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SEA ICE CONDITIONS IN THE
COOK INLET, ALASKA
DURING THE 1969-1970 WINTER

RICHARD J. HUTCHEON
MARINE METEOROLOGIST

ALASKA REGION
Anchorage,
Alaska

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These Memoranda are available from the Alaska Region Headquarters at the following address:

National Oceanic and Atmospheric Administration
National Weather Service Regional Headquarters
632 - 6th Ave., Hill Building
Anchorage, Alaska 99501

ATTN: Regional Climatologist

1. Freeze-Thaw Cycle in the Coastal Arctic of Alaska - 1968.
2. Climate Along A Pipeline from the Arctic to the Gulf of Alaska - 1968.
3. Coastal Weather and Marine Data Summary for Gulf of Alaska, Cape Spencer Westward to Kodiak Island - 1969.
4. Climate of the North Slope of Alaska. Harold Searby and Marcelle Hunter. February 1971.
5. Forecasting Ice in Cook Inlet, Alaska. Richard J. Hutcheon. August 1972.
6. Sea Ice Conditions in the Cook Inlet, Alaska during the 1969-1970 Winter. Richard J. Hutcheon. September 1972.

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SEA ICE CONDITIONS IN THE COOK INLET, ALASKA
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Introduction: The Cook Inlet sea ice observing program has been sketchy and fragmented among several organizations over the years prior to the 1969-70 winter. With the implementation of its marine forecast unit in October, 1969 the NOAA National Weather Service Forecast Office at Anchorage initiated a more aggressive observing program, and this is the first annual report based on that program. Annual reports for future years will be issued prior to August 15 of the summer following.

The 1969-70 Ice Year Compared to Other Years: The winter of 1969-70 was the second warmest in the more than 40 years of record in Anchorage. Average temperature for the October-March period was near 28 degrees which compares with a normal 21 degrees. Captain O. K. Collar, Sea Land pilot with 6 years experience piloting large ships up the Cook Inlet, stated that the 1969-70 winter was the easiest year in his experience. There were no serious problems; the worst period in the main shipping channel was from January 10 to 20.

Captain Collar's comments on previous winters are recorded here for future reference. The winter of 1964-65 was the worst for Cook Inlet ice in his 6 years; it was necessary to ram the ice on a number of occasions in order to get through. The second worst year according to Captain Collar, was 1968-69; that year, the ice extended southward almost to Anchor Point near Homer. The ice was harder in 1964-65, inflicting some rudder damage to the ship; the ice averaged 4 to 5 feet thick, with some "pans" (floes) 6 to 8 feet thick. Worst conditions were at the Forelands and in the Point Possession area. 1967-68 was a relatively mild ice season though not as easy as the 1969-70 winter. However, in 1967-68, the ice problem was sufficiently serious in the Anchorage area to rip out the piling at the City Dock.

Table 1, showing cumulative degree day data (base 32° F) at Anchorage for each of the past 6 winters, confirms (using cumulative values as of the end of February) 1964-65 as the worst and 1969-70 as the best years.

Table 2, using 42 years of record, provides degree day climatology for Anchorage using a base of 32 degrees.

Chronological Description of 1969-70 Ice Year: The first ice of the winter appeared in Cook Inlet in the middle of November when temperatures became unseasonably cold. The average daily temperature at Anchorage International Airport began falling on the 16th, and was down to 2 degrees by the 18th. Considerable young ice formed in the Inlet during this cold spell particularly in the shallower parts. Fresh water ice formed near the mouth of rivers in the northern part of the Inlet. A storm in the Gulf of Alaska on November 20, brought warmer temperatures to the South Central part of the State with the average daily temperature at Anchorage rising to 28 degrees. Temperatures continued to rise during the remainder of November.

By the first week in December the average daily temperature at the Anchorage Airport was near 35 degrees and most of the ice that had formed during the cold spell had melted. The only ice remaining was small scattered cakes of mainly fresh water ice stranded on the tidal flats in the northern part of the Inlet. Little change in ice conditions occurred during the first part of December. Temperatures continued to average in the low 30's. By December 10, Phillips Petroleum Platform near Tyonek reported the sea water temperature at 35 degrees.

