animals/year) for bowhead whales in the Beaufort and Chukchi Seas would be calculated using the derived density value as follows:

Beaufort/Chukchi annual survey area = 300 square nautical miles/year

300 square nautical miles/year x 2 = 600 square nautical miles/year ensonified

600 square nautical miles/year x 0.112569 bowhead whales/square nautical mile = 68 bowheads/year

Based on the results of its evaluation, Coast Survey has concluded that underwater sound associated with hydrographic survey operations may lead to temporary avoidance behavior (acoustic harassment), but is unlikely to injure marine mammals in the long term. These mammals include the toothed whales and true seals that can hear within the lower end of the frequency range of Coast Survey echosounders.

7. IMPACT TO SPECIES OR STOCK

The anticipated impact of the activity upon the species or stock

Sound from echosounders used during regular hydrographic survey operations could lead to behavioral changes in marine mammals that might affect migration, feeding, breeding, and the ability to avoid predators (Au and Hastings 2008). Existing ambient underwater noise from natural and anthropogenic sources is part of the physical marine environment. Surface waves and animal vocalizations provide the greatest source of naturally occurring ocean noise. Sources of anthropogenic noise include vessel propellers, seismic airguns, explosives, construction, naval sonars, and standard vessel depth finders (National Research Council 2003).

Hydrographic surveys and the associated transit operations adds to the general vessel traffic in the marine environment. Survey vessels introduce a new source of vessel noise into the existing baseline of underwater ambient sound, particularly in heavy commercial traffic areas. However, the cumulative impact of this one new source of vessel noise is negligible in the context of thousands of much larger and louder ships that travel in and out of busy harbors. All vessels in the water, except for the smallest boats, are typically equipped with a single-beam depth finder that is used for navigational safety in conjunction with nautical charts. These depth finders determine the instantaneous depth underneath the vessel in real-time, although they operate in the same manner as a typical survey single beam echosounder.

Table 6. Alaska Take Estimates – Beaufort/Chukchi Seas

ALASKA – Est. Survey Area: 300 sq nautical miles per year / Maximum Ensonified Area: 600 sq nautical miles per year						
Sub-Order / Family	Species	Population	Est Pop (N_{est})	Density (Animals per sq naut mile)	Density Source	1-year Acoustic Take Estimate (# Animals)
Mysticete	Bowhead Whale	Western Arctic[1]	10,545	0.112569	(Department of the Navy 2009, Perrin et al. 2009, Zerbini et al. 2007)	68
	Gray Whale	Eastern North Pacific	19,126	0.001029	(Department of the Navy 2009, Moore et al. 2007)	1
	Minke Whale	Alaska	unk	0.002058	(Department of the Navy 2009, Waite 2003)	1
Odontocete	Beluga Whale	Beaufort Sea and Eastern Chukchi Sea[1]	42,968	0.458686	(Department of the Navy 2009, Perrin et al. 2009, Zerbini et al. 2007)	275
	Harbor Porpoise	Bering Sea[2]	48,215	9.809514	(Department of the Navy 2010)	5,886
	Killer Whale	All U.S. Alaska Populations	3,213	0.034299	(Department of the Navy 2009, Zerbini et al. 2007)	21
Phocid	Bearded Seal	Alaska	unk	1.920744	(Bengtson et al. 2005)	1,152
	Ribbon Seal	Alaska[3]	49,000	1.271365	(Bengtson et al. 2005, Perrin et al. 2009)	763
	Ringed Seal	Alaska	unk	6.551109	(Bengtson et al. 2005)	3,931
	Spotted Seal	Alaska[3]	unk	3.788148	(Bengtson et al. 2005, Perrin et al. 2009)	2,273

[1] Density values derived from using killer whale as a surrogate species due to predator/prey relationship
[2] Density values for Alaska unknown; values for Pacific Coast population used as a proxy
[3] Density values derived from using the ringed seal as a surrogate species due to a common association with sea ice

Table 7. Alaska Take Estimates – Bering Sea

ALASKA – BERING SEA – Est. Survey Area: 400 sq nautical miles per year / Maximum Ensonified Area: 800 sq nautical miles per year						
Sub-Order / Family	Species	Population	Est Pop (N_{est})	Density (Animals per sq naut mile)	Density Source	1-year Acoustic Take Estimate (# Animals)
Mysticete	Bowhead Whale	Western Arctic[1]	10,545	0.112569	(Department of the Navy 2009, Perrin et al. 2009, Zerbini et al. 2007)	90
	Gray Whale	Eastern North Pacific	19,126	0.001029	(Department of the Navy 2009, Moore et al. 2007)	1
	Humpback Whale	Western North Pacific	938	0.006517	(Department of the Navy 2009, Rone et al. 2009)	5
	Minke Whale	Alaska	unk	0.002058	(Department of the Navy 2009, Waite 2003)	2
	North Pacific Right Whale	Eastern North Pacific[1]	31	0.000331	(Department of the Navy 2009, Perrin et al. 2009, Zerbini et al. 2007)	0
Odontocete	Baird's Beaked Whale	Alaska	unk	0.001715	(Department of the Navy 2009, Waite 2003)	1
	Beluga Whale	Eastern Bering Sea and Bristol Bay[1]	31,283	0.333948	(Department of the Navy 2009, Perrin et al. 2009, Zerbini et al. 2007)	267
	Dall's Porpoise	Alaska	83,400	0.648937	(Department of the Navy 2009, Waite 2003)	519
	Harbor Porpoise	Bering Sea[2]	48,215	9.809514	(Department of the Navy 2010)	7,848
	Killer Whale	All U.S. Alaska Populations	3,213	0.034299	(Department of the Navy 2009, Zerbini et al. 2007)	27
	Pacific White-sided Dolphin	Central North Pacific	26,880	0.071342	(Department of the Navy 2009, Waite 2003)	57
Phocid	Bearded Seal	Alaska	unk	1.920744	(Bengtson et al. 2005)	1,537
	Harbor (common) Seal	Aleutian, Pribilof, and Bristol Bay[2]	22,388	4.493169	(Department of the Navy 2010, Huber et al. 2001, Jeffries et al. 2003)	3,595
	Northern Elephant Seal	California Breeding	124,000	0.007546	(Carretta et al. 2011, Department of the Navy 2009)	6
	Ribbon Seal	Alaska[3]	49,000	1.271365	(Bengtson et al. 2005, Perrin et al. 2009)	1,017
	Ringed Seal	Alaska	unk	6.551109	(Bengtson et al. 2005)	5,241

	Spotted Seal	Alaska[3]	unk	3.788148	(Bengtson et al. 2005, Perrin et al. 2009)	3,031
Otariid	Northern Fur Seal	Pribilof Island/Eastern Pacific	653,171	0.404728	(Carretta et al. 2011, Department of the Navy 2009)	324
	Steller Sea Lion	Western U.S.	42,286	0.033613	(Allen and Angliss 2011, Department of the Navy 2009)	27

[1] Density values derived from using killer whale as a surrogate species due to predator/prey relationship
[2] Density values for Alaska unknown; values for Pacific Coast population used as a proxy
[3] Density values derived from using the ringed seal as a surrogate species due to a common association with sea ice

Table 8. Alaska Take Estimates – Gulf of Alaska

ALASKA – GULF OF ALASKA – Est. Survey Area: 1,000 sq nautical miles per year / Maximum Ensonified Area: 2,000 sq nautical miles per year						
Sub-Order / Family	Species	Population	Est Pop (N_{est})	Density (Animals per sq naut mile)	Density Source	1-year Acoustic Take Estimate (# Animals)
Mysticete	Gray Whale	Eastern North Pacific	19,126	0.001029	(Department of the Navy 2009, Moore et al. 2007)	2
	Humpback Whale	Western North Pacific	938	0.006517	(Department of the Navy 2009, Rone et al. 2009)	13
	Minke Whale	Alaska	unk	0.002058	(Department of the Navy 2009, Waite 2003)	4
	North Pacific Right Whale	Eastern North Pacific[1]	31	0.000331	(Department of the Navy 2009, Perrin et al. 2009, Zerbini et al. 2007)	1
Odontocete	Baird's Beaked Whale	Alaska	unk	0.001715	(Department of the Navy 2009, Waite 2003)	3
	Beluga Whale	Cook Inlet[1]	345	0.003683	(Department of the Navy 2009, Perrin et al. 2009, Zerbini et al. 2007)	7
	Dall's Porpoise	Alaska	83,400	0.648937	(Department of the Navy 2009, Waite 2003)	1,298
	Harbor Porpoise	Gulf of Alaska and Southeast Alaska[2]	42,192	9.809514	(Department of the Navy 2010)	19,619
	Killer Whale	All U.S. Alaska Populations	3,213	0.034299	(Department of the Navy 2009, Zerbini et al. 2007)	69
	Pacific White-sided Dolphin	Central North Pacific	26,880	0.071342	(Department of the Navy 2009, Waite 2003)	143
Phocid	Harbor (common) Seal	All Gulf of Alaska Populations[2]	130,204	4.493169	(Department of the Navy 2010, Huber et al. 2001, Jeffries et al. 2003)	8,986
	Northern Elephant Seal	California Breeding	124,000	0.007546	(Carretta et al. 2011, Department of the Navy 2009)	15
Otariid	Steller Sea Lion	Western U.S.	42,286	0.033613	(Allen and Angliss 2011, Department of the Navy 2009)	67

