

Wildlife Inventory Plan  
Alaska Maritime National Wildlife Refuge  
Protocol #11

Version 1.4

Parameter: Populations

Species: Black-legged and red-legged kittiwakes, common and thick-billed murres (northern fulmars and cormorants at some sites)

## PURPOSE

To detect 20% differences in numbers of birds present on monitoring plots between years (power = 90% at 0.1 level of significance).

## BREEDING BIOLOGY

Kittiwakes (*Rissa brevirostris* and *R. tridactyla*), murres (*Uria aalge* and *U. lomvia*), cormorants (*Phalacrocorax urile* and *P. pelagicus*) and northern fulmars (*Fulmarus glacialis*) are long-lived seabirds that spend the majority of the year at sea but nest on cliffs in dense colonies during the summer breeding season. During the breeding season, these species are central-place foragers and highly visible on their cliff nest sites and thus easily monitored and counted.

**Kittiwakes** build nest structures on cliff ledges with mud and vegetation. Red-legged kittiwakes build a small vegetation-lined mud cup for their (usually) single egg, in contrast to the deeper and larger grass nest that holds the (often) 2-egg clutch of black-legged kittiwakes (Byrd and Williams 1993, Hatch et al. 2009). Where both species co-occur (the Pribilof Islands and Buldir), black-legged and red-legged kittiwakes nest sympatrically on the cliffs; however, red-legged kittiwakes are often found in "clusters" with other red-legged kittiwakes, often under overhangs or projecting rocks or on narrower ledges than those used by black-legged kittiwakes (Kildaw 1999). Both parents share incubation and chick-rearing duties; chicks fledge at about 40 to 50 days of age. Black-legged kittiwakes breed at high latitudes across North America, Europe, and Asia. Red-legged kittiwakes, in contrast, are restricted to only a few islands in the Bering Sea; with the exception of a colony in the Commander Islands, red-legged kittiwakes breed exclusively within the Alaska Maritime National Wildlife Refuge (Byrd and Williams 1993, Hatch et al. 2009).

**Murres** lay a single egg directly on the cliff ledges with no nest constructed. At sites with both species, thick-billed murres usually nest on narrow ledges of sheer cliff, while common murres tend to nest on wider platforms in clumps several to many birds deep (see Figure 1 for murre identification clues). Flightless downy chicks leave the cliffs before fully independent after a short nestling period of about 20 days, after which chicks are attended and fed at sea by males for several months. Both species are abundant and widespread in northern latitudes, nesting on both North American coasts, in Asia and in Europe. Alaska supports just under half of the North American breeding population of common and thick-billed murres, although population estimates are rough for both species (Gaston and Hipfner 2000, Ainley et al. 2002).

**Northern fulmars** also lay a single egg, using slight depressions or scrapes in the substrate of cliffs or steep slopes as a nest site. Birds generally nest one to two meters apart, in colonies ranging from just a few to hundreds of thousands of birds. Both parents incubate, brood, and feed chicks, which fledge at about 50-60 days. Northern fulmars breed on remote islands at northern latitudes in both the Pacific and Atlantic oceans. About 70% of the North American breeding population nest in Alaska (Hatch and Nettleship 1998).

**Red-faced and pelagic cormorants** nest on cliffs in loose colonies, where they build nests constructed of grass, moss, and other plant material that may be gathered and carried considerable distances. At sites where species coexist, pelagic cormorant nests are generally located lower on the cliff face (in some places pelagic cormorants nest on steeper cliffs, narrower ledges, and closer to the sea

than red-faced cormorants). Cormorants have large clutches with up to 8 eggs; chicks fledge at about 40 to 60 days of age (Hobson 1997, Causey 2002, Wright unpubl. data). Red-faced cormorants are distributed along a narrow region across the Aleutian and Pribilof Islands, from the Gulf of Alaska to Kamchatka. The majority of the world's population breeds within the Alaska Maritime National Wildlife Refuge, particularly the Near Islands and the Pribilofs (Causey 2002). Pelagic cormorants are more widespread along the west coast of North America, found breeding from northern Alaska to the Baja peninsula in Mexico (Hobson 1997).

## PROCEDURE

**Data collection.**—Numbers of adult birds and nests (for kittiwakes and red-faced cormorants only) are counted on permanent plots as an index of the number of breeding birds attending the colony each year. Most plots are counted from a single fixed observation point, although some are counted while walking down the beach or by skiff from the water. It may be helpful to visit all plots with all crew members before beginning any counts to ensure everyone knows locations of observation points and plots. Use plot photos to identify plot boundaries. If necessary, mark observation points with fresh flagging to facilitate finding them later in the season when vegetation has grown thick.

Survey plots as follows:

1. Counts should be timed to coincide with the mid-incubation to early chick-rearing period of the nesting season (approximately two weeks before the first eggs hatch until less than 10% of chicks reach fledging age). When timing of species differs, the counting period represents a compromise among all species being counted (see island-specific details for approximate timing at each site).
2. Make all counts between 11:00 and 21:00 hr (varies somewhat by site, see island-specific details) on days when wind velocities are below 20-25 knots.
3. Count birds on all plots during each of 5-10 replicate counts (varies by site; see island-specific details). Depending on the site, you may not be able to count all plots on the same day; if that is the case, try to count on consecutive days, in order to reduce variability (the sample unit is a single count of birds or nests on **all plots**, ideally all counted within a day of each other).
4. At each plot, count (as applicable): kittiwakes and nests, murrelets, pelagic and red-faced cormorants and nests, and northern fulmars (species counted varies by site, see island-specific details). A nest is defined as **any structure to which vegetation has been added in the current year**. Unless otherwise noted, all birds and nests should be identified to species; if kittiwake or cormorant nests are unattended, use your best knowledge of nest structures and distribution on the cliff to make a call.
5. Use binoculars or a spotting scope and tally counters to count (click the tally counter for each bird/nest you count, so that you do *not* have to keep track in your head).
6. Count each species at least twice: if the first two counts are within 5% of each other, you have a good count; otherwise keep counting until you have two counts within 5% (if counting from a skiff, use 10% difference). Record both of these two counts in your field notebook. It is usually best to conduct all counts for one species before moving on to another (i.e., count red-legged kittiwakes until you have two counts within 5%, then move on to black-leggeds). In some instances, however, you can count two at once if you have two tally counters (i.e., for species with nests, you can count birds and nests at the same time using two tally counters if you wish; in addition, if counting kittiwakes or murrelets where most are one species, it may make sense to count the rare second species concurrently).

At the end of each day of counting (or at the very least, before you take your data notebook into the field again), enter the day's plot data in the electronic data file provided. This is important so that if

you lose your notebook (blown away on the wind or falling down a cliff), you won't lose hard-earned previous count data.

**Safety:** Counting from cliff top observation points require special safety considerations. At all times, be aware of yourself in relation to the cliff edge. Watch out for overhanging tussocks or rocks that might look stable but could give way under your weight and never blindly assume an observation point used in past years is necessarily safe this year, as cliffs can erode over the winter. If you happen to drop something over the edge, never lunge for it: nothing (including data) is worth endangering yourself or others. Also take care when hiking to plots along trails that may follow the cliff edge, as vegetation late in the season may be rank and can catch your feet.

Boat-based population counts have their own set of safety concerns regarding safe boating. See island-specific details for more information.

**Data analysis.**--For population indices, a single count of birds or nests on **all plots** is the sample unit, and the sample size for estimating the average number of birds/nests present in a particular year is the number of times all plots were surveyed during the mid-incubation to early chick-rearing period.

When entering data into the computer, record **ONLY** those two counts that are within 5% that you will use to generate a mean value for each plot each day. This average constitutes one replicate for the plot. Do not enter any counts that are not used (e.g., a third count not within 5% of the other two, or a count not completed because of fog) – otherwise it introduces potential for confusion in future years.

Calculate an annual mean from replicate counts of the system of plots for each species. For nests, also calculate a maximum nest number, which is calculated as the sum of maximum nest counts in each plot (and not the highest total nest count on any one replicate).

We present whole numbers of birds in population data. Whether calculating a replicate count using two counts within 5% or the annual mean of replicate counts, round your value to the nearest whole bird (round up when  $\geq .5$ , round down when  $< .5$ ).

