

A Review of Marine Debris Surveys, Accumulations and Cleanup Projects in Alaska through
2014



A Mountain of Plastic Trash Collected at Cape Suckling in 2013

Alaska Marine Stewardship Foundation
P.O. Box 210575
Auke Bay, Alaska 99821

www.alaskamsf.org

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Table of Contents

List of Acronyms	6
Preface	7
Introduction	7
Wind and Current Patterns along the Alaska Coast	8
Designation of Alaska Marine Debris Regions	10
Surveys	12
Marine Debris Cleanup Projects	13
Data Sources	13
Results	14
Region 1 Southeast Alaska Outside	14
Region 2 Southeast Alaska Inside	16
Region 3 Yakutat	18
Region 4 Prince William Sound	20
Region 5 Central Gulf of Alaska	22
Region 6 Cook Inlet.....	24
Region 7 Aleutians	26
Region 8 Bristol Bay	27
Region 9 Pribilof Islands	29
Region 10 Central Bering Coast.....	31
Region 11 Norton Sound.....	33
Region 12 St Lawrence Island.....	34
Region 13 Northern Bering Coast	36
Region 14 Arctic Region.....	37
Statewide Comparisons	38
Discussion	41
Literature Cited	42

List of Figures

Figure 1. The major ocean currents of the North Pacific Ocean.	7
Figure 2. Development of the Alaska current and gyres.	8
Figure 3. Flow from the Alaska current into the Bering Sea (Yi Chao, Jet Propulsion Lab, NASA).....	8
Figure 4. Currents of the Bering Sea.....	9
Figure 5. Storm tracks from October, November and December of 2010 in the North Pacific. ...	10
Figure 6. Alaska superimposed over the continental United States.....	10
Figure 7. Designated marine debris regions.	11
Figure 8. Map of Region 1, Southeast Alaska Outside	14
Figure 9. Map of Region 2, Southeast Alaska Inside.....	17
Figure 10. Map of Region 3, Yakutat.....	19
Figure 11. Map of Region 4, Prince William Sound.....	20
Figure 12. Map of Region 5, Central Gulf of Alaska.....	22
Figure 13. Map of Region 6, Cook Inlet.	25
Figure 14. Map of Region 7, the Aleutian Islands.	26
Figure 15. Map of Region 8, Bristol Bay.	27
Figure 16. Map of Region 9, Pribilof Islands.	29
Figure 17. Map of Region 10, Central Bering Coast.	32
Figure 18. Map of Region 11, Norton Sound.....	33
Figure 19. Map of Region 12, St. Lawrence Island.	35
Figure 20. Map of Region 13, Northern Bering Coast.....	36
Figure 21. Map of Region 14, Arctic Coast.	38

List of Tables

Table 1. The 14 different regions used in the analysis of marine debris.....	10
Table 2. Known surveys for marine debris in Alaska.	12
Table 3. General Project Information for Region 1, Southeast Alaska Outside.....	15
Table 4. Debris composition in Region 1, Southeast Alaska Outside.	16
Table 5. General Project Information for Region 2, Southeast Alaska Inside	17
Table 6. Debris composition in Region 2, Southeast Alaska Inside.	18
Table 7. General Project Information for Region 3, Yakutat.	19
Table 8. Debris composition in Region 3, Yakutat.....	20
Table 9. General Project Information for Region 4, Prince William Sound.	21
Table 10. Debris composition in Region 4, Prince William Sound.	22
Table 11. General Project Information for Region 5, Central Gulf of Alaska.	23
Table 12. Debris composition in Region 5, Central Gulf of Alaska.	24
Table 13. General Project Information for Region 6, Cook Inlet.	25
Table 14. General Project Information for Region 7, Aleutian Islands.	26
Table 15. Projects in Bristol Bay.	28
Table 16. Debris composition in Bristol Bay.	29
Table 17. General Project Information for Region 9, Pribilof Islands.....	30
Table 18. Debris composition in the Pribilof Islands.....	31
Table 19. General Project Information for Region 10, Central Bering Coast.....	32

Table 20. Debris composition in the Central Bering Coast.....	33
Table 21. General Project Information for Region 11, Norton Sound.....	34
Table 22. Debris composition in Norton Sound.	34
Table 23. General Project Information for Region 12, St Lawrence Island.....	35
Table 24. Debris composition on St. Lawrence Island	36
Table 25. General Project Information for Region 13, Northern Bering Coast.	37
Table 26. Debris composition on the Northern Bering Coast.	37
Table 27. Projects on Arctic Coast.....	38
Table 28. Summary of marine debris cleanup projects.	39
Table 29. Debris composition region.	41

List of Acronyms

ADFG	Alaska Department of Fish and Game
AMSF	Alaska Marine Stewardship Foundation
CACS	Center for Alaska Coastal Studies
CIAP	Community Impact Assessment Program
GOAK	Gulf of Alaska Keeper
ITN	Island Trails Network
MCAF	Marine Conservation Alliance Foundation
NOAA	National Oceanic and Atmospheric Administration
NAB	Northwest Arctic Borough
NSEDC	Norton Sound Economic Development Corporation
NPS	National Park Service
RBCA	Resurrection Bay Conservation Alliance

Preface

This is the first review of known marine debris activities in Alaska. With 44,500 miles of coastline it is difficult to track assessments, surveys and cleanups. This report will provide for constructive discussion and planning for future marine debris activities and possibly may become an annual report. Organizations and/or individuals are encouraged to provide information for inclusion in future reports. Either general or detailed information as defined in this document are welcome.

Introduction

Despite its small human population and remoteness, Alaska's coast is littered with marine debris. Maritime activities including shipping and fishing along with ocean currents have worked to deposit large amounts marine debris on the coastline. Ocean currents in particular bring a large amount of debris from as far as Asia to Alaska's shores (Figure 1). These currents bring debris from both land based activities and vessels. Rivers and infrequent events such as tsunamis transfer everyday products from terrestrial systems and deposit them into the oceans. The problem of marine debris has become much more intense over the years with the increase in worldwide population and increased use of the oceans through activities such as shipping, fishing and drilling. Consumer preferences in the form of single use disposable products has also contributed to the amount of marine debris. But the real problem of modern marine debris is its persistent nature once it is in the environment, specifically, plastics.



Figure 1. The major ocean currents of the North Pacific Ocean.

Beginning in the 1950's, plastics began to substitute for natural materials in many products. Eventually, many products were wholly made of plastics. Along with this, disposable single use items came into use such as beverage containers and lighters. In addition, the oceans were thought to be limitless and much trash, including many plastics, were deliberately dumped into the sea, likely including damaged or old fishing gear.

The purpose of this paper is to examine the problem and extent of marine debris in Alaska. The sources of data include Alaska Marine Stewardship Foundation (AMSF) files, formally reported results from Federal agencies and Non-Governmental agencies, newspaper accounts, other organizations and personal communication. The list is not complete but represents all accessible surveys and cleanups and compares and contrasts debris deposition rates and composition throughout Alaska. This paper may be used in conjunction with the Google Earth map of marine debris cleanup locations and detailed project reports found on the AMSF website at www.alaskamsf.org.

Wind and Current Patterns along the Alaska Coast

Gyres, large systems of rotating ocean currents, circulate water through the north Pacific. These gyres gather debris from all points of the Pacific Ocean as well as debris that may have originated in other Oceans or Seas. The North Pacific Gyre, in particular, plays a key role in bringing debris to Alaskan shores. As the eastward flowing North Pacific current approaches the North American continent, it splits north and south into the Alaskan and California currents. The Alaska current flows north and west and develops into the Alaska Gyre while the one that flows south is termed the California current (Figure 2). A portion of the Alaska current flows into the Bering Sea (Figure 3).

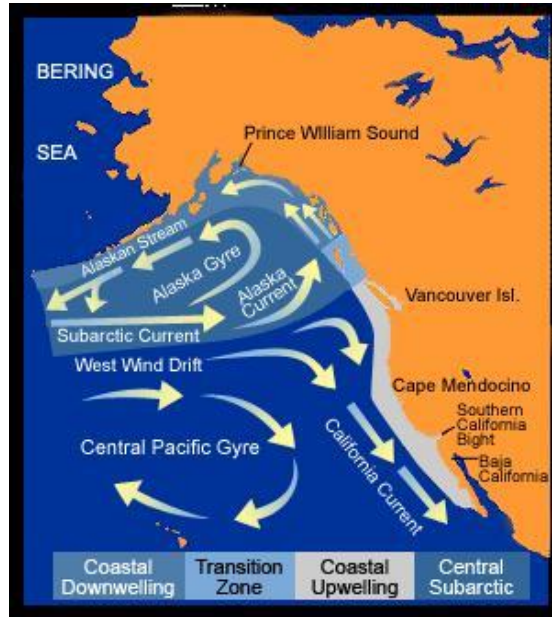


Figure 2. Development of the Alaska current and gyres.

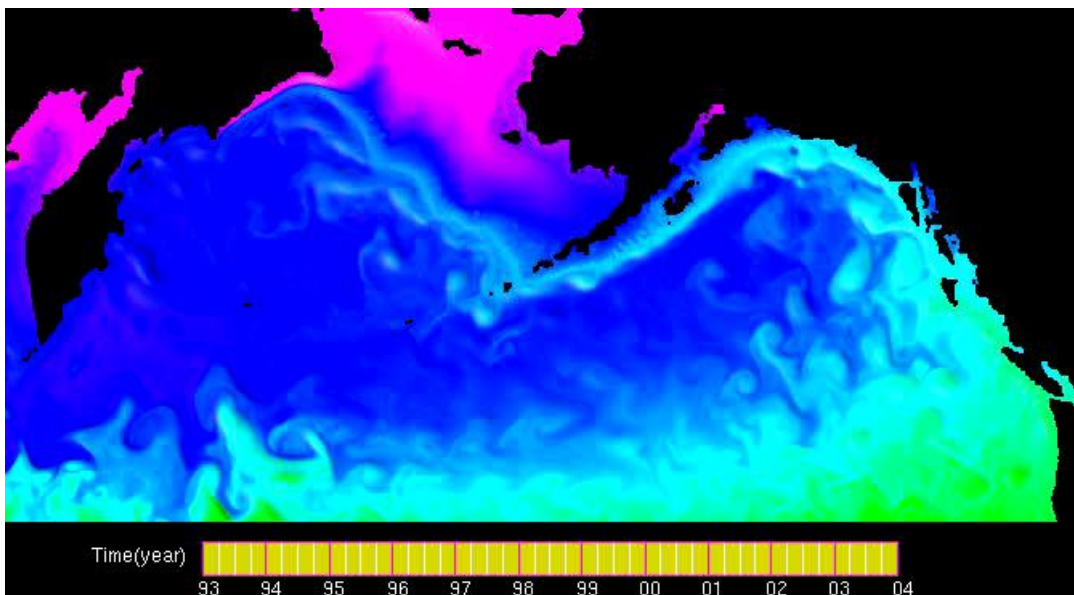


Figure 3. Flow from the Alaska current into the Bering Sea (Yi Chao, Jet Propulsion Lab, NASA).