[1] Density values derived from using killer whale as a surrogate species due to predator/prey relationship
[2] Density values for Alaska unknown; values for Pacific Coast population used as a proxy

Table 9. Pacific Coast Take Estimates

PACIFIC COAST – Est. Survey Area: 100 sq nautical miles per year / Maximum Ensonified Area: 200 sq nautical miles per year						
Sub-Order / Family	Species	Population	Est Pop (Nest)	Density (Animals per sq naut mile)	Density Source	1-year Acoustic Take Estimate (# Animals)
Mysticete	Gray Whale	Eastern North Pacific	19,126	0.001029	(Calambokidis et al. 2004)	0
	North Pacific Right Whale	Eastern North Pacific[1]	31	0.005942	(Department of the Navy 2010, Perrin et al. 2009)	1
	Blue Whale	Eastern North Pacific	2,497	0.006078	(Barlow et al. 2009)	1
	Humpback Whale	CA/OR/WA	2,043	0.003831	(Barlow et al. 2009)	1
	Minke Whale	CA/OR/WA	478	0.001372	(Department of the Navy 2010, Forney 2007)	0
Odontocete	Baird's Beaked Whale	CA/OR/WA	907	0.009261	(Department of the Navy 2010, Forney 2007)	2
	Bottlenose Dolphin	All U.S. Pacific Coast Pop	1,329	0.001766	(Department of the Navy 2008)	0
	Dall's Porpoise	CA/OR/WA	42,000	0.195676	(Barlow et al. 2009)	39
	Dwarf Sperm Whale	CA/OR/WA	unk	0.004226	(Department of the Navy 2008)	1
	Harbor Porpoise	All U.S. Pacific Coast Pop	78,662	9.809514	(Department of the Navy 2010)	1,962
	Killer Whale	All U.S. Pacific Coast Pop	680	0.130336	(Department of the Navy 2010)	26
	Long-Beaked Common Dolphin	California[2]	27,046	0.119218	(Barlow et al. 2009, Perrin et al. 2009)	24
	Pacific white-sided Dolphin	CA/OR/WA	26,930	0.264757	(Barlow et al. 2009)	53
	Short-Beaked Common Dolphin	CA/OR/WA	411,211	1.812613	(Barlow et al. 2009)	363
	Short-Finned Pilot Whale	CA/OR/WA[3]	760	0.001010	(Department of the Navy 2008, Perrin et al. 2009)	0
Otariid	California Sea Lion	United States	296,750	0.970662	(Department of the Navy 2010)	194
	Guadalupe Fur Seal	Mexico to California[4]	7,408	0.298236	(Department of the Navy 2010, NOAA 2011)	60
	Northern Fur Seal	San Miguel Island	9,968	0.401298	(Department of the Navy 2010)	80
	Steller Sea Lion	Eastern U.S.	58,334-72,223	0.032927	(Department of the Navy 2010)	7
Phocid	Harbor (common) Seal	All U.S. Pacific Coast Pop	>30,196	4.493169	(Department of the Navy 2010, Huber et al. 2001, Jeffries et al. 2003)	899
	Northern Elephant Seal	California Breeding	124,000	0.161205	(Carretta et al. 2011, Department of the Navy 2010)	32

[1] Density values derived from using killer whale as a surrogate species due to predator/prey relationship
[2] Density value derived from using the short-beaked common dolphin as a surrogate species due to common association
[3] Density value derived from using the bottlenose dolphin as a surrogate species due to common association

[4] Density value derived from using the northern fur seal as a surrogate species due to common association

Table 10. Atlantic Coast Take Estimates

ATLANTIC COAST – Est. Survey Area: 800 sq nautical miles per year / Maximum Ensonified Area: 1,600 sq nautical miles per year						
Sub-Order / Family	Species	Population	Est Pop (Nest)	Density (Animals per sq naut mile)	Density Source	1-year Acoustic Take Estimate (Animals)
Mysticete	Blue Whale	Western North Atlantic[1]	unk	0.006078	(Barlow et al. 2009)	10
	Humpback Whale	Gulf of Maine	847	0.004082	(Department of the Navy 2007b, 2007c)	7
	Minke Whale	Canadian East Coast	8,987	0.000751	(Department of the Navy 2007b, 2007c)	1
	North Atlantic Right Whale	Western North Atlantic	396	0.001962	(Department of the Navy 2007b, 2007c)	3
Odontocete	Atlantic Spotted Dolphin	Western North Atlantic	50,978	2.636324	(Department of the Navy 2007b, 2007c)	4,218
	Atlantic White-Sided Dolphin	Western North Atlantic	23,390	0.091421	(Department of the Navy 2007b, 2007c)	146
	Bottlenose Dolphin	All U.S. Atlantic pops.	>81,588	0.262363	(Department of the Navy 2007b, 2007c)	420
	Dwarf Sperm Whale	Western North Atlantic[1]	395	0.004226	(Department of the Navy 2008)	7
	Harbor Porpoise	Gulf of Maine/Bay of Fundy	89,054	0.037966	(Department of the Navy 2007b, 2007c)	61
	Killer Whale	Western North Atlantic[1]	unk	0.130336	(Department of the Navy 2010)	209
	Pantropical Spotted Dolphin	Western North Atlantic	4,439	0.060507	(Department of the Navy 2007b, 2007c)	97
	Short-Beaked Common Dolphin	Western North Atlantic[1]	120,743	1.812613	(Barlow et al. 2009)	2,900
	Short-Finned Pilot Whale	Western North Atlantic	24,674	0.052306	(Department of the Navy 2007b, 2007c, Waring et al. 2011)	84
	White-Beaked Dolphin	Western North Atlantic[4]	2,003	0.007928	(Department of the Navy 2007b, 2007c, Perrin et al. 2009)	13
Phocid	Gray Seal	Western North Atlantic	unk	0.155128	(Department of the Navy 2007b, 2007c)	248
	Harbor (common) Seal	Western North Atlantic	unk	1.943937	(Department of the Navy 2007b, 2007c)	3,110
	Harp Seal	Western North Atlantic[5]	unk	0.130336	(Department of the Navy 2010, Perrin et al. 2009)	209
	Hooded Seal	Western North Atlantic[5]	unk	0.130336	(Department of the Navy 2010, Perrin et al. 2009)	209

[1] Density values for Atlantic Coast unknown; values for Pacific Coast population used as a proxy
[2] Density value derived from using the bottlenose dolphin as a surrogate species due to common association
[3] Density value derived from using the Clymene dolphin as a surrogate species due to species' similarity
[4] Density value derived from using Risso's dolphin as a surrogate species due to common association
[5] Density values derived from using killer whale as a surrogate species due to predator/prey relationship

Table 11. Gulf of Mexico Take Estimates

GULF OF MEXICO – Est. Survey Area: 400 sq nautical miles per year / Maximum Ensonified Area: 800 sq nautical miles per year						
Sub-Order / Family	Species	Population	Est Pop (Nest)	Density (Animals per sq naut mile)	Density Source	1-year Acoustic Take Estimate (Animals)
Mysticete	Bryde's Whale	Gulf of Mexico	15	0.000202	(Department of the Navy 2007a)	0
Odontocete	Atlantic Spotted Dolphin	Gulf of Mexico	unk	0.160241	(Department of the Navy 2007a)	128
	Bottlenose Dolphin	All U.S. Gulf of Mexico pop	>14,208	0.242892	(Department of the Navy 2007a)	194
	Dwarf Sperm Whale	Gulf of Mexico Oceanic[1]	453	0.004226	(Department of the Navy 2008)	3
	Killer Whale	Gulf of Mexico Oceanic	49	0.000597	(Department of the Navy 2007a)	0
	Pantropical Spotted Dolphin	Gulf of Mexico Oceanic	34,067	0.500450	(Department of the Navy 2007a)	400
	Short-Finned Pilot Whale	Gulf of Mexico Oceanic	716	0.012111	(Department of the Navy 2007a)	10

[1] Density values for Gulf of Mexico unknown; values for Pacific Coast population used as a proxy

8. AVAILABILITY OF SPECIES FOR SUBSISTENCE USES

The anticipated impact of the activity on the availability of the species or stocks of marine mammals for subsistence uses

Alaska Native communities' subsistence activities may occur in or around survey areas. Their lands border the Beaufort, Chukchi, and Bering Seas, Kotzebue Sound, Bering Strait, and Norton Sound. Alaska Native Claims Settlement Act regional corporations in these areas include the Arctic Slope Regional, NANA Regional, Bering Straits Native, Calista, and Aleut Corporations (Figure 8), which overlap the North Slope, Northwest Arctic, Nome, Wade-Hampton, Bethel, Dillingham, Aleutians West, and Aleutians East boroughs (Figure 9). These regional corporations include communities located north of 60° N latitude (the MMPA definition of "Arctic waters") located on lands near Coast Survey's planned project areas. Figure 10 displays a map of the latest Arctic surveying and charting plan.

