

Kodiak Archipelago Marine Debris Survey

Introduction

Island Trails Network (ITN) partnered with the Marine Conservation Alliance Foundation (MCAF) from June 15-September 30, 2007 to conduct a survey of marine debris deposits in the Kodiak archipelago near Kodiak, Alaska.

Marine debris is defined by NOAA as any man-made object discarded, disposed of, or abandoned that enters the coastal or marine environment. It may enter directly from a ship, or indirectly when washed out to sea via rivers, streams and storm drains. For the purposes of this survey, we would add commercial fishing gear inadvertently lost at sea.

The results of the survey may be used for the purposes of designing, planning, and funding marine debris clean-ups in the Kodiak archipelago. Results from this survey may also be used to estimate mass and volume of debris deposits and subsequent work required in other marine debris projects outside Kodiak. The survey is a joint product of both organizations, and is available on the web at www.islandtrails.org/marinedebris.htm.

Background

Island Trails Network was established in 2006 to develop and maintain sustainable trail systems and promote responsible wilderness recreation throughout the Kodiak archipelago. As an island community with a rich maritime heritage, ITN broadly defines trails as any recreational route over land or sea. (www.islandtrails.org)

The Marine Conservation Alliance was established in 2001 by fishing associations, communities, Community Development Quota groups, harvesters, processors, and support sector businesses, to promote the sustainable use of North Pacific marine resources by present and future generations, based on sound science, prudent management, and a transparent, open public process. They seek practical solutions to resource use questions to both protect the marine environment and minimize impacts on the North Pacific fishing community. They also support research and public education about the fishery resources of the North Pacific. (www.marineconservationalliance.org)

Objectives:

The objectives of this survey were to:

1. Identify and prioritize 7 significant deposits within a 10-mile radius of a population center on Kodiak (includes 1 each for Kodiak city and

surrounding villages of Old Harbor, Akhiok, Port Lions, Ouzinkie, Karluk and Larsen Bay).

2. Identify and prioritize 7 significant deposits in areas deemed by ITN to have significant recreational value.
3. Identify all significant deposits (>1 ton) in Kodiak.
4. Identify the relative distribution of marine debris density in Kodiak, assigning each mile of coastline a value of 1-5 according to estimated density.

Voluntary Reporting Program:

Phase I of the survey was to establish a voluntary reporting program for marine debris deposits. This element of the survey consisted of a mass-mailing of 458 pieces to Kodiak seine and set net permit holders, as listed in the online database of the Alaska CFEC. Concurrently, 81 e-mail newsletters went out to Kodiak charter boat operators, pilots, lodges, and hunting guides (Attachment 2). Our toll-free marine debris “hotline” and online reporting form was advertised in the display advertisement in the Kodiak Daily Mirror weekly for 10 consecutive weeks, and local public radio station KMXT (once per day for 70 days).

Feedback from this part of the survey was disappointing. Although there were a few inquiries asking if we were hiring vessels, only seven phone calls, emails or conversations resulted in identifying an affected coastal area. The low levels of feedback from the voluntary reporting program suggest that marine debris is either low or no priority among the target audience, that the problem is perceived to be too pervasive to mitigate, or that we failed in our outreach effort.

Admittedly, the timing of the mailing was not ideal. The mailings were postmarked June 25, 2007, several weeks after the salmon fishing season was under way. Had the survey begun in the winter or spring, the mailing may have elicited more responses. The reporting guidelines were intended to be easy to understand, however they may still have been overly precise and/or confusing.

The locations and sources of voluntary reports we did receive are featured in the visual model of the survey.

Aerial Survey:

Phase II of the survey included collecting and analyzing aerial photographs of coastal areas to determine the extent of marine debris there. The area to be surveyed originally included the principal islands of Kodiak, Afognak, Shuyak and the Trinity Islands. There are 16 major islands in the archipelago, with a combined area of 4,500 square miles. Kodiak Island, the largest of the

archipelago, has an estimated 900 miles of coastline with 1,400 miles of coastline in the archipelago.

Since flight hours did not permit adequate coverage of the full area, Kodiak and Afognak Islands received higher priority than Shuyak and the Trinity Islands. Accordingly, the latter areas were not surveyed in 2007. Kodiak and Afognak received only partial surveys. In all, 1639 data points covering 629.5 miles of coastline were collected. This comprises about 45% of the archipelago.

Marine Debris – A Visual Model

Objective 4 of the survey was to provide a visual model of the Kodiak archipelago, assigning values of relative marine debris density to different areas of the coast. This model is online at www.islandtrails.org/marinedebris.htm and is viewable through Google Earth.

Within the model, the user can manipulate the data in a number of ways, including sorting by score, by source, or by geographic region. Several overlays are also provided, including area villages with a 10 NM radius, the Kodiak road system, public lands and relevant easements.

Perhaps most importantly, each of the raw data points is available for viewing by simply clicking on the red balloon pointing to the site. These photos have been re-sized for ease of downloading, but exist in high resolution in ITN's files and are available upon request.