The current in the Bering Sea continues the counter clockwise pattern (Figure 4).

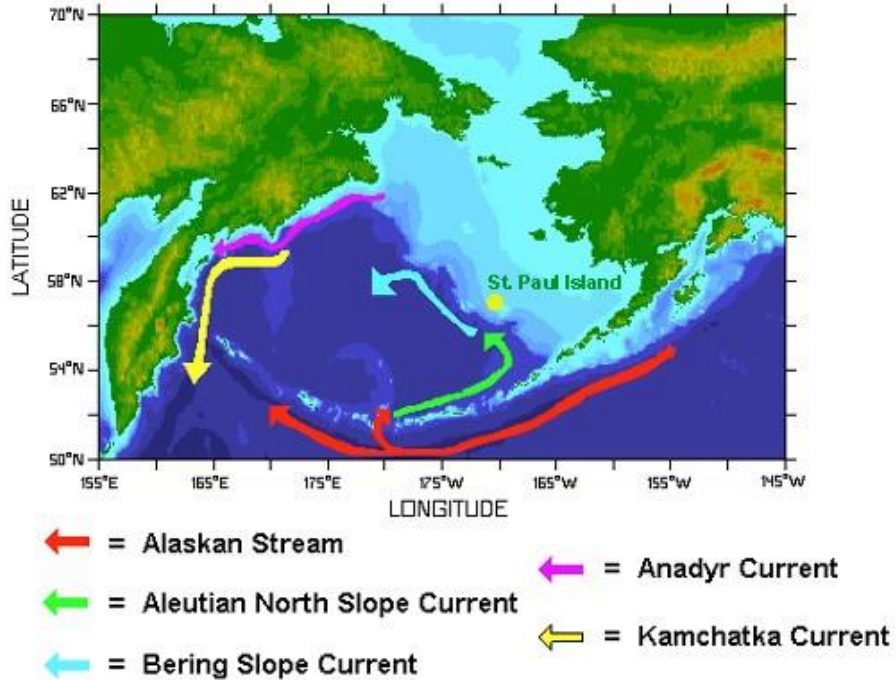


Figure 4. Currents of the Bering Sea.

Finally, storms have a major effect on debris which has a large portion of its mass above the water line, such as floats, buoys, ships etc. In the eastern portion of the North Pacific, storms consistently form in approximately the same latitude as the eastern moving portion of the gyre and move to the northeast (Figure 5). The Gulf of Alaska is an especially active storm area. The wind of the storms move this debris towards shore.

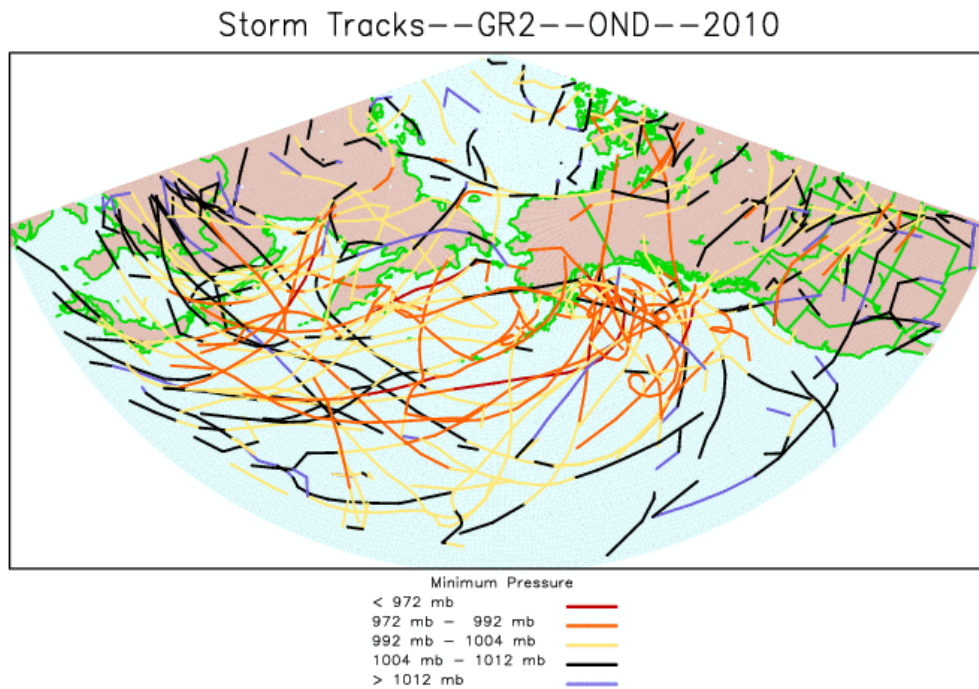


Figure 5. Storm tracks from October, November and December of 2010 in the North Pacific.

Designation of Alaska Marine Debris Regions

Alaska has approximately 44,500 of coastline (NOAA, 2008). Much of it occurs in the many islands of Southeast Alaska, Prince William Sound and the Aleutians, however much is due to the enormous size of the state. When Alaska is superimposed over the continental United States, it stretches from Florida to California (Figure 6).

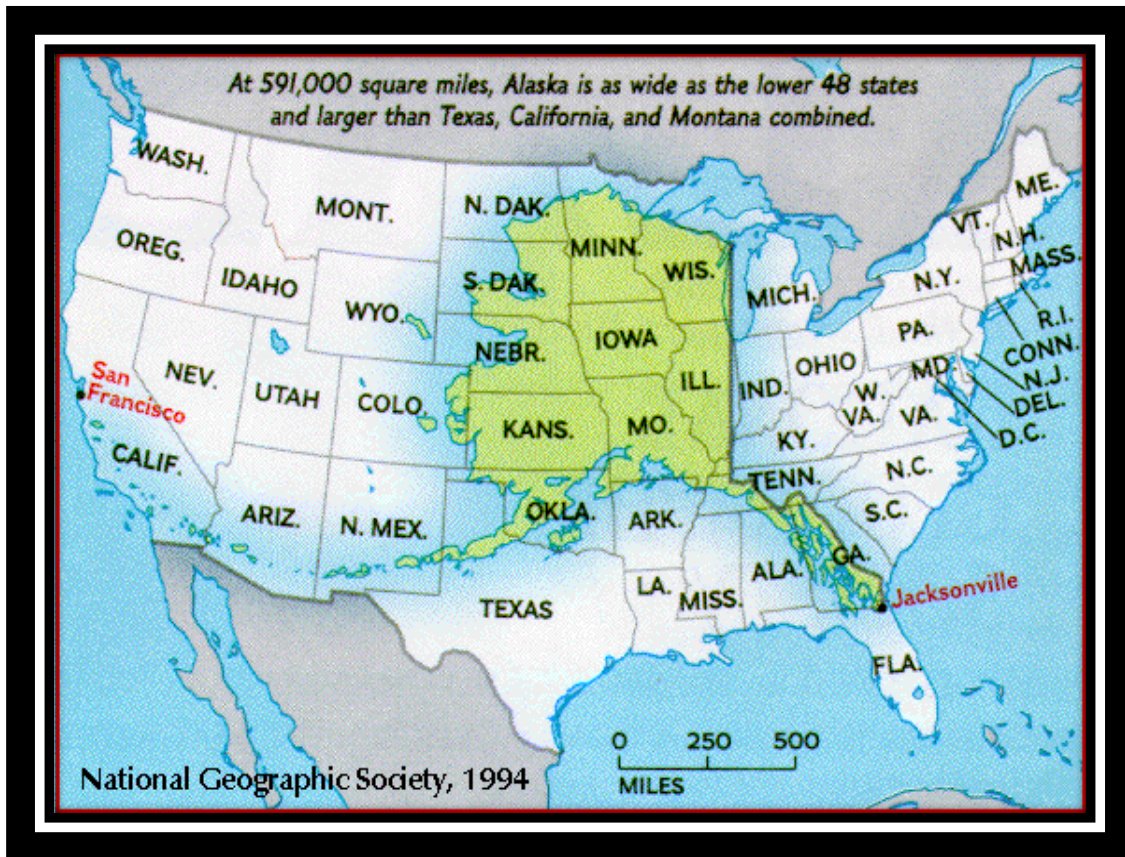


Figure 6. Alaska superimposed over the continental United States.

The areas of Alaska are also very different, both geographically and in terms of development. Based on these differences, as well as the effect of the currents and winds and an preliminary examination of data from marine debris cleanups, 14 different regions were established (Table 1 and Figure 7).

Table 1. The 14 different regions used in the analysis of marine debris.

Region	Boundaries	Region	Boundaries
1	Southeast Alaska Outside	8	Bristol Bay
2	Southeast Alaska Inside	9	Pribilof Islands
3	Yakutat	10	Central Bering Coast
	Dixon Entrance to Cape Fairweather		Unimak Pass to Cape Newenham
	Inside waters north of Dixon Entrance and east of the outer entrances		St George and St Paul Islands
	Cape Fairweather to Cape Suckling		Cape Newenham to Pt Romanof

4	Prince William Sound	Waters of Prince William Sound inside of Hinchinbrook and Montague Passages	11	Norton Sound	Pt Romanof to Cape Rodney
5	Central Gulf of Alaska	Cape Suckling to Unimak Pass including the south side of the Alaska Peninsula and Kodiak Island	12	St Lawrence Island	All of St Lawrence Island
6	Cook Inlet	Cape Elizabeth to Cape Douglas	13	Northern Bering Coast	Cape Rodney to Cape Espenberg including Diomedede Island
7	Aleutians	Unimak Pass to Attu Island	14	Arctic	Cape Espenberg to Demarcation Point

Data from surveys and cleanups is divided into these 14 regions (Figure 7).



Figure 7. Designated marine debris regions.

Two types of projects are detailed below: surveys and cleanups.

Surveys

Alaska is sparsely populated with few roads, particularly in the coastal areas. Access to the beaches is accomplished primarily by boat or small plane. Many miles of beach have had very few visitors and density and distribution of debris throughout Alaska is not well understood or documented. The first surveys of marine debris were conducted on selected beaches along the Gulf of Alaska by the Bureau of Commercial Fisheries (Merrill, 1980). Since then, a large portion of the Alaska has now been surveyed for marine debris (Table 2). In 2006, AMSF contracted with St Paul ECO to conduct a ground survey of St Paul Island and with Gulf of Alaska Keeper (GoAK) to conduct vessel based surveys in Prince William Sound. In 2007, AMSF contracted with the Norton Sound Economic Development Corporation (NSEDC) for a survey of marine debris of Western Alaska. The survey employed a single engine fixed wing aircraft with a hand held camera to fly from Cape Prince of Wales to Egegik including both St Lawrence and Hagemester Islands (Jones, W. and J. Ivanoff. 2010). In 2008, AMSF contracted with Airborne Technologies Incorporated (ATI) to conduct a fixed wing aerial survey using mounted cameras of Bristol Bay and the Alaska Peninsula. As a part of the contract, ATI produced a manual for conducting aerial surveys. This standard has been used in all following aerial surveys.