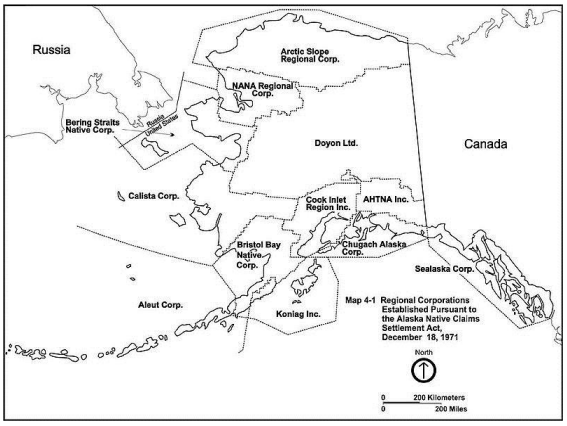


Figure 8. Alaska Native Claims Settlement Act native regional corporations

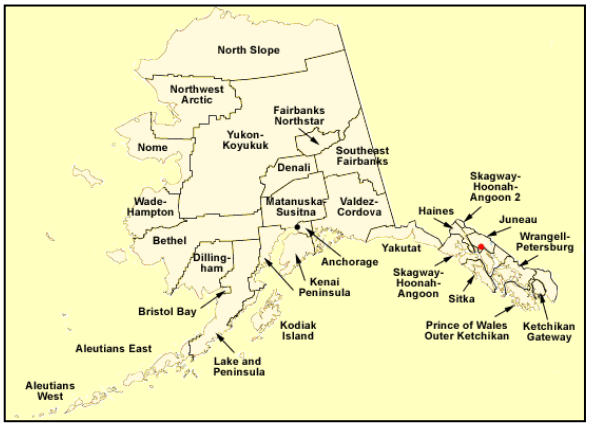


Figure 9. Alaska boroughs

The Inupiat villages of Barrow and Point Hope (Arctic Slope Regional Corporation, North Slope Borough), as well as those of Red Dog Mine and Kotzebue (NANA Regional Corporation, Northwest Arctic Borough), are located near planned survey areas. These communities derive income primarily through resource development, including oil and gas exploration. Ore from Red Dog Mine, located 90 miles north of Kotzebue, is owned by the NANA Regional Corporation; the mine employs a quarter of the Northwest Arctic Borough population. Inupiat and Yup'ik communities in Wales, Diomede, Brevig Mission, Teller, and St. Lawrence Island (Bering Straits Native Corporation, Nome Borough) also own and reside on lands adjacent to planned surveys. Cup'ik and Yup'ik communities on or around Nunivak Island, including the villages of Mekoryuk, Tununak, Umkumiute, and Toksook Bay (Calista Corporation, Bethel Borough) are also located above 60° north latitude near planned surveys.

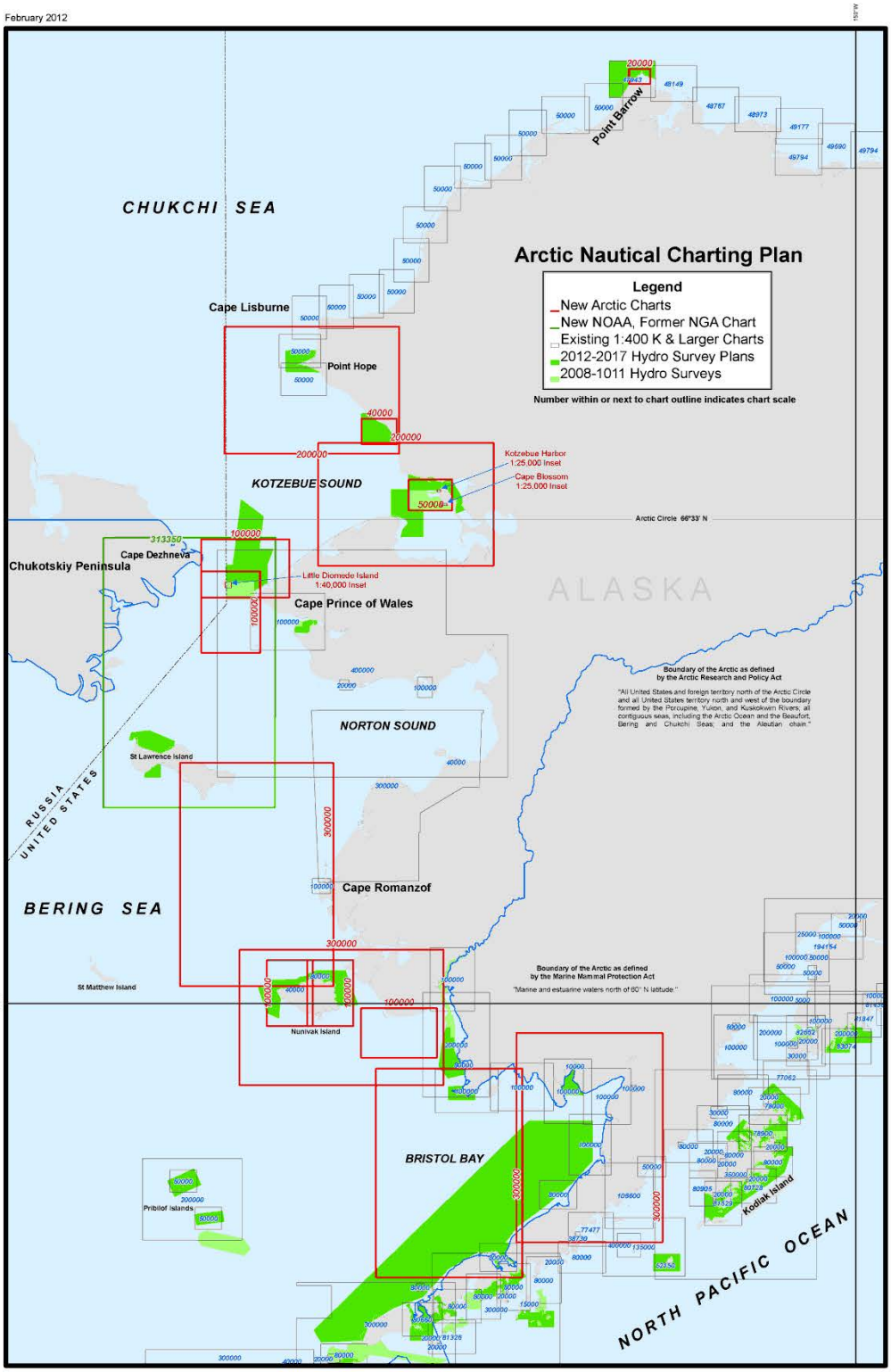


Figure 10. Arctic Surveying and Charting Plan

Each of the Alaska Native communities listed above relies on traditional whaling, sealing, and other subsistence hunting and fishing activities. Hunting and fishing also support the local economies of many of these communities. Whales provide meat, oil, baleen, and bone products. Bowhead whale hunts occur in the Beaufort Sea in the spring (April and May) and fall (September and October), and in the Chukchi Sea in the spring (March to June). Beluga whale hunts take place in the Chukchi Sea in the spring and late summer. Chukchi Sea communities also hunt ice seals, including the ringed, spotted, ribbon, and bearded seals for meat, hides, and oil, primarily in the spring and winter.

As with any hydrographic survey located anywhere, sound from echosounders used during Arctic survey operations could lead to behavioral changes in marine mammals that might affect migration, feeding, breeding, and the ability to avoid predators (Au and Hastings 2008). Hydrographic surveys also add to the general vessel traffic in the marine environment. Each year, Coast Survey will survey approximately 700 square nautical miles in the Beaufort, Chukchi, and Bering Seas. Table 12 includes take estimates for the bowhead and beluga whale, as well as the ringed, spotted, ribbon, and bearded seals. Take estimates are for Level B Acoustic Harassment and are calculated based on the methods described in Section 7.

Table 12. Arctic Subsistence Species Take Estimates

Beaufort/Chukchi/Bering Seas – Est. survey area 700 NM per year / Max ensonified area 1,400 NM per year				
Species	Population	Est Pop (N_{est})	Density (Animals per sq naut mile)	1-year Acoustic Take Estimate (# Animals)
Bowhead Whale	Western Arctic	10,545	0.112569	158
Beluga Whale	Beaufort Sea and Eastern Chukchi Sea	42,968	0.792635	1,110
Bearded Seal	Alaska	unk	1.920744	2,689
Ribbon Seal	Alaska	49,000	1.271365	1,780
Ringed Seal	Alaska	252,488	6.551109	9,172
Spotted Seal	Alaska	146,000	3.788148	5,303

Avoidance behavior among Arctic subsistence marine mammal species is the most common behavioral change to be expected, particularly as survey ships approach, with beluga whales in particular traveling several kilometers away from the ship's track (Richardson et al. 1995). Bowhead whales will typically try to outswim the vessel, but will swim away from the ship as it moves closer (Richardson et al. 1995). Beluga and bowhead whales will usually return to the site following displacement after one or two days if the ship has moved to a different area (Richardson et al. 1995). Arctic seals are typically associated with the sea ice and are therefore unlikely to be located near survey ships, which must avoid the ice; however, if seals are swimming far away from the ice, they will most likely exhibit shorter term avoidance behavior in the presence of a ship (Richardson et al. 1995).