### Literature Cited

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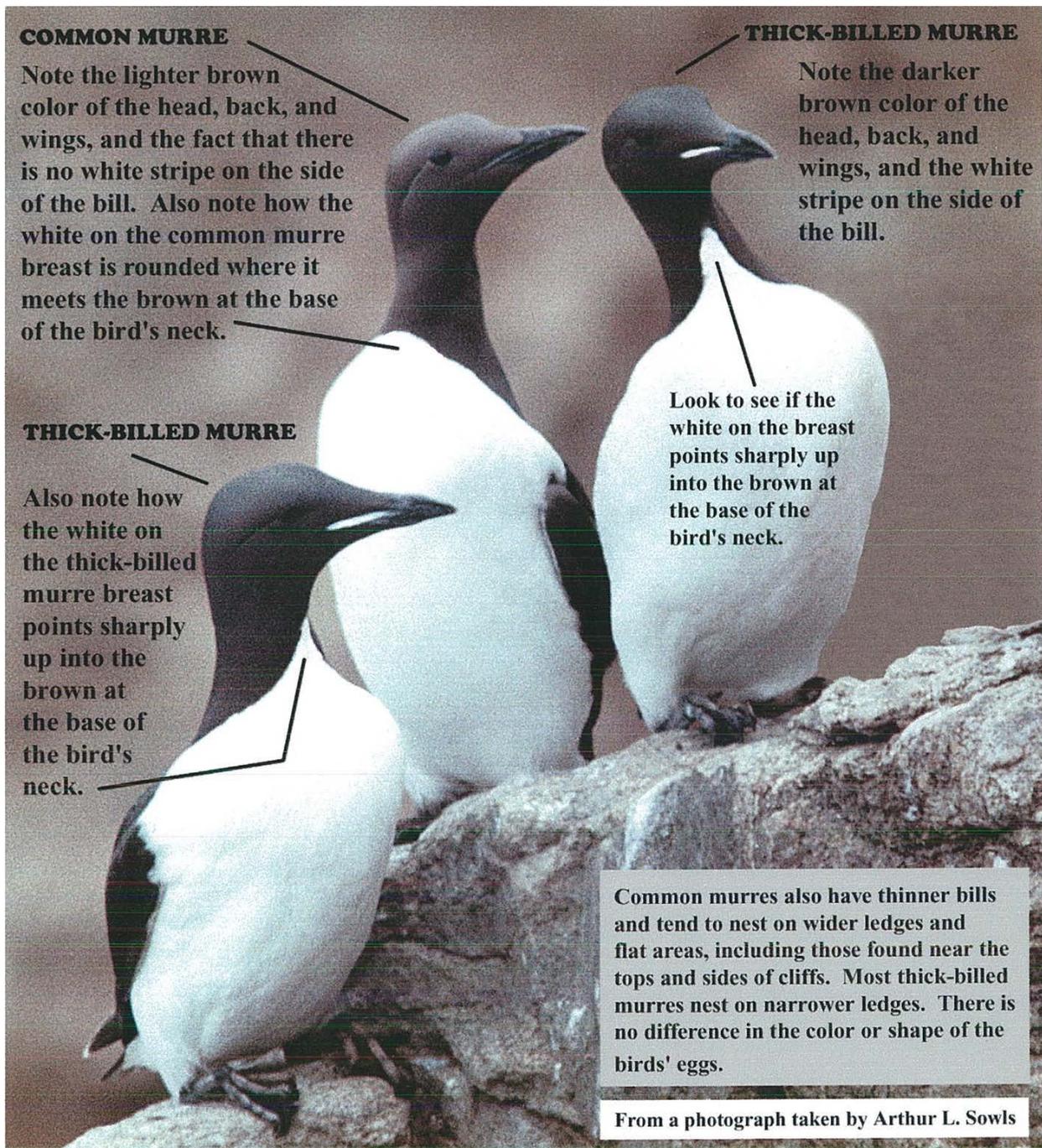


Figure 1. Clues for distinguishing between common and thick-billed murrens.

Attachment A. Aiktak Island specifics (includes Figure A1 and Table A1)

## PROCEDURE DETAILS SPECIFIC TO AIKTAK

Population counts at Aiktak are conducted every year for common and thick-billed murres. For land-based counts, murres are counted on 10 plots from fixed observation points atop the cliffs (Figure A1 and Table A1). All plots should be counted in a single day, between 1100 and 1800h. Aim for 5-7 replicates during mid-incubation to early chick-rearing, which is usually mid-July through mid-August on Aiktak. If egg laying is late (in recent years of breeding failure, murres did not lay until mid-July through early August), adjust timing of counts appropriately.

It is usually possible to distinguish between species on plots 1-3, 5, and 7-10, using a spotting scope (to date, only common murres have attended plots 1 and 2). Record common murre, thick-billed murre, and unknown murres as separate count records in the field data book. Species discrimination is not generally possible on plots 4 and 6 and counts of birds on these plots are usually lumped together.

It is most efficient on Aiktak to separate plots and have each person visit and count half the plots simultaneously (with a crew of two, each person counts 5 plots). That way, it is easier to get a full count of all plots completed before the ever-threatening fog rolls in. It is not necessary for the same person to count the same plots for all replicates (feel free to switch it up for variety). In May or June before the first count, visit all plot observations points together with plot photos and descriptions to ensure that each person is familiar with the plot boundaries. Note that many population plots are also productivity plots (see Ledgenester Productivity Protocol) but some are viewed from different observation points when monitoring productivity versus populations.

High plots (e.g., plots B and C) are more susceptible to fog so it may be helpful to count those plots first on days when visibility is questionable. It is extremely frustrating to get most of your count completed but be unable to complete your last plot because the fog rolled in (it can happen QUICKLY!).

When possible, murres are also counted from the water as part of general circumnavigation surveys – see Circumnavigation Protocol for details. It will probably be necessary to lump all murres together, as it is usually difficult to distinguish between species during boat-based surveys.

### ***Specific Requirements for Aiktak***

Dates: *May or June:* Familiarize crew with plots and observation points.

*Mid-July to mid-August:* Conduct 5-7 replicate counts of all plots.

Optimal sample size: 5-7 replicate counts of all plots.

Time of day: 1100-1800h.

Weather: Winds less than 25 knots, good visibility (no fog!).

Equipment needed: Binoculars, spotting scope, tripod, tally counters, Rite-in-the-Rain® notebook, two pencils, plot photos (laminated or with clear plastic photo protectors with tops taped closed).

Equipment suggested: Crazy creek chair, lens cleaning cloths.

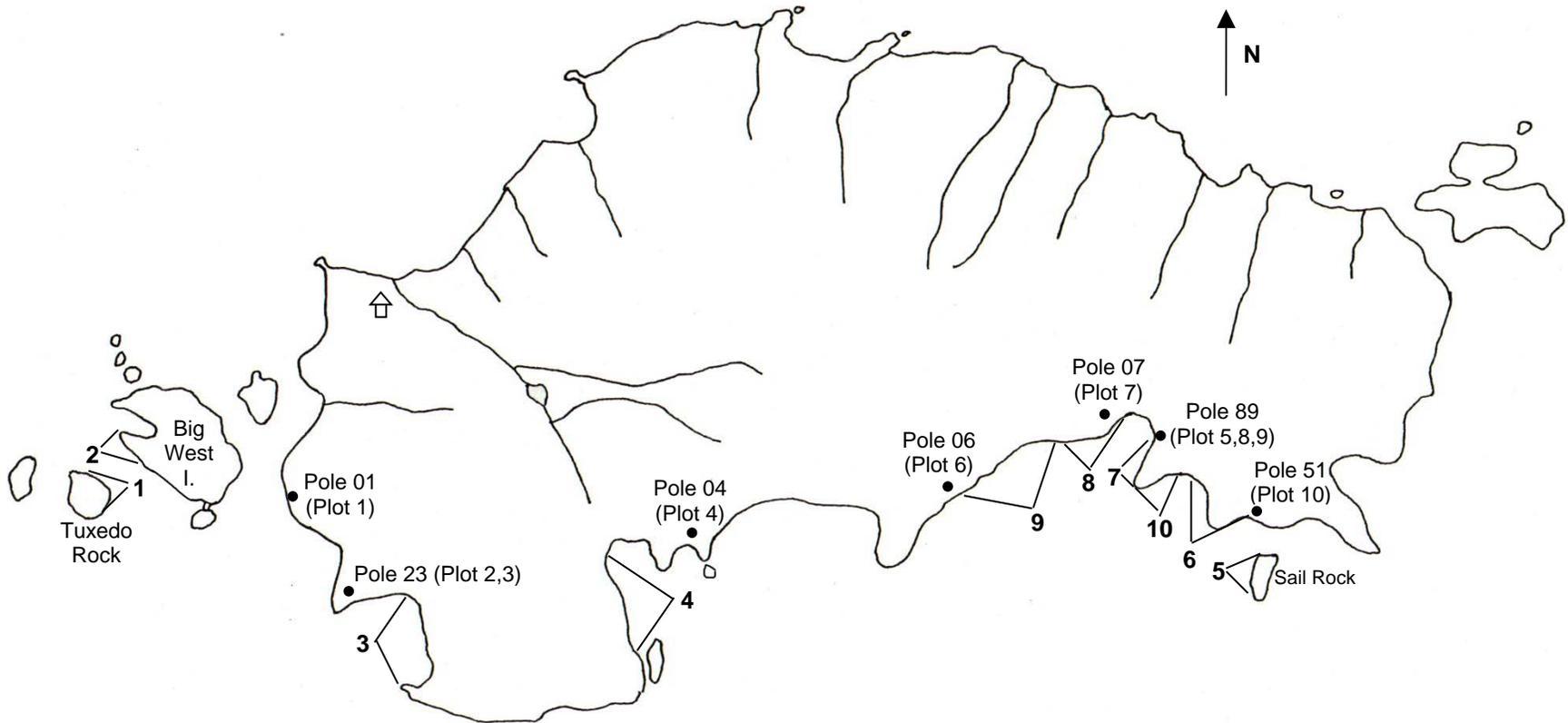


Figure A1. Locations of murre population plots at Aiktak Island. Numbers indicate population plots, dots indicate observation points.

Table A1. Descriptions of murre population plots at Aiktak Island.

