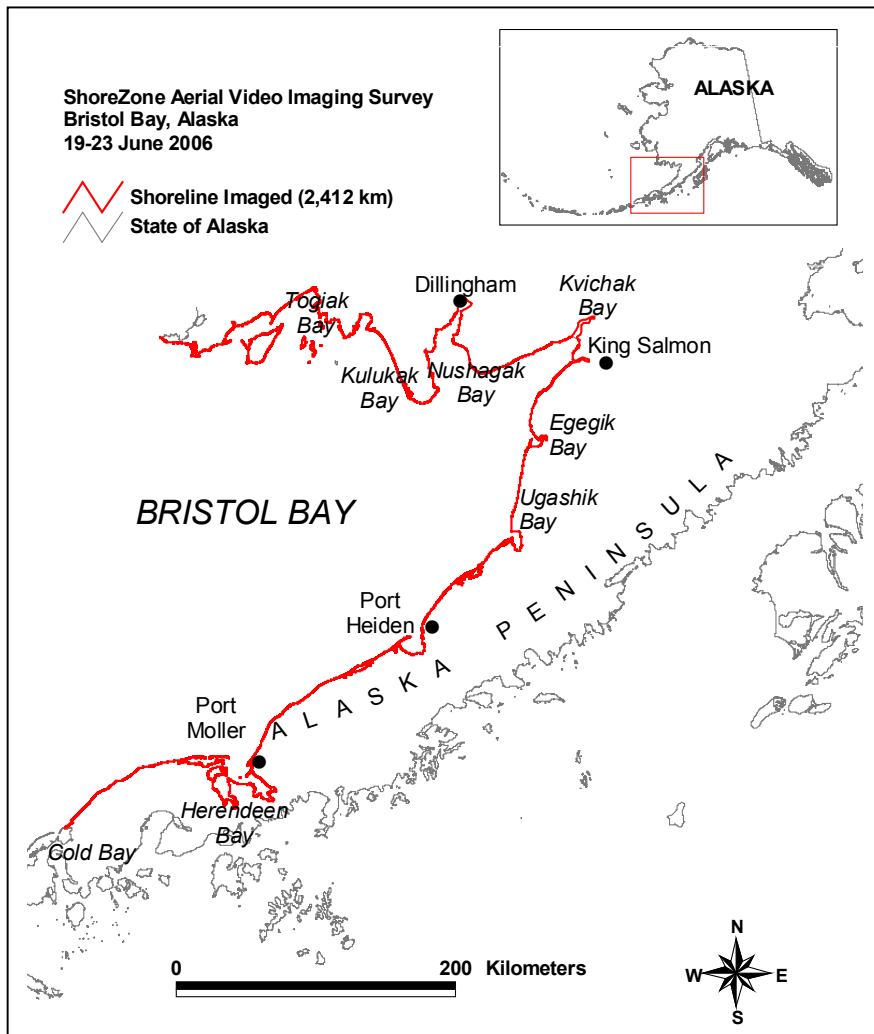


FLIGHT REPORT

ShoreZone Aerial Video Imaging (AVI) Survey

Bristol Bay, Alaska, 19-23 June 2006



Prepared for
The Nature Conservancy
Juneau, Alaska
by



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ShoreZone is a coastal habitat mapping and classification system in which georeferenced aerial imagery is collected specifically for the interpretation and integration of geological and biological features of the intertidal zone and nearshore environment. Oblique low-altitude aerial video and digital still imagery of the coastal zone is collected during summer low tides (zero tide level or lower), usually from a helicopter flying at <100 m altitude. The flight trackline is recorded at 1-second intervals using Fugawi electronic navigation software and is continuously monitored in-flight to ensure all shorelines have been imaged. Video and still imagery is georeferenced and time-synchronized. Video imagery is accompanied by continuous, simultaneous commentary by a geologist and a biologist aboard the aircraft. The imagery and commentary are later used in the definition of discrete along-shore coastal habitat units and the “mapping” of observed physical, geomorphic, sedimentary, and biological features in those units. Units are digitized as shoreline segments in ArcView or ArcGIS, then integrated with the along-shore and across-shore geological and biological data housed in a Microsoft Access database. Mapped habitat features include degree of wave exposure, substrate type, sediment texture, intertidal flora and fauna (abundance and community composition), subtidal algae, and some subtidal fauna.

The purpose of this flight report is to summarize the field activities of the ShoreZone aerial video imaging (AVI) survey conducted in **Bristol Bay, Alaska** during the low-tide window **19-23 June 2006**. The survey was conducted by **Coastal & Ocean Resources Inc.** (CORI, Sidney, British Columbia) under contract to The Nature Conservancy (TNC, Juneau, Alaska). A coastal ecologist from Archipelago Marine Research Ltd. (AMR, Victoria, British Columbia) was sub-contracted by CORI to provide biological expertise. **Table 1** provides a summary of crew affiliations and responsibilities. The survey was based in two principal field stations: King Salmon (in the northeast corner of Bristol Bay) and Cold Bay (near the southern end of the Alaska Peninsula). These locations were selected on the basis of availability of accommodations and fuel. The aircraft used in this survey was a fixed-wing Cessna 206 float-plane chartered from Branch River Air (BRA) in King Salmon.

The length of shoreline imaged during the survey was **2,412 km** (from Point Moffet near the southern end of the Alaska Peninsula to Cape Newenham in the northwest corner of Bristol Bay). **Figure 1** summarizes the extent of aerial imagery collected by video tape number. Imagery was not collected at Round Island in Togiak Bay (~10 km of shoreline) because the island is a walrus preserve, and overflights are not permitted. Imagery was not collected south of Point Moffet because of poor flying visibility on both of the days that the crew was stationed in Cold Bay. The Izembeck Wilderness and Unimak Island lie outside (to the south) of the area imaged in this survey.

Particular attention was paid to the location and size of seabird colonies and walrus/seal haul-outs in the region, especially near the Togiak National Wildlife Refuge (TNWR) and the Walrus Islands State Game Sanctuary (WISGS). Branch River Air has permits to fly over these areas (except Round Island, which was avoided), and regulations were cleared pre-flight with representatives of both TNWR and WISGS.

The Bristol Bay AVI survey flight plan was constructed to take advantage of large-scale tidal delays in the bay, such that while flying northward (or westward), zero-tide windows continually opened up, enabling the continuous collection of data and imagery for 4-6 hours (400-600 km of shoreline) each day. This survey was also unique in that two geomorphologists shared the videography and navigation duties, switching seats and roles in-flight or during brief landings. This enabled the crew to capitalize on the long tide windows and compress the 2400-km survey into four days.

The tables and figures on the following pages summarize, by video tape number, the extent and location of the AVI data and imagery collected in Bristol Bay. Maps for each tape are annotated with representative geographic names, trackline times (in hh:mm:ss UTC), and photo numbers. UTC time is also imprinted on video imagery (provided on DVD with this report).

The final section of this report (beginning on page 39) contains daily updates with selected photos prepared while in the field. Because of the remote location and lack of internet access, these field updates were not able to be sent by the flight crew while in Bristol Bay and are thus included here.

Table 1. Southeast Alaska AVI Flight Personnel and Responsibilities (Team Bristol)

Crew Member	Individual / Affiliation	Responsibilities
<i>Geomorphologist</i>	Jodi Harney Neil Borecky CORI, Sidney BC	survey coordination, videography, geologic commentary, in-flight navigation, post-flight data processing, project reporting
<i>Coastal Ecologist</i>	Heather Anderson AMR, Victoria BC	biologic commentary, digital photography
<i>Pilot</i>	Marco Alletto BRA, King Salmon AK	

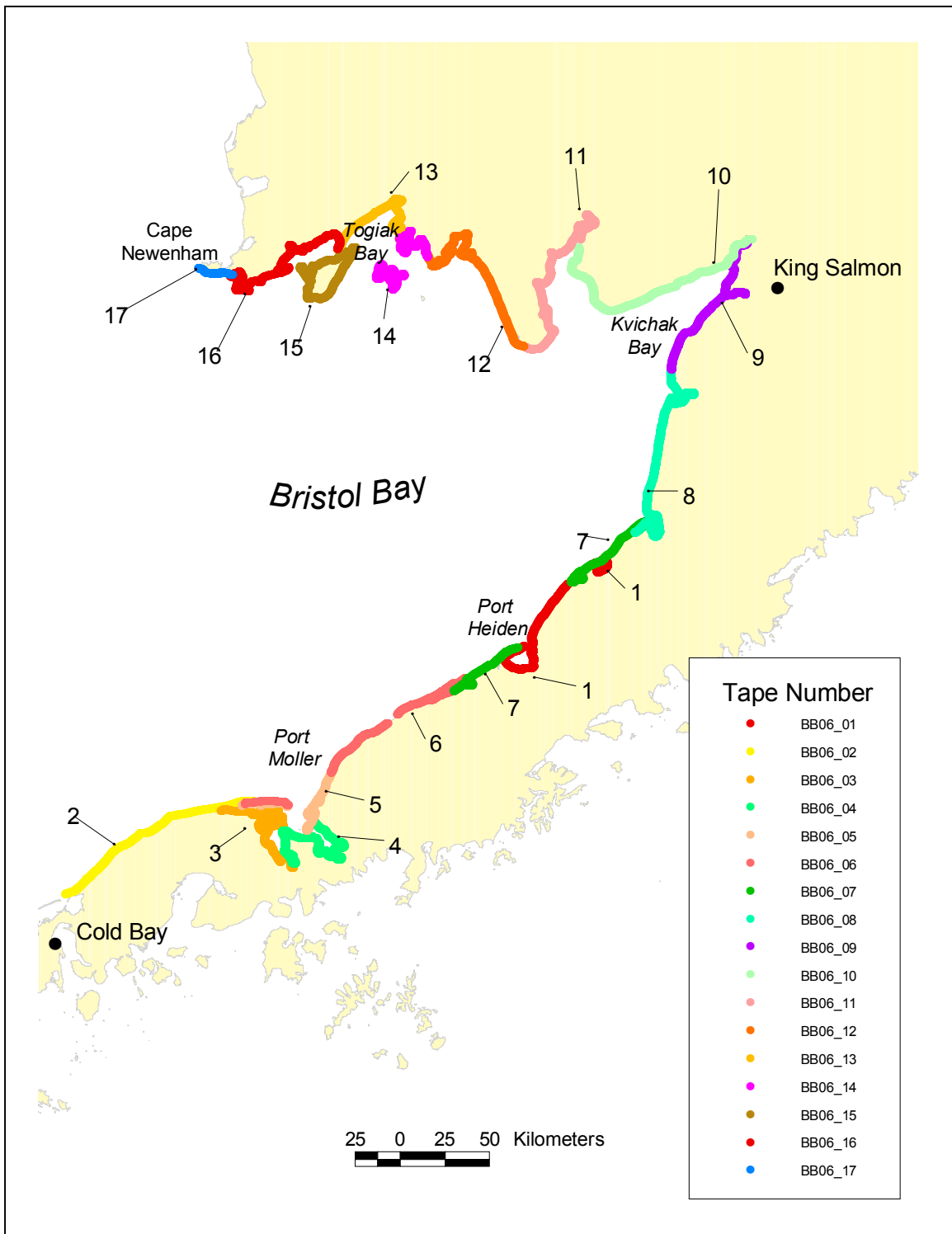


Figure 1. Summary of Bristol Bay AVI coverage (2,412 km shoreline), by tape number