Coast Survey will make every possible effort to avoid areas where these animals are known to be concentrated or if they are observed during operations in order to minimize disturbances, and does not expect to observe a reduction in species numbers a result of its operations. The above

take estimates are very conservative, with a "take" defined as any exposure to an operational single beam or multibeam echosounder. In reality, the animals are not likely to remain within the ensonified area during operations and injury would be minimal or negligible; however, for the purpose of this application, avoidance behavior is considered a Level B acoustic harassment "take."

9. IMPACT UPON MARINE MAMMAL HABITAT

The anticipated impact of the activity upon the habitat of the marine mammal populations, and the likelihood of restoration of the affected habitat

Cetaceans feed primarily on crustaceans, zooplankton, fish and squid, although killer whales also feed on other marine mammals. Pinnipeds feed on crustaceans, cephalopods, and fish. Marine mammal prey are found at all trophic levels are often located near thermoclines, eddies, and upwellings (Perrin 2009).

Coast Survey projects will not result in habitat loss for marine mammals. The fish upon which many marine mammals prey cannot hear well above 1 kHz (Au and Hastings), which is well out of range of Coast Survey echosounders. Survey projects would also have no effect on the fish habitat. Coast Survey collects grab samples of seafloor sediment during survey operations by lowering a grab sampler through the water column using a clamshell bottom snapper to obtain samples of the surface sediment layer, but would not impact fish habitat due to the small footprint and low intensity of the activity.

10. IMPACT OF HABITAT LOSS ON MARINE MAMMALS

The anticipated impact of the loss or modification of the habitat on the marine mammal populations involved

Coast Survey does not anticipate loss or modification of marine mammal habitat.

11. MITIGATION MEASURES

The availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, their habitat, and on their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance

Each year, NOAA ships are required to include 24 hours of "safety stand down" training activities for on-board personnel. NOAA is incorporating basic strategies for marine mammal detection and monitoring into standard ocean observatory roles for personnel. NOAA's Office of Science and Technology is working with other NOAA Fisheries offices and universities to

establish a uniform submission site for recorded observations of marine mammals and sea turtles. Contractor vessels would also be required to incorporate these basic strategies for marine mammal detection and monitoring as they are developed.

Coast Survey believes the best mitigation measure is avoidance of areas where marine mammals are observed in rookeries, mating grounds, and other significant areas. The key improvement will be a better ability of fleet officers and other watch standers to recognize these important areas. During the informal stage of consultation, Coast Survey has been working with the Office of Protected Resources to better identify opportunities for observation training, particularly those opportunities that could be available to the entire NOAA fleet.

12. PLAN OF COOPERATION

Where the proposed activity would take place in or near a traditional Arctic subsistence hunting area and/or may affect the availability of a species or stock of marine mammal for Arctic subsistence uses, the applicant must submit either a plan of cooperation or information that identifies what measures have been taken and/or will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses

Coast Survey has developed the following Plan of Cooperation - an evolving, working document that outlines mitigation measures (principally avoidance) and includes plans for and results of meetings with Alaska Native communities.

12.1 Mitigation Measures

Coast Survey's principal mitigation measure is avoidance of areas used by Alaska Native communities for the bowhead whale, beluga whale, and Arctic seal hunts during each hunting season. The Coast Survey Alaska navigation manager will continue to work with communities to avoid surveying in known subsistence hunting areas at the times of year when the hunt will occur. Coast Survey will make every attempt possible to avoid interfering with bowhead and beluga whale, and Arctic seal subsistence activities.

12.2 Community Meetings

Throughout the year, the Anchorage-based Alaska navigation manager, who undertakes Coast Survey customer service and outreach in the region, works with local Alaska Native communities and Alaska Native Claims Settlement Act Native Corporations to discuss planned surveys. The navigation manager works with his or her shipping contacts around the state to contact the appropriate local shipping, political, and Alaska Native representatives in each coastal village. Typically, Native leadership (political and Native governmental) is interested in where Coast Survey is surveying, which activities would take place during the survey, and how the survey could affect their communities. These meetings also provide Coast Survey with

valuable insights into local knowledge. They inform Coast Survey about particular areas where surveys would disturb subsistence fishing or hunting activities, and give Coast Survey notice on areas to avoid surveying.

In the summer of 2011, the Director of Coast Survey, Marine Chart Division Chief, and Alaska navigation manager met with local and regional Alaska Native leadership in Kotzebue, AK and participated in a radio interview on Radio KOTZ (AM 720) to discuss survey plans and navigation products in the approaches to Kotzebue Sound. Further, the NOAA Ship *Fairweather* engaged in public outreach during the 2011 survey operations in Kotzebue Sound. Scientific support stations were located on shore and many local residents were very interested and supportive of these activities. The *Fairweather* engaged in a similar type of outreach when conducting the Bering Strait Survey in 2010. Select local village residents of Little Diomede were hosted aboard the *Fairweather* for a tour of survey operations. The village also hosted the crew of the *Fairweather* for an evening of traditional song, dance, and food. The village residents were very engaged in the survey activities and provided guide services for installation of support stations atop Little Diomede Island. The lessons learned from these two surveys have provided invaluable outreach lessons that continue to be implemented in planning for future surveys.

In 2012, the Alaska navigation manager attended the Arctic Open Water Meeting (March 6-8, 2012) in Anchorage in order to develop and strengthen relationships with Alaska Native advocacy groups throughout the state. He also met with members of the Kawerak community in Nome (April 26, 2012) and Inupiat communities as part of the North Slope Borough Assembly Meeting (August 7, 2012) to discuss planned surveys in those areas. The aforementioned meetings in the Alaskan villages were broadcast on local AM radio stations throughout the region. Appendix A includes the slides from the presentation given by the Alaska navigation manager at the North Slope Borough Assembly Meeting. This example is typical for this type of presentation and includes discussion of the following topics:

13. MONITORING AND REPORTING

The suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity. Monitoring plans should include a description of the survey techniques that would be used to determine the movement and activity of marine mammals near the activity site(s) including migration and other habitat uses, such as feeding. Guidelines for developing a site-specific monitoring plan may be obtained by writing to the Director, Office of Protected Resources

A designated lookout stands watch on the ship's bridge during Coast Survey transit and survey operations, scanning the water for humans, animals, vessels, and other objects. Personnel on board NOAA and contractor vessels monitor and report locations of marine mammal sightings as

part of their regular operational protocol. Currently, the lookout records any sightings of marine mammals on either a paper marine mammal log or by an automated marine mammal report logging system, which many NOAA ships also use for weather reporting. NOAA Fisheries' Office of Science and Technology is developing a smartphone application for filing reports. Regardless of format or mode of delivery, the observation report records the species, number of animals, behavior, time, and location of the sighting. Figure 11 includes an example of a marine mammal observation log.

On smaller vessels, the coxswain performs lookout duties in addition to steering the boat. The launches do not have logs but the launch personnel call in any unique sightings to the ship. In congested areas, the coxswain often asks that an additional person stand on the bow to scan the water for dangerous objects. Lookouts are trained to call out any obstructions they see, including boats, kelp, logs, or marine mammals, and call them out as soon as possible to avoid a collision.

As a general precaution, vessel operators follow entry restrictions to protected areas for marine mammals, which are depicted on NOAA's nautical charts and described in detail in the U.S. Coast Pilot, both used for navigation during surveys. Important updates to restricted areas are broadcast through the U.S. Coast Guard "Local Notice to Mariners" and, in more urgent cases, are released through broadcast on VHF channel 16 or 22. Coast Survey applies Local Notice to Mariners updates to all charting products.

14. REDUCING INCIDENTAL TAKE

Suggested means of learning of, encouraging, and coordinating research opportunities, plans, and activities relating to reducing such incidental taking and evaluating its effects.

Coast Survey is working to incorporate geospatial files of marine mammal locations into a greater, comprehensive Geographic Information Systems (GIS) planning effort. In particular, Coast Survey is hoping to use its GIS expertise to populate valuable observational metadata and behavioral attributes into GIS files that would be available to the wider NOAA community.

In addition, Coast Survey would like to share its observations on cruises to remote areas that would otherwise be unavailable to the scientific community (Figure 11).

DATE:

VESSEL/SURVEY NAME & ID:

OBSERVER CONTACT:

Group No.	Date	Time (hh.mm.ss)	Lat (dms)	Long (dms)	Species ID	Group Size	Photos taken (Y/N)	Comments

Group No - In sequence of sightings during survey preferably different group no. by species type

Group Size - Number of individuals seen in vicinity

Species ID - Common or scientific name

Comments - Include any behavior observed such as traveling, feeding, predation, and if mother with calves are seen, and report any adverse reactions, injury, entanglement, or behavior. Comment if animal has a satellite or turtle pit or flipper tag record number.

Photos - Series/Range photos. Always take a blank photo between different groups sighted. If possible, take multiple pictures of dorsal fins, saddle patch (for Killer whales), tail flukes for whales, or even the full animal

Figure 11. Marine Mammal Observation Log

REFERENCES

Allen, B. M. & R. P. Angliss (2011) Draft Alaska Marine Mammal Stock Assessments, 2011. http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2011_draft.pdf (last accessed February 2, 2012).

Au, W. W. L. & M. C. Hastings. 2008. *Principles of Marine Bioacoustics*. New York: Springer.