Results for many of the surveys may be found on the AMSF website or by contacting AMSF or the surveyor.

Table 2. Known surveys for marine debris in Alaska.

Year	Surveyor	Sponsor	Funding	Type	Region(s)	Area Surveyed
1970s	NOAA	NOAA	NOAA	Ground	Southeast Outside, Yakutat, Central Gulf of Alaska, Aleutians	Yakutat, Kayak Island and Amchitka
2006	St Paul ECO	AMSF	NOAA	Ground	Pribilofs	St Paul Island
	GoAK	AMSF	NOAA	Vessel	PWS	Western Side of PWS
		AMSF	NOAA	Aerial	Central Gulf of Alaska	Outer Montague Island
2007	Ocean Conservancy			Ground	Yakutat	Yakutat
	Island Trails Network	AMSF	NOAA	Aerial	Central Gulf of Alaska	Kodiak Island Archipelago
	NSEDC	AMSF	NOAA	Aerial	Bristol Bay, Central Bering Coast, Norton Sound, St Lawrence Island and Northern Bering Coast	Cape Prince of Wales to Egegik
	GoAK	AMSF	NOAA	Vessel	PWS	Naked, Smith, Green and Montague Islands
2008	Airborne Technologies, Inc.	AMSF	NOAA	Aerial	Bristol Bay	Cape Constantine to Port Moller
		AMSF	NOAA	Aerial	Central Gulf of Alaska, Cook Inlet	Wide Bay to the Susistna River

	Seldovia Village Tribe	CACS	NOAA		Cook Inlet	Kenai Peninsula
	NOAA	NOAA	NOAA	Aerial	Central Gulf of Alaska	South side of Alaska Peninsula
	GoAK	AMSF	NOAA	Vessel	PWS	Northern PWS
2009	ATI	AMSF	NOAA	Aerial	Arctic	Kotzebue to Wainwright
	FV Carly Renee	AMSF	NOAA	Vessel	Aleutians	Unalaska, Akutan, Unimak
	GoAK	AMSF	NOAA	Vessel	PWS	Northern PWS
2012	ATI	State of Alaska	State of Alaska	Aerial	Southeast Alaska Outside, Yakutat, Central Gulf of Alaska, Bristol Bay	Cape Muzon to Hallo Bay, Egegik to Cape Constantine
2013	NSEDC	NSEDC	NSEDC	Aerial	St Lawrence Island	All

In 2012, the debris from the March 2011 Japanese tsunami prompted a survey of the outside coast of the Gulf of Alaska. This was the most comprehensive survey done in the Gulf of Alaska. Results are reported by NOAA, et al. (2013) and found on the Alaska Department of Environmental Conservation website (<http://www.arcgis.com/home/item.html?id=8ac40a055c5349b19e20cf84fdbeacf0>).

Each of the 8,000 individual high resolution still photographs was examined and density of debris rated on a scale of zero (0) for no debris to five (5) for the heaviest debris. Working together with AMSF and others, the NOAA developed 44 individual shoreline segments and analyzed them using Geographic Information System (GIS) software to provide average debris density rating for each of the segments. The results were incorporated into their Environmental Response Management Application (ERMA) for the arctic where it could be visually displayed along with overlays of environmental parameters.

Marine Debris Cleanup Projects

Data Sources

AMSF has the only statewide marine debris database for Alaska. Much of the data came from AMSF project files. Additional data came from requests to contractors and review of newspaper articles¹. Data collected by AMSF progressed over time and a discussion can be found at AMSF, 2014. The AMSF Form 2 was developed specifically for use in Alaska and reports categories by weight rather than number of items. In 2010, AMSF began entering the data into a Microsoft ACCESS Database. All AMSF project data has been entered into this database as well as data from projects that used AMSF Form 2 datasheets.

Two levels of data are reported for each region. The first level is a general review of all known projects that have occurred in the region. Total weights and length of beach cleaned are reported here if known. This data came from the AMSF files, Center for Alaskan Coastal Studies (CACS) and from contributed news articles. The second level is detailed data that is from the AMSF-managed Microsoft ACCESS database. Because this report is meant to give an overview of the marine debris problem across Alaska, the detailed data is summarized at the project level. That is, individual beach data was collected for more than one beach but is reported as a total in this assessment. Some of this detailed data may be found in contractor reports on the AMSF website (<http://www.alaskamsf.org/marine-debris/project-reports/>). Data reported here is summarized by project, year and region.

¹ Mr. Thomas Gemmell provided many of the articles through a news scanning service.

The quality of reported data from marine debris cleanup projects varies greatly. With respect to weight, many of the totals are best guess estimates. Some estimates are made by weighing several bags and determining an average weight and applying that to the total count of bags, while in projects sponsored by AMSF, many totals are determined by using a scale to determine weight by category. The precision of the location may also vary. Many, particularly earlier cleanups, only recorded vague location data. Many also did not record the length of beach that was cleaned making it impossible to record rates of debris deposition over unit area.

Results

There have been many groups that have conducted marine debris cleanups throughout Alaska. Many are small volunteer groups that do not keep records. Some are larger volunteer groups that may keep records. The Ocean Conservancy sponsors an International Coastal Cleanup day each year in which many small groups clean local beaches and record data on a form provided by the Ocean Conservancy. In this document, all reported marine debris cleanup results were gathered from many sources as could be identified, and presented for publication. Doubtless, data were never recorded for many unreported cleanups.

For each region, there is a description of the geography, currents and types of activities that occur within it. Activities in each region are reported in a general table. The table includes a general location, name of the contractor, year of cleanup, the names of the sponsoring group², source of the funds and data and the number of pounds collected and miles cleaned if reported.

Region 1 Southeast Alaska Outside

Region 1, the Southeast Alaska Outside, covers the coastline from the Dixon Entrance to Cape Fairweather (Figure 8). The coastline is primarily rocky with many small islands, large indented bays and major entrances into the Southeast Alaska inside waters. The accessible cleanable beaches are mostly small pocket beaches. There are two major communities on the outer coast and several smaller ones. There is only very limited road access to the beaches in the area and access is primarily by boat when the weather and/or swells permit. The current and prevalent winds are from the southeast.



Figure 8. Map of Region 1, Southeast Alaska Outside

There are many active fisheries within the area. Salmon fishing with nets and troll gear takes place close to shore while longline fisheries occur from shore to great distances offshore. Pot fishing for crab and shrimp also takes place close to shore. Prior to the Magnuson/Stevens Act in 1976 there were large foreign trawl fleets operating close to shore.

² Refer to list of Acronyms

A total of 17 cleanups have been reported for the region (Table 3). The majority of the cleanups have been based close the communities of Sitka and Craig. Lowrie Island one is a small island located far offshore but is an important haul out and rookery for Steller Sea Lions. Based on accessible data, a total of 167,334 lbs. of debris have been removed from a minimum of 137.7 miles of coast. Two projects did not record the length of the beach cleaned.

Table 3. General Project Information for Region 1, Southeast Alaska Outside.

Location	Contractor	Year	Sponsor	Funding Source	Data Source	Pounds Collected	Miles cleaned
Lowrie Island	Alaska Dept. Fish and Game, Wildlife Conservation	2008	AMSF	ADFG and NOAA	AMSF	671	
Sitka	Sitka Trail Works	2006	AMSF	NOAA	AMSF	690	
	F/V Cherokee	2008	AMSF	NOAA	AMSF	8,840	7.5
		2009	AMSF	NOAA	AMSF	18,320	8.1
		2010	AMSF	NOAA	AMSF	12,490	8.6
		2011	CACS	NOAA	CACS	400	1
	Sitka Conservation Society	2010	CACS	NOAA	CACS	1,800	1
	Sitka High School	2013			AMSF	550	0.6
	Sitka Sound Science Center	2010	CACS	NOAA	CACS	15	6
		2012	AMSF	CIAP	AMSF	12,650	5.8
		2013	AMSF	CIAP	AMSF	11,821	13.5
Craig	Island Charters	2009	AMSF	NOAA	AMSF	20,140	10.5
		2010	AMSF	NOAA	AMSF	20,389	11.9
		2010	CACS	NOAA	CACS	963	2.0
		2011	AMSF	NOAA	AMSF	17,664	17.7
		2011	CACS	NOAA	CACS	931	2.0
		2012	AMSF	CIAP	AMSF	20,997	17.2
		2013	AMSF	CIAP	AMSF	20,725	24.3
Totals						168,695	137.7

Trawl, cargo and seine web and all line dominate the composition of the debris in Sitka and Craig while floats were dominant at Lowrie Island (Table 4). Rates of deposition of debris per 100 yards ranged from 47 lbs. to 129 lbs. with an average of 71 lbs.

Table 4. Debris composition in Region 1, Southeast Alaska Outside.

Location	Year	Trawl, Seine, Cargo Net	All Line or Rope	Domestic Gill Net	High Seas Drift Net	Floats	Other Fishing Related	Banding	Plastic Beverage Bottles	Other Plastic, Non-Beverage	Metal	Foam	Other NonVessel Related	Pounds per 100 yards
Craig	2009	33%	21%	0%	0%	0%	5%	1%	14%	14%	0%	7%	4%	103
	2010	19%	32%	0%	3%	3%	4%	0%	3%	17%	0%	8%	11%	96
	2011	18%	37%	0%	0%	5%	6%	0%	0%	17%	4%	5%	7%	47
	2012	22%	35%	0%	1%	4%	7%	2%	1%	12%	2%	8%	6%	65
	2013	15%	28%	0%	1%	10%	5%	0%	1%	19%	7%	9%	6%	47
Lowrie Is	2008	3%	0%	0%	0%	44%	17%	0%	1%	0%	0%	0%	35%	
Sitka	2008	38%	28%	0%	0%	3%	6%	0%	3%	5%	0%	0%	17%	59
	2009	23%	8%	0%	1%	13%	4%	0%	7%	4%	0%	10%	31%	129
	2010	24%	23%	0%	1%	9%	1%	2%	5%	4%	0%	7%	23%	74
	2012	30%	28%	0%	1%	8%	1%	2%	4%	5%	7%	13%	2%	124
	2013	36%	7%		0%	18%	1%	0%	4%	2%	2%	22%	9%	50
	2013		16%						7%	15%		60%		53
Overall		24%	25%	0%	1%	7%	4%	1%	5%	11%	2%	9%	11%	71

Region 2 Southeast Alaska Inside

The Southeast Alaska Inside region is bounded by the outer coast and Dixon Entrance. The coastline is similar to that of the outside, with many small pocket beaches. The major difference is that the majority of the area is free of surf. Thus there are more anchorages and safer access to the beaches. There are several cities and towns throughout the region. The currents are complex through the islands but the wind is predominately from the southeast.