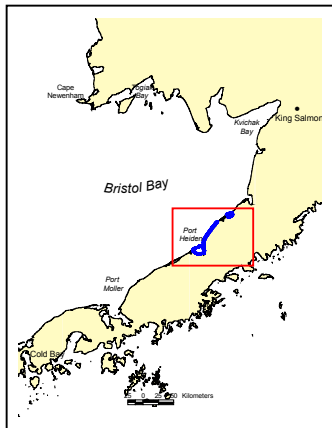
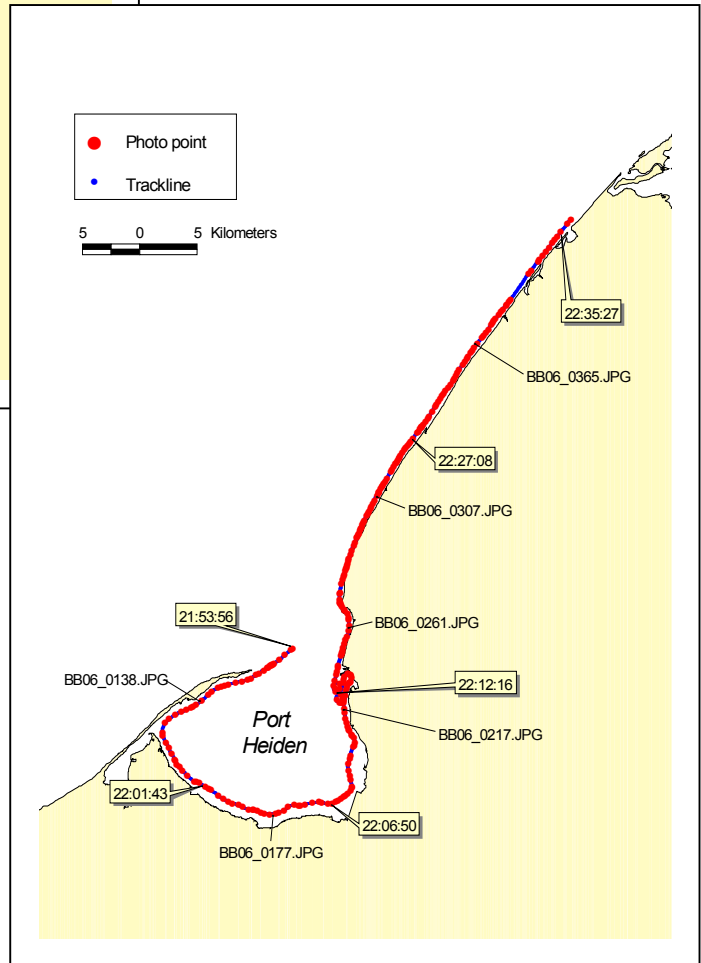
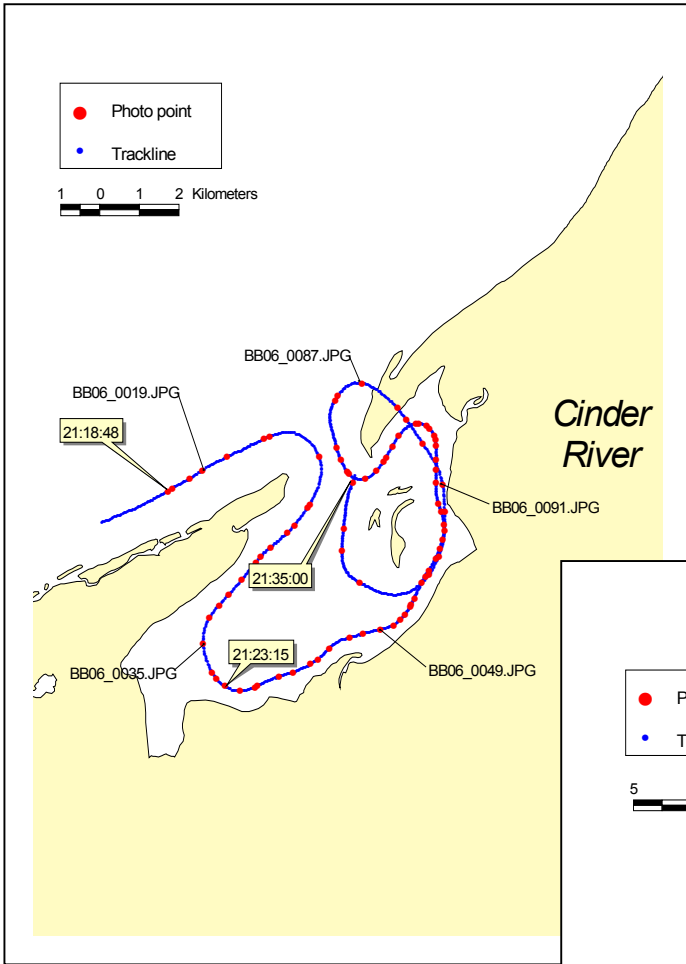


Figure 2. Location of Tape BB06_01, 19 June 2006

2006 Bristol Bay Aerial Video Imaging Survey Tape Log

Tape: BB06_01 **Date:** 19 June 06

General Location: Cinder River, Port Heiden

Time Start (UTC):	21:18:00	Geo:	Borecky
Filming Break:	21:35:05 to 21:53:56	Bio:	Anderson
Time End (UTC):	22:35:58	Nav:	Harney
Tape Length:	59:15	Pilot:	Alletto

Weather: Generally sunny; variable ceiling southward

Time (UTC)	Location	Photo
21:18:48	Start, Cinder River	BB06_0016
21:23:15	Head of Cinder River turning point	BB06_0038
21:24:53	Mud Creek	BB06_0047
21:35:00	Finish Cinder River	BB06_0099
21:35:05 to 21:53:56	Transit to Port Heiden	
21:53:56	Start Port Heiden	BB06_0114
22:06:50	Meshik River	BB06_0189
22:12:16	Port Heiden town	BB06_0222
22:35:27	Hook Lagoon area	BB06_0391

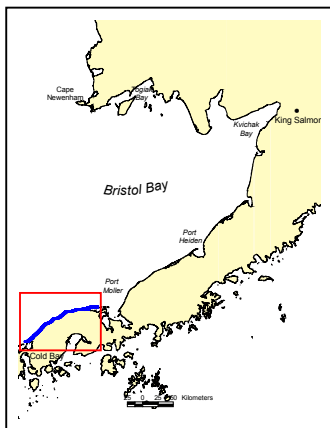
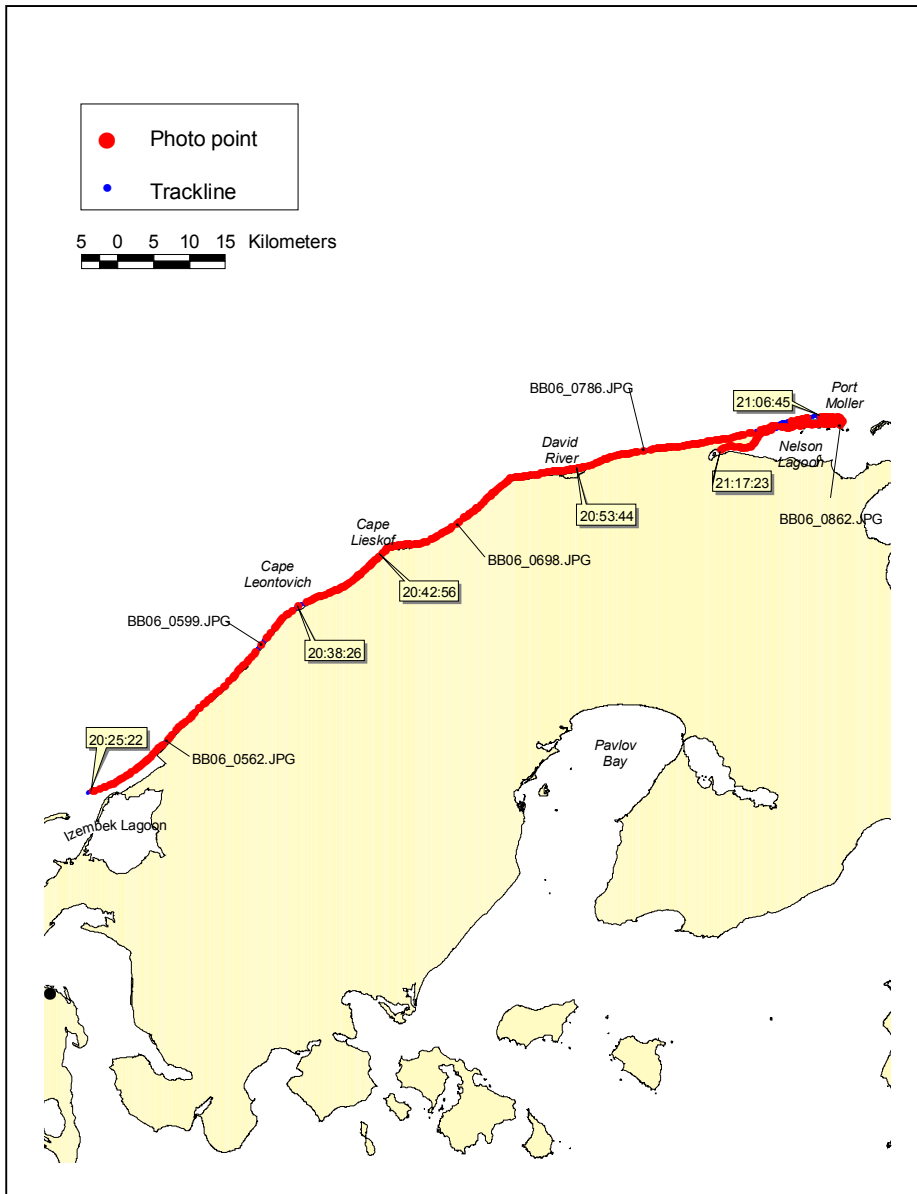


Figure 3. Location of Tape BB06_02, 20 June 2006

2006 Bristol Bay Aerial Video Imaging Survey Tape Log

Tape: BB06_02 **Date:** 20 June 06

General Location: Moffet Point to Nelson Lagoon

Time Start (UTC): 20:25:08

Time End (UTC): 21:17:25

Tape Length: 52:18

Geo: Borecky

Bio: Anderson

Nav: Harney

Pilot: Alletto

Weather: Overcast, intermittent clouds, rain, and fog; variable ceiling; poor visibility (marginal flying conditions)

Time (UTC)	Location	Photo
20:25:22	Moffet Point	BB06_0531
20:38:26	Cape Leontovich	BB06_0613
20:42:56	Cape Lieskof	BB06_0660
20:53:44	David River	BB06_0755
21:06:45	Lagoon Point	BB06_0847
21:17:23	Nelson Lagoon	BB06_0949

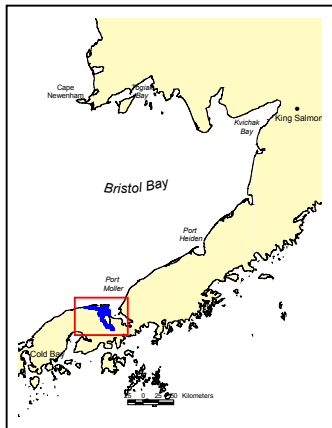
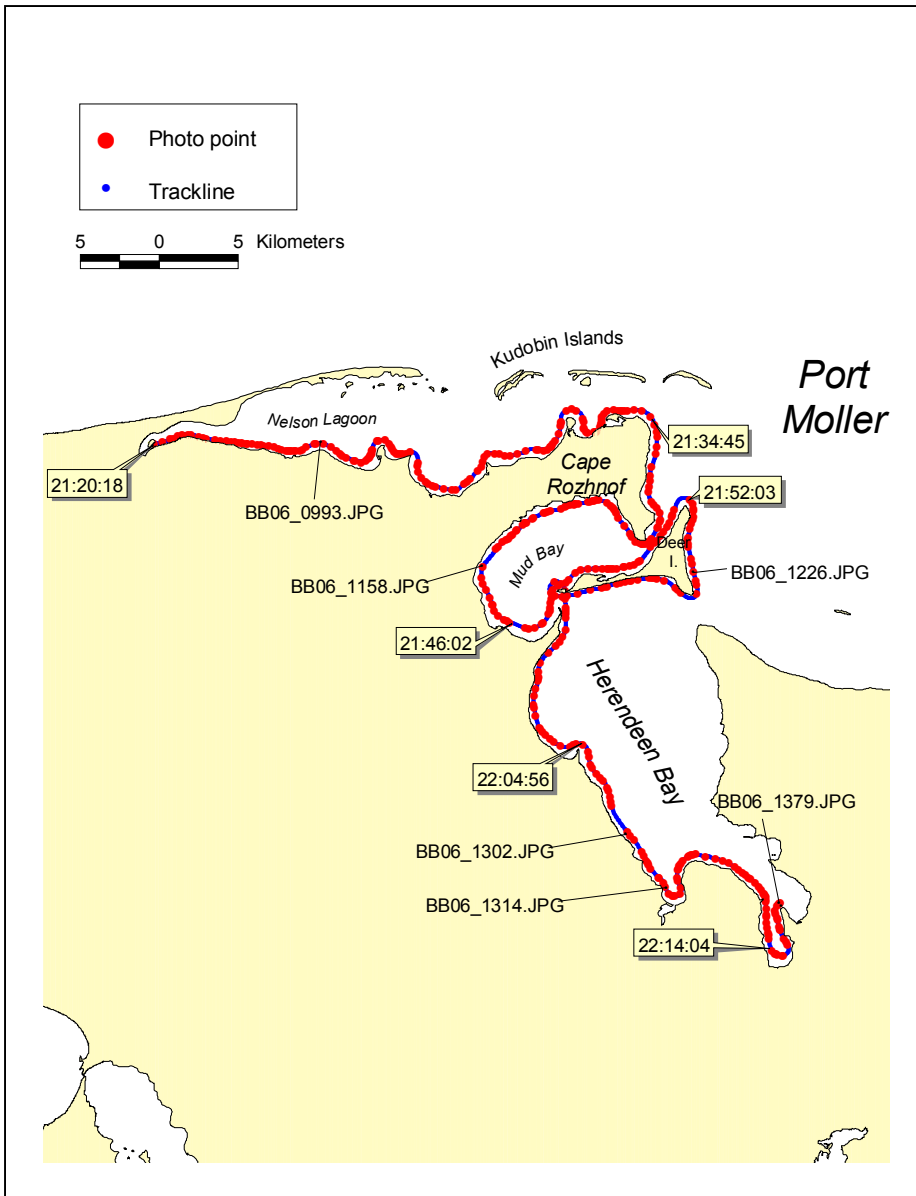


Figure 4. Location of Tape BB06_03, 20 June 2006

2006 Bristol Bay Aerial Video Imaging Survey Tape Log

Tape: BB06_03 **Date:** 20 June 06

General Location: Western Port Moller: Nelson Lagoon, Cape Rozhnof, Deer Island, Herendeen Bay

Time Start (UTC): 21:20:12
Time End (UTC): 22:16:21
Tape Length: 56:06

Geo: Borecky
Bio: Anderson
Nav: Harney
Pilot: Alletto

Weather: Overcast, intermittent clouds, rain, and fog; variable ceiling; poor visibility (marginal flying conditions)

Time (UTC)	Location	Photo
21:21:18	Nelson Lagoon	BB06_0953
21:34:45	Cape Rozhnof	BB06_1088
21:46:02	Head of Mud Bay	BB06_1169
21:52:03	NE point of Deer Island	BB06_1212
22:04:56	Village spit, Herendeen Bay	BB06_1289
22:14:04	Head of Herendeen Bay, near old cannery	BB06_1360