Barlow, J., M. C. Ferguson, E. A. Becker, J. V. Redfern, K. A. Forney, I. L. Vilchis, P. C. Fiedler, T. Gerrodette & L. T. Ballance (2009) Predictive Modeling of Marine Mammal Density from existing survey data and model validation using upcoming surveys. *NOAA Technical Memorandum. NOAA-TMNMFS-SWFSC-XXX***,** 196. http://seamap.env.duke.edu/serdp/serdp_map.php (last accessed February 11, 2012).

Bengtson, J. L., L. M. Hiruki-Raring, M. A. Simpkins & P. L. Boveng (2005) Ringed and bearded seal densities in the eastern Chukchi Sea, 1999-2000. *Polar Biology,* 28**,** 833-845.

Calambokidis, J., R. Lumper, J. Laake, M. Gosho & P. Gearin (2004) Gray Whale Photographic Identification in 1998-2003: Collaborative Research in the Pacific Northwest. http://www.cascadiaresearch.org/reports/rep-ER-98-03rev.pdf (last accessed February 11, 2012).

Carretta, J. V., K. A. Forney, E. Oleson, K. Martien, M. M. Muto, M. S. Lowry, J. Barlow, J. Baker, B. Hanson, D. Lynch, L. Carswell, R. L. Brownell Jr., J. Robbins, D. K. Mittila, K. Ralls & M. C. Hill (2011) Draft U.S. Pacific Marine Mammal Stock Assessments: 2011. http://www.nmfs.noaa.gov/pr/pdfs/sars/po2011_draft.pdf (last accessed February 2, 2012).

Department of the Navy (2007a) Navy OPAREA Density Estimate (NODE) for the Gulf of Mexico. Prepared for the Department of the Navy, U.S. Fleet Forces Command, Norfolk, Virginia. Contract #N62470-02-D-9997, CTO 0030. Prepared by Geo-Marine, Inc., Hampton, Virginia. http://seamap.env.duke.edu/serdp/serdp_map.php (last accessed February 11, 2012).

--- (2007b) Navy OPAREA Density Estimate (NODE) for the Northeast OPAREAs. Prepared for the Department of the Navy, U.S. Fleet Forces Command, Norfolk, Virginia. Contract #N62470-02-D-9997, CTO 0030. Prepared by Geo-Marine, Inc., Hampton, Virginia. http://seamap.env.duke.edu/serdp/serdp_map.php (last accessed February 11, 2012).

--- (2007c) Navy OPAREA Density Estimate (NODE) for the Southeast OPAREAs. Prepared for the Department of the Navy, U.S. Fleet Forces Command, Norfolk, Virginia. Contract #N62470-02-D-9997, CTO 0030. Prepared by Geo-Marine, Inc., Hampton, Virginia. http://seamap.env.duke.edu/serdp/serdp_map.php (last accessed February 11, 2012).

--- (2008) Request for Letter of Authorization for the Incidental Harassment of Marine Mammals Resulting from Navy Training Activities Conducted Within the Northwest Training Range Complex. http://www.cpf.navy.mil/content/foia/NWTRC_Ltr_of_Authorization.pdf (last accessed February 24, 2012).

--- (2009) Request for Letter of Authorization for the Incidental Harassment of Marine Mammals Resulting from Navy Training Activities in the Gulf of Alaska Temporary Maritime

Activities Area. http://www.nmfs.noaa.gov/pr/pdfs/permits/goa_loa_application.pdf (last accessed February 11, 2012).
--- (2010) Final NAVSEA NUWC Keyport Range Complex Extension Environmental Impact Statement/Overseas Environmental Impact Statement. http://www.navsea.navy.mil/nuwc/keyport/Environmental/Documents.aspx (last accessed February 24, 2012).
Forney, K. A. (2007) Preliminary Estimates of Cetacean Abundance Along the U.S. West Coast and Within Four National Marine Sanctuaries During 2005. *NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-406*. http://swfsc.noaa.gov/publications/TM/SWFSC/NOAA-TM-NMFS-SWFSC-406.PDF (last accessed February 24, 2012).
Huber, H. R., S. J. Jeffries, R. F. Brown, R. L. DeLong & G. VanBlaricom (2001) Correcting Aerial Survey Counts of Harbor Seals in Washington and Oregon. *Marine Mammal Science,* 17**,** 276-293.
Jeffries, S. J., H. R. Huber, J. Calambokidis & J. Laake (2003) Trends and Status of Harbor Seals in Washington State: 1978-1999. *Journal of Wildlife Management,* 67**,** 208-219.
Moore, S. E., K. M. Wynne, J. Clement-Kinney & J. M. Grebmeier (2007) Gray whale occurrence and forage southeast of Kodiak Island, Alaska. *Marine Mammal Science,* 23**,** 419-428.
National Research Council. 2003. *Ocean Noise and Marine Mammals*. Washington, D.C.: National Academies Press.
National Science Foundation & U.S. Geological Survey (2011) Environmental Assessment of a Marine Geophysical Survey by the R/V *Marcus G. Langseth* in the Central-Western Bering Sea, August 2011. http://www.nsf.gov/geo/oce/envcomp/usgs-bering-sea-2011-ea-final-20-june.pdf (last accessed February 10, 2012).
NOAA. 2004. Final Report of the National Oceanic and Atmospheric Administration (NOAA) International Symposium: "Shipping Noise and Marine Mammals: A Forum for Science, Management, and Technology," 18-19 May 2004. Arlington, VA.
--- (2011) Marine Mammals - Office of Protected Resources - NOAA Fisheries. http://www.nmfs.noaa.gov/pr/species/mammals/ (last accessed February 9, 2012).
Perrin, W. F., B. G. Würsig & J. G. M. Thewissen. 2009. *Encyclopedia of Marine Mammals*. London: Academic.
Richardson, W. J., C. R. Greene Jr., C. I. Malme & D. H. Thomson. 1995. *Marine Mammals and Noise*. San Diego, CA: Academic Press.
Rone, B. K., A.B. Douglas, P. Clapham, A. Martinez, L. J. Morse, A. N. Zerbini & J. Calambokidis (2009) Final Report for the April 2009 Gulf of Alaska Line-Transect Survey (GOALS) in the Navy Training Exercise Area. 28. http://www.cascadiaresearch.org/reports/GOA_April_2009_Final_Report-Resubmit.pdf (last accessed February 11, 2012).
Southall, B. L., A. E. Bowles, W. T. Ellison, J. J. Finneran, R. L. Gentry, C. R. Green, D. Kastak, D. R. Ketten, J. H. Miller, P. E. Nachtigall, W. J. Richardson, J. A. Thomas & P. L. Tyack (2007) Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. *Aquatic Mammals,* 33**,** 411-509.

U.S. Fish & Wildlife Service (2009) Final Florida Manatee Stock Assessment Report. http://www.fws.gov/northflorida/Manatee/manatees.htm (last accessed February 11, 2012).

--- (2012) Alaska Region - Marine Mammals Management: Stock Assessment Reports. http://alaska.fws.gov/fisheries/mmm/stock/stock.htm (last accessed February 11, 2012).

Urick, R. J. 1983. *Principles of Underwater Sound (3rd Edition)*. Los Altos, CA: Peninsula Publishing.

Waite, J. (2003) Cetacean Assessment and Ecology Program: Cetacean Survey. *AFSC Quarterly Research Reports, July-September*.

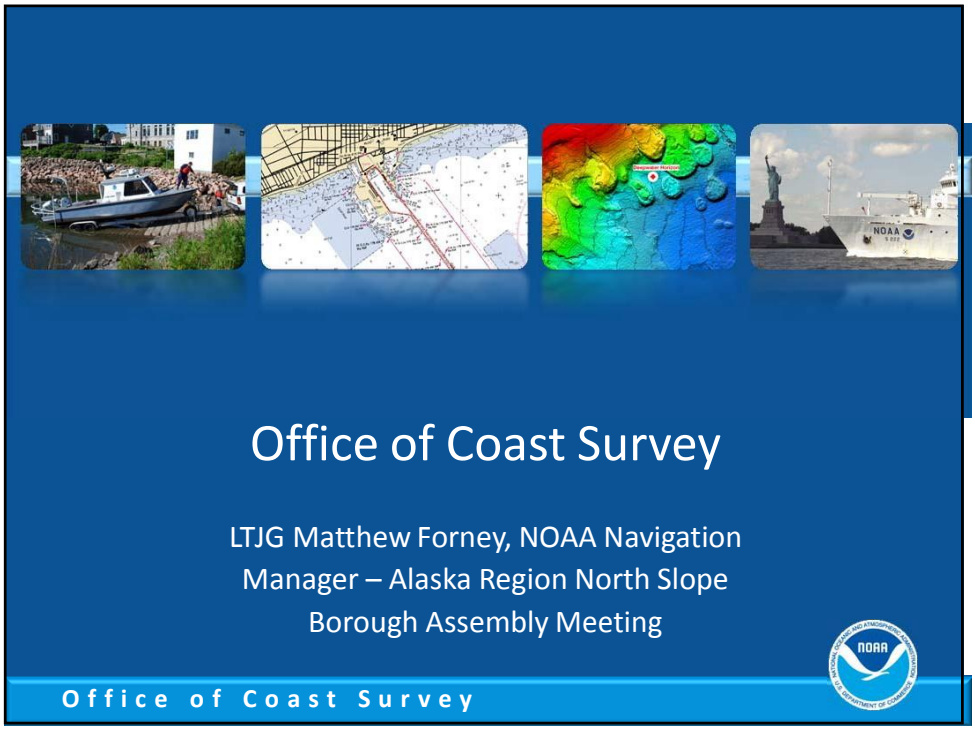
Waring, G. T., E. Josephson, K. Maze-Foley & P. E. Rosel (2011) Draft US Atlantic and Gulf of Mexico marine mammal stock assessments 2011. *NOAA technical memorandum NMFS-NE-219***,** 1 electronic document (532 p.). http://www.nmfs.noaa.gov/pr/pdfs/sars/ao2011_draft_summary.pdf (last accessed February 2, 2012).