Plot	Obs. Point	Description
1	Pole 01	On the east side of Tuxedo Rock, a small island just beyond Big West Island. Population plot is counted from pole 01 (note: productivity on plot 1 is done from pole 48, on Big West Island). To date, only common murrens have nested here.
2	Pole 23	A small rocky peninsula jutting west off Big West Island. Population plot is counted from a large yellow lichen-encrusted rock just northwest of pole 23 (note: productivity on plot 2 is done from pole 48, on Big West Island). To date, only common murrens have nested here.
3	Pole 23	The southern cliff of the Southwest Bight, including both the large cliff-face and a smaller peninsula jutting out to the west. Usually a mix of thick-billed and common murrens nest here. Plot best viewed during the afternoon.
4	Pole 04	Cave and adjacent cliff face at the southeast tip of the east-facing side of Petrel Valley Cove. The cave is a horizontal slot opposite the seastack; most birds are in deep shadow. Species discrimination is not possible from land.
5	Pole 89	Triangular offshore rock at the southeast tip of the island, called Sail Rock. Usually a mix of thick-billed and common murrens. Population is counted from about 2m southeast of pole 89 (note: productivity on plot 5 is done about 3m south of pole 51). Caution should be used due to eroding soil and overhanging vegetation around both areas.
6	Pole 06	Cliff face extending eastward from the peninsula of plots 7/10, to just west of Sail Rock. Usually includes both thick-billed and common murrens, but species discrimination is not possible. Observation point is near the highest point of the island and often enshrouded in fog.
7	Pole 07	Entire west face of small peninsula west of plot 6. Usually a mix of thick-billed common murrens.
8	Pole 89	Top portion of cliff face viewed look back at southern cliffs from east end of island, east of plot 9. Usually a mix of thick-billed and common murrens.
9	Pole 89	Cliff face abutting plot 8 to the west. Usually a mix of thick-billed and common murrens.
10	Pole 51	East face of peninsula containing plot 7. Usually a mix of thick-billed and common murrens.

Attachment B. Buldir Island specifics (includes Figures B1-6 and Tables B1-2)

## PROCEDURE DETAILS SPECIFIC TO BULDIR

Population counts at Buldir are conducted every two years. Species counted are northern fulmars, pelagic and red-faced cormorants (and nests), black-legged and red-legged kittiwakes (and nests), and common and thick-billed murres. If kittiwake nests are abandoned, make a judgment call as to species: red-legged kittiwake nests tend to be smaller, are often under ledges, and are more likely present in areas of higher red-legged kittiwake abundance. Note that kittiwakes are not counted on all plots (Tables B1-2).

Counts occur on 32 population plots, which are located in two distinct areas: Kittiwake Lane (15 plots) and Spike Camp (17 plots; Figures B1-3 and Tables B1-2). Plots at Kittiwake Lane are counted from the beach, plots at Spike Camp are counted from both the beach and the cliff tops. All plots can be counted using binoculars.

The count window at Buldir (mid-incubation to early chick-rearing) is typically from 25 June until 25 July. Use timing information from productivity plots to adjust if necessary in early or late years. Aim for five replicates. All counts should be conducted between 1100 and 1800h. A crew of four is ideal although counts can be conducted with three. You will probably not be able to survey all plots in both areas on the same day, but try to count the areas on consecutive days, in order to reduce temporal variability (i.e., count Kittiwake Lane plots on one day and Spike Camp plots the next). You must count all plots within one geographic areas on the same day (i.e., don't count half the plots at Kittiwake Lane one day and half the next. The sample unit (each replicate) is a single count of birds or nests on all plots (ideally counted within a day of each other).

Ideally these counts will take a total of 10 consecutive days (five complete replicates), alternating KWL with Spike Camp counts, but weather and other tasks will likely prevent this from being possible. Try to stick to the alternating schedule whenever possible but it may be advantageous to return to a site if weather conditions favor the plots you counted on the previous day. For example, if you just counted KWL but awoke to strong south winds the following morning, you can count KWL again since that area is more likely to be sheltered whereas a count at Spike may not be possible.

Suggested division of labor: Each crew member will have a set of plots he/she will count throughout the population census period. Try to split the workload as evenly as possible, taking into account plot size and density and hiking time to plots. One suggestion for splitting the workload between four crew members is as follows:

<u>Spike Camp</u>	<u>Kittiwake Lane</u>
Person 1: 8-14, B	Person 1: 1-2
Person 2: 1-4, A	Person 2: 3-4
Person 3: 5-6	Person 3: 5-7
Person 4: 7, C	Person 4: 8-15

Note, the above breakdown is just a suggestion and may have to be adjusted based on individual experience and ability. Note also that "Person 1" does not have to be the same individual at both Spike Camp and KWL.

In addition to regular population counts, attempt to count birds on seven plots on Middle Rock (Figure B2). Count just once every summer, as soon as possible after the first week of July and no later than 25 July. Middle Rock counts are done from a skiff so a good boating day is needed. If there is no skiff at camp, you may be able to conduct a count using a skiff on the Tiglax during resupply or another visit if time and weather allows. Ask ahead about that possibility as the ship's visit approaches (don't wait until the day before!). Middle Rock counts are a low priority compared to the main ledgenester population counts so don't stress if you aren't able to get it done.

## DESCRIPTION OF BULDIR STUDY AREA

*Kittiwake Lane (KWL) plots:* To get to KWL population plots, hike east from Main Camp along the north beach toward East Cape (if a skiff is available, it is also possible to travel by boat). This is a ninety minute to two hour hike over boulders and loose cobbles. The plot numbering begins at the east end with plot 1 and continues to the west.

*Spike Camp plots:* To reach the population plots at Spike Camp, hike southeast from Main Camp along the trail to South Marsh. The trail will split with the right spur heading toward South Marsh and the left trail continuing toward and crossing Tattler Creek. Follow this left trail across the eastern end of North Marsh and head up through Glissade Valley, through the pass between Owl Knob and Buldir Eccentric and then down into Gentle Valley and The Dip. When approaching the southeastern coast, you will come to a three way junction in the trail. Plots 8-13 lie to the north (left; Figure B3) and are viewed from above. The remaining cliff-top plot (14) and access to the beach are south (right) of this junction (Figure B3). To get to the beach plots, follow the trail past the cabin, hike up and over Peregrine Point and descend on the west side. You will see a large boulder about  $\frac{3}{4}$  of the way up the hill on your right as you near Peregrine Point. There is a length of flagged rebar that indicates where you should begin heading up the hill. Work your way up to the boulder, being cautious of auklet and puffin burrows, then cross the gully to reach the ridge of Peregrine Point (Figure B4). Once over the ridge, descend the slope towards a slide just above the beach. Follow the left side of the slide where you will find a yellow rope attached to an anchor (Figure B5). When you reach the rope, descend to the beach on the exposed rock face (Figure B6). Once on the beach, head north where the population plots begin just past Peregrine Point. Consult the most recent population plot photos (available in the "Photos/Maps: Pop Counts" binder as well as on the camp laptop) in addition to any markings on the cliff face to determine the boundaries of each plot. These spray-painted plot boundary markings can wear off or become obscured so re-paint them prior to the counting period.

Safety note: The cliffs of Buldir are comprised of rocks embedded in dirt and are very susceptible to erosion and rockfalls. It is very important to always wear a hard hat and stay alert whenever walking to/from or working at KWL or on the beach below Spike Camp. It is tempting to listen to music to make the walk to KWL seem to pass more quickly but wearing earphones is not recommended as you will often hear rockfalls and slides before you see them. When walking between Main Camp and KWL, be sure to pause at the leading edge of any slides and check for activity before continuing. While counting do not sit at the mouth of any gully as rockfalls can occur without warning. The cliffs become more active following heavy rains so be flexible in your scheduling of work at KWL to avoid these times. The hazards of working under cliffs can be unpredictable but by remaining aware, using common sense and minimizing your time in high-risk areas you will drastically reduce your exposure to any danger.

### ***Specific Requirements for Buldir – main ledgenester population counts***

Dates: May or June: Familiarize crew with plots and observation points.

25 June to 25 July: Conduct 5 replicate counts of all plots.

Optimal sample size: 5 replicate counts of all plots.

Time of day: 1100-1800h.

Weather: Winds less than 25 knots, good visibility (no fog!).

Equipment needed: Binoculars, tally counters, Rite-in-the-Rain® notebook, two pencils, plot photos (laminated or with clear plastic photo protectors with tops taped closed).

Equipment suggested: Crazy Creek chair, thermos with a hot drink, lots of snacks, lens cleaning cloths, plenty of warm clothes.

***Specific Requirements for Buldir – Middle Rock count***

Dates: early July to 25 July.

Optimal sample size: 1 counts of all plots.

Time of day: 1100-1800h.

Weather: Calm winds and calm seas (winds less than 15 knots and seas less than 3 ft), clear visibility, little to no precipitation.

Equipment needed: Binoculars, tally counters, plot photos (laminated or with clear plastic photo protectors with tops taped closed), Rite-in-the-Rain<sup>®</sup> notebook, two pencils, inflatable skiff with all safety gear (don't forget to bring your satellite phone and VHF!).