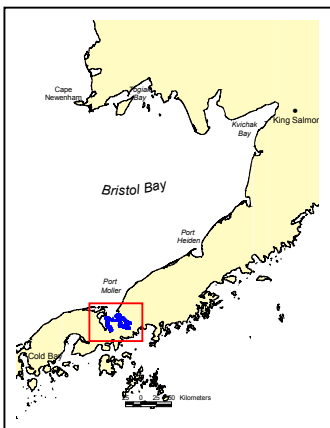
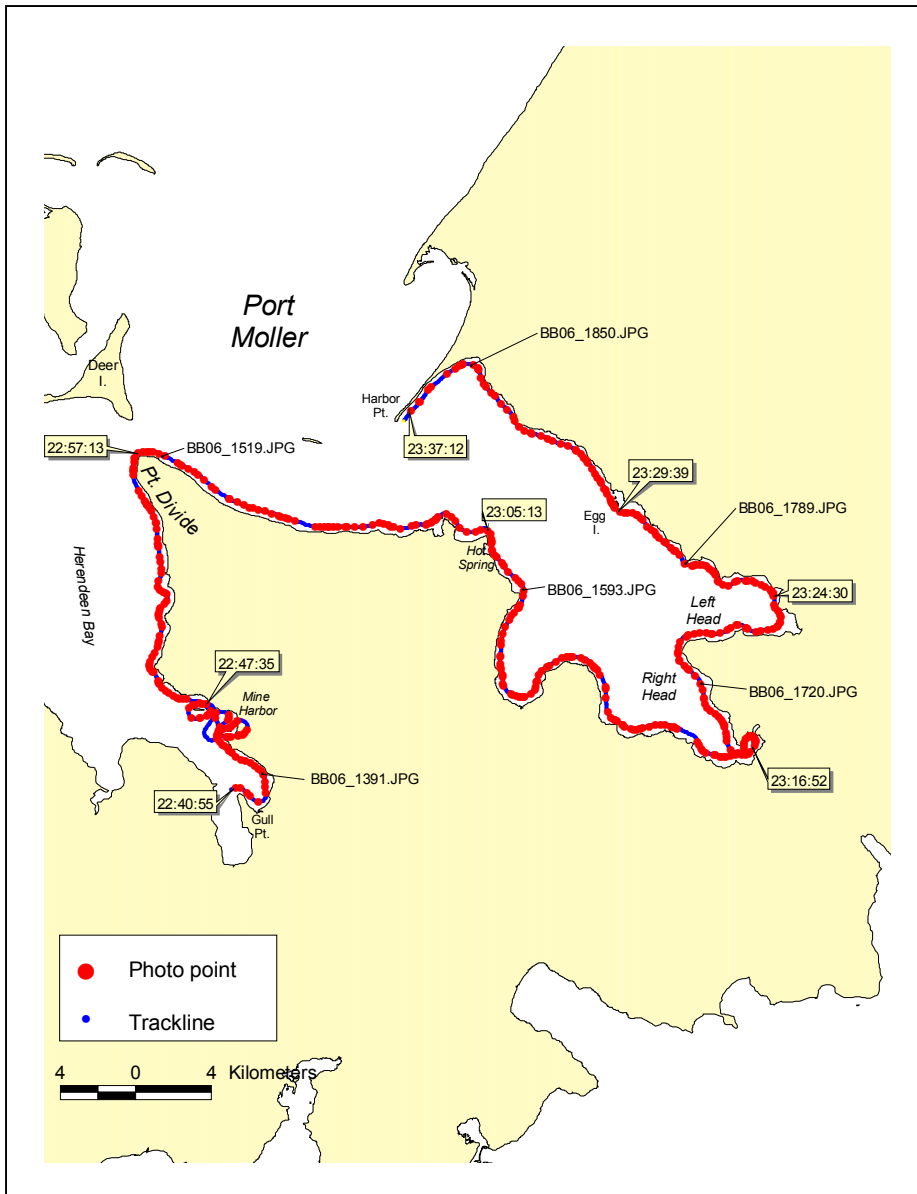


Figure 5. Location of Tape BB06_04, 20 June 2006

2006 Bristol Bay Aerial Video Imaging Survey Tape Log

Tape: BB06_04 **Date:** 20 June 06

General Location: Port Moller

Time Start (UTC): 22:40:48

Time End (UTC): 23:37:29

Tape Length: 56:41

Geo: Harney

Bio: Anderson

Nav: Borecky

Pilot: Alletto

Weather: Overcast, intermittent clouds, rain, and fog; variable ceiling; poor visibility (marginal flying conditions)

Time (UTC)	Location	Photo
22:40:55	Gull Pt.	BB06_1383
22:47:35	Mine Harbor	BB06_1437
22:57:13	Pt. Divide	BB06_1513
23:05:13	Hot Spring	BB06_1578
23:16:52	Right Head	BB06_1687
23:24:30	Left Head	BB06_1760
23:29:39	Egg Island	BB06_1808
23:37:12	Harbor Pt.	BB06_1860

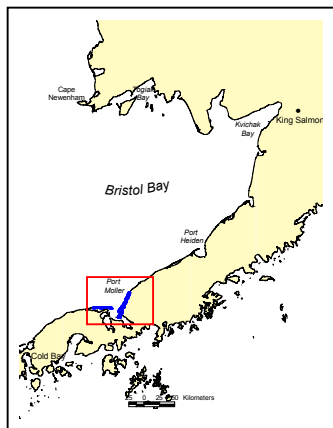
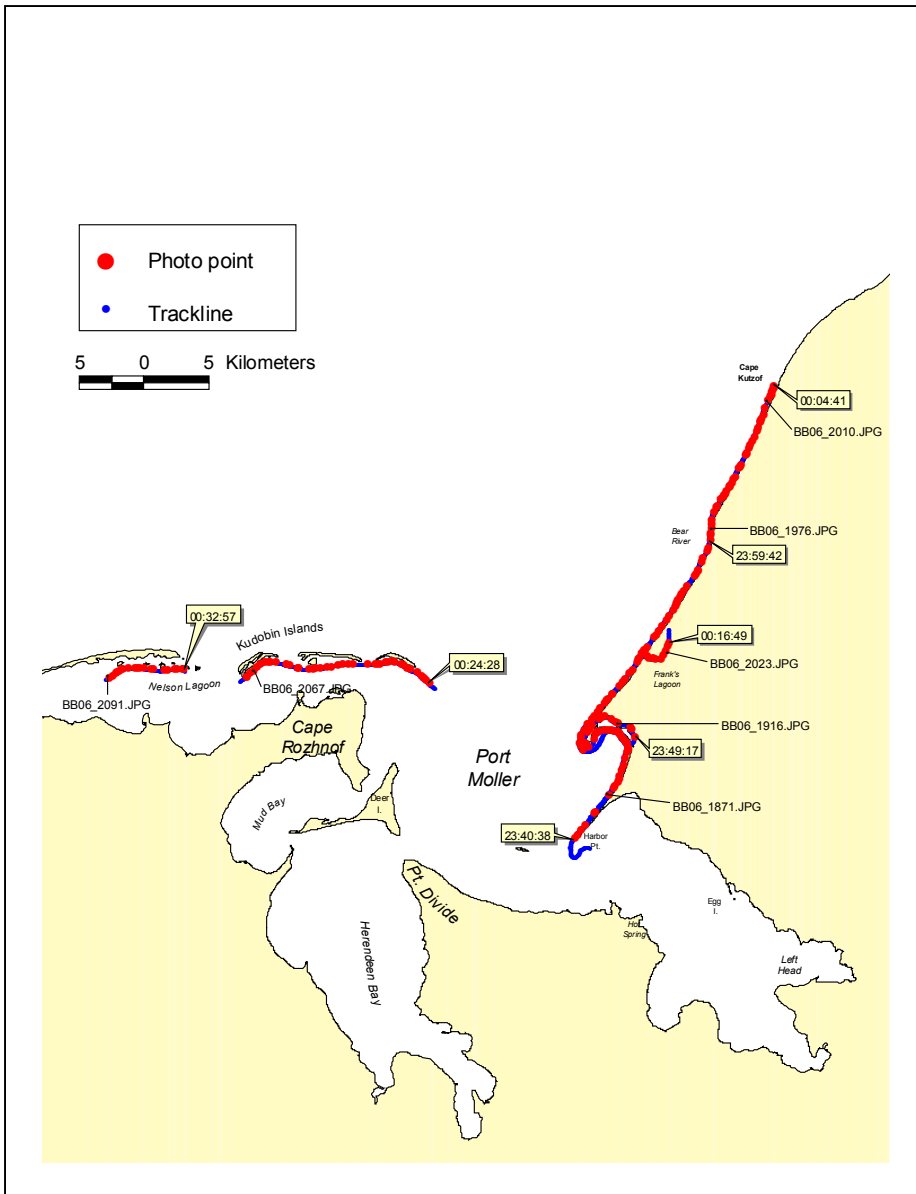


Figure 6. Location of Tape BB06_05, 20 June 2006

2006 Bristol Bay Aerial Video Imaging Survey Tape Log

Tape: BB06_05 **Date:** 20 June 06

General Location: Port Moller, Harbor Point to Cape Kutuzof, Kudobin Islands, Nelson Lagoon

Time Start (UTC): 23:39:13		Geo: Harney	
Transit to Frank Lagoon	00:04:44 to 00:16:20	Bio: Anderson	
Transit to Kudobin Islands	00:18:00 to 00:24:14	Nav: Borecky	
Transit to inner Nelson Lagoon	00:30:26 to 00:32:51	Pilot: Alletto	
Time End (UTC):	00:35:21		
Tape Length:	56:07		

Weather: Overcast, intermittent clouds, rain, and fog; variable ceiling; poor visibility (marginal flying conditions)

Time (UTC)	Location	Photo
23:40:38	Harbor Point, Port Moller	BB06_1865
23:49:17	Town of Port Moller	BB06_1919
23:59:42	Bear River	BB06_1973
00:04:41	Cape Kutuzof	BB06_2016
00:04:44 to 00:16:20	Transit to Frank Lagoon	
00:16:49	Frank's Lagoon	BB06_2021
00:18:00 to 00:24:14	Transit to Kudobin Islands	
00:24:28	Kudobin Islands	BB06_2030
00:30:26 to 00:32:51	Transit to inner Nelson Lagoon	
00:32:57	Nelson Lagoon	BB06_2072

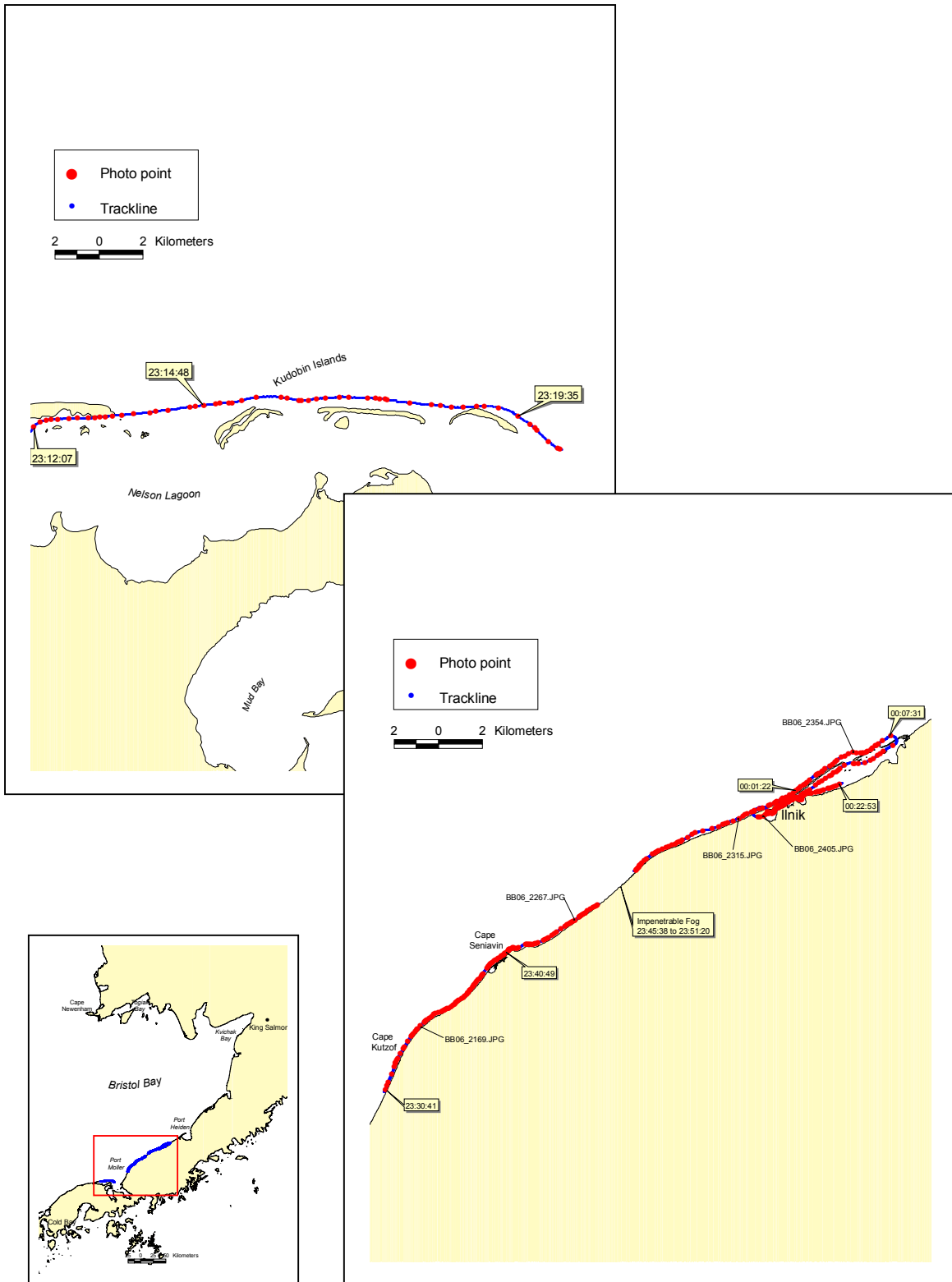


Figure 7. Location of Tape BB06_06, 21 June 2006

2006 Bristol Bay Aerial Video Imaging Survey Tape Log

Tape: BB06_06 **Date:** 21 June 06

General Location: Cape Kutuzof to Ilnik, Kudobin Islands

Time Start (UTC): 23:12:40	Geo: Borecky
Transit Kudobin Isls to Cape Kutuzof	Bio: Anderson
Fog break	Nav: Harney
Time End (UTC): 00:23:06	Pilot: Alletto
Tape Length: 54:43	