Commercial and recreational fishing occurs through all areas of the region. Drift gillnet and purse seine herring and salmon fisheries occur in limited areas. The troll salmon fishery occurs throughout the region. King, Tanner and Dungeness crab fisheries also occur throughout the region as does longline fishing for halibut and blackcod. Towed barges carry almost all the supplies and goods throughout the region. The region is also a host to a very large tour ship industry. Very few cleanups have occurred in the inside waters as they are considered to have a lower density of debris, however recent work by the Sitka Sound Science Center (O'Connell Pers comm 2013) has documented significant debris along the eastern shore of Baranof Island and that is likely true for Kuiu Island and Admiralty as well (Table 5).



Figure 9. Map of Region 2, Southeast Alaska Inside.

Thirteen recorded cleanups have occurred in the region (Table 5). Accessible data shows that a total of 315,310 lbs. from a minimum of 79 miles of coast has been collected. The 2008 Ketchikan Gateway Borough cleanup, which contributed the majority of the weight was in the harbor area.

Table 5. General Project Information for Region 2, Southeast Alaska Inside

Location	Contractor	Year	Sponsor	Funding Source	Data Source	Pounds Collected	Miles Cleaned
Juneau	Tuning the Tides	2008	AMSF	NOAA	AMSF	620	
		2009	AMSF	NOAA	AMSF	2,865	12.0
	Juneau Watershed Partnership	2009	CACS	NOAA	CACS	6,080	14.0
	Juneau Watershed Partnership	2010	CACS	NOAA	CACS	4,240	18.0
	Gastineau Guiding	2009	AMSF		AMSF		
	Southeast Alaska Independent Living	2014	Self	Self	Juneau Empire	450	
Ketchikan	Keep Alaska Beautiful Southeast	2011	AMSF	NOAA	AMSF	5,359	2.0
	Ketchikan Gateway Borough	2011	KGB	NOAA	Associated Press	280,000	7.0
Port Alexander	FV Otter Beachcomber	2014	AMSF	CIAP	AMSF	6,846	5.0
Haines	Takshanuk Watershed Forum	2011	CACS	NOAA	CACS	1,500	20.0
Saxman		2010	CACS	NOAA	CACS	2,400	

	City of Saxman	2011				990	
Kasaan	Organized Village of Kasaan	2011	CACS	NOAA	CACS	3,960	1.0
Totals						315,310	79.0

Only three of the projects collected detailed data. (Table 6). The frequency of trawl, seine and cargo nets is less than on the outer coast. The greatest percentage of the debris was Other Non-Vessel Related. The density ranged from 14 lbs. per 100 yards at Juneau to 107 lbs. per 100 yards south of Ketchikan. More remote locations in Southeast Inside may have significant debris and SSSC has found line, nets, Styrofoam, and buoys as far north as Katharine Island in Chatham Strait.

Table 6. Debris composition in Region 2, Southeast Alaska Inside.

Location	Year	Trawl, Seine, Cargo Net	All Line or Rope	Domestic Gill Net	High Seas Drift Net	Floats	Other Fishing Related	Banding	Plastic Beverage Bottles	Other Plastic, Non-Beverage	Metal	Foam	Other NonVessel Related	Pounds per 100 Yards
Juneau	2009	0%	6%	0%	0%	2%	9%	0%	7%	11%	8%	8%	51%	14
Port Alexander	2014	6%	8%	0%	9%	8%	15%	1%	3%	11%	3%	16%	18%	78
Ketchikan	2011	14%	20%	2%	1%	3%	7%	0%	4%	19%	10%	12%	7%	107
Overall		7%	11%	1%	5%	5%	12%	1%	4%	13%	6%	13%	22%	40

Region 3 Yakutat

The Yakutat region extends from Cape Fairweather to Cape Suckling (Figure 10). It is characterized by long sandy beaches with only a few bays. There is only one city within the region, Yakutat, where beaches can be accessed by vehicle. Outside of Yakutat, access to the beach is difficult from the water due to surf. However there are many unimproved landing strips and many areas where planes can land on the beach. There are several cabins and sport fishing lodges in the region. Once on the beach, the flat sandy shores are easily transited by vehicles including ATVs.

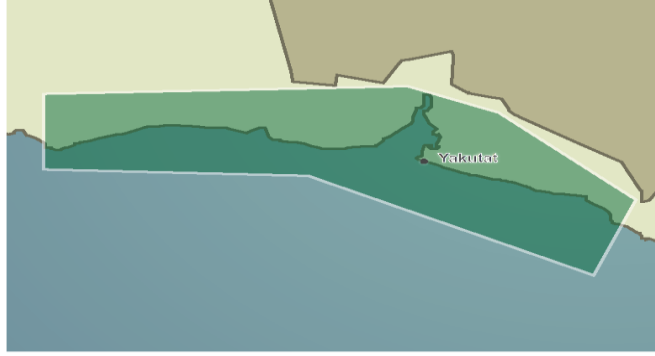


Figure 10. Map of Region 3, Yakutat.

Fishing in the area consists of trolling, set gillnetting and sport fishing for salmon. Longlining for halibut and blackcod also take place along with Dungeness crab fisheries. Prior to the Magnuson/Stevens Act there were large numbers of foreign trawlers operating in the region.

The Alaska current flows north and west along the coast and the predominant wind is from the southeast.

The majority of the cleanups have been conducted by the Yakutat Salmon Board, which is aligned with the City and Borough of Yakutat (Table 7). In 2013, a cleanup at Cape Suckling by the Cape St. Elias Lightkeepers Association (CSELA) removed very dense deposits of debris, largely of Tohoku tsunami origin. Based on accessible data, there has been a total of 114,692 lbs. removed from a minimum of 125.5 miles of beach.

Table 7. General Project Information for Region 3, Yakutat.

Location	Contractor	Year	Sponsor	Funding Source	Data Source	Pounds Collected	Miles Cleaned
Yakutat	Yakutat Salmon Board	2007	AMSF	ABC-Coastal Code-NOAA	AMSF	16,800	14.0
		2008	AMSF	ABC-Coastal Code-NOAA		6,404	
		2009	AMSF	ABC-Coastal Code-NOAA		9,104	13.8
		2010	AMSF	NOAA-COASTAL Code		6,471	16.3
	City and Borough of Yakutat	2011	AMSF	ABC-Coastal Code-NOAA		3,028	16.0
		2012	AMSF	CIAP		10,590	25.8
		2013	AMSF	CIAP		7,681	27.2
Cape Suckling	Cape St Elias Lightkeepers Assn	2013	AMSF	CIAP		54,614	12.4
Totals						114,692	125.5

The debris composition is primarily floats except that the 2008 data skews the composition towards other non-vessel type debris (Table 8). The density has averaged 57 lbs. per 100 yards however, the 2013 Cape Suckling cleanup had one of the highest recorded densities of debris with 250 lbs. per 100 yards.

Table 8. Debris composition in Region 3, Yakutat.

Location	Year	Trawl, Seine, Cargo Net	All Line or Rope	Domestic Gill Net	High Seas Drift Net	Floats	Other Fishing Related	Banding	Plastic Beverage Bottles	Other Plastic, Non-Beverage	Metal	Foam	Other NonVessel Related	Pounds per 100 Yards
Yakutat	2008	0%	0%	3%	1%	14%	0%	0%	0%	0%	9%	0%	73%	
	2009	13%	23%	1%	0%	4%	22%	0%	9%	19%	2%	3%	6%	38
	2010	20%	25%	3%	0%	7%	13%	0%	10%	8%	2%	4%	8%	22
	2011	3%	28%	0%	0%	7%	2%	1%	15%	21%	3%	8%	11%	2
	2012	11%	3%	0%	8%	42%	1%	0%	3%	4%	10%	16%	3%	23
Cape Suckling	2013	28%	0%	0%	0%	14%	0%	0%	7%	22%	7%	15%	6%	99
		3%	1%	0%	0%	37%	1%	0%	9%	19%	7%	22%	0%	250
Overall		8%	4%	0%	1%	29%	3%	0%	8%	15%	7%	16%	7%	57

Region 4 Prince William Sound

The Prince William Sound (PWS) region includes only those beaches found inside the entrances on each side of Montague Island (Figure 11). Debris from the bays in the entrances, particularly Hinchinbrook Entrance is included in the Central Gulf of Alaska Region.

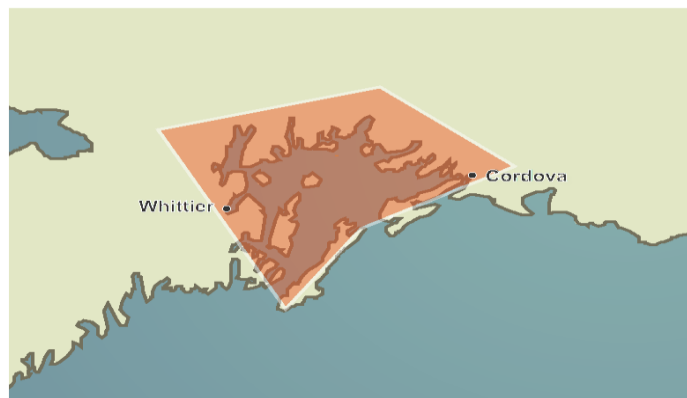


Figure 11. Map of Region 4, Prince William Sound.

The beaches of PWS are similar to those of Southeast Alaska Outside and Inside Regions. Primarily rocky beaches with pockets of sandy beaches. However, debris does enter PWS through Hinchinbrook Entrance and flows north and west where it is deposited on beaches on the many islands. The wind is predominately from the southeast.

Many different types of fisheries take place in PWS including sport fishing, purse seining, drift and set gillnetting for salmon. There are also numerous shellfish pot fisheries within PWS. It is also a popular destination for recreation for residents of Anchorage and the interior.

There are several cities and villages in PWS however, the majority of the cleanups have originated from Whittier which is the closest access from the Anchorage area. Accessible data indicates a total of 399,874 lbs. have been removed from a minimum of 609.2 miles of beach (Table 9). Organized volunteer cleanups have been used, in addition to cleanups by paid crew. The cleanups regularly take place far from cities and villages and involve the use of vessels. Many of the volunteers use kayaks to access beaches and camp on the beaches that they clean.

Table 9. General Project Information for Region 4, Prince William Sound.

The dominate category is Trawl, Cargo and Seine net (Table 10). There are also substantial amounts of foam and other non-vessel related debris. Although the foreign fisheries did not operate in PWS, the strong currents carried nets and line in through the entrances where they were deposited on the beaches. The density of the deposits inside PWS is relatively low, ranging from 2.8 lbs. to 4.6 lbs. per 100 yards with an average of 3.6 lbs.