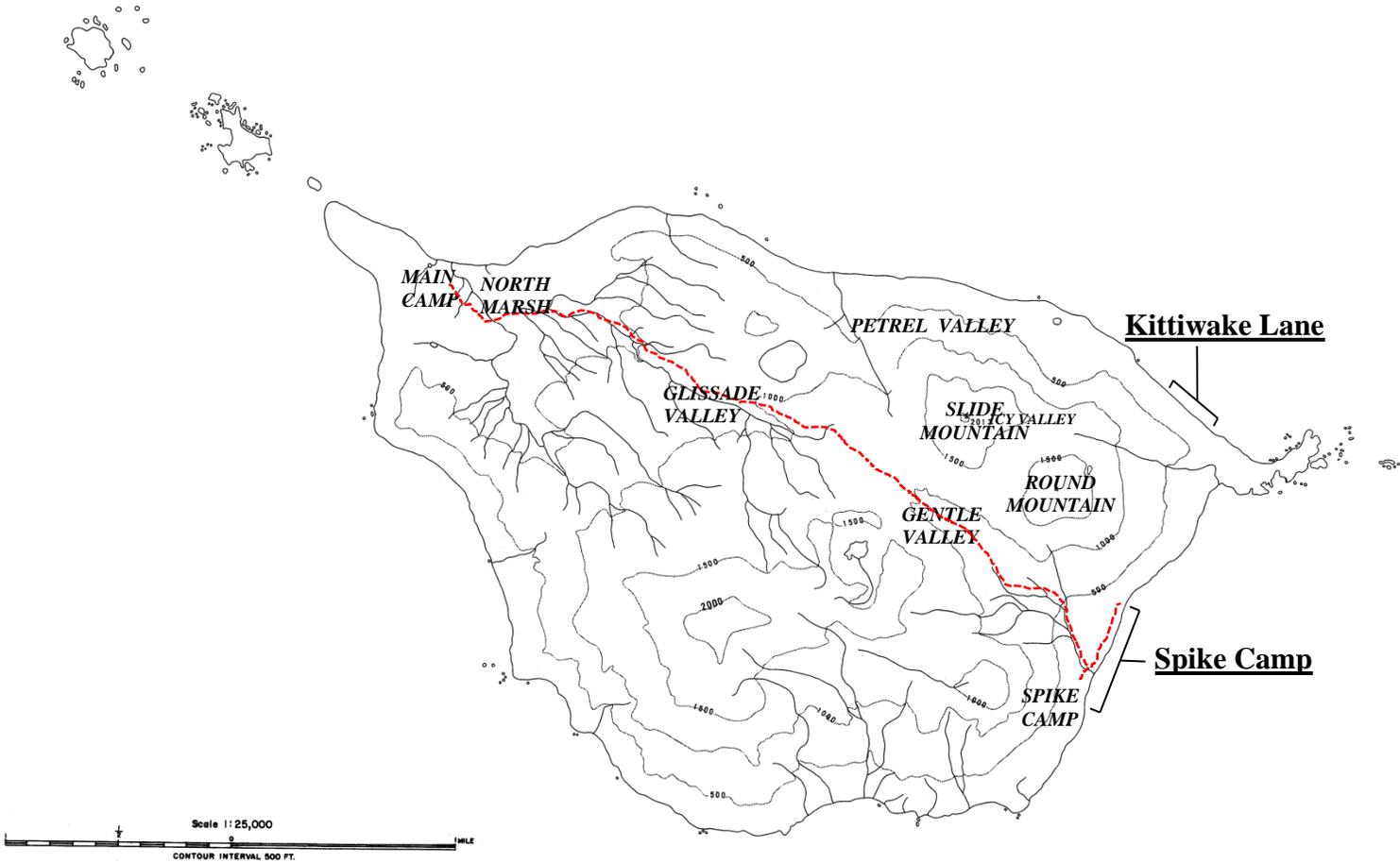


Figure B1. Locations of ledgenester population plot areas at Buldir Island. The red dashed line indicates the approximate route to Spike Camp from the main camp.

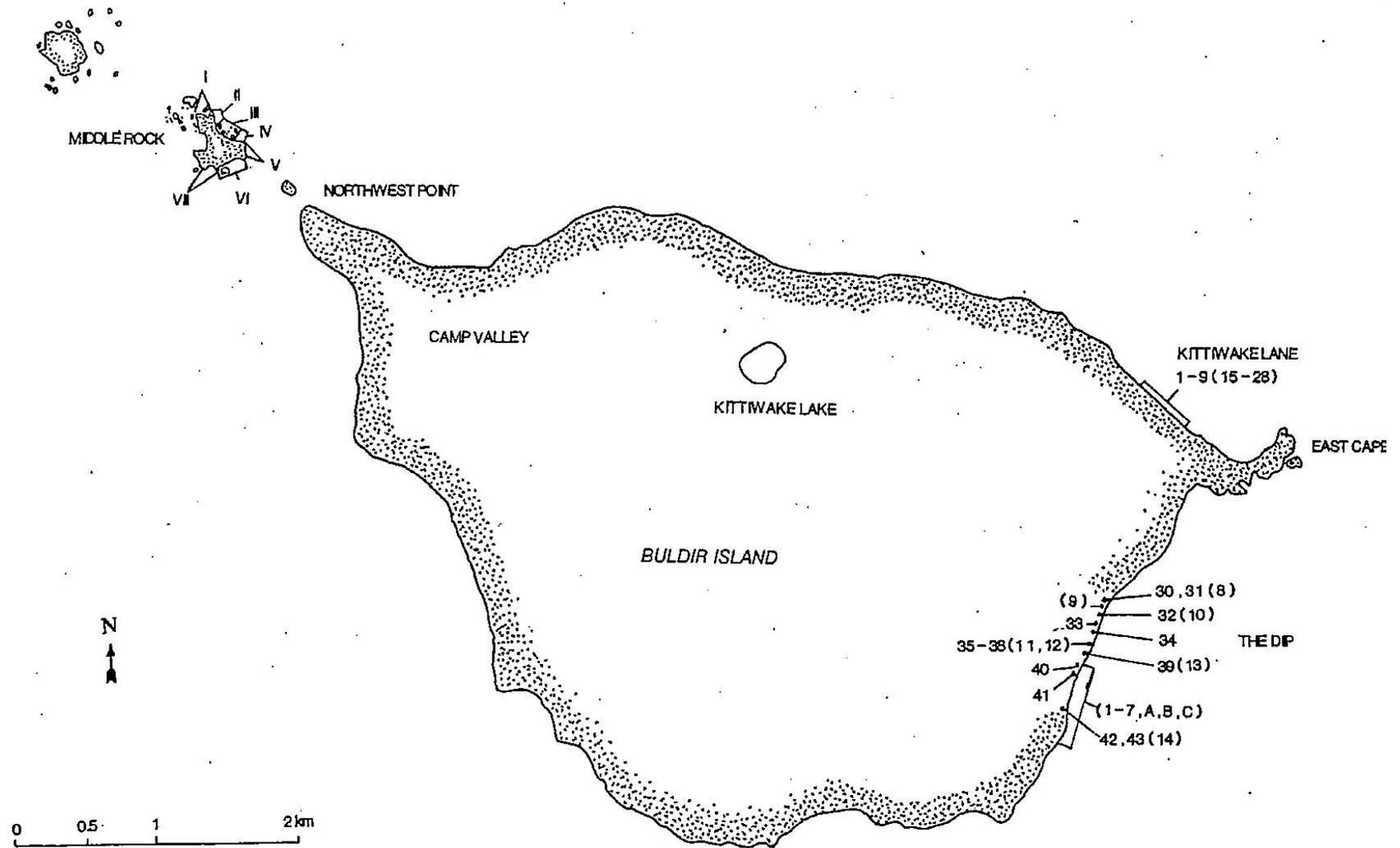


Figure B2. Locations of ledgenester population plots at Buldir Island.