The following explains how the visual model achieves the objectives of the survey, describes the scoring system, and explains how the photos were interpreted.

Marine Debris in areas near population centers

Objective 1 of the survey intended to identify significant deposits within a 10-mile radius of a population center on Kodiak, including one each for Kodiak city and surrounding villages of Old Harbor, Akhiok, Port Lions, Ouzinkie, Karluk and Larsen Bay. Some villages were only partially surveyed, and two (Larsen Bay and Karluk) not at all. These are listed in Attachment 1.

The seven villages are shown in the model, with a radius of 10 NM drawn around each. These areas were deemed close enough to the village to launch a volunteer-powered clean up effort drawing a volunteer base from the local population. These proposed clean-up sites may be shifted or re-prioritized once the entire coastline has been surveyed.

Marine Debris in areas of significant recreational value

Objective 2 of the survey attempts to identify and prioritize 7 significant marine debris deposits in areas of significant recreational value. Although we did not survey the entire archipelago because of logistical and weather delays, we did select 7 sites based on the areas we did survey. These are listed in Attachment 1.

The recreational value of a coastal area is subjective, especially when compared to another area. All lands in the archipelago have some recreational value through hunting, fishing, wildlife viewing, hiking, boating or camping. The areas most heavily used for recreation are commonly those most accessible.

The Kodiak road system, available as a separate overlay in this model, is the most obvious access point for recreational sites. Areas accessible by foot or vehicle tend to see more human recreation than sites requiring vessel or aircraft transportation. Thus, marine debris sites on the road system were given some priority over those off the road system. One notable exception is Long Island, which is only minutes from town by skiff and frequently used for various types of recreation.

Beyond the road system, coastal areas are deemed to have significant recreational value if they are (1) owned by government entities and accessible to the public or (2) are privately owned but have guaranteed access by easement. Such public lands include State Parks and Recreation Sites, National Wildlife Refuges, Borough Recreation Sites, or simply state-owned or BLM lands (KIB Comprehensive Plan, 2007).

Private and native-owned lands throughout the archipelago also have recreational value, although land use fees sometimes discourage use. Still, private lands often have trail or campsite easements to allow public access. Listed on the survey are 45 one-acre campsites guaranteed access by public easement. Though more easements exist throughout the borough, those listed in this survey are situated in coastal areas and prone to be impacted by marine debris.

Glossary of Terms:

Site: For the purposes of this survey, an individual data point. Site area includes all coastline contained within the photo, and may vary depending on altitude from which the photo was taken.

Adhesion: The characteristics of the coastline that make it likely that marine debris will remain in once place after coming into contact with the shoreline. These characteristics include terrain slope, curvature of the coastline, vegetation, and soil/rock composition and texture.

High Energy Beach: A prevailing atmosphere of high wave height, strong current velocity, and frequent onshore/offshore winds associated with points, capes and other exposed coastlines.

Low Energy Beach: A prevailing atmosphere of low to moderate wave height, weak current velocity, and frequent alongshore winds associated with fjords, bays, and other sheltered coastlines.

Scoring:

1: Very light density:

Areas with a score of "1" were primarily steep capes and cliffs affording little to no adhesion at any stage of tide. Any debris that would come into contact with this shore would be washed back out to sea in the next high tide or offshore wind. These points are usually located in high energy areas, usually exposed to high seas and strong currents which would in theory carry a lot of marine debris. However these same energy forces carve a coastline that is unable to harbor marine debris, and it is transported to lower-energy areas.

2. Light density:

Areas scored "2" were presumably either low-energy sites sheltered from waves, wind and tide, possessed topographical characteristics that made adhesion unlikely, or both. Given that an up-close examination usually reveals more debris than is apparent from an aerial view, some coastlines where little to no driftwood was visible were still assumed to harbor marine debris not visible from 500 feet. Therefore, terrain could in theory support an accumulation of marine debris through adhesion would receive at least a "2".

3. Moderate density:

A data point received a "3" if it included a visible and substantial accumulation of marine debris, either spread out intermittently along a beach or in dense clusters. These areas may have significant length and width along a coastline, but rarely possess vertical depth. These areas were usually subjected to moderately high energy levels or possessed terrain features that would allow debris to have a high rate of adhesion, but usually not both.

4. High density:

Photographs scored with a "4" feature continuous, uninterrupted deposits of marine debris, flotsam, and/or driftwood. These deposits often feature significant length, width, and depth. Sometimes these deposits occurred well above the high tide line, even butting up against a forested area by a storm surge. Areas

receiving a “4” were usually subjected to high energy levels and possessed terrain features allowing for a high adhesion rate.

5 Very high density

These areas consist of large scale, uninterrupted deposits of marine debris, flotsam and/or driftwood. These deposits invariably feature significant length, width and depth. These areas were exposed to high energy levels, possessed terrain features allowing for adhesion and accumulation, and possible other factors such as favorable currents or frequent onshore winds.