Project		Contractor	Year	Sponsor	Funding Source	Data Source	Pounds Collected	Miles Cleaned
Prince William Sound	Professional	Gulf of Alaska Keeper	2006	AMSF	NOAA	AMSF	72,000	350.0
			2007				80,000	111.0
			2008				80,000	
	Volunteer		2009				8,000	50.0
	Professional		2009				62,000	11.0
	Monitoring		2009				554	1.4
	Professional		2010				22,000	9.0
	Volunteer		2010				18,000	18.0
	Monitoring		2010				1,060	1.4
	Professional and Volunteer Monitoring		2011				46,000	5.0
			2011				1,060	1.4
	Volunteer		2012				8,000	40.0
			Prince William Sound Keeper				2009	CACS
Totals							399,874	609.2

Table 10. Debris composition in Region 4, Prince William Sound.

Location	Year	Trawl, Seine, Cargo Net	All Line or Rope	Domestic Gill Net	High Seas Drift Net	Floats	Other Fishing Related	Banding	Plastic Beverage Bottles	Other Plastic, Non-Beverage	Metal	Foam	Other NonVessel Related	Pounds per 100 Yards
Prince William Sound	2009	3%	5%	1%	1%	5%	5%	3%	5%	5%	2%	45%	20%	2.8
	2010	25%	23%	3%	1%	4%	6%	1%	4%	5%	1%	10%	20%	4.6
	2011	36%	16%	0%	1%	10%	5%	1%	2%	5%	1%	8%	14%	3.4
Overall		23%	16%	1%	1%	6%	5%	2%	4%	5%	1%	18%	18%	3.6

Region 5 Central Gulf of Alaska

The Central Gulf of Alaska (CGA) region stretches from Cape Suckling to Unimak Pass (Figure 12). PWS proper is excluded and the Kodiak Archipelago is included. The region contains some of the most rugged coast in Alaska. It is also the landfall of the majority of the storms in the North Pacific. There are many rocky headlands with pocket beaches along with long stretches of rocky/sandy beaches such as outer Montague Island. Many of the beaches are covered with large quantities of driftwood. The area includes Gore Point.



Figure 12. Map of Region 5, Central Gulf of Alaska.

There are several small communities in the area with Kodiak being the only large city. Access to the beaches is difficult due to the remoteness. All the beaches are subject to surf and the weather is often stormy. Access is either by boat or float plane.

There are many different types of fisheries conducted in the area include sport fishing, purse seining, set and drift gillnetting for salmon; sport and commercial longline fishing for halibut,

black cod and rockfish; pot fishing for shellfish; longlining for Pacific cod; and trawling for a number of bottom fish species.

Accessible data shows that there have been 24 recorded cleanups in the region by seven groups (Table 11). These cleanups have removed a total of 562,452 lbs. from a minimum of 499.7 miles of beach.

Table 11. General Project Information for Region 5, Central Gulf of Alaska.

Location	Contractor	Year	Sponsor	Funding Source	Data Source	Pounds Collected	Miles Cleaned
Shelikof Strait	EarthTabs	2008	AMSF	NOAA	AMSF	6,250	2.0
		2009	AMSF	NOAA	AMSF	18,000	7.0
Gore Point	Gulf of Alaska Keeper	2007	AMSF and REI	NOAA and AMSF	GoAK	90,000	
		2009	NOAA	NOAA and	GoAK	80,000	85.0
		2011	Other	NOAA and	GoAK	50,000	206.0
Montague Island		2012	AMSF	CIAP	AMSF	31,000	12.3
Kayak Island	Cordova Boy Scouts	2012	Cordova Boy Scouts and Cordova Times Vol 97 Issue 41			6,000	1.0
Afognak and Shuyak	Blue Fox Bay Lodge	2012	AMSF	CIAP	AMSF	11,691	8.0
		2013				16,235	18.0
		2014				4,894	4.5
				ADEC		2,858	1.1
Kodiak	Island Trails Network	2013	State of Alaska		ITN	80,000	53.0
		2008	AMSF	NOAA	AMSF	18,759	7.0
		2009			AMSF	14,249	6.0
		2010			AMSF	12,988	11.1
		2011			AMSF	6,109	19.8
		2012			AMSF	16,543	15.7
		2013			AMSF	27,084	9.6
		2008	CACS	CACS	4,700	7.0	
Tugidak		2013	NOAA	NOAA	ITN	33,000	4.0
Resurrection Bay	Resurrection Bay Conservation Alliance	2008	CACS	NOAA	CACS	3,000	5.0
		2009		RBCA	RBCA	18,960	6.3
Hallo Bay	National Park Service	2013	NPS	NPS	AMSF	4,372	3.3
Shumagin Islands	Pauloff Harbor Tribe	2009	CACS	NOAA	CACS	5,900	7.0
Totals						562,592	499.7

The dominant debris has been trawl, seine and cargo nets. The second dominant category is all line, which combined with nets comprises almost half of the total (Table 12). Rates of deposition have ranged from 11 lbs. to 418 lbs. per 100 yards with an average of 78 lbs. There were no data from Gore Point included which is considered to be one of the largest collector locations on the Alaska coast.

Table 12. Debris composition in Region 5, Central Gulf of Alaska.

Location	Year	Trawl, Seine, Cargo Net	All Line or Rope	Domestic Gill Net	High Seas Drift Net	Floats	Other Fishing Related	Banding	Plastic Beverage Bottles	Other Plastic, Non-Beverage	Metal	Foam	Other NonVessel Related	Pounds per 100 Yards
Afognak	2012	33%	19%	0%	0%	20%	1%	0%	3%	14%	1%	7%	1%	82
	2013	26%	29%	0%	5%	11%	2%	0%	1%	17%	1%	5%	1%	51
	2014	22%	23%	1%	1%	14%	2%	0%	2%	23%	2%	7%	4%	79
Kodiak	2008	20%	23%	0%	0%	5%	0%	0%	15%	15%	2%	10%	10%	65
	2009	14%	20%	2%	0%	12%	3%	0%	12%	16%	1%	8%	12%	94
	2010	20%	21%	0%	1%	5%	0%	0%	15%	15%	2%	12%	9%	56
	2011	18%	21%	0%	0%	12%	4%	1%	7%	26%	3%	9%	1%	11
	2012	13%	14%	0%	0%	8%	5%	3%	15%	13%	9%	14%	5%	54
	2013	15%	0%	1%	###	17%	4%	1%	13%	16%	1%	11%	5%	418
Montague Island	2012	37%	14%	0%	1%	16%	7%	0%	3%	4%	0%	6%	13%	34
	2009	32%	19%	1%	2%	9%	3%	1%	3%	5%	1%	11%	13%	248
	2010	42%	16%	4%	3%	12%	2%	1%	2%	4%	1%	4%	10%	139
Hallo Bay	2013	14%	23%	0%	2%	28%	0%	1%	2%	19%	4%	7%	0%	75
Seward	2009	19%	0%	0%	0%	0%	27%	0%	29%	3%	0%	15%	6%	95
Shelikof	2008	42%	8%	0%	0%	6%	22%	0%	5%	13%	0%	4%	1%	89
	2009	38%	16%	2%	3%	13%	7%	2%	4%	5%	2%	4%	4%	225
Overall		28%	16%	1%	3%	12%	5%	1%	7%	10%	2%	8%	8%	78

Region 6 Cook Inlet

Cook Inlet is a long inlet extending from the Gulf of Alaska and begins at a line from Cape Douglas to Cape Elizabeth (Figure 13). It has the largest tidal changes in Alaska and some of the strongest currents. The central part of the inlet is characterized by eddies which collect debris including large quantities of driftwood. The east side beaches are long continuous sand beaches up against bluffs broken by several

large rivers. The west side also has some long sandy beaches but rocky headlands with smaller pocket beaches dominate the shorelines closer to the Gulf of Alaska.

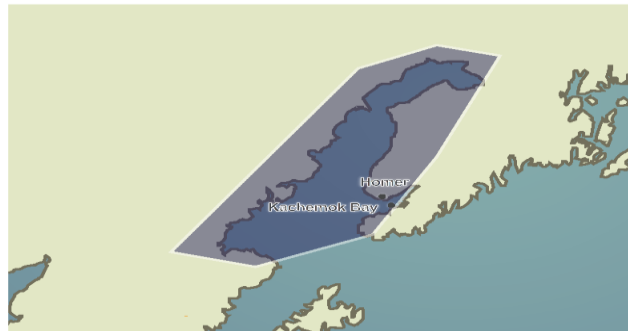


Figure 13. Map of Region 6, Cook Inlet.

Only salmon net and sport fisheries occur in the majority of Cook Inlet except in Kachemak Bay where there are recreational and commercial halibut and shellfish fisheries. There are also beach clam fisheries throughout the area. There are several large cities within the area, including Anchorage at the head of the inlet. Access to beaches on the eastside is by vehicle. There is a highway that provides access to the beaches on approximately half of the lower east side. Access to beaches on the west side is by planes landing on unimproved strips or on the beach or by boat. There are few permanent settlements on the west side.

Accessible data shows that a total of 18,459 lbs. of debris have been removed from 146.5 miles of coastline. All of the recorded projects have taken place through the Center for Alaskan Coastal Studies. There is no detailed data available for Cook Inlet.

Table 13. General Project Information for Region 6, Cook Inlet.

Location	Contractor	Year	Sponsor	Funding Source	Data Source	Pounds Collected	Miles cleaned
Homer	Kachemak Bay Conservation Society	2011	CACs	NOAA	CACs	655	1.5
	Friends of Kachemak State Park	2009				1,355	9
		2010				1,200	3
		2011				1,200	4
	Homer Chamber of Commerce	2008				596	2
		2009				500	6
	Fireweed Academy	2008				50	2
	McNeil Canyon School	2008				827	7
		2009				1,080	7
		2010				717	4
		2011				2,230	6
	CACs	2012				4,373	70
	Cook Inlet Keeper	2009				150	4
2010		925	9				
Kenai	Kenaitze Tribe	2008				140	2

		2009			140	2
		2010			210	2
	Kenai Watershed Forum	2008			2,000	4
Anchorage	Rogers Park Elementary 4th Grade	2010			111	2
Totals					18,459	146.5

Region 7 Aleutians

The Aleutian Islands begin at the end of the Alaska Peninsula and continue westward for approximately 1,200 miles (Figure 14). It is comprised of 14 large and 55 small islands and is the break between the Bering Sea and the Pacific Ocean. The coast is largely rocky headlands with small rocky beaches. There are several cities and villages throughout the region with Dutch Harbor being the largest. The Alaska current moves west along the Pacific side while the current is mixed on the Bering Sea side. The Aleutian low dominates the weather in the area and winds can come from any direction.



Figure 14. Map of Region 7, the Aleutian Islands.

Almost all types of fisheries take place adjacent to the islands. The islands are also home to innumerable bird and marine mammal populations. Access to the beaches is difficult. They can only be reached by vessel and the surf can be difficult to contend with.

Amchitka Island was one of the first places in Alaska to be studied for the presence and effects of marine debris (Merrell, 1980). Five known cleanups have taken place and have removed a total of 68,720 lbs. from a minimum of eight miles of beach (Table 14). Three of the cleanups, the two by Magone Marine and one by NOAA, were mitigation cleanups. The NOAA cleanup was a response to the grounding of the freighter Selandang Ayu on the coast of Unalaska Island.