Weather: Overcast, intermittent clouds, rain, and fog; variable ceiling; heavy fog on portion of Ugashik coast (4 km break)

Time (UTC)	Location	Photo
23:12:07	Nelson Lagoon, near Kudobin Islands	BB06_2095
23:19:35	Eastern Kudobin Islands	BB06_2143
23:20:28 to 23:30:29	Transit to Cape Kutuzof	
	Cape Kutuzof	BB06_2150
	Cape Seniavin	BB06_2226
23:45:38 to 23:51:20	Fog break	
00:01:22	Start of spit outside Ilnik	BB06_2333
00:07:31	NE entrance to Ilnik Lagoon	BB06_2367
00:22:53	Inside Ilnik Lagoon	BB06_2452

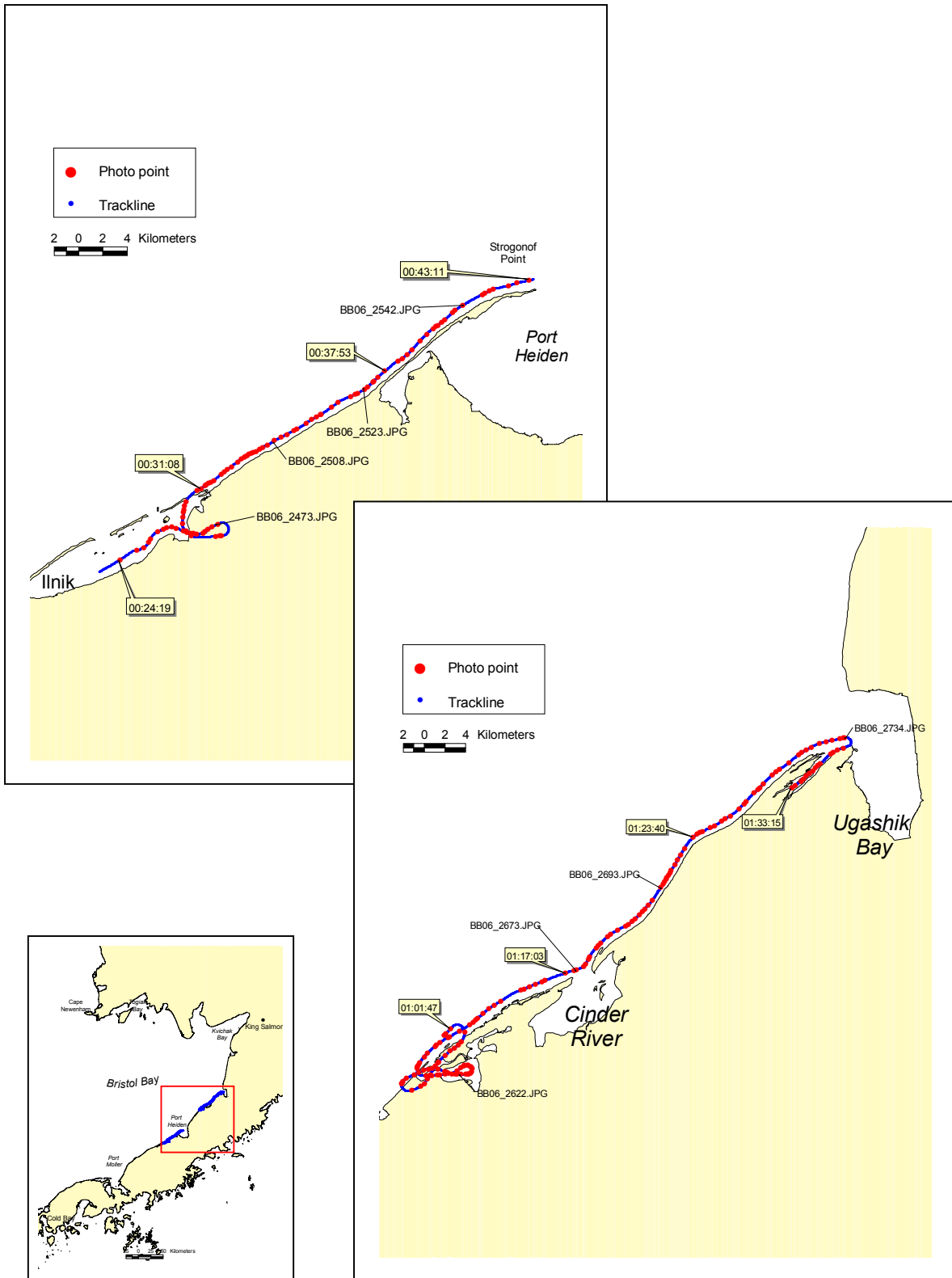


Figure 8. Location of Tape BB06_07, 21 June 2006

2006 Bristol Bay Aerial Video Imaging Survey Tape Log

Tape: BB06_07 **Date:** 21 June 06

General Location: Ilnik to Port Heiden, Cinder River, Ugashik Bay

Time Start (UTC): 00:23:29	Geo: Borecky/Harney
Transit between Port Heiden's Stroganof Point and Cinder River	Bio: Anderson
Time End (UTC): 01:33:18	Nav: Harney/Borecky
Tape Length: 51:43	Pilot: Alletto

Weather: Overcast with sunny periods; intermittent clouds and fog; variable ceiling

Time (UTC)	Location	Photo
00:24:19	Ilnik	BB06_2454
00:37:53	Start of Stroganof Spit (view of inner Port Heiden Lagoon)	BB06_2528
00:43:11	End of Stroganof Spit	BB06_2549
00:43:20 to 01:01:26	Transit between Port Heiden and Cinder River (switch geo/nav)	
01:01:47	Cinder River Lagoon Resume	BB06_2590
01:17:03	Mouth of Cinder River	BB06_2671
01:23:40	Halfway between Cinder and Ugashik Bay	BB06_2705
01:33:15	Ugashik Bay	BB06_2748

*Note portions of this trackline must be rebuilt in the transit

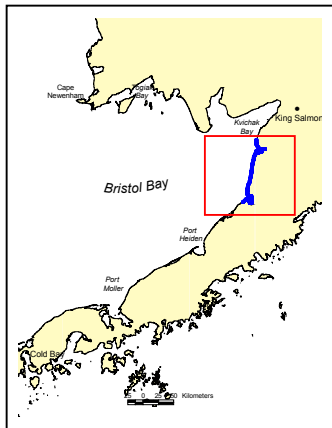
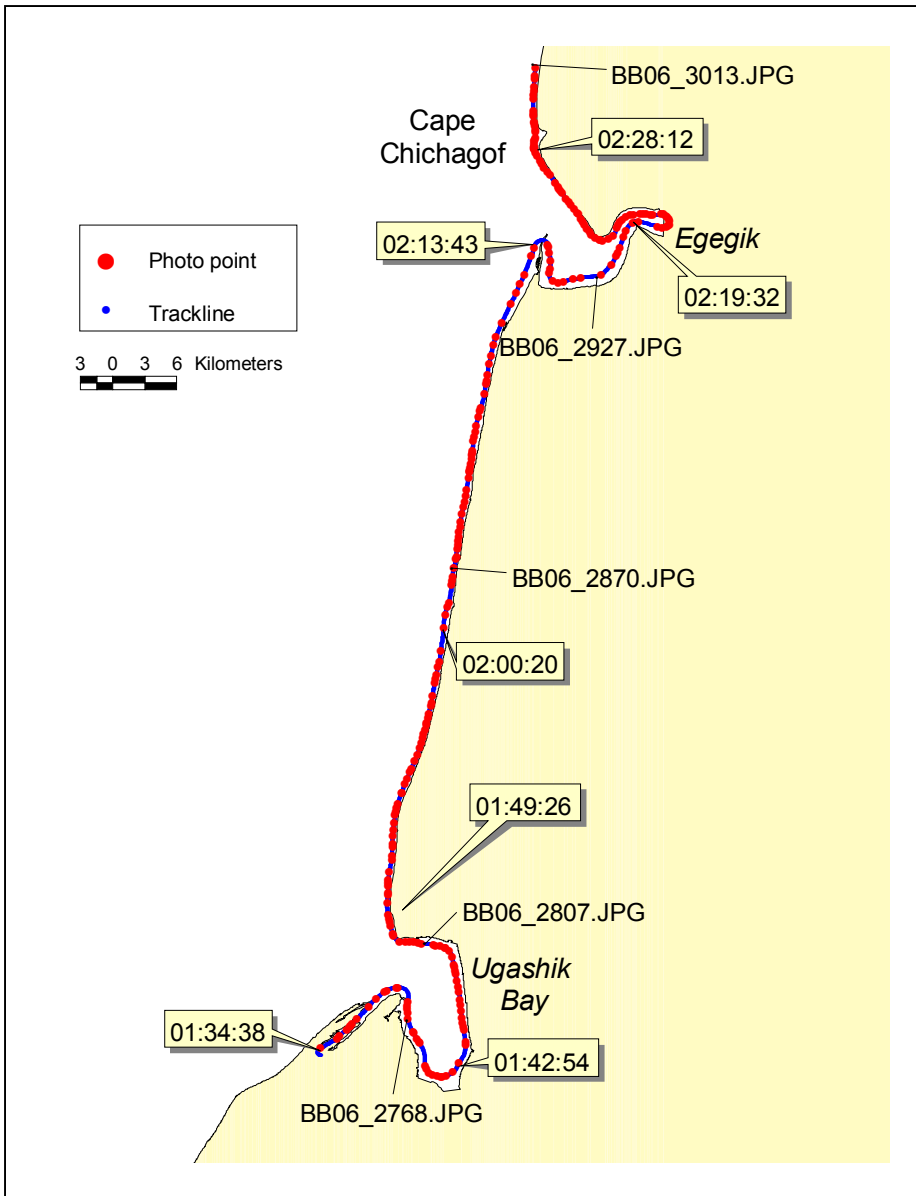


Figure 9. Location of Tape BB06_08, 21 June 2006

2006 Bristol Bay Aerial Video Imaging Survey Tape Log

Tape: BB06_08 **Date:** 21 June 06

General Location: Ugashik Bay to Egegik

Time Start (UTC): 01:34:12

Time End (UTC): 02:30:57

Tape Length: 56:46

Geo: Harney

Bio: Anderson

Nav: Borecky

Pilot: Alletto

Weather: Overcast with sunny periods; intermittent clouds and fog; variable ceiling

Time (UTC)	Location	Photo
01:34:38	Start, western lagoon of Ugashik Bay	BB06_2750
01:42:54	Mouth of Ugashik River	BB06_2783
01:49:26	Smokey Point, Ugashik Bay	BB06_2813
02:00:20	Halfway between Ugashik and Egegik	BB06_2863
02:13:43	Mouth of Egegik Bay	BB06_2915
02:19:32	Confluence of King Salmon and Egegik Rivers	BB06_2941
02:28:12	Cape Chichagof	BB06_2994

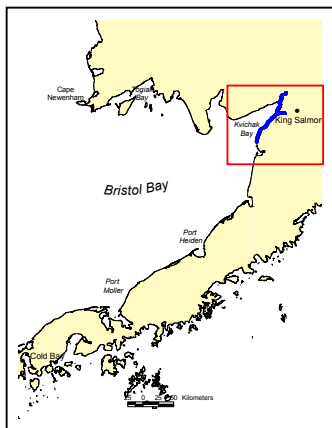
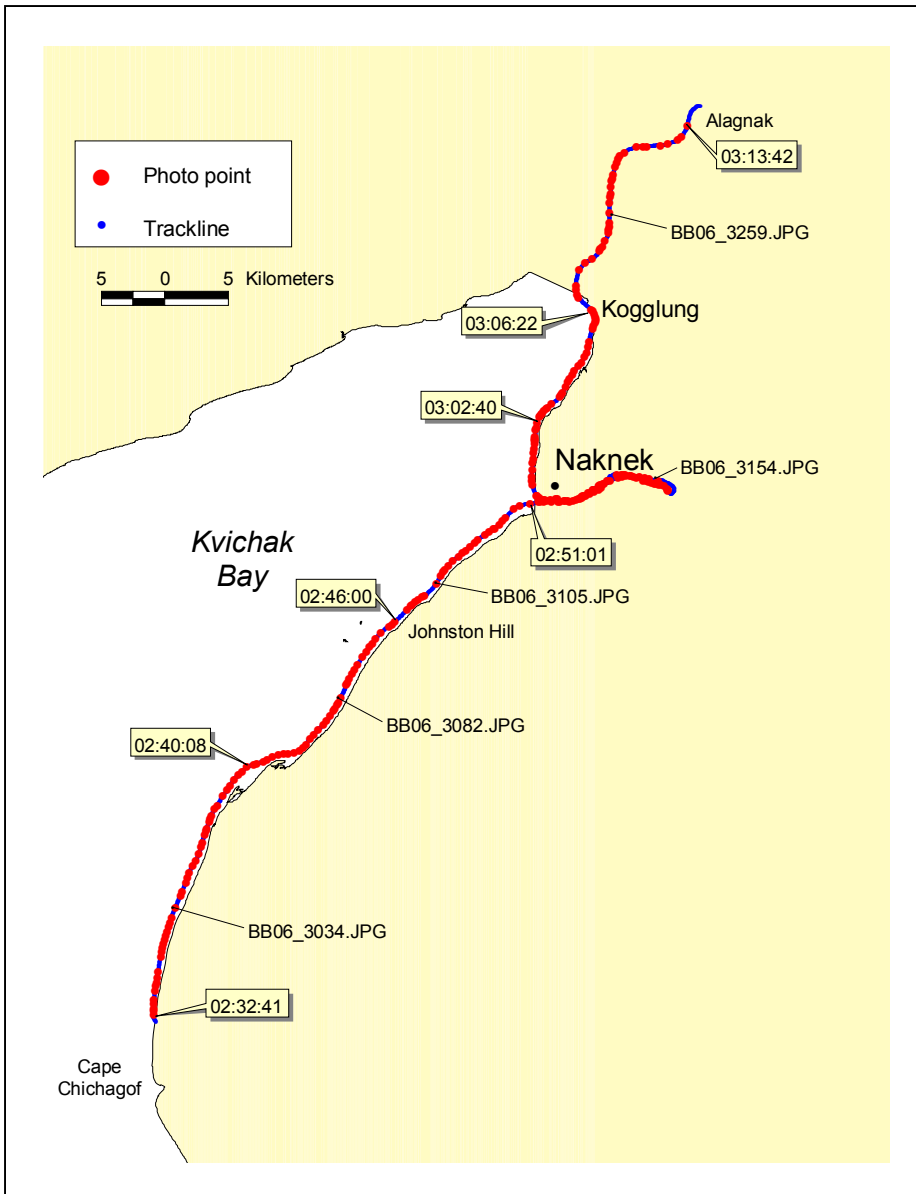