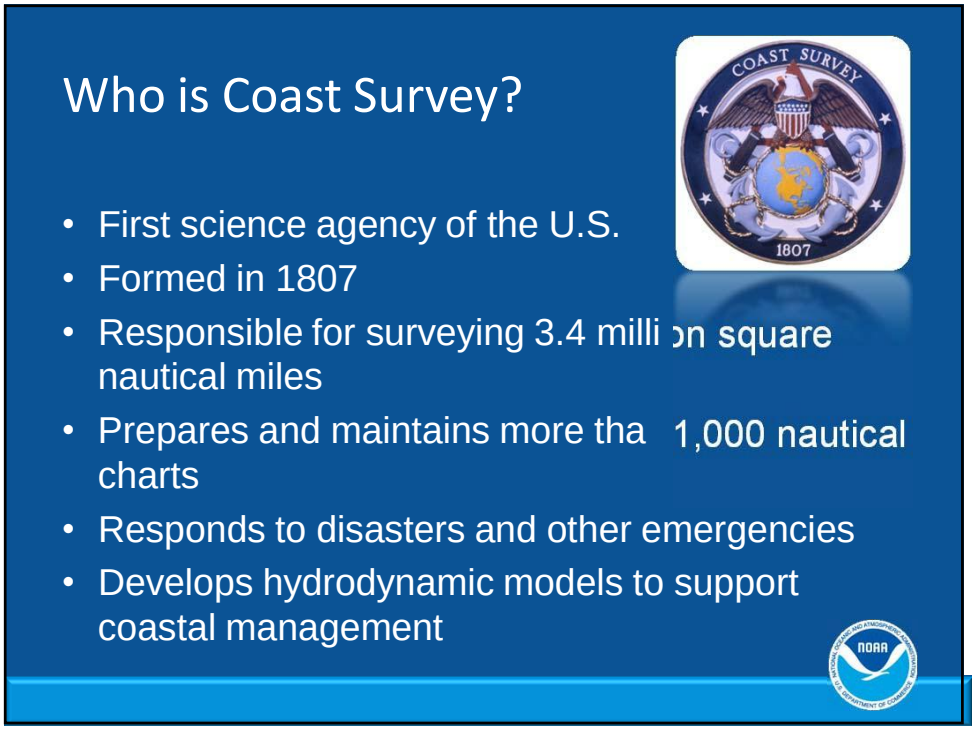
Wartzok, D. & D. R. Ketten. 1999. Marine Mammal Sensory Systems. In *Biology of Marine Mammals*, eds. J. E. Reynolds & S. A. Rommel, 117-175. Washington, D.C.: Smithsonian Institution Press.

Weber, T. 2008. An Assessment of Marine Mammal Noise Exposure from the SeaBeam 2112. White paper for the Center for Coastal and Ocean Mapping, University of New Hampshire, Durham, NH.

Zerbini, A. N., J. M. Waite, J. W. Durban, R. LeDuc, M. E. Dahlheim, P. R. Wade & P. R. Wade (2007) Estimating abundance of killer whales in the nearshore waters of the Gulf of Alaska and Aleutian Islands using line-transect sampling. *Marine Biology*, 150**,** 1033-1045.

APPENDIX A – NORTH SLOPE COMMUNITY PRESENTATION

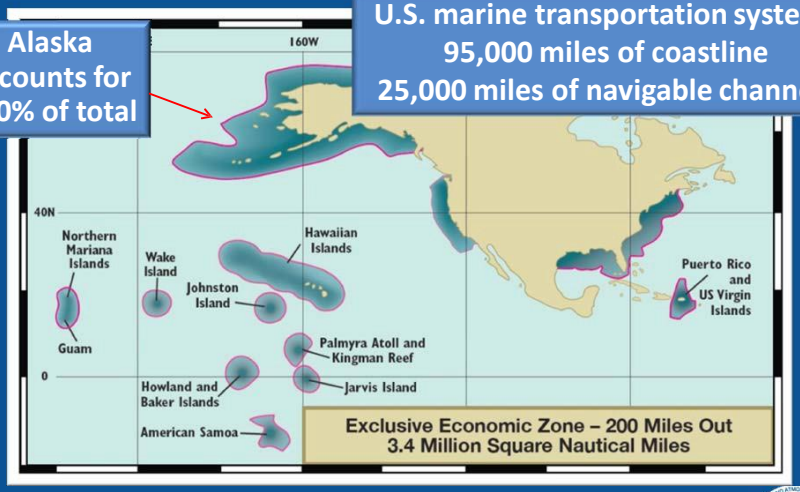




Scope of coverage

Alaska accounts for ~40% of total

U.S. marine transportation system:
95,000 miles of coastline
25,000 miles of navigable channels

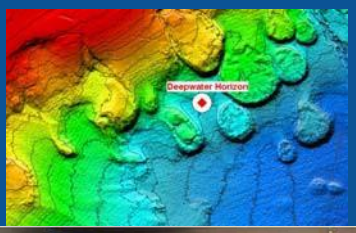


Coast Survey Navigation Managers

- Resolving charting and navigation questions
- Bringing NOAA technologies to maritime community
- Taking maritime industry feedback to NOAA scientists and management
- Assisting in hurricane or disaster preparation and response
- Alaska Navigation Manager

LTJG Matthew Forney, NOAA
matthew.forney@noaa.gov
907-271-3327

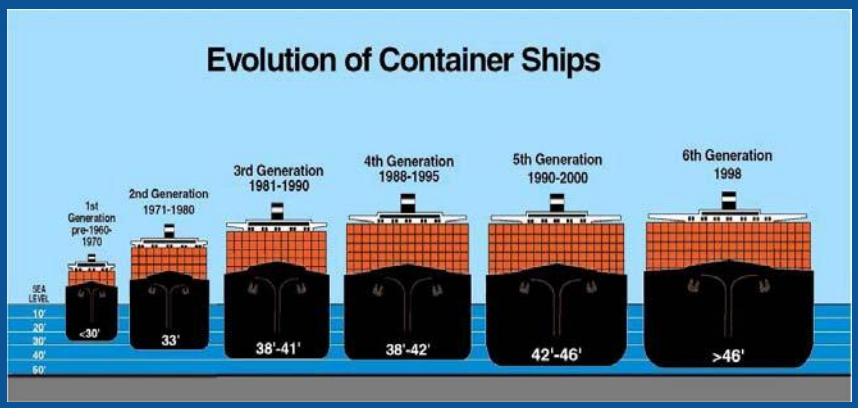
Responding to a release of hazardous materials / oil spill



Office of Coast Survey

NOAA keeps mariners safe and commerce moving

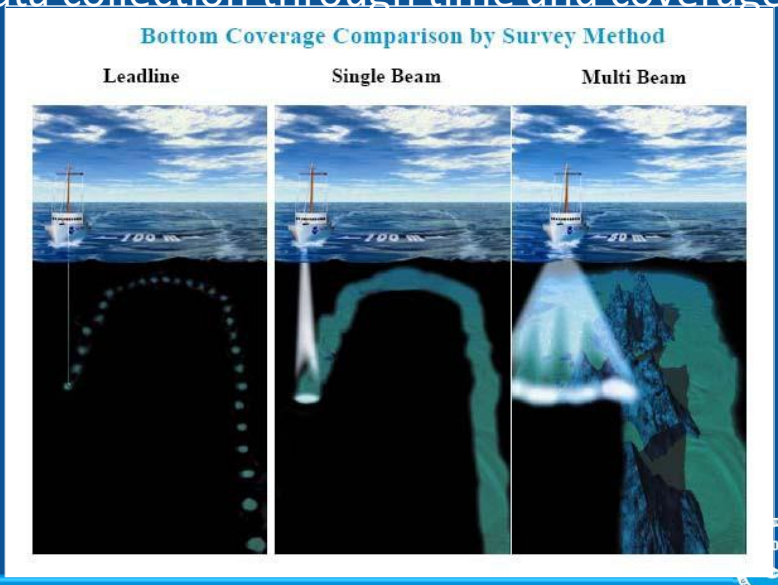
Helping the maritime system handle more traffic and larger vessels in crowded ports & sea-lanes



NOAA provides up-to-date, accurate, and accessible navigation information

Office of Coast Survey

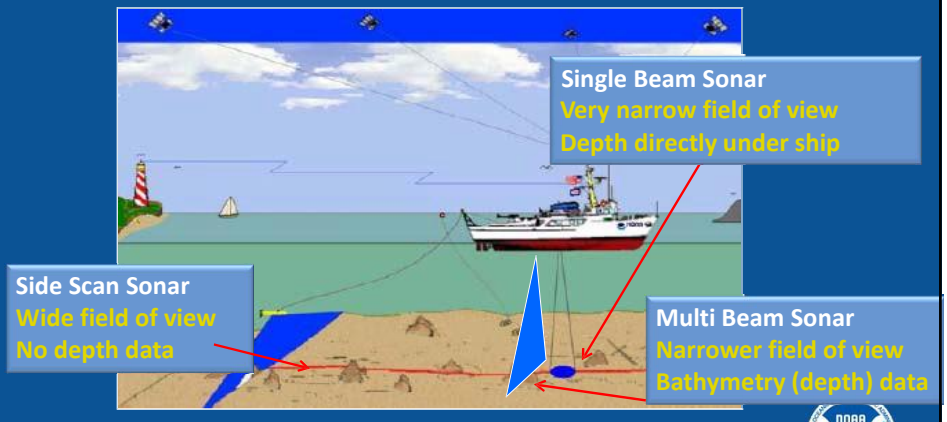
Data collection through time and coverage



Office of Coast Survey

What is bathymetry? How is it collected?