Notes on scoring:

There is no correlation of a score of 3 to an “average” or typical beach. Although the overall study attempts to establish patterns in relative distribution of debris, individual data points were scored empirically based on evidence in the photo and not based on trends in other data points in the area.

Scores are awarded to the photograph only, not to any coastline not photographed. Efforts were usually made to photograph deposits of marine debris and sometimes the absence of deposits. Thus the photos are not a representative sample of the coastline, but favor the higher density accumulations of debris and areas “worst affected”. However, some cliffs and capes where little or no debris exists were photographed to show that the area has been surveyed and no gap in the survey exists there.

Because of these inconsistencies of the elevation, elapsed time, and purpose in capturing individual data points, there is little use in averaging scores to achieve a median representative score for a larger area. With respect to Objective 3 of the study, all data points receiving a score of “5” are considered to be “significant” and may hold one or more tons of marine debris.

Driftwood and Marine Debris:

This survey assumes that some link exists between the presence of driftwood and the presence of marine debris. Undoubtedly some variations on this link exist. Debris able to be transported by wind above the intertidal zone will persist in areas where heavier driftwood, unable to be transported by wind, does not. Consequently, although the absence of driftwood does not indicate an absence of marine debris, the presence of driftwood usually means that marine debris is also present. This impacts scoring descriptions above.

Other environmental factors may affect plastics more than driftwood, such as the effect of wind on the debris while it is at sea. Denser debris such as driftwood may be more affected by tidal influences than wind. Conversely for debris of

lower density such as Styrofoam or plastics, wind may be more influential than tide.

Many estimates in the survey were made based on the presence or absence of driftwood. Most driftwood logs have been stripped by force of the ocean of any bark or branches and are relatively smooth on their surface.

Not all driftwood crosses the ocean. Some is flushed out of rivers and deposited in the adjacent delta, some timbers fall over an eroding cliff, and some are the by-product of commercial logging. As a general rule, only driftwood without branches or bark, having a smooth appearance, and often possessing a bleached color was considered to have been deposited by ocean forces. Particular care was taken near river deltas, eroding shorelines and logging areas to distinguish between the two types of driftwood and only consider long-traveled logs in scoring.

However, a higher instance of this more recent driftwood, with bark and branches intact become tangled with fishing web. Anything that by its shape is able to snag webbing has usually done so, suggesting that webbing has likely come in contact with other objects things before its entangling marriage with a tree.

Summary & Recommendations:

Marine Debris is a widespread phenomenon that has impacted shores on all sides of Kodiak Island. In Kodiak's case, more troubling than any one deposit of debris is how widely the phenomenon is spread. The findings of this survey are sufficient to identify several areas of particular concern along the east side of Kodiak and Afognak Islands. The true distribution patterns will not be known until the west side of Kodiak and Afognak as well as the Trinity Islands and Shuyak are surveyed.

When additional marine debris resources for Kodiak become available, the following recommendations should be considered:

- Continue to survey the 55% of the coastline that has not had aerial surveillance.
- Collect samples of marine debris at sites ranging from 1-5, recording weight and volume of marine debris per given distance along the shore. Such sampling could be paired with a survey of relative distribution to estimate total mass and volume of marine debris and for planning site specific clean-up operations.
- Continue a scaled-back public outreach campaign, but using different methods and/or timing.

Contact

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Rank	Village Sites	Description	Latitude	Longitude	Score	Landowner	Comment
1	Kodiak	Monk's Lagoon	N57-53.651	W152-20.527	4	Ouzinkie Native Corp.	Near burial site of St. Herman
2	Ouzinkie	Vicinity of North Cape	N57-53.651	W152-20.527	4	Ouzinkie Native Corp.	
3	Port Lions	Dry Spruce Island	N57-57.767	W153-03.318	5	Private Non-native	
4	Old Harbor	Vicinity of Ocean Bay	N57-04.055	W153-12.815	5	Old Harbor Native Corp	Over 10 NM from village site - area partially surveyed
5	Akhiok	Vicinity Cape Alitak			UNK	Kodiak NWR	Unverified voluntary report more promising than surveyed area
6	Larsen Bay						Data unavailable
7	Karluk						Data unavailable
Rank	Rec Sites	Description	Latitude	Longitude	Score	Landowner	Comment
1	Road System	Cape Chiniak	N57-36.730	W152-09.610	4	Lesnoi Native Corp.	
2	Road System	Sacramento River Trail	N57-31.191	W152-17.301	5	State	
3	Road System	Long Island			4	Lesnoi Native Corp.	Not formally surveyed. Scored 4 based on numerous recent visits
4	Road System	Vicinity of Cliff Point	N57-42.473	W152-28.226	4	USCG/Lesnoi	
5	Off Road System	Marmot Island	N58-13.345	W151-47.754	5	State	
6	Off Road System	Raspberry Island	N58-05.927	W153-07.867	5	Borough	
7	Off Road System	Shuyak - Dead Bird Bay	N58-34.566	W152-09.610	UNK	State	