Figure 10. Location of Tape BB06_09, 21 June 2006

2006 Bristol Bay Aerial Video Imaging Survey Tape Log

Tape: BB06_09 **Date:** 21 June 06

General Location: Cape Chichagof to Kvichak River, including Naknek

Time Start (UTC): 02:32:28

Geo: Harney

Time End (UTC): 03:14:29

Bio: Anderson

Tape Length: 42:02

Nav: Borecky

Pilot: Alletto

Weather: Overcast, intermittent clouds, rain, and fog; variable ceiling

Time (UTC)	Location	Photo
02:32:41	North of Cape Chichagof (4 km)	BB06_3014
02:40:08	Start of wide mud flats in Kvichak Bay	BB06_3059
02:46:00	Johnston Hill area	BB06_3097
05:51:01	Mouth of Naknek River (south Naknek)	BB06_3126
03:02:40	Libbyville	BB06_3212
03:06:22	Graveyard Point, Koggiung	BB06_3243
03:13:42	Confluence of Kvichak and Alagnak Rivers	BB06_3279

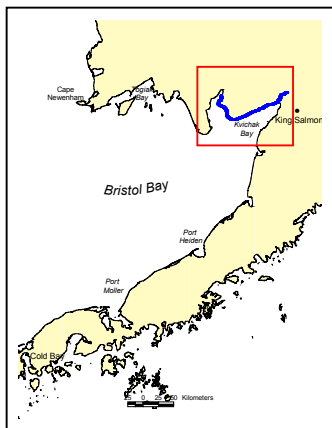
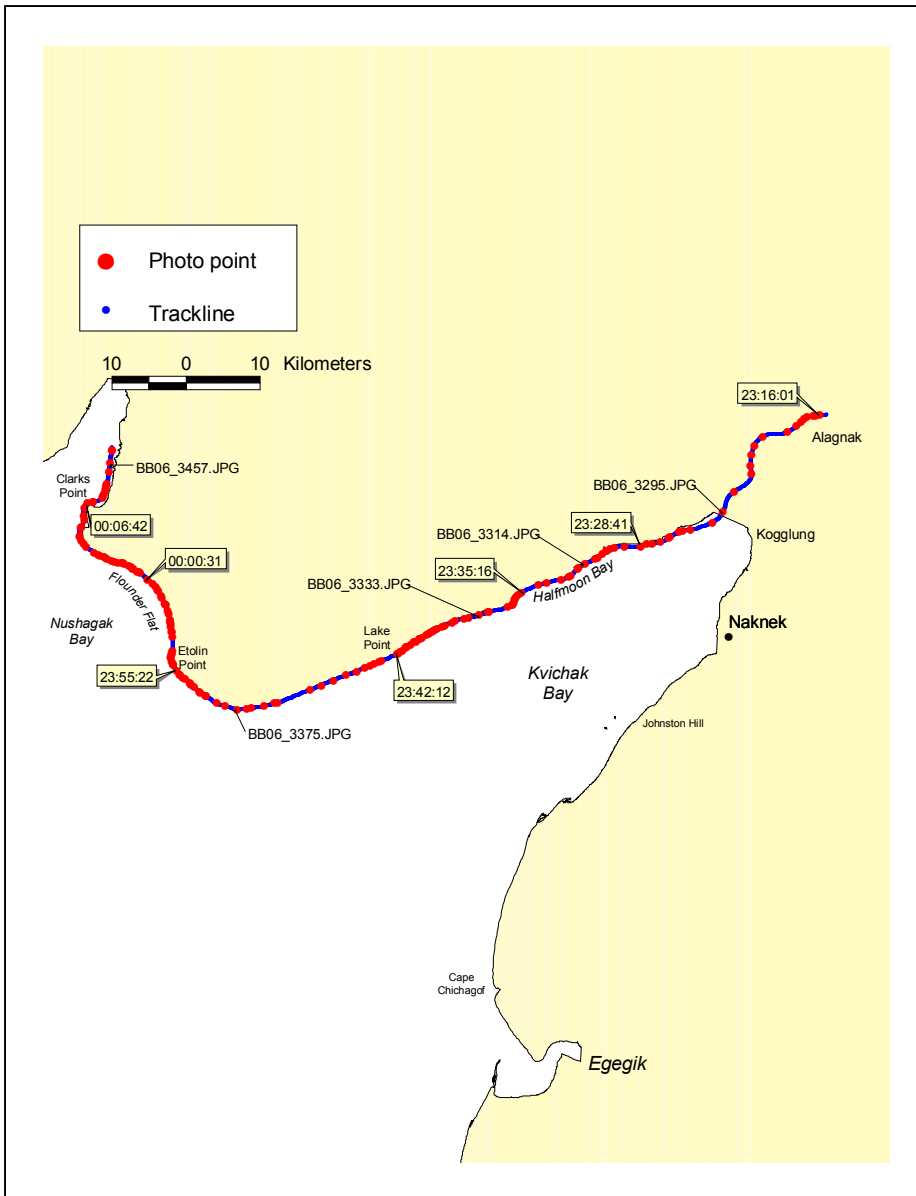


Figure 11. Location of Tape BB06_10, 22 June 2006

2006 Bristol Bay Aerial Video Imaging Survey Tape Log

Tape: BB06_10 **Date:** 22 June 06

General Location: Kvichak Bay to Nushagak Bay

Time Start (UTC): 23:15:43

Time End (UTC): 00:10:15

Tape Length: 54:33

Geo: Borecky

Bio: Anderson

Nav: Harney

Pilot: Alletto

Weather: Overcast with sunny periods; intermittent clouds and fog; variable ceiling

Time (UTC)	Location	Photo
23:16:01	Alagnak	BB06_3281
23:28:41	Start Halfmoon Bay	BB06_3305
23:35:16	End Halfmoon Bay	BB06_3322
23:42:12	Lake Point	BB06_3358
23:55:22	Etolin Point	BB06_3390
00:00:31	Middle of Flounder Flats	BB06_3417
00:06:42	Clarks Point	BB06_3447

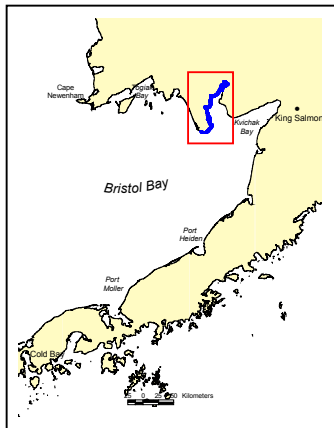
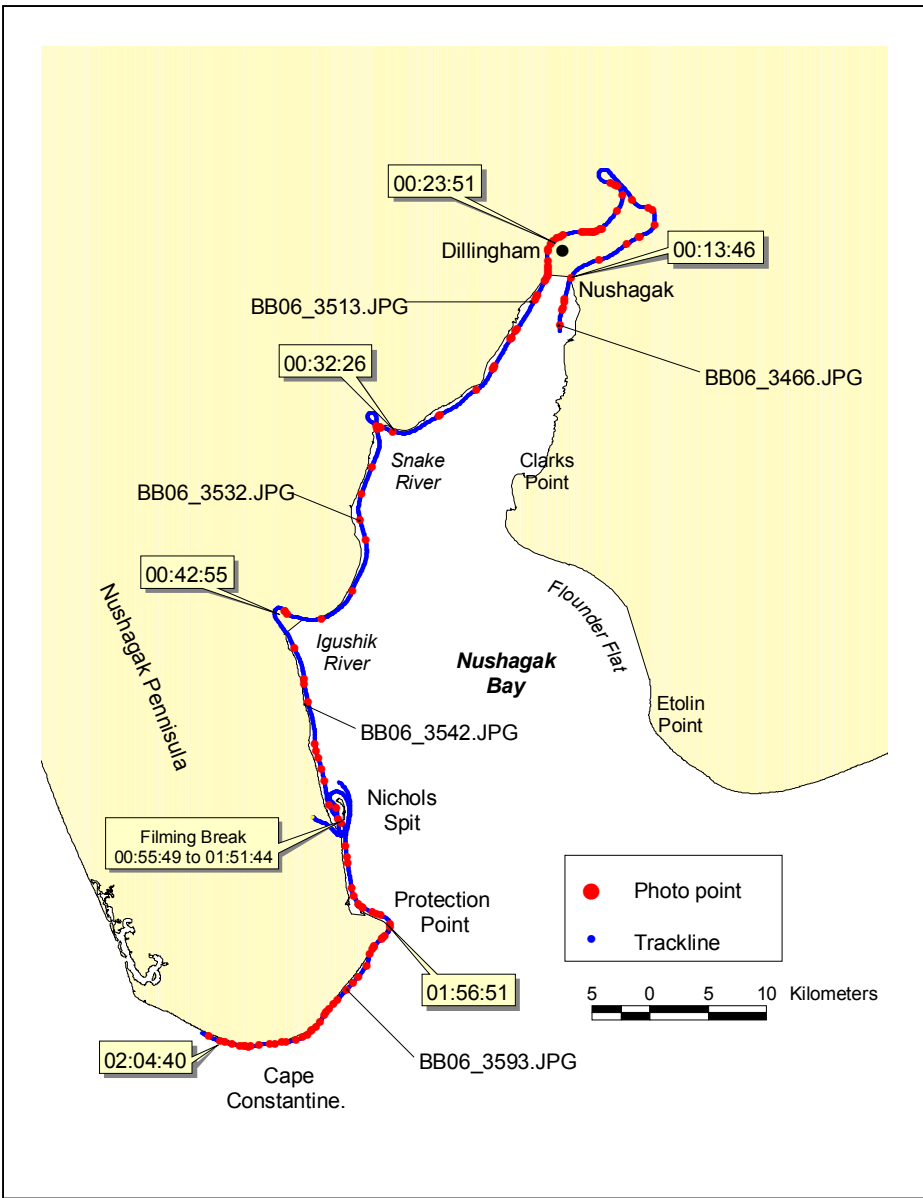


Figure 12. Location of Tape BB06_11, 22 June 2006

2006 Bristol Bay Aerial Video Imaging Survey Tape Log

Tape: BB06_11 **Date:** 22 June 06

General Location: Nushagak Bay, Dillingham, Nushagak Peninsula

Time Start (UTC): 00:11:59	Geo: Borecky/Harney
Filming break 00:55:49 to 01:51:44	Bio: Anderson
Time End (UTC): 02:05:20	Nav: Harney/Borecky
Tape Length: 57:26	Pilot: Alletto

Weather: Overcast with sunny periods; intermittent clouds and fog; variable ceiling

Time (UTC)	Location	Photo
00:13:46	northern Nushagak Bay, near Dillingham	BB06_3471
00:23:51	Dillingham	BB06_3499
00:32:26	Snake River	BB06_3525
00:42:55	Igushik River	BB06_3537
00:55:49 to 01:51:44	Filming break near Nichols Spit (rough conditions)	
01:56:51	Protection Point	BB06_3581
02:04:40	Cape Constantine	BB06_3618