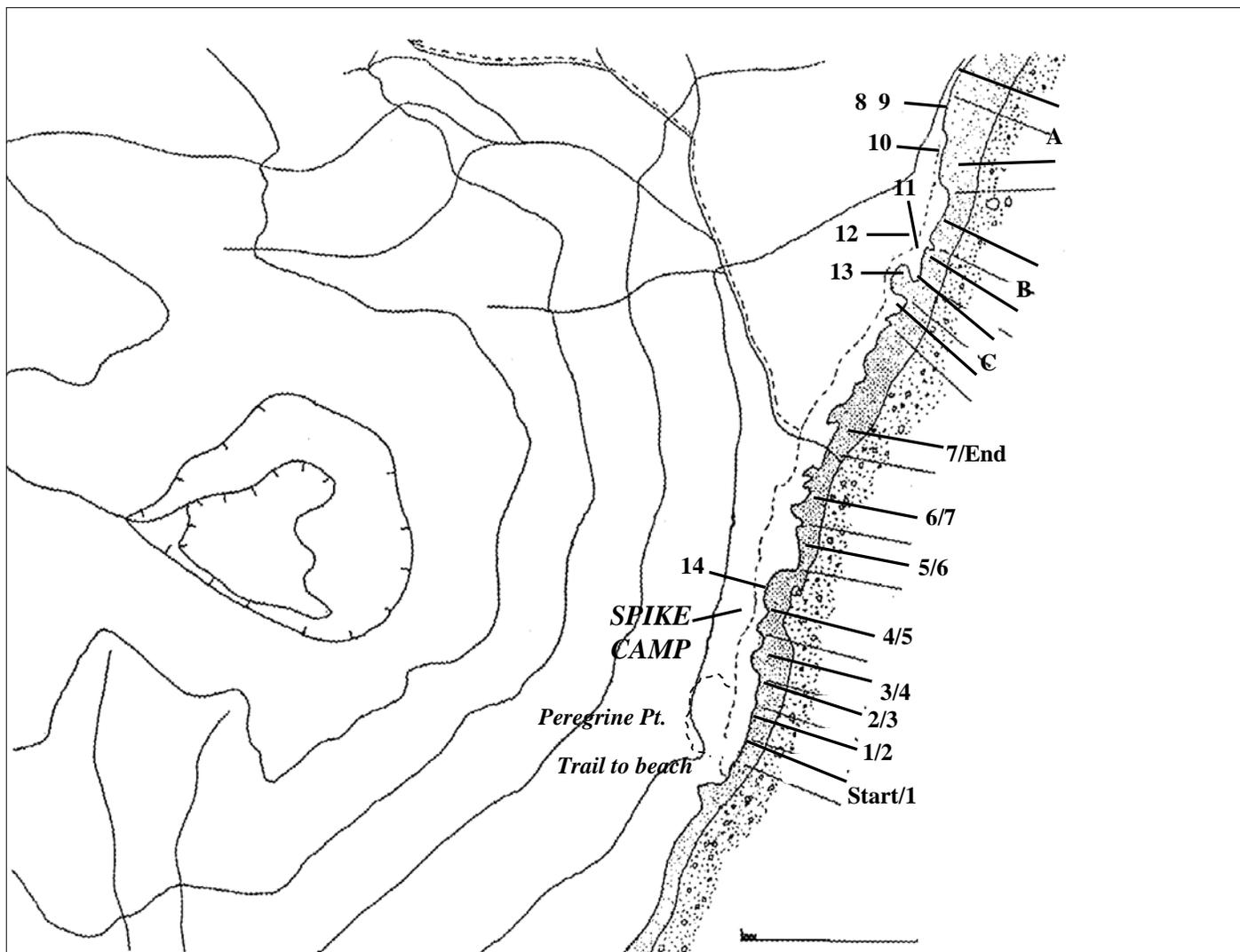


Figure B3. Locations of ledgenester population plots at Spike Camp, Buldir Island. Plots 8-14 are counted from the cliffs above while the rest (plots 1-7) are counted from the beach.



Figure B4. Access to beach plots from Spike Camp, Buldir Island. View looking west from trail from the cabin.



Figure B5. Access to beach plots from Spike Camp, Buldir Island. View looking down towards beach from the top of Peregrine Point. Note the two boulders on the beach.

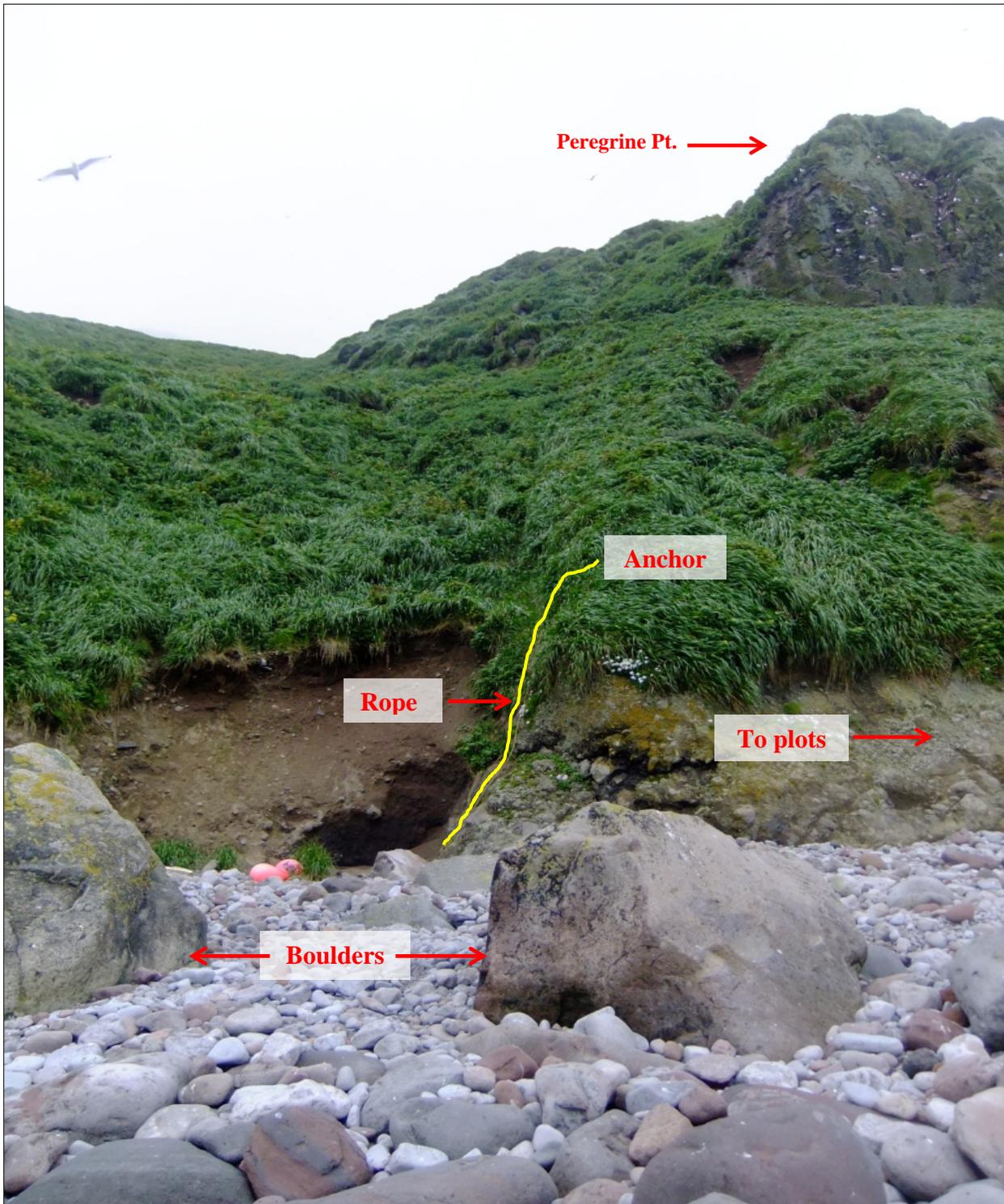


Figure B6. Access to beach plots from Spike Camp, Buldir Island. View from beach at location of rope. Always check the stability of the anchor and condition of the rope before descending.

Table B1. Population counts conducted at Kittiwake Lane (KWL) plots, Buldir Island. An x indicates plots in which adults are counted; underlines indicate those species for which nests are also counted.

Plot	NOFU	RFCO	PECO	BLKI	RLKI	COMU	TBMU
1 (15)	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
2 (16)	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
3 (17)	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
4 (18)	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
5 (19)	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
6 (20)	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
7 (21)	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
8 (22)	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
9 (23)	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
10 (24)	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
11 (25)	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
12 (26)	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
13 (27)	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
14 (28)	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
15 (29)	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x

Table B2. Population counts conducted at Spike Camp plots, Buldir Island. An x indicates plots in which adults are counted; underlines indicate those species for which nests are also counted.

Plot	NOFU	RFCO	PECO	BLKI	RLKI	COMU	TBMU
1	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
2	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
3	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
4	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
5	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
6	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
7	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	x	x
8	<u>x</u>	<u>x</u>	<u>x</u>			x	x
9	<u>x</u>	<u>x</u>	<u>x</u>			x	x
10	<u>x</u>	<u>x</u>	<u>x</u>			x	x
11	<u>x</u>	<u>x</u>	<u>x</u>			x	x
12	<u>x</u>	<u>x</u>	<u>x</u>			x	x
13	<u>x</u>	<u>x</u>	<u>x</u>			x	x
14	<u>x</u>	<u>x</u>	<u>x</u>			x	x
A	<u>x</u>	<u>x</u>	<u>x</u>		<u>x</u>	x	x
B	<u>x</u>	<u>x</u>	<u>x</u>		<u>x</u>	x	x
C	<u>x</u>	<u>x</u>	<u>x</u>		<u>x</u>	x	x

## Attachment C. Cape Lisburne specifics (includes Figures C1-15 and Table C1)

**PROCEDURE DETAILS SPECIFIC TO CAPE LISBURNE**

Land-based population counts at Cape Lisburne are conducted every year for black-legged kittiwakes, kittiwake nests, and common and thick-billed murres. Murre species have traditionally been combined during land-based counts but it probably would be possible to separate the species under good viewing conditions. The count window at Cape Lisburne (mid-incubation to mid-chick-rearing) typically is from mid- to late July until early to mid-August (until the first murre chick jumps). If breeding chronology is late, adjust timing of counts appropriately.

**Land-based counts:**

Land-based population plots are located along First Beach (Figure C1). To get to First Beach, drive east past the runway and turn right just before the western end of the runway (route marked in red on Figure C2). Drive down the steep road between the wind sock and the gravel storage area to get to the beach. Once on the beach, drive as near to the water's edge as is safe (yellow "x" on Figure C2) and look westward along First Beach through binoculars to check for bears on the beach (this also is a good place to ensure that the surf is not too high to safely proceed down the beach to the plots). Be sure to look behind you (eastward) to make sure there are no bears on the runway or on the seawall heading your way; and scan the hills above the beach for bears that might be heading down.

If there is a bear (or bears) on the beach, do not proceed to the plots. Delay the count until the bear(s) clears the area. Although there are two places (chutes) where a bear can potentially climb up from the beach, it is best not to assume that they will do so. It is not a good idea to trap a bear at the western end of the beach. If, after you get down to the plots, a bear enters onto the beach between you and the way back to the buildings, proceed slowly towards the bear on your ATVs. Spread out and stand up on your ATV to make as large a picture as possible and make a lot of noise. Once a bear sees you, it usually will head back up the beach or climb the hills or chutes to allow you to pass. Make sure that your bear defensive measures (spray, flash/bangs, gun) are readily accessible and give the bear ample time to clear the area before proceeding. **Be alert for bears any time you are outside of a building during your stay at Cape Lisburne.** Also, periodically scan for bears during counts. Don't get so absorbed in counting that you forget about situational awareness.