Clear skies over the south central sections of Alaska during the middle of December allowed temperatures to drop with averages in the northern half of the Inlet falling to the mid-twenties. Young ice began to form again in the shallower areas of the Inlet and on the tidal flats. With the exception of a few warmer days, temperatures averaged in the 20's for the remainder of the month causing a slow increase in ice around the edge of the Inlet.

A report from Tyonek on December 17, indicated scattered ice cakes in that area with thicknesses up to 8 or 10 inches. Cakes of this thickness were occasionally carried into the central part of the Inlet by tidal action where they slowly melted. By December 19, the sea water temperature at the Phillips Platform had dropped to 33 degrees and "tidal" ice was 2 to 3 inches thick.

By the end of December, as much as 0.4 of young ice had formed in the northern part of the Inlet with small cakes drifting with tidal currents as far south as Kalgin Island. The thickness of these cakes was usually 2 to 4 inches but some were reported up to 8 inches.

By the first part of January, the Phillips Platform reported the sea water temperature down to 31 degrees. The air temperatures continued in the upper 20's or low 30's. At the end of the first week in January, reports indicated that considerable ice had formed north and west of Point Possession with estimates of 5 to 10 tenths concentration. Considerable shore ice also had formed around most of the Inlet north of Kalgin Island and large patches of young ice drifted with the tidal currents in the center of the Inlet.

On January 5, an intense high pressure area centered near Barter Island began bringing cold Arctic air over much of Alaska. Average daily temperatures at Anchorage International Airport dropped below 10 degrees and frequently were near zero.

Ice concentration increased steadily during this cold period and by the middle of the month 7 to 10 tenths of medium and large floes 4 to 12 inches thick covered the Inlet north of the Forelands. Small and medium floes with 0.4 to 0.8 coverage existed between the Forelands and the southern part of Kalgin Island with scattered patches of brash and cakes from Kalgin Island to near Anchor Point. Nikiski Dock reported occasional "heavy" floes with new ice up to 2 inches thick. Captain Collar, a Sea Land pilot, indicated that the ice on the main shipping channel was at it's worst from about January 10 to 20.

On January 25, Nikiski Dock relayed a message from a ship 5 miles north of Tyonek that they were stuck tight in the ice. At this same time, the Phillips Platform was estimating ice thickness up to 24 inches. Homer Boat Harbor reported light ice on January 26.

By the end of January nearly 10 tenths various size ice floes existed north of the Forelands with 0.6 to 0.9 between the Forelands and Kalgin Island. Up to 0.8 existed between Kalgin Island and Chisik Island. On January 31, Dolly Varden Platform reported the ice thickness to be 3 feet. Nikiski Dock reported a ice concentration of 0.6 and the ice was reported to be nearly solid in the vicinity of Drift River.

Beginning in the latter part of January a series of storms began moving eastward along the Aleutian Chain, pushing relatively warm, moist air into the South Central part of the State. By the first of February the average daily temperatures at Anchorage International Airport had risen into the upper teens. Temperatures continued to rise during the first half of the month reaching the unseasonably warm 30's by the middle of February. Afternoon temperatures occasionally climbed to over 40 degrees.

On February 9, the Navy Fleet Weather Facility at Kodiak made an aerial reconnaissance of the Inlet and reported the following:

"West of a line from Kustatan Point (West Foreland) to Fire Island and south of a line Fire Island to the south side of the mouth of Susitna River ten tenths coverage with 0.8 brash and 0.2 small floes however, only 0.2 brash in an area 7 miles southwest of Fire Island with no floe ice.

West of a line Fire Island to Point McKenzie and north of a line Fire Island to Susitna River only 0.1 brash.

From Fire Island northeastward into Knik Arm 0.9 coverage with scattered cakes.

East of a line Kustatan Point (West Foreland) to Fire Island to Point Campbell but not including Turnagain Arm 0.6 coverage with 0.1 small floes and 0.5 brash.

Turnagain Arm not observed.

Area south of a line from Kenai to Kustatan Point (West Foreland) not observed."