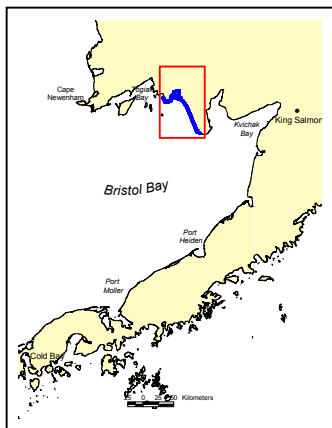
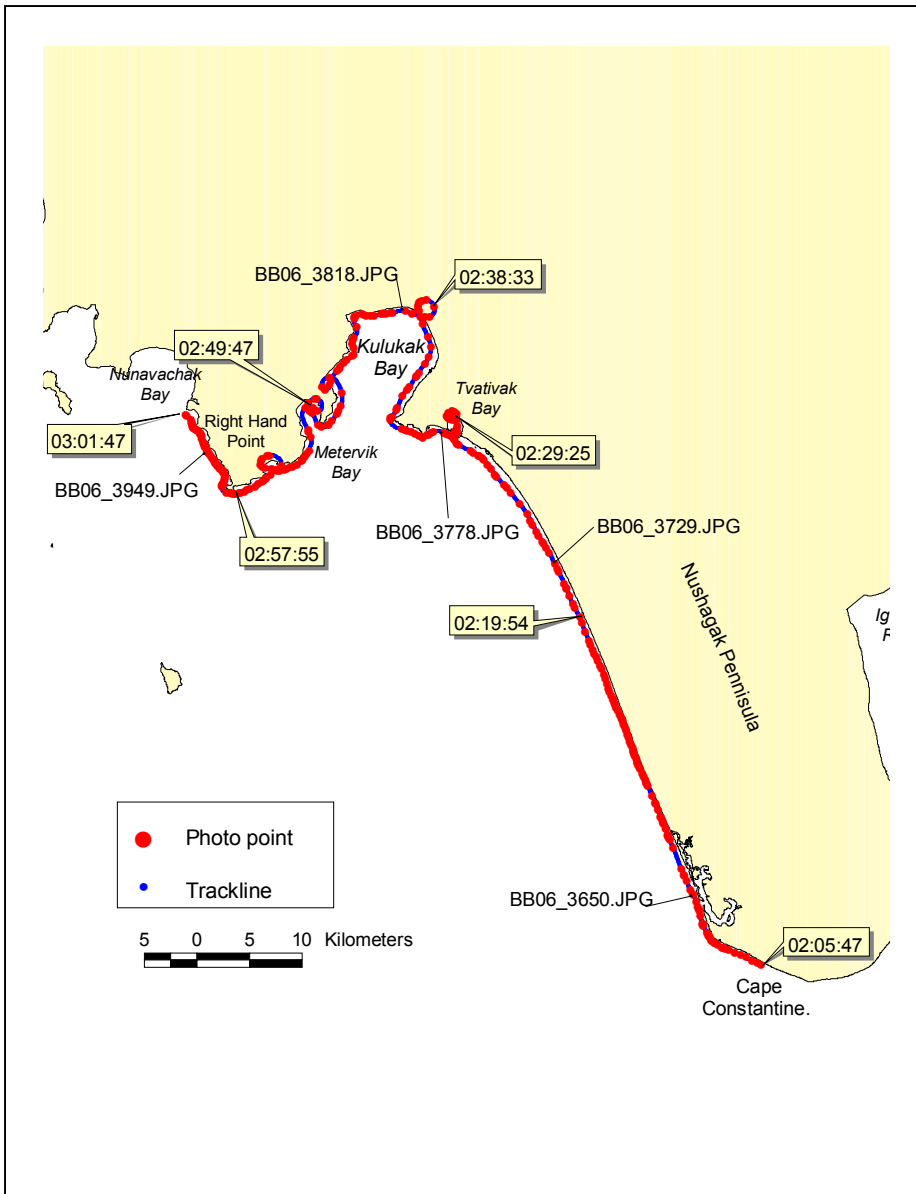


Figure 13. Location of Tape BB06_12, 22 June 2006

2006 Bristol Bay Aerial Video Imaging Survey Tape Log

Tape: BB06_12 **Date:** 22 June 06

General Location: Nushagak Penninsula (west side) , Kulukak Bay, Metervik Bay,
Right Hand Point

Time Start (UTC): 02:05:46

Time End (UTC): 03:01:48

Tape Length: 56:03

Geo: Harney

Bio: Anderson

Nav: Borecky

Pilot: Alletto

Weather: Overcast with sunny periods; intermittent clouds and fog; variable ceiling

Time (UTC)	Location	Photo
02:05:47	Cape Constantine	BB06_3623
02:19:54	Halfway between Cape Constantine and Tvativak Bay, Nushagak Peninsula	BB06_3720
02:29:25	Head of Tvativak Bay	BB06_3770
02:38:33	Head of Kulukak Bay	BB06_3814
02:49:47	Head of Metervik Bay	BB06_3864
02:57:55	Right Hand Point	BB06_3911
03:01:47	Mouth of Nunavachak Bay	BB06_3982

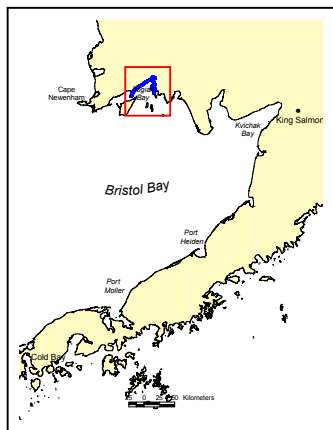
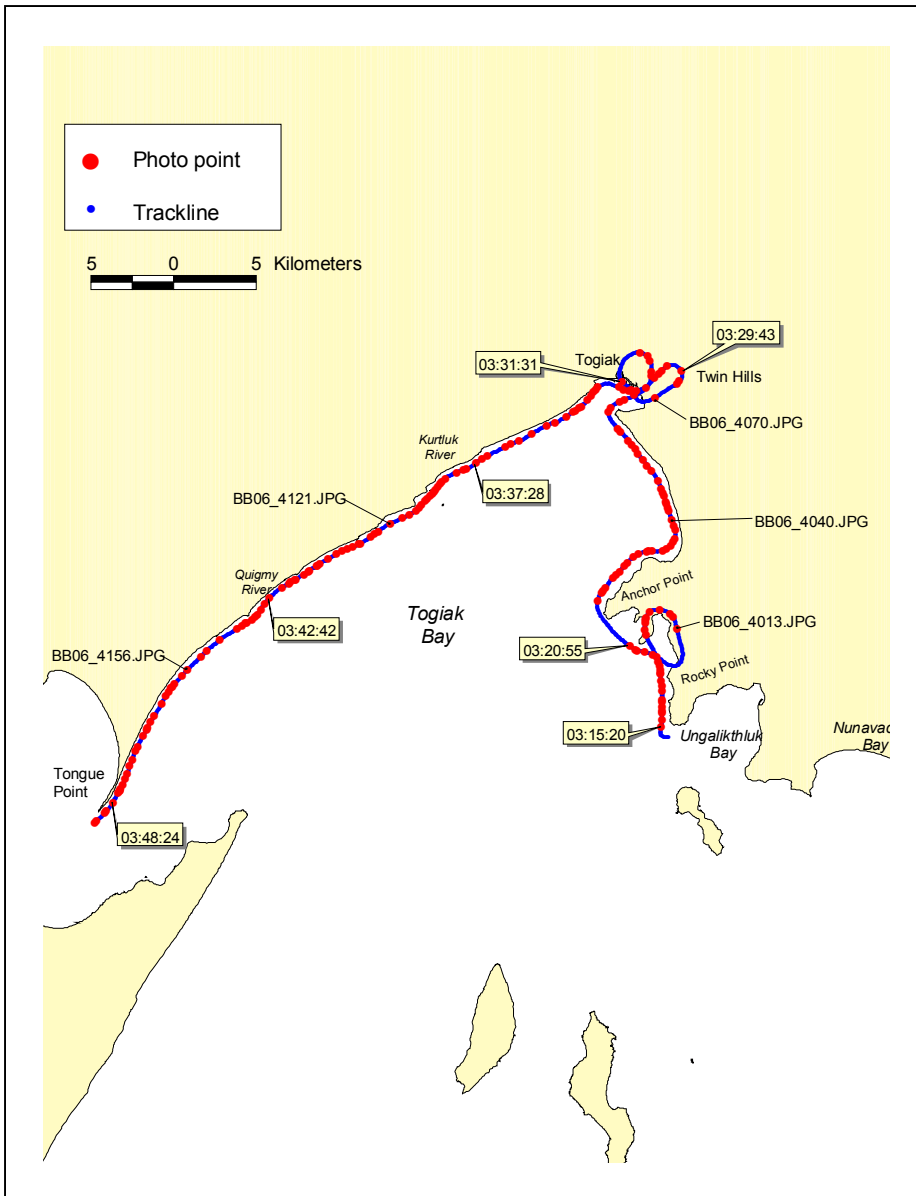


Figure 14. Location of Tape BB06_13, 22 June 2006

2006 Bristol Bay Aerial Video Imaging Survey Tape Log

Tape: BB06_13 **Date:** 22 June 06

General Location: Togiak Bay

Time Start (UTC): 03:14:56

Time End (UTC): 03:48:54

Tape Length: 33:58

Geo: Borecky

Bio: Anderson

Nav: Harney

Pilot: Alletto

Weather: Overcast with sunny periods; intermittent clouds and fog;
variable ceiling

Time (UTC)	Location	Photo
03:15:20	Rocky Point	BB06_3988
03:20:55	Anchor Point	BB06_4018
03:31:31	Togiak	BB06_4074
03:37:28	Kurtluk River	BB06_4102
03:42:42	Quigmy River	BB06_4143
03:48:24	Tongue Point	BB06_4180

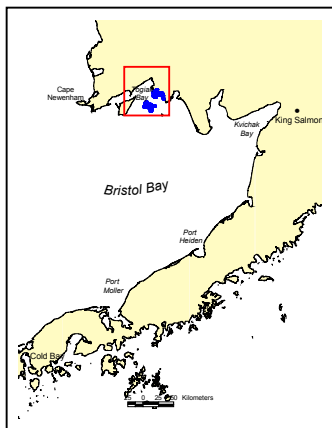


Figure 15. Location of Tape BB06_14, 23 June 2006

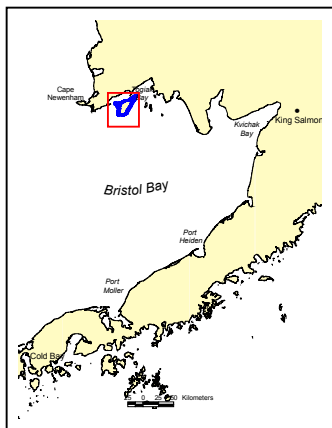
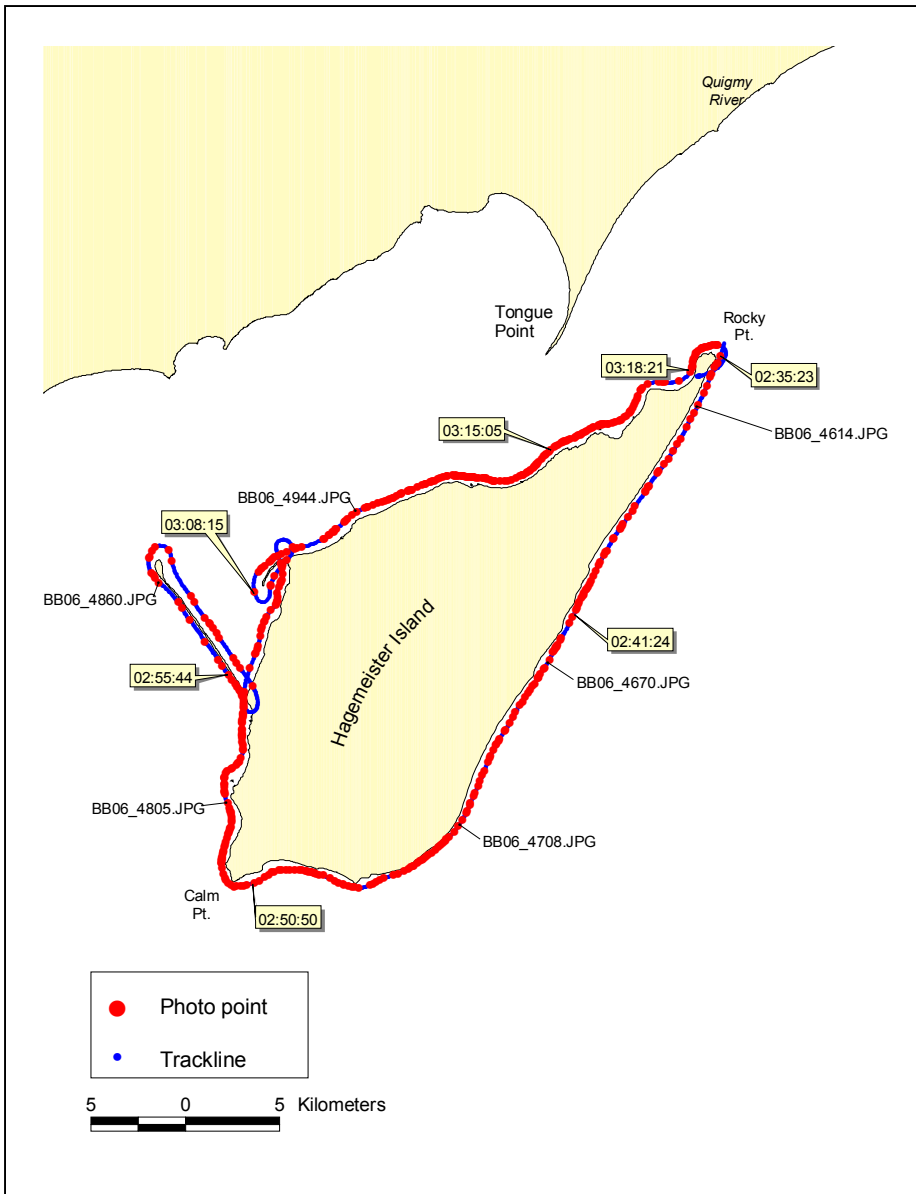