For land-based counts, black-legged kittiwakes, kittiwake nests, and murres are counted on 10 plots on First Beach (Figure C1-15, Table C1). Kittiwake nests are counted only during the first three or four counts. Murre species have been combined for most counts in the past. It should be possible to separate common and thick-billed murres if the visibility is good. Ten-power binoculars may be necessary for this.

All plots are counted from the beach, using 7-power binoculars, usually while the observer is seated on an ATV (Figure C3). Observation points are not marked but it is possible to tell where to park based on the angle from which the plot photo was taken. Tire tracks also can be used within a season to ensure that counts are made from a similar spot on the beach (assuming high surf doesn't wash the tracks away between visits).

At land plots 2 and 8, it is necessary to count from two different locations. The main part of plot 2 is counted from one location and the western end is counted from a different location further along the beach to the west (Figure C7). The eastern section of plot 8 also is counted from this (plot 2) western location, before moving a bit farther west so the entirety of the cave portion of plot 8 can be seen. Ensure that birds are not double-counted on these plots! It can be a good idea to break some of the larger plots into sub-plots to make counting easier (e. g., plot 2, Figure C8).

In recent years, beach erosion, due to more intense storms, has made it harder to count from some locations used in the past. It will need to be decided each year whether the current beach configuration will allow counts to be made that are comparable to past counts. A few test counts may be necessary to determine this.

**Boat-based counts:**

For boat-based counts, black-legged kittiwakes, kittiwake nests, and/or murres (species combined) are counted from a skiff on plots along the western and northern coasts of Cape Lisburne (Figure C1). Seventy-five plots established in 1976 comprise all of the coast from just south of Kay Creek

to the eastern end of First Beach. Plot 76 apparently was added in 1977. Complete colony counts of the original 75 plots were conducted in 1976 and 1977. Since then, a subset of 10 plots has been counted (Plots 11, 12, 25, 26, 30, 32, 65, 66, 70 and 72). Murres are counted by 10s or 100s--depending on the size of the plot, the density of birds on the plot, and viewing conditions.

The skiff is launched from the beach just east of the eastern end of the runway (yellow square on Figure C2). It is best to proceed to the south end of the count area (plot 1 or plot 11, depending on whether it is a full or partial count) and count your way back towards First Beach. Opposing currents at the cape can result in rough seas and it is advisable to keep a close eye on conditions there during the counts. Tidal ranges are small so the skiff can be beached and pulled up without much concern for it drifting away on the incoming tide.

Never boat in questionable weather, and abort any counts if conditions deteriorate during your survey. Always submit a float plan with the appropriate USFWS office and bring your VHF radio, satellite telephone, and all boat safety gear (as well as bear safety gear in case it's necessary to stop at a beach along the way). Part of the process of filing a boat plan at Cape Lisburne is to inform the Station Chief of your plans. Don't forget to close out your float plan after you return to the site (both with the USFWS office and site personnel).

### ***Specific Requirements for Cape Lisburne:***

Dates: Mid- to late July until early to mid-August.

Optimal sample size: A minimum of 5-7 replicate counts of all land-based plots. Black-legged kittiwake nests are counted only during the first 3 or 4 counts. Maximum kittiwake nest counts are used. One boat-based count is conducted in years when the boat is deployed.

Time of day: Land-based Counts: 1300-1900h, Boat-Based Counts: 1100-1900h.

Weather: Land-based counts: Winds less than 25 knots, good visibility, Boat-based counts: Fairly calm seas and good visibility.

Equipment needed: Binoculars, Rite-in-the-Rain<sup>®</sup> notebook, two pencils, plot photos (laminated or with clear plastic photo protectors with tops taped closed), ultra-fine tipped Sharpies for writing on photos, helmet for working near the base of the cliffs (climbing helmets work best), bear defense equipment, hand-held radio, insect repellent, boat safety gear for boat counts.

Optics: 7-power binoculars for both land- and boat-based population counts. 10-power binoculars may be necessary for murre species identification during land-based counts.

Equipment suggested: Thermos of hot drink, lots of snacks, lens cleaning cloths, complete change of clothes, camera, spare batteries (for radios, camera, etc.).

Table C1. Locations of First Beach land-based plots at Cape Lisburne (in order from east to west). All coordinates are in WGS84.

Plot	Latitude (° N)	Longitude (° W)
B/A <sup>a</sup>	68° 52.71'	166° 09.72'
1	68° 52.73'	166° 09.97'
2	68° 52.75'	166° 10.26'
8	68° 52.76'	166° 10.45'
3	68° 52.77'	166° 10.57'
4/5 <sup>a</sup>	68° 52.78'	166° 10.74'
6/7 <sup>a</sup>	68° 52.79'	166° 10.80'

<sup>a</sup>Midpoint between adjoining plots.

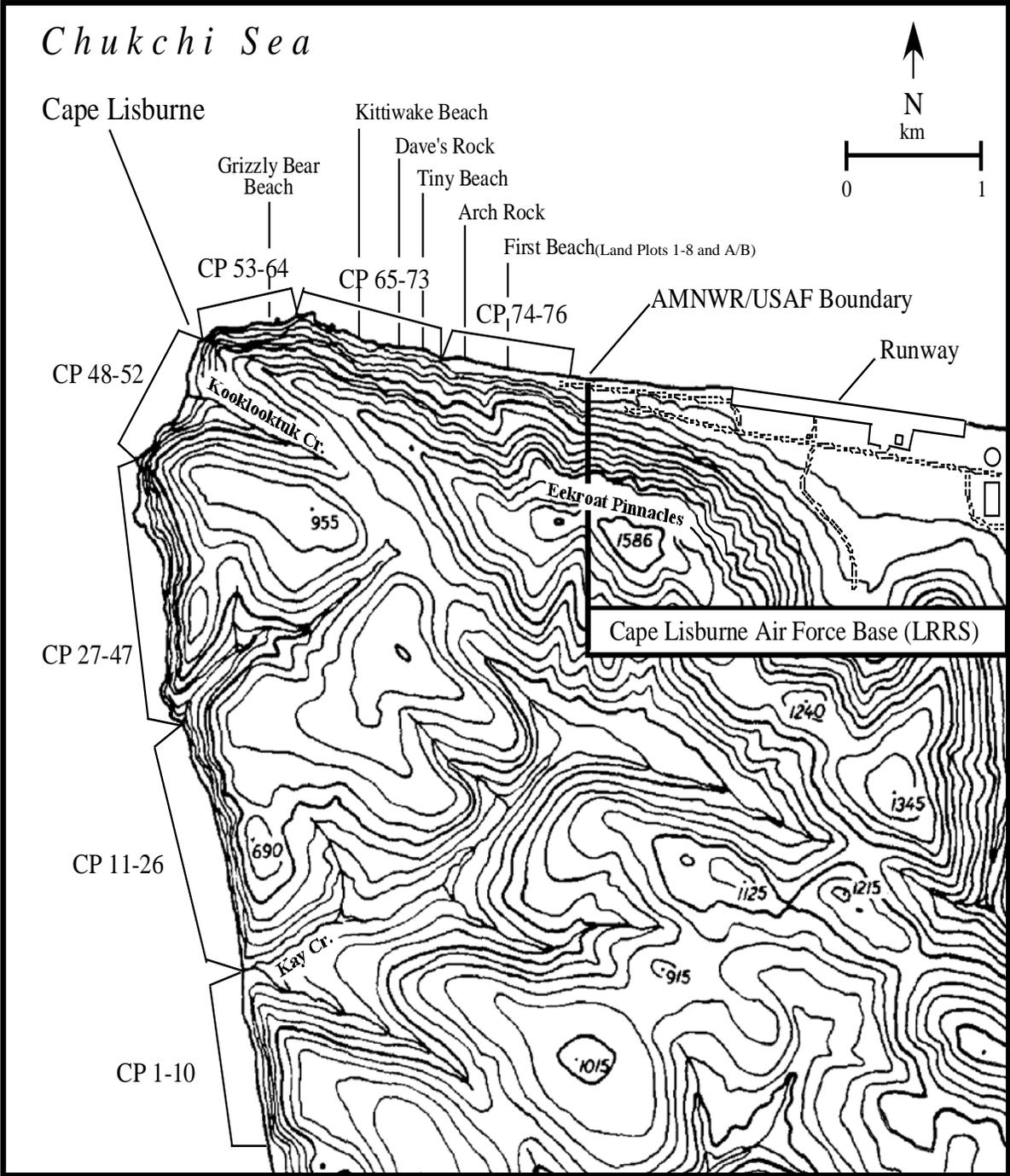


Figure C1. Map of seabird monitoring plots at Cape Lisburne, Alaska.