By February 10, there were indications that the relatively high temperatures were causing erosion of the ice. The water temperature in the northern part of the Inlet remained near 30 degrees so melting in that area proceeded slowly, but with strong winds and tidal action, considerable breakup of the ice floes occurred.

On February 16, an aerial ice reconnaissance by a BLM plane indicated ice coverage 9 to 10 tenths from Ninilchik northward with 10 to 15 miles of open water from Nikiski to Point Possession. South of the Forelands 0.4 to 0.6 small floes and brash existed. The largest floes were near the center of the Inlet from Kalgin Island to the Forelands.

Warm temperatures continued through the remainder of February and by the 25th, an ice report from an observer aboard the Rig Tender from the Anchorage Dock to the Phillips Platform indicated 0.1 to 0.2 from Knik Arm to about the Fire Island-Point MacKenzie line and northward. From Fire Island to the platform only patches and bands of mainly brash ice existed but with a few floes up to 3 feet thick. Sea water temperature in the Inlet remained about 31 degrees.

Average daily temperatures continued mostly in the 30s throughout March except for a brief cooler spell during the first week. The latter created considerable new thin ice in the extreme northern part of the Inlet with patches and bands extending southward to near Tyonek. Older grounded ice floes were occasionally lifted free by tidal action and carried into the center of the Inlet to gradually melt as they entered warmer water in the southern sections.

As temperatures climbed into the 30s again during the middle of March, most of the young thin ice melted. By the 17th, the sea water temperature was 32 degrees.

On March 23, an aerial ice reconnaissance indicated only widely scattered small floes mainly in the center of the Inlet with the tidal flats nearly clear of ice.

T A B L E 1

Cumulative Degree Days (Base 32° F.) for Each of the Past
6 Winters at Anchorage, Alaska

Year	<u>By Nov. 30</u>	<u>By Dec. 31</u>	<u>By Jan. 31</u>	<u>By Feb. 28</u>
1964-65	313	1270	1948	2554
1965-66	338	918	1608	2086
1966-67	429	1080	1848	2335
1967-68	133	626	1228	1480
1968-69	290	1083	1929	2317
1969-70	265	369	1078	1157

T A B L E 2

Climatological Summary of Cumulative Degree Days (Base 32 F.)
at Anchorage, Alaska for October through March

(period of record begins with 1923-24 winter*)

The winters of 1955-56 accumulated more degree days than any other winter since the period of record began in 1923. The winter of 1930-31 accumulated the least. The percentages listed in the left hand column indicates the percent of years which have had a greater number of degree days accumulated by the end of a particular month. For example, 90% of the time more than 906 degree days have accumulated by January 31.

	<u>By Nov. 30</u>	<u>By Dec. 31</u>	<u>By Jan. 31</u>	<u>By Feb. 28</u>	<u>By Mar. 31</u>
1955-56	680	1415	2240	2873	3253
10% above	590	1400	2040	2560	2740
25%	500	1170	1930	2400	2580
Average	314	884	1479	1877	2146
75%	160	690	1130	1440	1690
90% above	120	460	906	1180	1490
1930-31	253	414	637	794	980