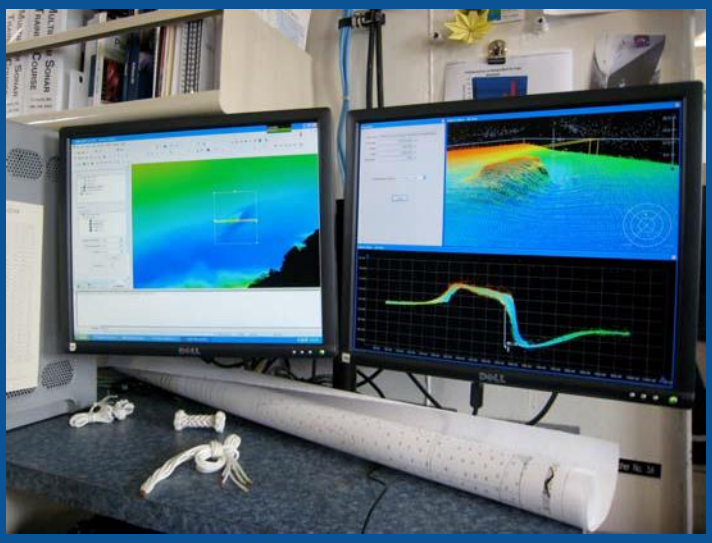
- the measurement of water depth at various places in a body of water; *also*: the information derived from such measurements



Office of Coast Survey

Hydrographic Surveying

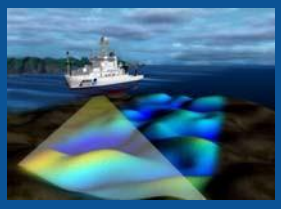
- More than just GPS and an echosounder
- Correctors to hydrographic data
  - Water levels
  - Settlement and Squat
  - Sound speed through the water
  - Vessel motion (heave/roll/pitch)
  - GPS base stations
- Millions of soundings processed, corrected, visualized and analyzed to find final “least depth”



Office of Coast Survey

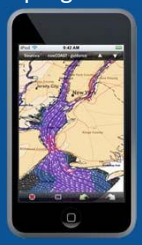
Navigation product production

Acquires data

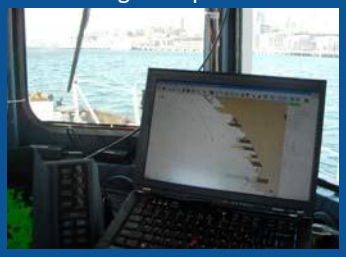


Processes data

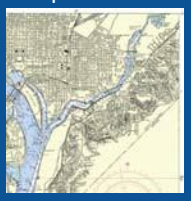
Smart phone programs



E-navigation products



Paper charts



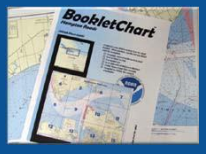
Office of Coast Survey

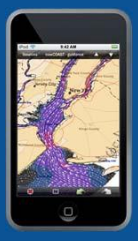
NOAA is the nation's provider of navigation products…

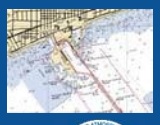
- 1019 paper / raster charts
- 876 electronic navigational charts
- *Coast Pilot*
- PocketChart™
- Booklet Charts
- 1002 Print on Demand charts
- Weekly updates
- PORTS

Over 100 companies are agents for NOAA's nautical charts, selling to millions of recreational boaters, commercial fishermen, and maritime pilots

Dozens of companies sell systems or software that give mariners access to NOAA's electronic navigational charts







Office of Coast Survey

NOAA survey platforms in Alaska

NOAA Ship *Rainier* (S-221)

- Commissioned 1968
- Homeport: Newport, OR
- 231 ft / 1591 GRT / 2600 HP
- 6 survey launches

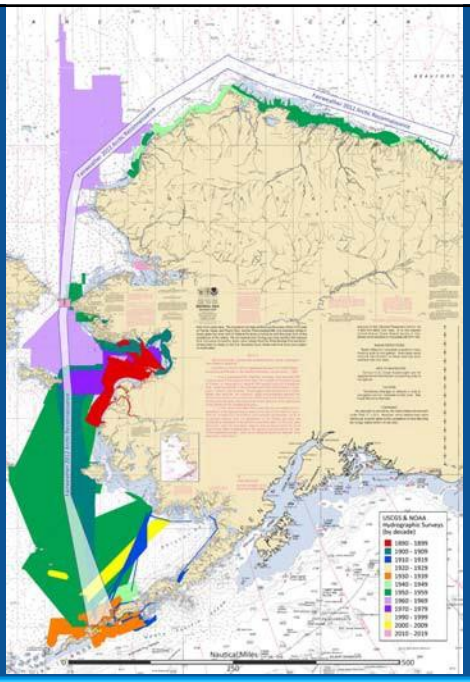
NOAA Ship *Fairweather* (S-220)

- Commissioned 1968
  - Deactivated 1989
  - Reactivated 2004
- Homeport: Ketchikan, AK
- 231 ft / 1591 GRT / 2600 HP
- 4 survey launches