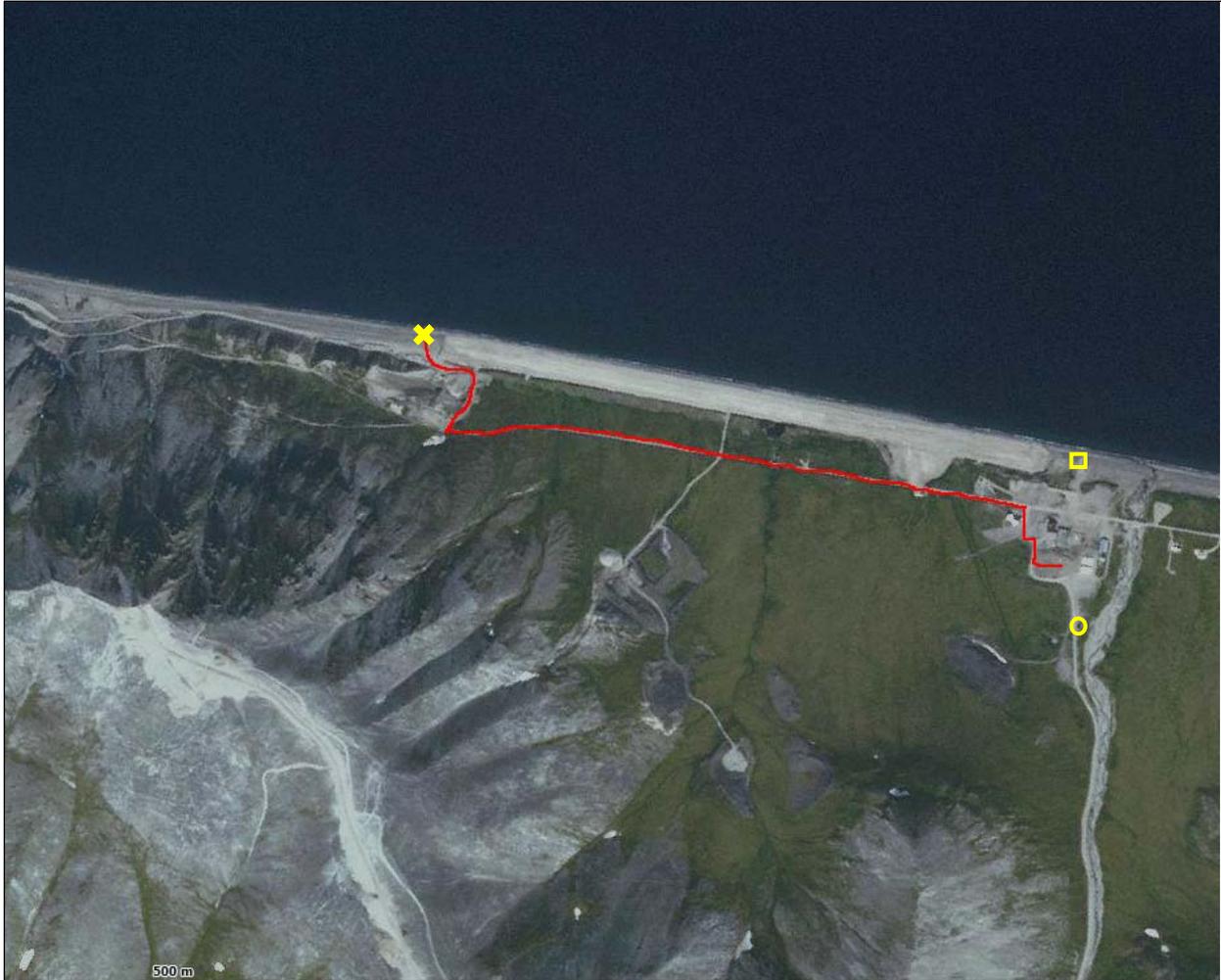


Figure C2. Route from the Cape Lisburne living quarters/shop area to First Beach at the western end of the runway (red line). Yellow "x" marks the location from which to scan for bears on the beach below the land plots before proceeding to the plot area. Yellow circle is the location of the Flight Shack storage building. Yellow square indicates the location of sea surface temperature measurement and skiff launching beach.



Figure C3. Land-based plots are counted from observation points on the beach below the cliffs. Counts are done while seated on 4-wheeler ATVs, using binoculars. It's a good idea to wear a helmet when working close under the cliffs (right). Stay alert for bears.



Figure C4. Land-based plot B at Cape Lisburne, Alaska.

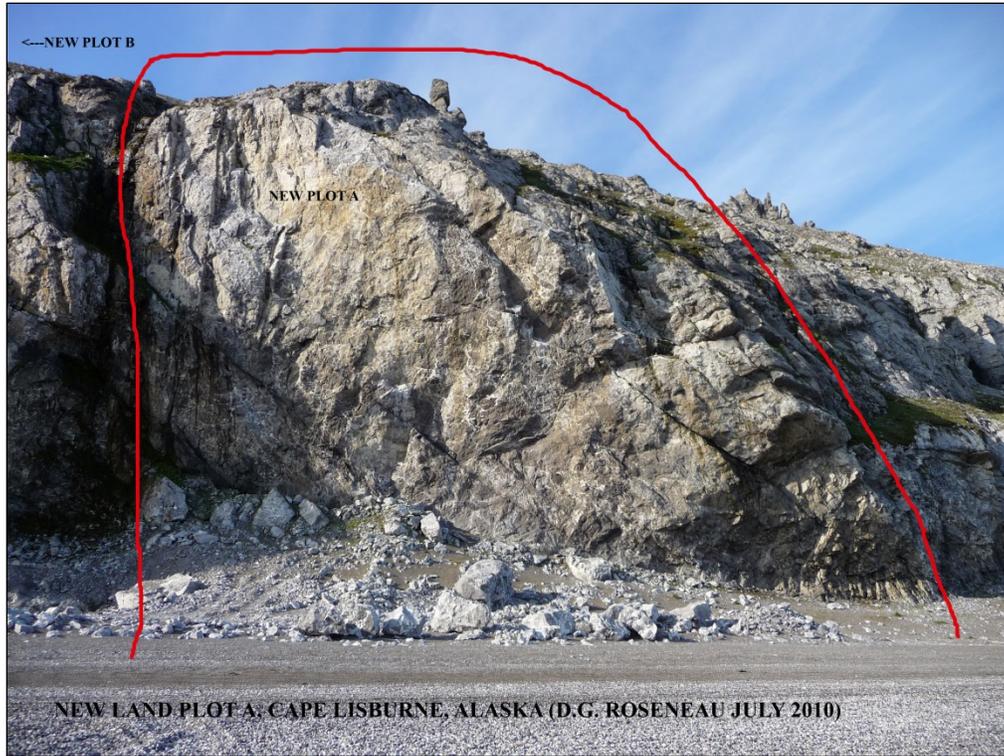


Figure C5. Land-based plot A at Cape Lisburne, Alaska.

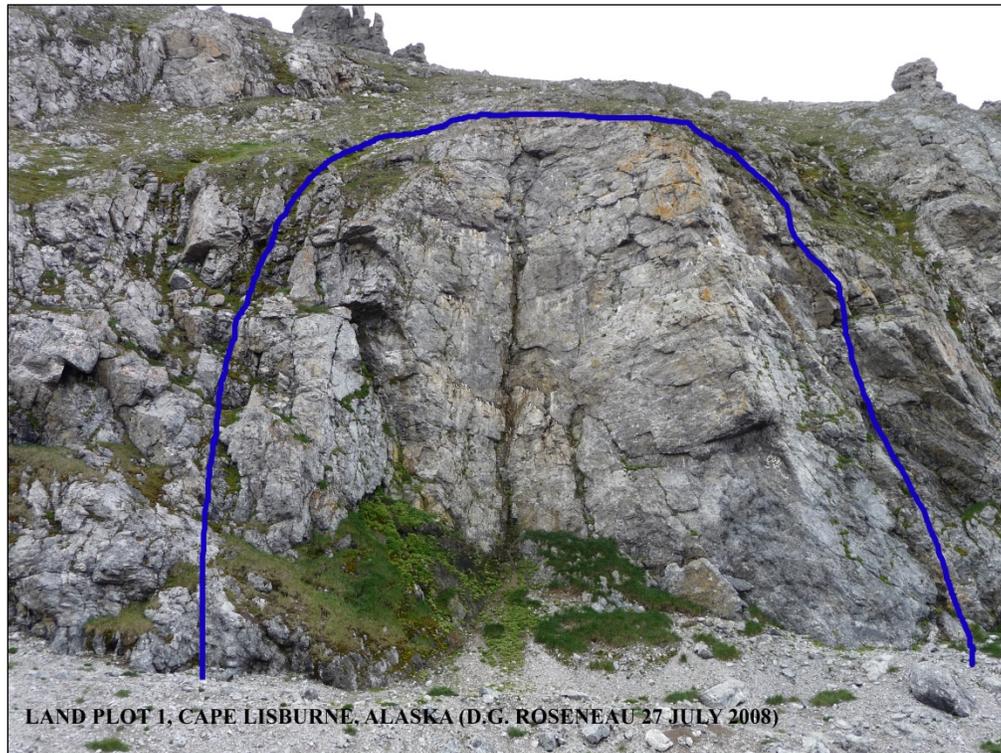


Figure C6. Land-based plot 1 at Cape Lisburne, Alaska.