* 1925-26, 1926-27, 1928-29 missing

Figure 1

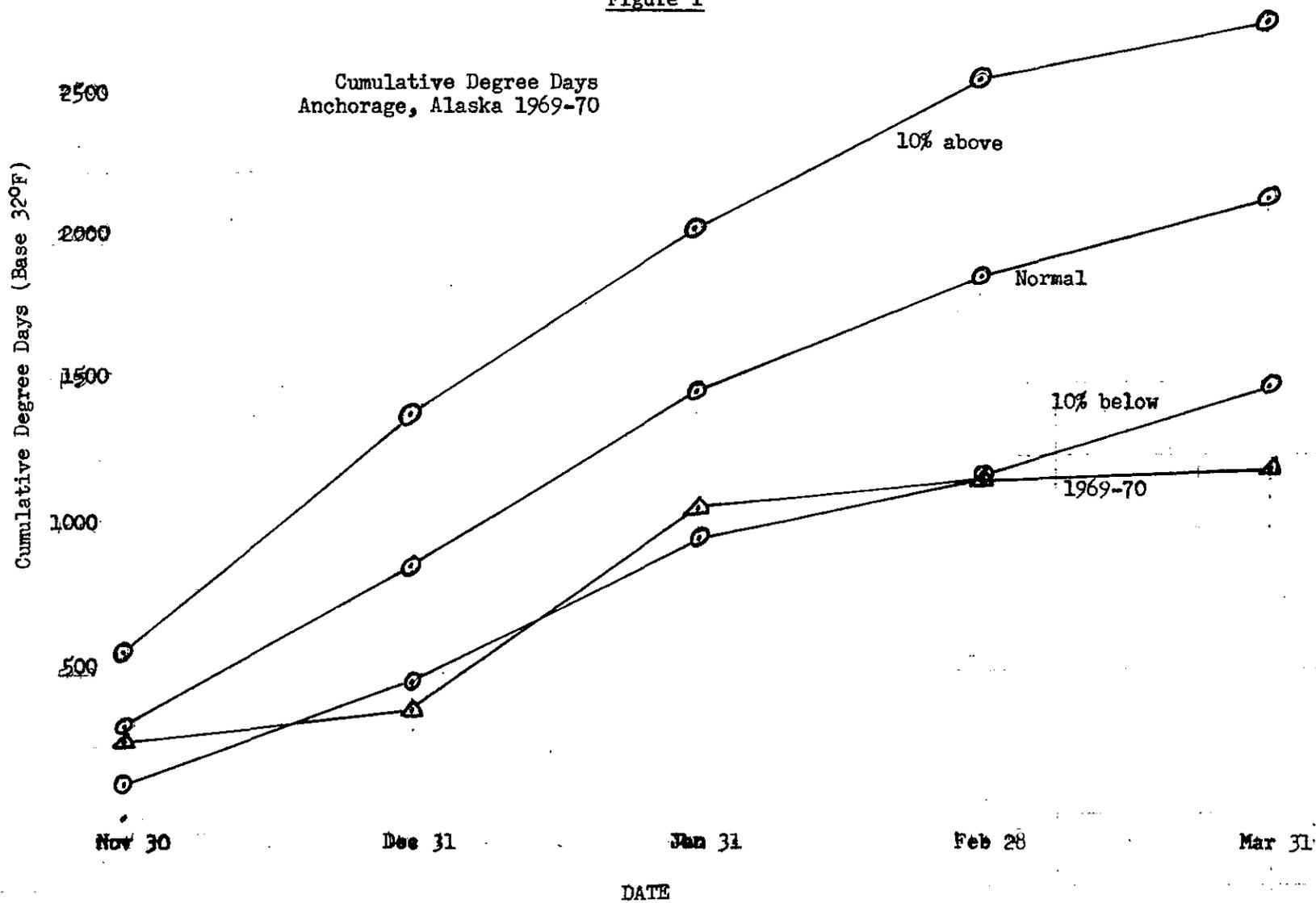
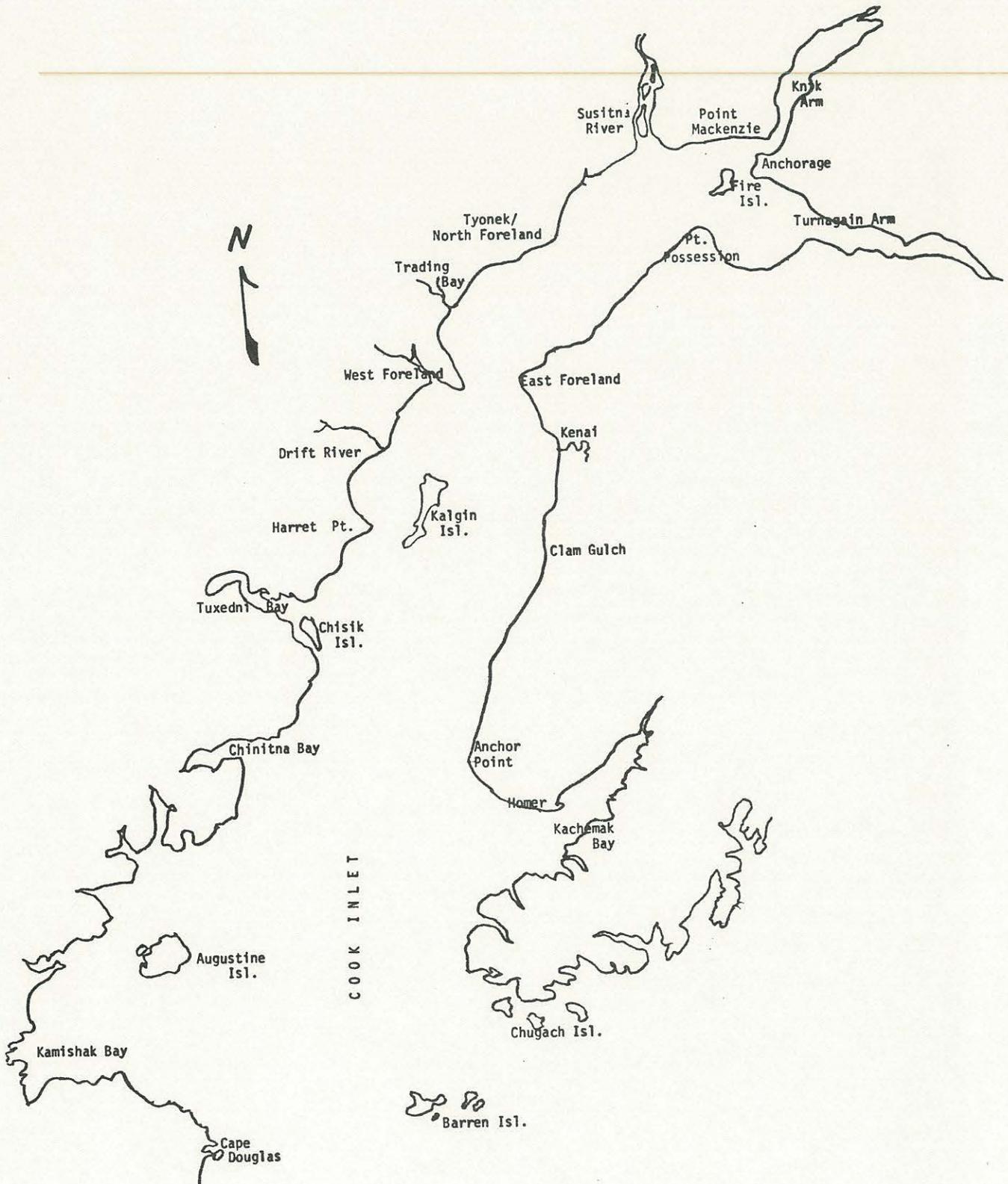