Office of Coast Survey

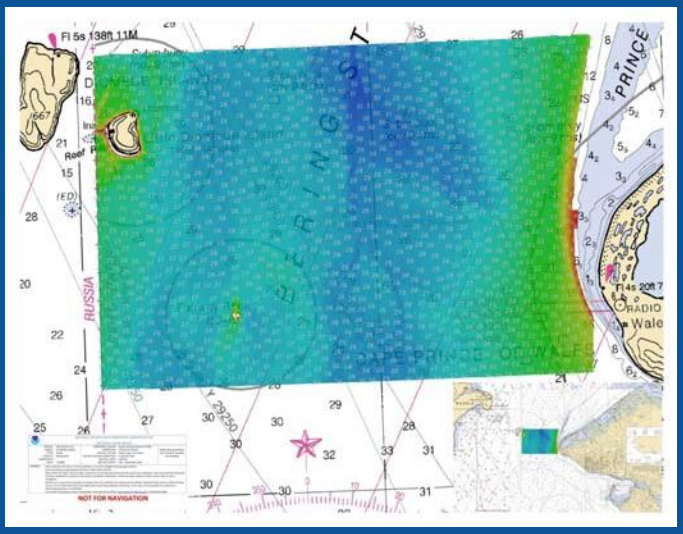
Arctic Research and Policy Act of 1984

Office of Coast Survey

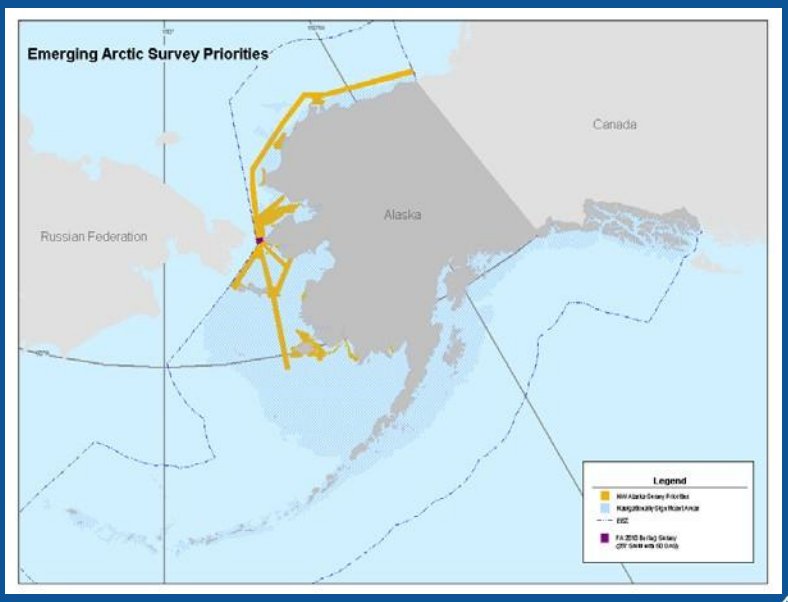


Office of Coast Survey

Summer 2010 Bering Strait Survey

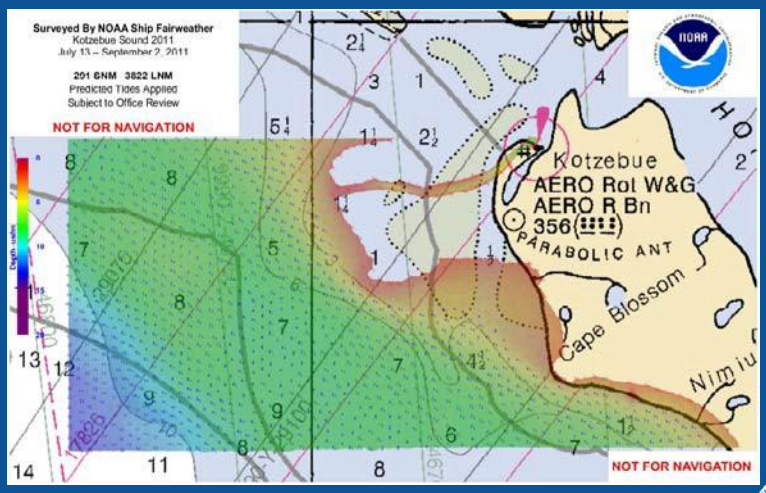


Office of Coast Survey



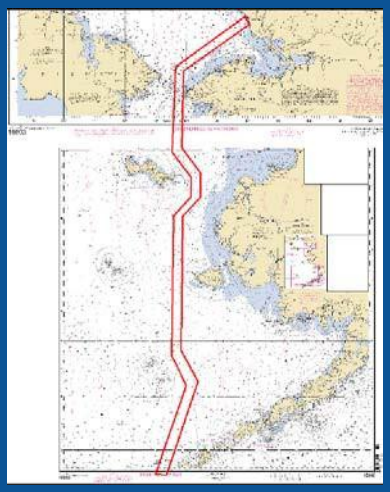
Office of Coast Survey

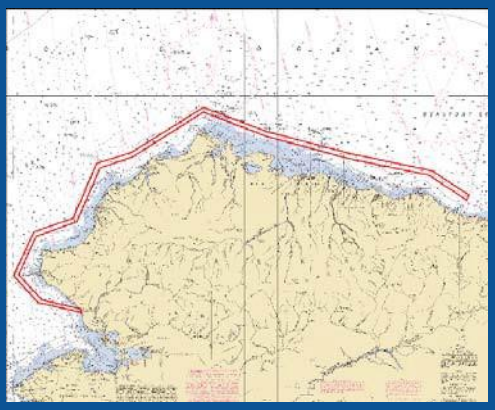
Summer 2011 Kotzebue Sound Survey New Chart 16161



Office of Coast Survey

Summer 2012 Track Line Surveys
August 1 to August 25





Office of Coast Survey

NOAA Ship Multibeam Echosounder Systems

NOAA Ship *Fairweather*

- Reson 7111
  - 100 kHz Frequency
  - 1000m Depth Range
- Reson 7125 (Launch)
  - Dual Frequency 200kHz and 400kHz
  - 400m and 200m Depth Range Respectively
- Reson 8160
  - 50kHz Frequency
  - 3000m Depth Range

NOAA Ship *Rainier*

- Reson 7125 (Launch)
  - Dual Frequency 200kHz and 400kHz
  - 400m and 200m Depth Range Respectively
- Konsberg EM 710
  - Frequency Range of 70kHz to 100kHz
  - 2000m Depth Range

Office of Coast Survey

U.S. Arctic Marine Mammals

U.S. Marine Mammals in the Chukchi and Beaufort Seas		
Species	Scientific Name	Type/Hearing Range
Humpback Whale	Megaptera novaengliae	Baleen Whale (<22 kHz)
Whale	Balaenoptera musculus	
Whale	Balaenoptera physalus	
Bowhead Whale	Balaena mysticetus	
Whale	Balaenoptera acutorostrata	
Gray Whale	Eschrichtius robustus	
Killer Whale	Orcinus orca	Toothed Whale (<180 kHz)
Porpoise	Phocoena phocoena	
Beluga Whale	Delphinapterus leucas	
Spotted Seal	Phoca largha	True Seal (<75 kHz)
Seal	Histriophoca fasciata	
Ringed Seal	Phoca hispida	
Bearded Seal	Erignathus barbatus	
Pacific Walrus	Odobenus rosmarus	Walrus (<50 kHz)
Polar Bear	Ursus maritimus	Polar Bear (<23 kHz)

Echosounder Effects on Marine Mammals

- High frequency underwater noise could lead to avoidance behavior in those species whose hearing range overlaps the frequency range of the sound source.
- Coast Survey uses side scan sonar and multibeam echosounders ranging from 50 – 500 kHz, and single beam echosounders ranging from 12 – 100 kHz.

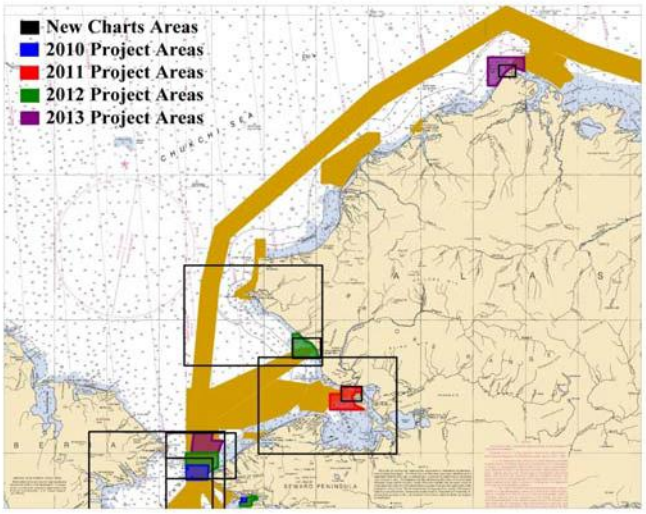
Echosounder Effects on Marine Mammals

- Baleen whales and eared seals cannot typically hear in the 50 – 500 kHz frequency range underwater, and are not at risk for acoustic harassment from side scan sonar and multibeam echosounders.
- Some toothed whales and true seals can hear in the 50 – 500 kHz frequency range.

Marine Mammal Functional Hearing Frequency Ranges		
Mysticete	Baleen Whale	7 Hz – 22 kHz
Odontocete	Toothed Whale	150 Hz – 180 kHz
Otariid	Eared Seal	1 kHz – 30 kHz
Phocid	True Seal	200 Hz – 75 kHz
Walrus	Walrus	200 Hz – 50 kHz

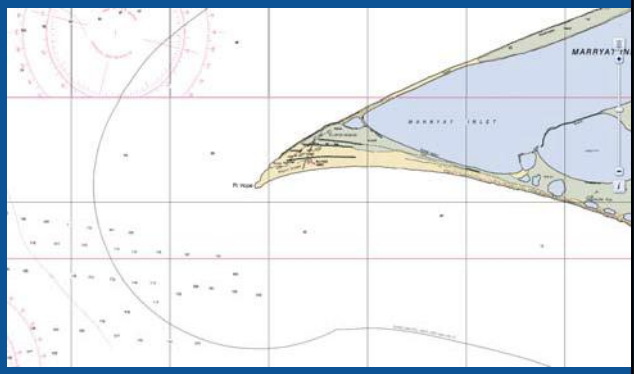
- Power is lost rapidly in the water column and does not propagate far from the source because it is attenuated. Also due to the narrow pulse width, if exposure is encountered, It is for a very short time.

Northern Arctic Hydrographic Survey Priority Areas and proposed new chart coverage showing planned and completed hydrographic survey project areas



State of Arctic Charts!

- Very poorly charted
- Most surveys pre-date 1900
- Most areas never surveyed by U.S. Russian or British Admiralty Surveys
- 100 square NM between soundings

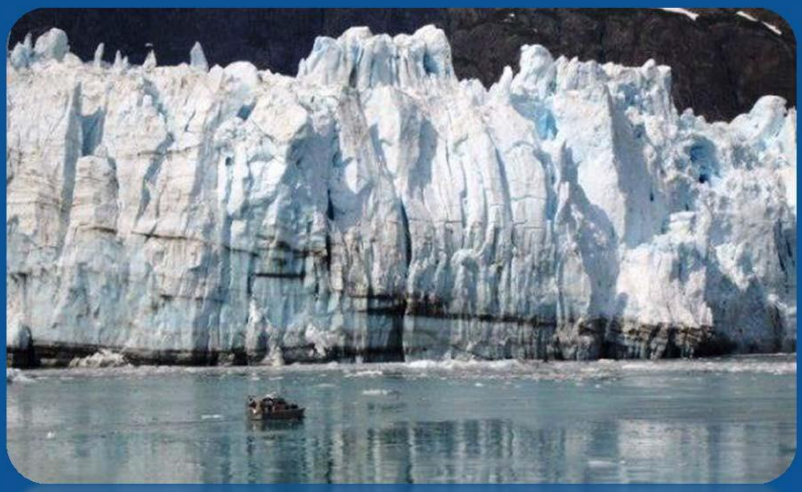


Office of Coast Survey

Thank You
North Slope Borough and the City of Barrow

LTJG Matthew Forney, NOAA
Navigation Manager of Alaska
(907) 271-3327
matthew.forney@noaa.gov

Questions?



Office of Coast Survey