Figure 16. Location of Tape BB06_15, 23 June 2006

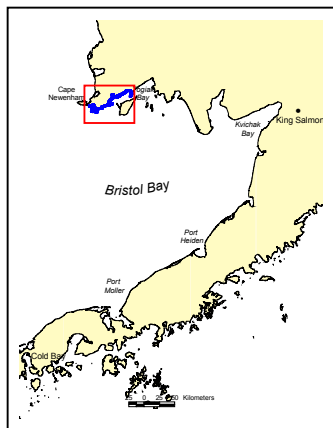
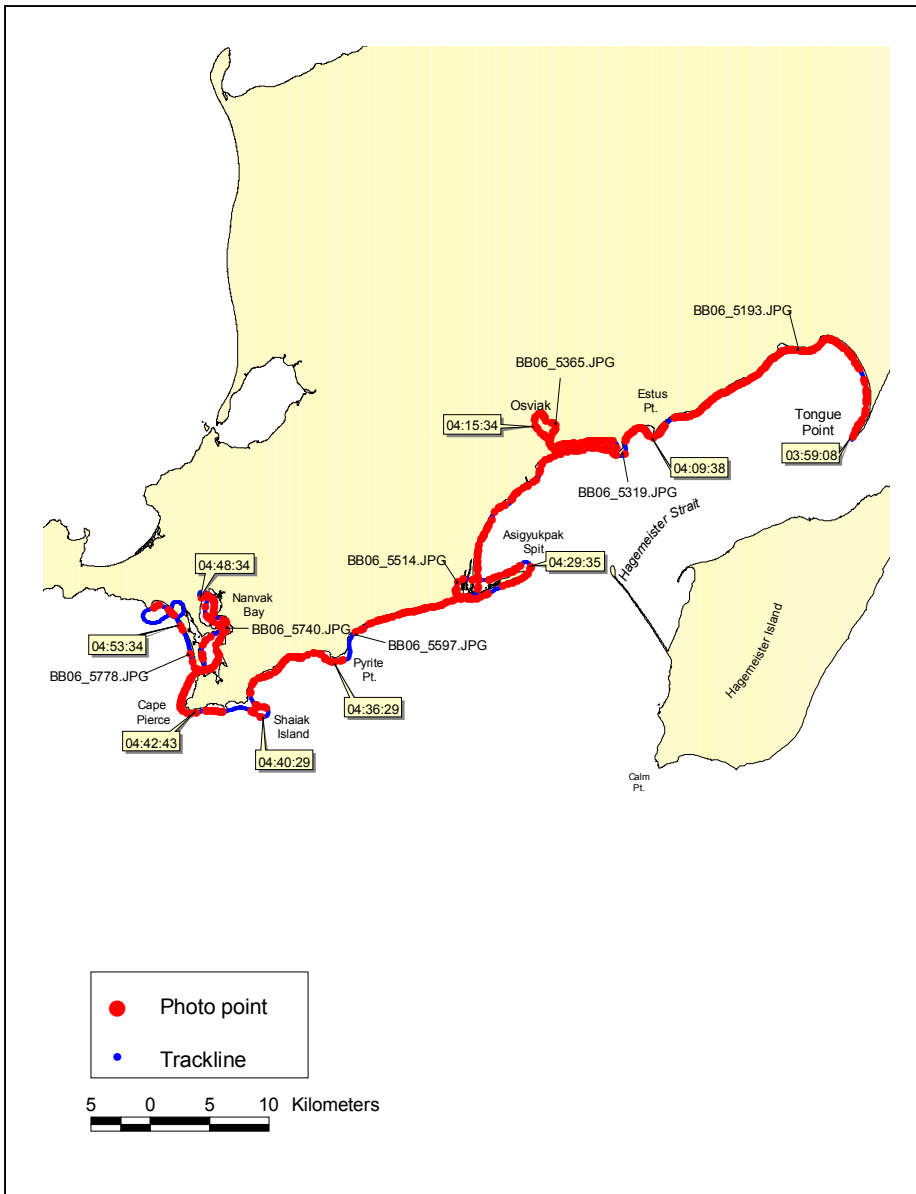


Figure 17. Location of Tape BB06_16, 23 June 2006

2006 Bristol Bay Aerial Video Imaging Survey Tape Log

Tape: BB06_16 **Date:** 23 June 06

General Location: Hagemeister Strait, Osviak, Asigyukpak Spit, Cape Peirce, Nanvak Bay

Time Start (UTC): 03:59:02
Time End (UTC): 04:56:56
Tape Length: 57:54

Geo: Harney
Bio: Anderson
Nav: Borecky
Pilot: Alletto

Weather: Overcast, variable ceiling; intermittent storm clouds and rain; low, heavy fog in some areas; windy and turbulent approaching Capes Peirce and Newenham

Time (UTC)	Location	Photo
03:59:08	Tongue Point	BB06_5133
04:09:38	Estus Point	BB06_5294
04:15:34	Osviak	BB06_5381
04:29:35	Asigyukpak Spit	BB06_5337
04:36:29	Pyrite Point	BB06_5600
04:42:43	Cape Peirce	BB06_5672
04:48:34	Nanvak Bay	BB06_5756

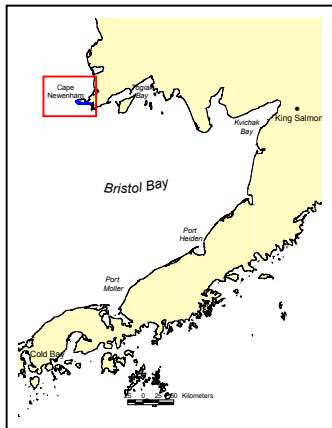
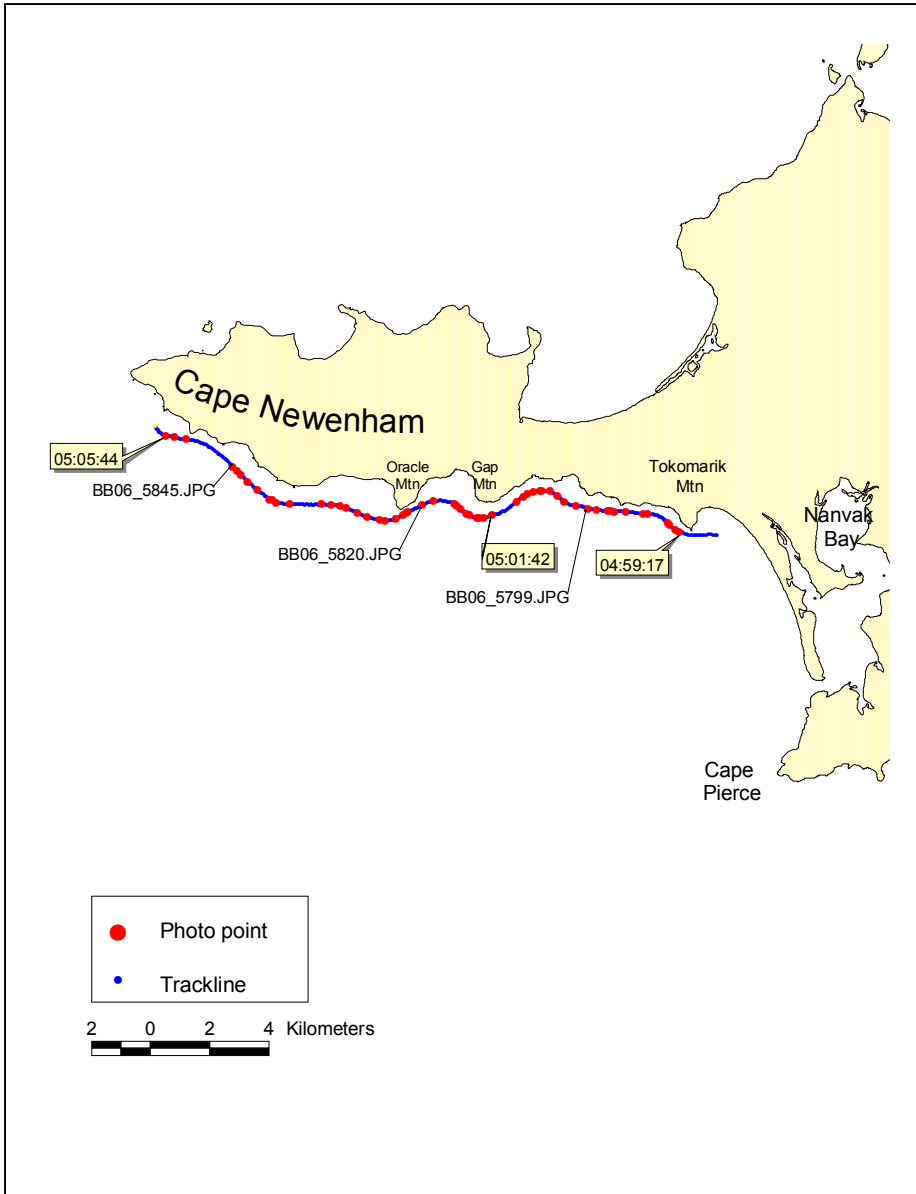


Figure 18. Location of Tape BB06_17, 23 June 2006

2006 Bristol Bay Aerial Video Imaging Survey Tape Log

Tape: BB06_17 **Date:** 23 June 06

General Location: Cape Newenham

Time Start (UTC): 04:58:56

Geo: Harney

Bio: Anderson

Nav: Borecky

Pilot: Alletto

Time End (UTC): 05:05:55

Tape Length: 07:00

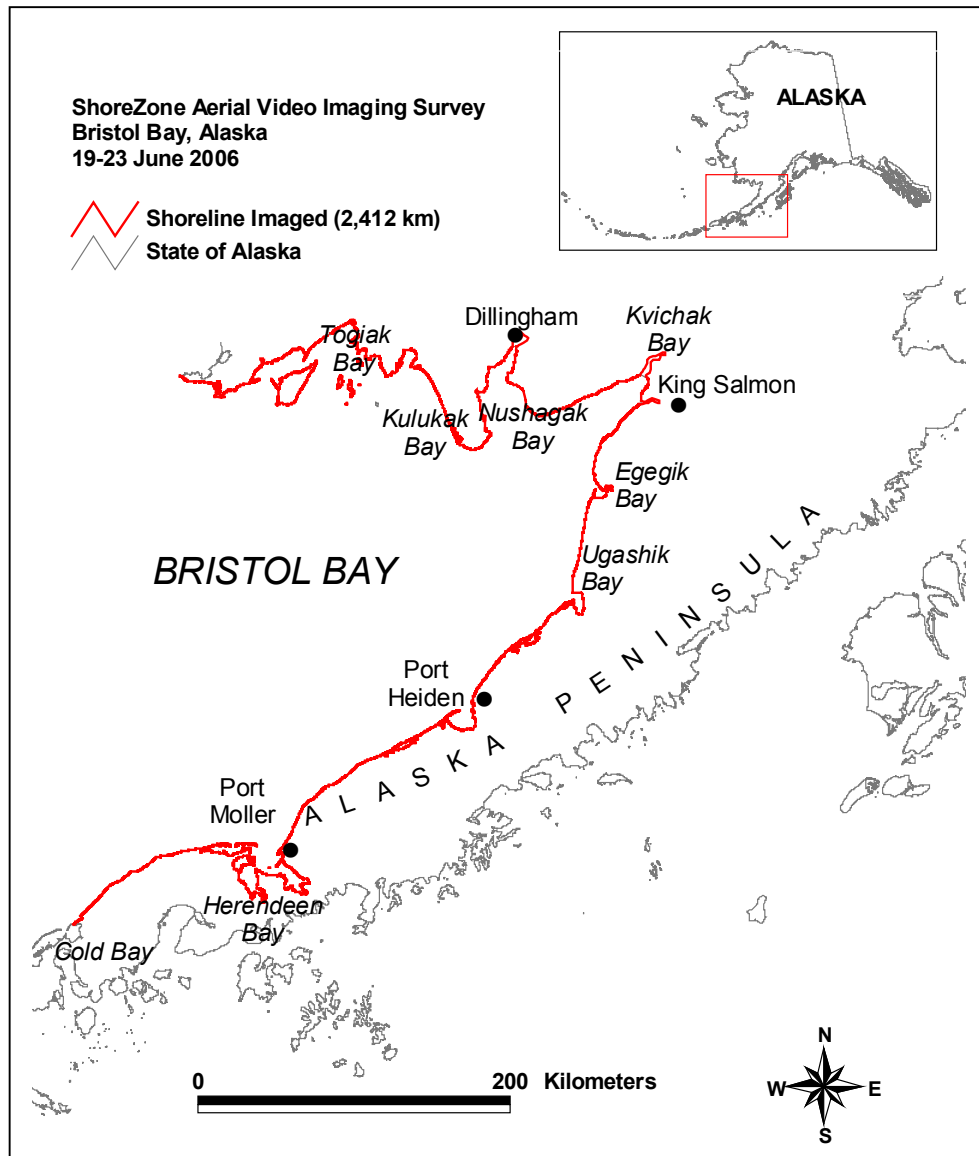
Weather: Overcast, variable ceiling; intermittent storm clouds and rain, low, heavy fog in some areas; windy and turbulent approaching Capes Peirce and Newenham

Time (UTC)	Location	Photo
04:59:17	Tokomarik Mountain... above Nanvak Bay	BB06_5788
05:01:42	Gap Mountain	BB06_5810
05:05:44	Cape Newenham	BB06_5848

DAILY FIELD SUMMARIES

ShoreZone Aerial Video Imaging (AVI) Survey

Bristol Bay, Alaska, 19-23 June 2006



Prepared for
The Nature Conservancy
Juneau, Alaska
by



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ShoreZone Bristol Bay AVI Survey: June 2006

Fixed wing Cessna 206, Branch River Air

Home base: King Salmon

Field base: Cold Bay

ShoreZone Bristol Bay AVI Survey**19 June 2006**

Transit to Cold Bay, southern Alaska Peninsula; imaging in southern Ugashik Bay and Port Heiden

Tide window (ADT): 1318 – 1432 (Heiden)

Liftoff (ADT): 1230 (King Salmon)

Setdown: 1640 (Cold Bay)

Cessna time: 4.1 hours

Fuel: Branch River Air

Flown = 145 km:

Southern Ugashik Bay, Cinder River, Port Heiden to Hook Lagoon

Imagery collected: 1.0 hours

Tapes: BB06_01

Conditions:

Generally sunny; variable ceiling southward

Highlights and interesting features:

- 7 km mud flats at Ugashik
- seals on sand bars offshore of Port Heiden
- Cinder and Meshik Rivers

Comments

Decided to transit south to work the area while the weather is “good.” Set up and loaded the Cessna at Branch River Air; took off at 11:30 for Cold Bay (timed to arrive at Port Heiden for the low tide window). Imaged Port Heiden and a small bay in southern Ugashik on the way down (75 km) because the area was clear of fog, which our pilot said was uncommon.