Table 14. General Project Information for Region 7, Aleutian Islands.

Location	Contractor	Year	Sponsor	Funding Source	Data Source	Pounds Collected	Miles Cleaned
Unalaska	Magone Marine	2007	AMSF	Pacific Stevedoring and NOAA	AMSF	14,000	3.0
		2008				9,000	5.0

	NOAA - Office of Reponse and Restoration	2005	NOAA	NOAA	NOAA	13,020	
	Qawalangin Tribe of Unalaska	2007	AMSF	Alaska Coastal Management Plan	AMSF	2,000	
Agattu, Attu and Great Sitkin	USFWS	2009	Other		Press Release	700	
Nikolski	US Coast Guard	2007	Other		Associated Press	30,000	
Totals						68,720	8.0

No detailed debris composition data has been collected in the region, but reports indicate that is likely similar to the CGA.

Region 8 Bristol Bay

Region 8 is the north shore of the Alaska Peninsula and Bristol Bay (Figure 15). It extends from Unimak Pass in the west to Cape Newenham to the north and east. The primary current flows from west to east. The beaches are flat, wide and composed of sand and mud, particularly in Bristol Bay proper. Ocean salmon drift and set gillnet fisheries occur throughout the region but are particularly intense in Bristol Bay proper. Crab fisheries occur in the deeper water of the area and further to the west. Trawl and longline fisheries occur in the Bering Sea west and north of the area.

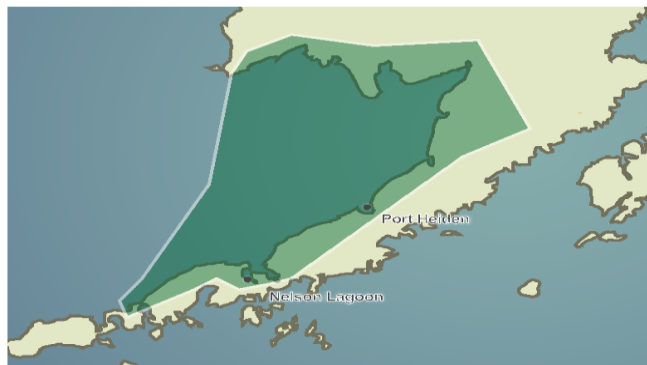


Figure 15. Map of Region 8, Bristol Bay.

Documented cleanups have occurred at two locations; Port Heiden and Nelson Lagoon. Both projects were sponsored by AMSF (Table 15). Through these cleanups, a total of 329,317 lbs.

of debris was removed from 269 miles of beach. Some of the beaches were cleaned more than once.

Table 15. General Project Information for Region 8, Bristol Bay.

Project Name	Contractor	Year	Sponsor	Funding Source	Data Source	Pounds Collected	Miles Cleaned
Port Heiden	Native Council of Port Heiden	2008	AMSF	NOAA	AMSF	53,000	10.0
		2009				17,435	0.1
		2010				34,940	10.0
		2011		22,175		38.8	
		2012		26,153		42.9	
		2013		19,367		56.3	
		2014		39,246		64.0	
Nelson Lagoon	Nelson Lagoon Tribal Council	2009	AMSF	NOAA	AMSF	88,834	20.0
		2010				28,167	27.0
Totals						329,317	269.0

Cleanups conducted by the Native Village of Port Heiden (NVPH) began in 2008 and were directed at a landfill located in the old abandoned village that was quickly eroding back into the ocean. The landfill had been used by locals and by the United States armed services facilities located there. They also cleaned a collection area approximately 20 miles from the village called Ship Creek. The old landfill continued to be cleaned in 2009 through 2011. The NVPH reported that the fall storms of 2011 have exposed almost all of the old landfill.

In 2010, the NVPH began to work on a portion of the outer coast across the bay. The area is remote and equipment and personnel had to be hauled from the village to the site. Through 2010, NVPH has removed 212,316 lbs. of debris. In recent years, trawl, seine and cargo nets and line have comprised the majority of the debris (Table 16).

Cleanups conducted by the Nelson Lagoon Tribal Council (NLTC) began in 2009. The beach can be accessed by pickup trucks from the village. The cleanup area in 2009 and 2010 consisted of the beach directly accessible from the village. A total of 117,001 lbs. of debris have been removed and deposited at Nelson Lagoon landfill. The majority of debris is line from the Bering Sea crab fisheries. Overall, the rate of deposition averages 56 lbs. per 100 yards.

Table 16. Debris composition in Region 8, Bristol Bay.

Location	Year	Trawl, Seine, Cargo Net	All Line or Rope	Domestic Gill Net	High Seas Drift Net	Floats	Other Fishing Related	Banding	Plastic Beverage Bottles	Other Plastic, Non-Beverage	Metal	Foam	Other NonVessel Related	Pounds per 100 Yards
Nelson Lagoon	2009	8%	45%	18%	0%	4%	3%	0%	0%	7%	0%	0%	14%	252
	2010	14%	60%	0%	0%	6%	15%	1%	2%	1%	1%	1%	0%	52
Port Heiden	2009	0%	9%	16%	0%	7%	6%	2%	22%	18%	11%	5%	4%	
	2010	4%	6%	2%	0%	3%	1%	0%	1%	1%	0%	0%	82%	199
	2011	3%	12%	1%	0%	1%	7%	0%	9%	8%	58%	0%	1%	32
	2012	6%	4%	2%	0%	2%	3%	0%	1%	4%	74%	0%	5%	35
	2013	26%	27%	7%	0%	6%	1%	1%	1%	7%	23%	0%	3%	20
	2014	13%	32%	8%		12%	3%	0%	0%	5%	17%	0%	9%	35
Overall		9%	29%	9%	0%	5%	4%	0%	3%	6%	17%	1%	17%	56

In 2011, NLTC realized that they could not support the amount of debris in their landfill. They began to sort and place the materials in supersacks in preparation for future shipping to a recycling facility. Proper disposal of marine debris is very difficult.

Region 9 Pribilof Islands

Region 9 includes all five of the Pribilof Islands archipelago (Figure 16). The Pribilof Islands are located on the western edge of the Eastern Bering Sea Shelf. The two large islands, St George and St Paul are populated. The beaches on St Paul are mostly long and sandy while on St George, the beaches are rocky. Access on to the beaches on both islands is by road or trail. On St Paul, ATVs are used on the beach. On St George, the rocky shore allows only foot access.



Figure 16. Map of Region 9, Pribilof Islands.

All beaches on St Paul Island are accessible and are cleaned on a regular basis. Only 10 beaches on St George Island are accessible by land and are mostly cleaned annually. Beaches on St George accessible only by water have not been cleaned. This may partially explain why despite the closeness of the two islands, the deposit rates of debris on St Paul are larger.

There have been 11 recorded years of cleanups on St Paul and eight on St George (Table 16). Through these cleanups, a total of 305,040 lbs. of debris have been removed from 63.7 miles of beach. Some of the beaches were cleaned more than once. There were previous cleanups on both islands where little data were collected.

Table 17. General Project Information for Region 9, Pribilof Islands.

Location	Contractor	Year	Sponsor	Funding Source	Data Source	Pounds Collected	Miles Cleaned
St George	St George Traditional Council	2006	AMSF	NOAA	AMSF	10,828	3.0
		2007				6,005	3.0
		2008				2,607	4.0
		2009				21,947	7.5
		2010				13,799	7.5
		2011				8,250	3.0
		2012				CIAP	8,713
		2014		NOAA	AMSF	10,157	1.6
St Paul	Aleut Community of St Paul Island, Tribal Government, Ecosystem Conservation Office	2003	AMSF	NOAA	AMSF	26,000	
		2004				20,000	
		2005				26,000	2.0
		2006				36,000	2.0
		2007				20,000	7.0
		2008				20,000	
		2009				21,580	2.6
		2010				3,920	1.8
		2010				17,755	1.8
		2011				12,031	8.3
		2013	CIAP	19,448	6.5		
Totals						305,040	63.7

Although the two islands are only approximately 40 miles apart, the debris composition appears to differ (Table 17). St Paul appears to get considerably more trawl, cargo and seine net and line than St George.

Overall the rate of debris deposition appears to be greater on St Paul, however, since 2011, the rates on St George are greater than for St Paul. Rates of deposition on St. Paul Island have been as high as 547 lbs. per 100 yards. The average deposition rate for both islands is 172 lbs. per 100 yards.

Table 18. Debris composition in Region 9, Pribilof Islands.

Location	Year	Trawl, Seine, Cargo Net	All Line or Rope	Domestic Gill Net	High Seas Drift Net	Floats	Other Fishing Related	Banding	Plastic Beverage Bottles	Other Plastic, Non-Beverage	Metal	Foam	Other NonVessel Related	Pounds per 100 yards
St George	2009	0%	0%	0%	0%	0%	69%	0%	0%	0%	0%	0%	31%	146
	2010	8%	27%	16%	0%	9%	1%	1%	1%	28%	0%	0%	9%	64
	2011	3%	36%	0%	1%	4%	18%	0%	0%	14%	13%	0%	10%	156
	2012	5%	24%	0%	0%	3%	7%	0%	1%	8%	5%	0%	48%	239
	2014	2%	54%	0%	0%	2%	0%	0%	1%	10%	11%	1%	19%	361
St Paul	2009	16%	49%	1%	1%	9%	13%	0%	1%	2%	0%	1%	8%	466
	2010	30%	45%	0%	0%	0%	18%	0%	0%	4%	0%	0%	3%	547
	2010	10%	46%	0%	0%	0%	14%	1%	0%	0%	0%	0%	28%	126
	2011	19%	61%	0%	0%	5%	2%	0%	2%	7%	1%	1%	2%	83
	2013	18%	57%	0%	0%	13%	0%	0%	1%	7%	3%	0%	1%	170
Overall		13%	40%	1%	0%	5%	17%	0%	1%	7%	3%	0%	13%	172

Region 10 Central Bering Coast

Region 10, the Central Bering Coast covers the coastline between Bristol Bay and Norton Sound (Figure 17). It includes both the Kuskokwim and Yukon River deltas and Nunivak Island. The coastline is primarily low, flat tundra with few communities or facilities. Water depth is shallow, less than 100 ft., for many miles offshore. The near shore current is primarily driven by the outflow of the Kuskokwim and Yukon Rivers.

Small salmon and herring fisheries take place in the region. The current flow is north and is likely dominated by the outflow of the Kuskokwim River.