Figure 2

Map of Cook Inlet



G L O S S A R Y

TERM	USUAL AGE	USUAL THICKNESS
NEW ICE	DAYS TO WEEKS	LESS THAN 2 INCHES
YOUNG ICE	DAYS TO WEEKS	2 TO 6 INCHES
MEDIUM WINTER ICE	DAYS TO WEEKS	6 TO 12 INCHES
THICK WINTER ICE	WEEKS TO MONTHS	MORE THAN 12 INCHES
YOUNG POLAR ICE	1 TO 2 YEARS	LESS THAN 7 FEET
ARCTIC PACK	MORE THAN 2 YEARS	7 FEET OR MORE

TENTHS COVERAGE	CATEGORICAL TERM
0	ICE FREE
1-3	VERY OPEN PACK ICE
4-6	OPEN PACK ICE
7-9	CLOSE PACK ICE
10	VERY CLOSE PACK ICE

TERM	FLOE SIZE (DIAMETER)
BRASH	LESS THAN 6 FEET (FRAGMENTED)
CAKES	6 TO 30 FEET
SMALL FLOES	30 TO 600 FEET
MEDIUM FLOES	600 TO 3200 FEET
LARGE FLOES	MORE THAN 3200 FEET



Northwest across Cook Inlet

Floes, Cakes and Brash

Courtesy Captain B.J. Logan, American Institute
of Marine Underwriters



Northwest across Cook Inlet

Floes, Cakes and Brash

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