Landed on Blinn Lake under clear (even sunny!) skies. Flight Services let Mary Martin of Cold Bay Lodge know we were on the lake, and she retrieved us within an hour while we broke down the electronics and hardware in the Cessna. Cold Bay is a few buildings on a narrow strip of land between the Bering Sea and Pacific Ocean... not a tree in sight and very windy.

**ShoreZone Bristol Bay AVI Survey
19 June 2006 – Photo Picks**

	
<p>Port Heiden Hundreds of seals hauled out on sand bars offshore BB06_0121.jpg</p>	<p>Port Heiden Ponds, stream channels, and wide mud flats BB06_0155.jpg</p>
	
<p>Port Heiden Meandering streams, marsh grasses, wide mud flats BB06_0159.jpg</p>	<p>Port Heiden BB06_0165.jpg</p>
	
<p>North of Port Heiden Sand-pebble beach, cliff of peat and ash BB06_0324.jpg</p>	<p>North of Port Heiden Meandering stream, beach, and sand islets offshore BB06_0338.jpg</p>

**ShoreZone Bristol Bay AVI Survey
20 June 2006**

Moffet Point to Port Moller

Tide window (ADT): 1118 – 1418 (Moller), 1314 – 1612 (Heiden)

Liftoff (ADT): 1100

Setdown: 1700

Cessna time: 5.1 hours

Fuel: Frosty Fuels with fuel truck in morning, left at Blinn Lake, refueled evening

Flown = 590 km:

Moffet Point, Nelson Lagoon, Port Herendeen, Port Moller

Imagery collected: 3.7 hours

Tapes: SE06_BB02 – BB05

Conditions:

Overcast, intermittent clouds, rain, and fog; variable ceiling; poor visibility (marginal flying conditions)

Highlights and interesting features:

- Wide sand and mud flats with eelgrass in Herendeen and Moller
- Lagoons that are filled in with mudflats
- Sandy spits, bars, and islets alongshore
- Wide marshes
- Steep eroding cliffs near Moller
- Dead walrus on the beach; dead whale being eaten by a bear
- Stream fans with coarser material

**ShoreZone Bristol Bay AVI Survey
20 June 2006 – Photo Picks**

	
<p>Cape Leontovich Cathedral River carving through a high-energy beach BB06_0647.jpg</p>	<p>Port Moller (northwest side) Meandering channels and ponds in dune grass BB06_1072.jpg</p>
	
<p>Herendeen Bay Patchy <i>Fucus</i> (rockweed) on upper rock platforms; continuous <i>Zostera</i> (eelgrass) on lower sand flats. BB06_1311.jpg</p>	<p>Herendeen Bay Dark patches are the blue mussel bioband, common in this bay BB06_1346.jpg</p>
	
<p>Herendeen Bay Dense stands of dune grass in the backshore, bears on the sand-pebble beach, and continuous beds of eelgrass near shore BB06_1522.jpg</p>	<p>Port Moller (southwest side) Estuary with distinct wetland biobands: tall, blue-green dune grasses (upper) and marsh herbs and grasses (lower). BB06_1608.jpg</p>

**ShoreZone Bristol Bay AVI Survey
20 June 2006 – Photo Picks (cont)**

	
<p>Left Head, Port Moller <i>Verrucaria</i> (black lichen) on steep cliff with <i>Fucus</i> below; mud flats extend offshore several km BB06_1763.jpg</p>	<p>Left Head, Port Moller Extensive beds of <i>Zostera</i> eelgrass BB06_1803.jpg</p>
	
<p>Egg Island, northeastern Port Moller Steep cliff with dark <i>Verrucaria</i> (black lichen) band; <i>Zostera</i> eelgrass in the subtidal on the back side of the islet. BB06_1808.jpg</p>	<p>Harbor Point, Port Moller Eagles nesting in navigation marker at the end of a sandy spit at the entrance of Port Moller BB06_1866.jpg</p>

ShoreZone Bristol Bay AVI Survey

21 June 2006

Filling in Port Moller, Heiden; Ugashik to Kvichak Bay

Tide windows (ADT): Moller = 1145 – 1532, Heiden = 1340 – 1725, Nushagak (PP) = 1634 – 1946, Kvichak = 2000 2200

Fuel truck: 0830

Patch ruptured float: 0900 - 1400

Liftoff: 1445

Setdown: 20:15

Cessna time: 5.3 hours

Fuel: Frosty Fuels with fuel truck in morning, King Salmon in evening

Flown = 615 km:

Filling in Port Moller, Port Heiden, and Ugashik to Kvichak Bay (up to Alagnak River)

Imagery collected: 3.7 hours

Tapes: BB06 – BB09







Conditions:

Overcast, intermittent clouds, rain, and fog; variable ceiling; heavy fog on portion of Ugashik coast (4 km gap in imagery)

Highlights and interesting features:

- repairing the hole torn in one of the floats using aluminum, roofing screws, and epoxy (all before the tide window ran out)
- Walrus haul-out at Cape Seniavin
- mud cutbanks in Kvichak Bay at Naknek and Alagnak Rivers
- extensive sand bars and barrier islands

**ShoreZone Bristol Bay AVI Survey
21 June 2006 – Photo Picks**

	
<p>Nelson Lagoon Sandy barrier islands just south of Port Moller BB06_2114.jpg</p>	<p>Nelson Lagoon Sandy barrier islands just south of Port Moller BB06_2142.jpg</p>
	
<p>Cape Kutuzof, north of Port Moller Coarse-grained lag deposit on sand beach BB06_2169.jpg</p>	<p>Cape Seniavin Enormous walrus haul-out BB06_2230.jpg</p>
	
<p>South of Port Heiden Wide sand-pebble beaches and steep, eroding cliffs BB06_2500.jpg</p>	<p>Stroganof Point Sandy spits and barrier islands, entrance Port Heiden BB06_2548.jpg</p>

**ShoreZone Bristol Bay AVI Survey
21 June 2006 – Photo Picks (cont)**



Hook Lagoon, south of Cinder River
Common shoreline is sand with continuous dune
grass in the supratidal
BB06_2605.jpg



Cinder River State Critical Habitat Area
Tidal flats and sand bars extending far offshore
BB06_2671.jpg



Cape Greig, north of Ugashik Bay
Steep, high cliffs with coarse talus base, sand-pebble
beach, and wide sand flats.
BB06_2832.jpg



Egegik River
Wide estuary and extensive marsh
BB06_2945.jpg

ShoreZone Bristol Bay AVI Survey

22 June 2006

Kvichak Bay (at Alagnak River) to Togiak

Tide windows (ADT): Moller = 1145 – 1532, Heiden = 1340 – 1725, Nushagak (PP) = 1714 - 2047

Liftoff: 1500

Setdown: 2100

Cessna time: 5.2 hours

Fuel: King Salmon

Flown = 550 km:

Kvichak Bay (at Alagnak River) to Togiak

Imagery collected: 3.7 hours

Tapes: BB10 – BB13







Conditions:

Overcast with sunny periods; intermittent clouds and fog; variable ceiling

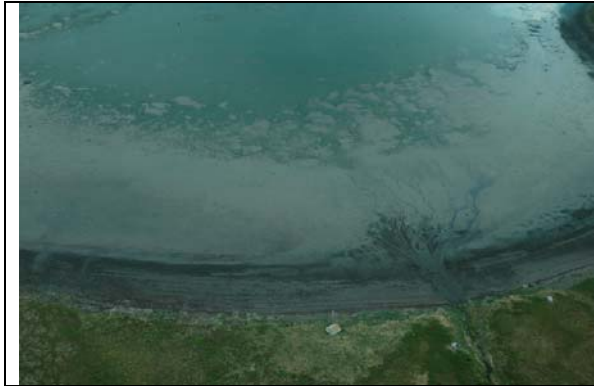
Highlights and interesting features:

- rock platforms and steep eroding cliffs of sediment and organic material
- sand dunes of Nushagak Peninsula
- extensive sand and mud flats
- steep, eroding cliffs of peat, soil, and ash at Etolin Point and Ekuk Bluff, near Nushagak
- wide marsh and mud flats at mouth of Togiak River

**ShoreZone Bristol Bay AVI Survey
22 June 2006 – Photo Picks**

	
<p>Etolin Point Steep, eroding cliffs of peat, soil, and ash between Nushagak and Kvichak Bays BB06_3385.jpg</p>	<p>Ekuk Bluff, northern Nushagak Bay Fine ash eroding from cliff, forming cross-shore patterns on the beach face BB06_3432.jpg</p>
	
<p>Nushagak Peninsula (east of Cape Constantine) Extensive dunes (both active and vegetated with dune grass) grading to wide sand flats offshore BB06_3636.jpg</p>	<p>Tvativak Bay (northern Kulukak Bay) Marsh grasses and herbs in lower estuary and continuous stands of dune grasses and herbs in the supratidal BB06_3764.jpg</p>
	
<p>Kulukak Point Talus at the base of mountains on the northwest Nushagak Peninsula grade into wide sand flats extending far offshore BB06_3794.jpg</p>	<p>Kulukak Point Rock platform with a mixture of green algae and red turf algae BB06_3967.jpg</p>

**ShoreZone Bristol Bay AVI Survey
22 June 2006 – Photo Picks (cont)**



Togiak Bay
Pocket beach inside Anchor Point with continuous eelgrass in the nearshore

BB06_4009.jpg



Togiak Bay
Distinct biobanding on boulder beach just east of Anchor Point: dark *Verrucaria* band in the splash zone above a red algae band

BB06_4016.jpg



Togiak Bay
Ship stranded high in the wetland suggests a former waterline position

BB06_4078.jpg



Togiak River
Extensive estuary and tidal flats in northern Togiak Bay

BB06_4081.jpg

ShoreZone Bristol Bay AVI Survey
23 June 06

Walrus Islands to Cape Newenham

Tide window (ADT): Walrus = 1800 - 2215

Liftoff: 1630

Setdown: 2230

Cessna time: 5.7 hours

Fuel: King Salmon

Flown = 405 km:

Walrus Islands, Hagemeister Island, Cape Pierce, Cape Newenham

(did not fly Round Islands or The Twins due to flight restrictions; Twins can be mapped like Black Rock)

Imagery collected: 3.0 hours

Tapes: BB14 – BB17







Conditions:

Overcast, variable ceiling; intermittent storm clouds and rain, low, heavy fog in some areas; windy and turbulent approaching Capes Pierce and Newenham


Highlights and interesting features:

- long sand spits at Tongue Point and on Hagemeister
- beautiful Walrus Islands but not many mammals observed
- enormous nesting seabird colonies on Black Rock and Cape Newenham
- extensive dunes of Nanvak Bay
- incredible steep, craggy Cape Newenham

**ShoreZone Bristol Bay AVI Survey
23 June 2006 – Photo Picks**

	
<p>Ungalikthluk Bay Lower rock platforms covered in a continuous band of red algae; some ice remains on the cliff face BB06_4229.jpg</p>	<p>Nunavachak Bay Wide delta and marsh at the mouth of Nunavachak Lake drainage BB06_4270.jpg</p>
	
<p>Togiak Bay Steep cliff and linear beach between Ungalikthluk and Nunavachak Bays BB06_4295.jpg</p>	<p>Black Rock, Togiak Bay Enormous colonies of nesting seabirds in the Walrus Islands State Game Sanctuary BB06_4446.jpg</p>
	
<p>Hagemeister Island, Togiak Bay Beautiful setting: waterfalls pouring over high cliffs onto wide, sandy beaches. BB06_4666.jpg</p>	<p>Hagemeister Island, Togiak Bay A part of the Togiak National Wildlife Refuge BB06_4749.jpg</p>

**ShoreZone Bristol Bay AVI Survey
23 June 2006 – Photo Picks (cont)**

	
<p>Asigyukpak Spit Bright green eelgrass formed a continuous, dense bed in the nearshore subtidal along this narrow sand spit at the western edge of Hagemeister Strait BB06_5518.jpg</p>	<p>Cape Peirce High wave exposure indicated by the presence of a dark red algae band at the waterline; near northwest corner of Bristol Bay BB06_5679.jpg</p>
	
<p>Nanvak Bay Active and vegetated sand dunes outside Nanvak Bay, north of Cape Peirce BB06_5770.jpg</p>	<p>Nanvak Bay Active and vegetated sand dunes outside Nanvak Bay, north of Cape Peirce BB06_5710.jpg</p>
	
<p>Cape Newenham Northwest corner of Bristol Bay BB06_5856.jpg</p>	<p>Cape Newenham Sea arches, sea caves, and sea stacks of the spectacular northwest edge of Bristol Bay BB06_5845.jpg</p>