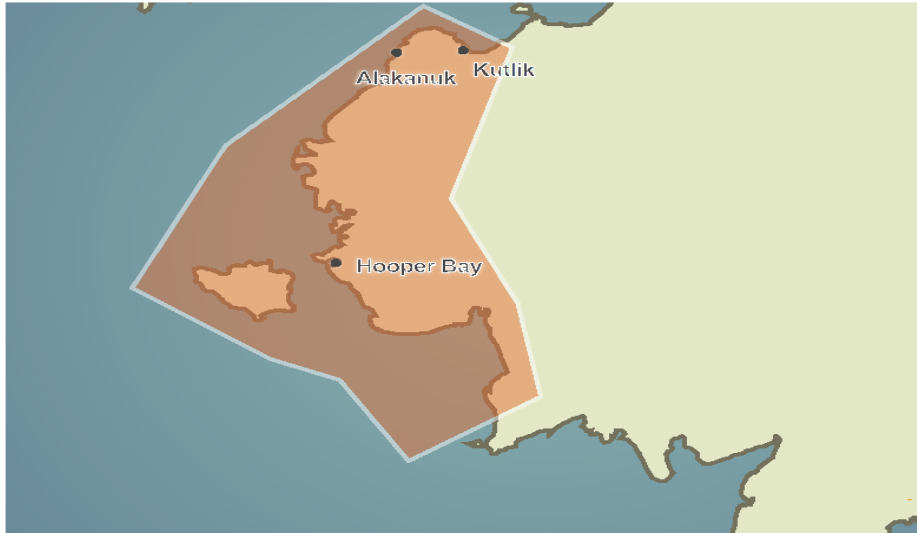


Figure 17. Map of Region 10, Central Bering Coast.

There have been three MCAF sponsored cleanups in the area: Hooper Bay, Alakanuk and Kotlik. Combined they have removed a total of 25,955 lbs. of debris from 61.8 miles of beach (Table 19). All three of the cleanups were conducted by the Yukon River Drainage Fishermen's Association based in Anchorage.

Table 19. General Project Information for Region 10, Central Bering Coast.

Location	Contractor	Year	Sponsor	Funding Source	Data Source	Pounds Collected	Miles Cleaned
Kotlik	Yukon River Drainage Fisheries Association	2009	AMSF	NOAA	AMSF	3,550	24.0
Alakanuk		2009				7,310	16.0
Hooper Bay		2010				15,095	21.8
Totals						25,955	61.8

The composition of the debris varies between locations (Table 20). In Kotlik, the primary type of debris was domestic gillnet, while other non-vessel related was the majority at Alakanuk and the primary type of debris at Hooper Bay was Other fishing related. Overall, the majority of debris in the Central Bering Coast is other fishing related.

The rates of deposition range from 8 lbs. per 100 yards to 39 lbs. with an average of 24 lbs.

Table 20. Debris composition in Region 10, Central Bering Coast.

Location	Year	Trawl, Seine, Cargo Net	All Line or Rope	Domestic Gill Net	High Seas Drift Net	Floats	Other Fishing Related	Banding	Plastic Beverage Bottles	Other Plastic, Non-Beverage	Metal	Foam	Other NonVessel Related	Pounds per 100 Yards
Hooper Bay	2010	1%	0%	2%	0%	0%	66%	4%	1%	7%	1%	1%	18%	39
Alakanuk	2009	0%	1%	20%	0%	0%	0%	0%	1%	10%	3%	1%	64%	26
Kotlik	2009	0%	1%	56%	0%	1%	0%	0%	1%	2%	1%	3%	33%	8
Overall		1%	0%	14%	0%	0%	38%	2%	1%	7%	1%	1%	33%	24

Region 11 Norton Sound

The area is defined as beginning at Pt Romanof on the southern shore, and continuing to Cape Rodney on the northern shore (Figure 18). Norton Sound is a unique body of water with a counter clockwise current. Much of the surface water is from the Yukon and Kuskokwim Rivers. There are nine communities located on the shore within this area, the largest being Nome.



Figure 18. Map of Region 11, Norton Sound.

Salmon and herring fisheries occur in both fresh and marine waters throughout the region as well as a king crab fishery. Recently, offshore gold dredging has been taking place along the coast near Nome.

The Norton Sound Economic Development Corporation (NSEDC), a Community Development Quota corporation, includes all nine of these communities. The NSEDC set a goal to clean all marine beaches and freshwater systems located within and adjacent to their community members. AMSF partnered with NSEDC and funded the marine portion of the cleanup in five of these communities (Table 21).

A total of nine known cleanups have been conducted, removing 429,610 lbs. of debris from a minimum of 210 miles of beach.

Table 21. General Project Information for Region 11, Norton Sound.

Location	Contractor	Year	Sponsor	Funding Source	Data Source	Pounds Collected	Miles Cleaned
Unalakleet	Norton Sound Economic Development Corporation, Fisheries Research and Development	2006	AMSF and NSEDC	NOAA and NSEDC	AMSF	60,000	10.0
Unalakleet		2007				107,000	10.0
Shaktoolik		2007				43,620	25.0
Golovin		2008				22,031	65.0
St Michael		2009				152,009	15.0
Stebbins		2009				28,450	55.0
Koyuk		2010	26,251				
Nome		2011	16,500	30.0			
Elim		2010	34,625				
Totals						490,486	210.0

The composition of the debris in the Norton Sound Region is different than in most other regions. It is composed largely of non-fishing items, 87% is categorized as other non-vessel related. This is perhaps a result of the cleanups being in the close vicinity of the communities and the debris may also be from the freshwater systems near the communities (Table 21). The rate of deposition ranged from 17 lbs. per 100 yards to 576 with an average of 84 lbs.

Table 22. Debris composition in Region 11, Norton Sound.

Location	Year	Trawl, Seine, Cargo Net	All Line or Rope	Domestic Gill Net	High Seas Drift Net	Floats	Other Fishing Related	Banding	Plastic Beverage Bottles	Other Plastic, Non-Beverage	Metal	Foam	Other NonVessel Related	Pounds per 100 Yards
Golovin	2008	0%	0%	0%	0%	0%	11%	0%	0%	5%	78%	4%	2%	17
St Michael	2009	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	99%	576
Stebbins	2009	5%	0%	9%	0%	0%	0%	0%	2%	0%	0%	2%	83%	29
Overall		1%	0%	2%	0%	0%	1%	0%	0%	1%	8%	1%	87%	84

Region 12 St Lawrence Island

Region 12 is St Lawrence Island. The island is approximately 90 miles long and varies from eight to 22 miles wide. It is situated at the northern end of the Bering Sea, just south of the Bering Strait (Figure 19). There are two communities on the island: Savoonga and Gambell. The current is from the south and flows towards the Bering Strait. Longline fisheries for halibut take place close to the two villages. Marine mammals are frequent in the area and are hunted for subsistence.



Figure 19. Map of Region 12, St. Lawrence Island.

Five cleanups have occurred on the island, all a partnership between AMSF and NSEDC, of which the communities are members (Table 23). Through these cleanups, a total of 156,373 pounds have been removed from 150.6 miles of coast.

Table 23. General Project Information for Region 12, St Lawrence Island.

Location	Contractor	Year	Sponsor	Funding Source	Data Source	Pounds Collected	Miles Cleaned
Gambell	Norton Sound Economic Development Corporation, Fisheries Research and Development	2008	AMSF and NSEDC	NOAA and NSEDC	AMSF	66,540	30.0
		2009				20,425	45.0
2008		CIAP and NSEDC		34,627		25.0	
2012				15,421		25.0	
2014				NOAA and NSEDC		19,360	25.6
Totals						156,373	150.6

The composition of the debris is different from that of Norton Sound being comprised of more fishing gear (Table 24). The deposition rates have ranged from 26 pounds per 100 yards at

Gambell in 2009 to 126 pounds per 100 yards at Gambell in 2008. The average is 59 lbs. per 100 yards.

Table 24. Debris composition in Region 12, St. Lawrence Island

Location	Year	Trawl, Seine, Cargo Net	All Line or Rope	Domestic Gill Net	High Seas Drift Net	Floats	Other Fishing Related	Banding	Plastic Beverage Bottles	Other Plastic, Non-Beverage	Metal	Foam	Other NonVessel Related	Pounds per 100 Yards
Gambell	2008	0%	0%	0%	0%	0%	58%	0%	0%	21%	12%	2%	8%	126
	2009	13%	1%	0%	0%	1%	1%	0%	1%	1%	1%	1%	82%	26
Savoonga	2008	0%	0%	0%	0%	0%	54%	0%	0%	40%	6%	1%	0%	78
	2012	40%	3%	2%	0%	0%	0%	0%	11%	0%	0%	3%	42%	35
	2014	19%	15%	3%	0%	15%	9%	0%	5%	3%	21%	2%	8%	43
Overall		7%	1%	0%	0%	0%	32%	0%	1%	17%	8%	1%	23%	59

Region 13 Northern Bering Coast

The Northern Bering Coast Region extends from Cape Rodney, west of Nome, to Cape Espenberg, the northern tip of the Seward Peninsula and includes Diomedede Island (Figure 20). The area is also known as the Bering Straits area. Several villages are located throughout the area and all are members of NSEDC. The current flows north towards the Chukchi Sea. Winds are from the north. Subsistence salmon fisheries occur in the area.

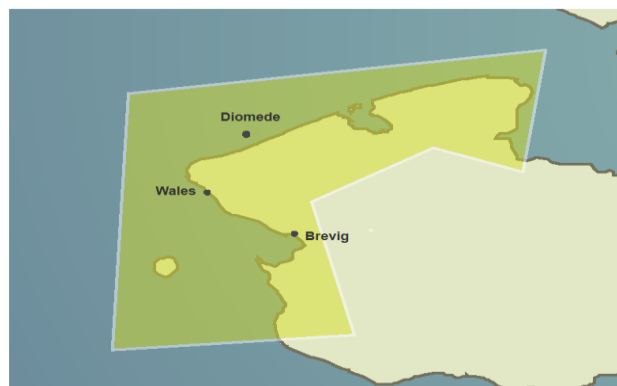


Figure 20. Map of Region 13, Northern Bering Coast.

Four cleanups, collecting a total 76,556 pounds (Table 24). The average rate of deposition was 26.0 pounds per 100 yards (Table 25). The Diomedede cleanup took place in front of the village.

Table 25. General Project Information for Region 13, Northern Bering Coast.

Location	Contractor	Year	Sponsor	Funding Source	Data Source	Pounds Collected	Miles Cleaned
Diomedede	Norton Sound Economic Development Corporation, Fisheries Research and Development	2009	AMSF and NSEDC	NOAA and NSEDC	AMSF	7,125	0.1
Brevig Mission		2009				47,225	33.0
Wales		2010				6,925	17.2
Teller		2010				15,281	123.1
Totals						76,556	173.4

Debris composition indicates that only Wales had deposits of fishing gear (Table 26). The debris in the other cleanups was determined to be primarily non-vessel related.

Table 26. Debris composition in Region 13, Northern Bering Coast.

Location	Year	Trawl, Seine, Cargo Net	All Line or Rope	Domestic Gill Net	High Seas Drift Net	Floats	Other Fishing Related	Banding	Plastic Beverage Bottles	Other Plastic, Non-Beverage	Metal	Foam	Other NonVessel Related	Pounds per 100 Yards
Brevig Mission	2009	0%	0%	0%	0%	0%	2%	0%	0%	2%	18%	1%	77%	81
Diomedede	2009	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	2,892
Teller	2010	0%	3%	0%	0%	2%	1%	0%	10%	9%	21%	8%	47%	7
Wales	2010	25%	20%	2%	19%	3%	3%	6%	4%	3%	9%	4%	1%	21
Overall		2%	2%	0%	2%	1%	2%	1%	2%	4%	16%	3%	67%	25

Region 14 Arctic Region

The Arctic region extends from Cape Espenberg to Demarcation Point (Figure 21). There has been only one known cleanup in the Arctic region (Table 27), it removed 450 lbs.

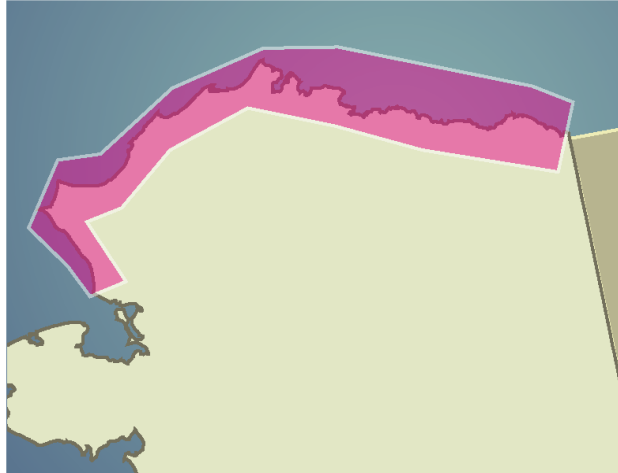


Figure 21. Map of Region 14, Arctic Coast.

Table 27. General Project Information for Region 14, Arctic Coast.

Location	Contractor	Year	Sponsor	Funding Source	Data Source	Pounds Collected	Miles Cleaned
Kotzebue	Northwest Arctic Borough (NAB)	2012	NAB	NAB	NAB	450	15
Totals						450	15

There is no debris composition data.

Statewide Comparisons

Fourteen regions were designated based on consideration of geography, beaches, currents and potential sources of marine debris. The type and density of marine debris was expected to be unique between the regions. Marine cleanup projects are primarily limited by accessibility. Accessibility is a function of beach access and proximity to communities for labor and equipment.

A minimum of 3,043,864 lbs. of marine debris have been removed from a minimum 2,591 miles of coastline by 148 different projects (Table 28). Some of the miles of reported coastline have been cleaned more than once making the mileage an overestimate. The majority of debris removed and the greatest number of projects was in the Central Gulf of Alaska region. The largest number of miles cleaned in a region is 569.2 miles in Prince William Sound.

The total number of miles cleaned is a minimum as there were many projects that did not record this. However, it also overestimates how much of the coast has been cleaned as it includes several areas that have been cleaned several times. But based on an estimate 44,500 miles, only 6% of the coastline has been cleaned.

Table 28. Summary of marine debris cleanup projects.

	Region	Pounds Collected	Miles Cleaned	Number of Projects	Pounds per 100 Yards	
					General	Detailed
1	Southeast Alaska Outside	167,334	137.7	18	69	71
2	Southeast Alaska Inside	315,310	79.0	13	224	40
3	Yakutat	114,692	125.5	8	49	57
4	Prince William Sound	399,874	609.2	13	30	4
5	Central Gulf of Alaska	562,592	499.7	24	54	78
6	Cook Inlet	18,459	146.5	19	7	
7	Aleutians	68,720	8.0	6	163	
8	Bristol Bay	329,317	269.0	9	69	56
9	Pribilof Islands	305,040	63.7	19	213	172
10	Central Bering Coast	25,955	61.8	3	24	24
11	Norton Sound	490,486	210.0	9	116	84
12	St Lawrence Island	156,373	150.6	4	59	59
13	Northern Bering Coast	76,556	173.4	4	25	25
14	Arctic	450	15.0	1	2	
Total		3,031,158	2,549.1	150		

The greatest density of debris in both the general and detailed assessments was in the Pribilof Islands, with 172 lbs. per 100 yards for the detailed estimate (Figure 22). The detailed estimate is the best estimate.

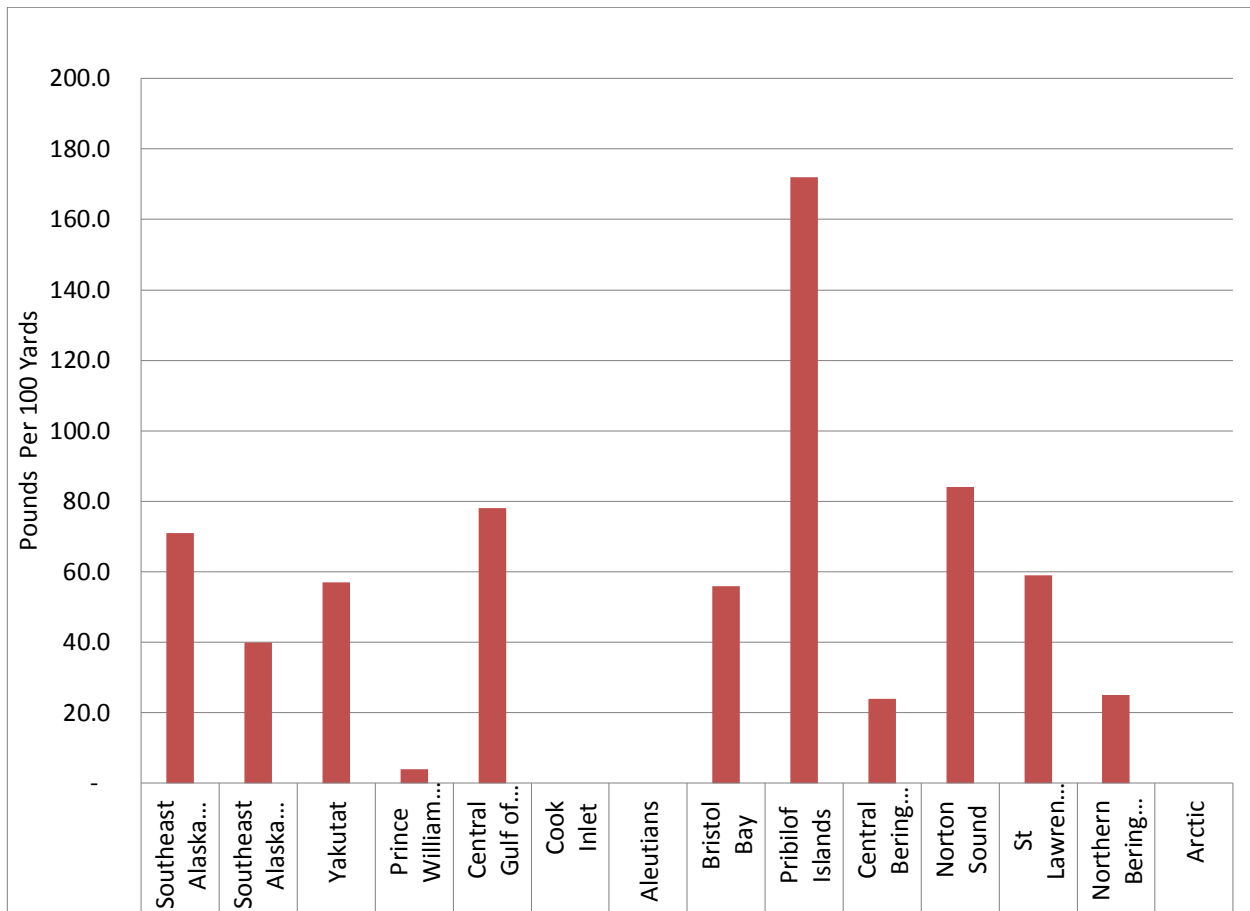


Figure 22. Rates of debris deposition (pounds per 100 yards) by region.

The type of debris does vary between the different regions Table (29). Trawl, cargo and seine net and all line or rope dominate the composition in the Gulf of Alaska regions (except for Region 2, Southeast Alaska Inside) and Regions 8 and 9 (Bristol Bay and Pribilof Islands). The other Bering Sea regions (10 through 13) are comprised of other fishing related and other non-vessel related debris.

Table 29. Debris composition by region.

Region	Trawl, Seine, Cargo Net	All Line or Rope	Domestic Gill Net	High Seas Drift Net	Floats	Other Fishing Related	Banding	Plastic Beverage Bottles	Other Plastic, Non-Beverage	Metal	Foam	Other NonVessel Related	Pounds per 100 yards
1	24%	25%	0%	1%	7%	4%	1%	5%	11%	2%	9%	11%	71
2	7%	11%	1%	5%	5%	12%	1%	4%	13%	6%	13%	22%	40
3	8%	4%	0%	1%	29%	3%	0%	8%	15%	7%	16%	7%	57
4	23%	16%	1%	1%	6%	5%	2%	4%	5%	1%	18%	18%	4
5	28%	16%	1%	3%	12%	5%	1%	7%	10%	2%	8%	8%	78
6													
7													
8	9%	29%	9%	0%	5%	4%	0%	3%	6%	17%	1%	17%	56
9	13%	40%	1%	0%	5%	17%	0%	1%	7%	3%	0%	13%	172
10	1%	0%	14%	0%	0%	38%	2%	1%	7%	1%	1%	33%	24
11	1%	0%	2%	0%	0%	1%	0%	0%	1%	8%	1%	87%	84
12	10%	3%	1%	0%	2%	32%	0%	2%	17%	8%	1%	23%	59
13	2%	2%	0%	2%	1%	2%	1%	2%	4%	16%	3%	67%	25
14													

Discussion

Despite the small human population in Alaska, marine debris is a significant problem. The first recorded marine debris work in Alaska was conducted by NOAA on Amchitka Island in the early 1970s. NOAA documented the presence of plastic marine debris, primarily from the fishing industry and largely of non US origin. Plastics had just recently come into widespread common use and were particularly well suited to use in the harsh and wet conditions of the fishing industry.

A total of 3.043 million lbs. debris were documented to have been removed from Alaska's coastline in this report. Undoubtedly there are many undocumented cleanups that have occurred with many more pounds of debris being removed. A number of different sources of funding have been responsible for the work, but the primary source has been NOAA. The Marine Debris Reduction Act of 2006 was to provide up to \$10 million per year in funding for marine debris cleanups, however, it has not received full funding.

The Alaska coastline is perhaps the most challenging place there is to conduct marine debris cleanups. Working on remote beaches, difficulty of access, limited workforce and the weather

contribute to the problem. Also, there is no centralized or coordinated plan for Alaska. A partial list of priorities for the Gulf of Alaska exists as a result of the 2011 Tohoku tsunami but there are no priorities set for the remainder of the state.

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