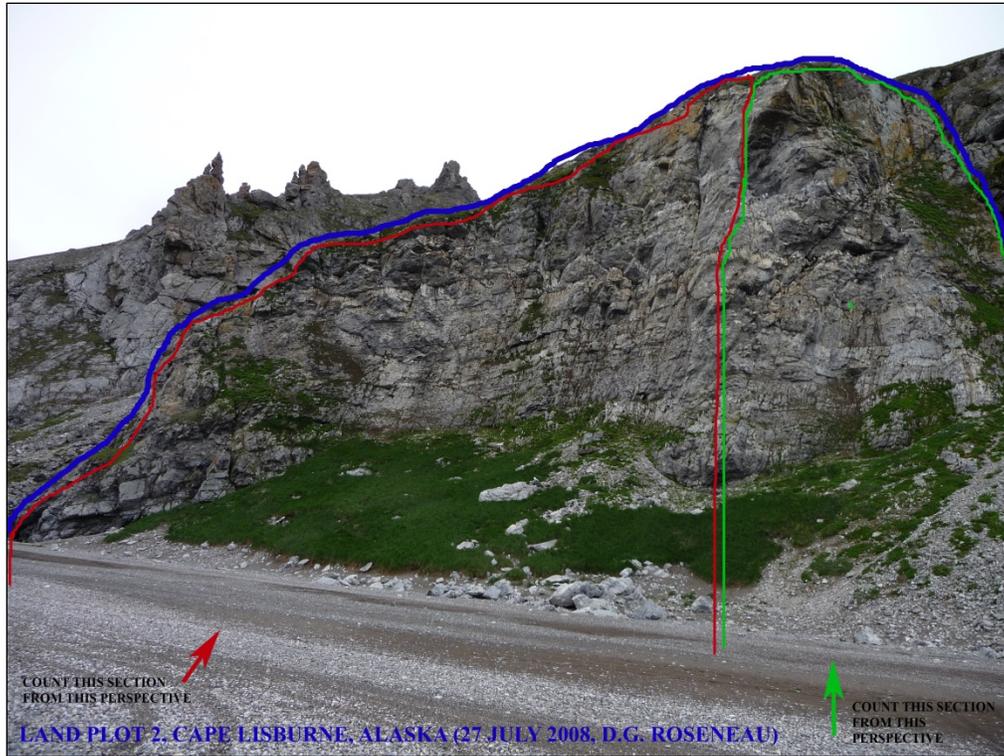


Figure C7. Land-based plot 2 at Cape Lisburne, Alaska. Note the two observation locations.

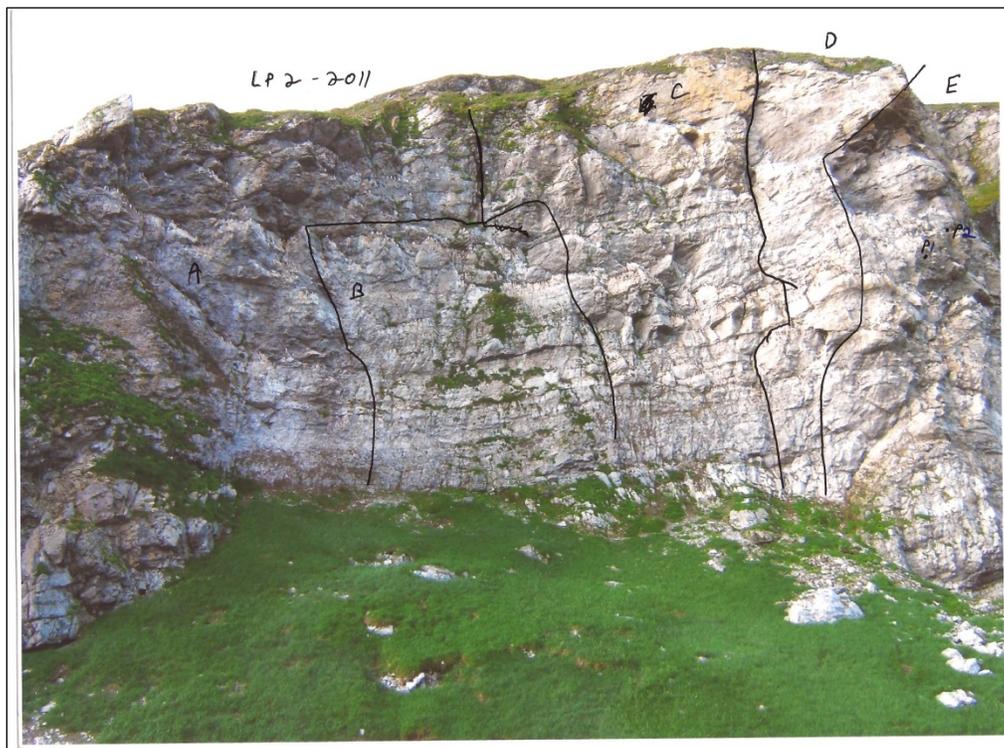


Figure C8. Example of sub-plots at land-based plot 2 at Cape Lisburne, Alaska.

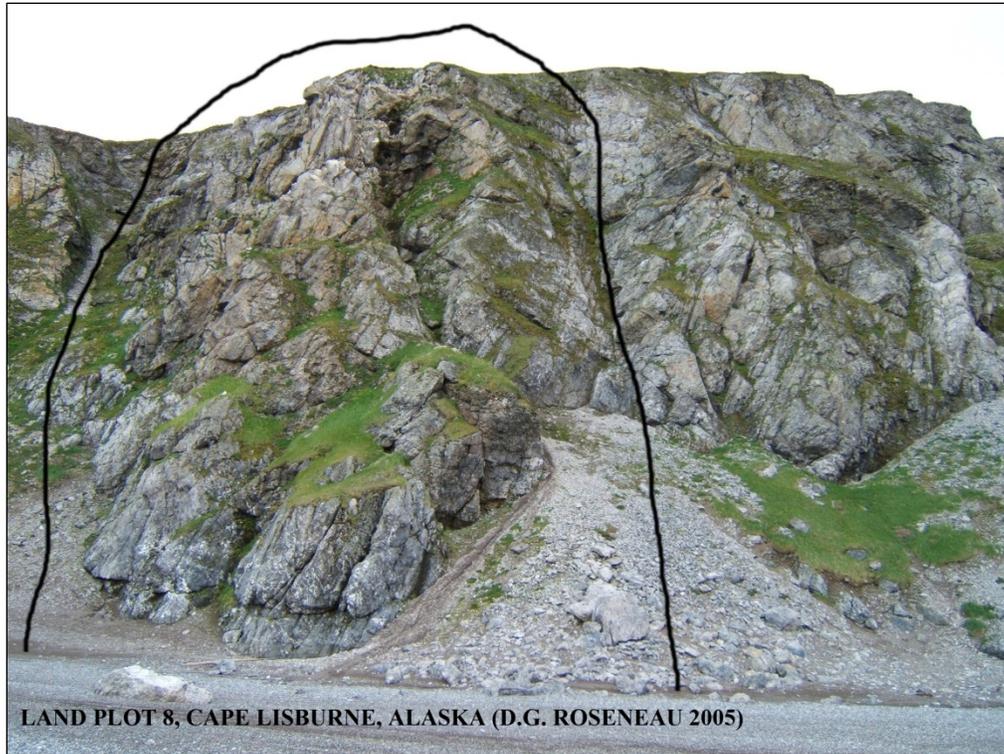


Figure C9. Land-based plot 8 at Cape Lisburne, Alaska. Counted from two observation locations.

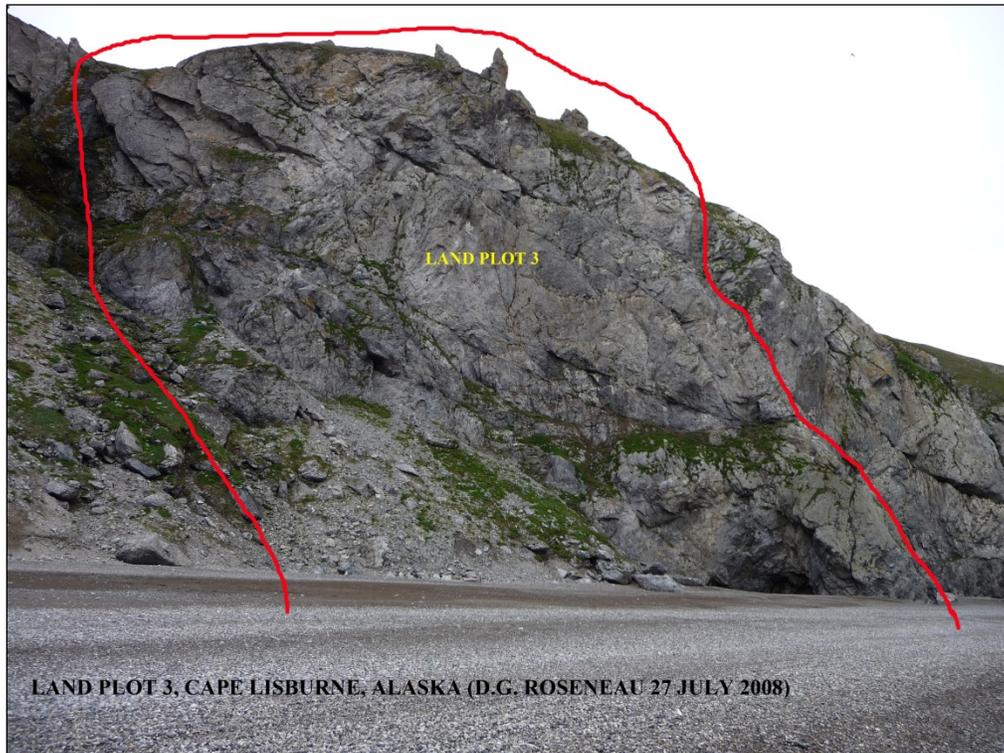


Figure C10. Land-based plot 3 at Cape Lisburne, Alaska.

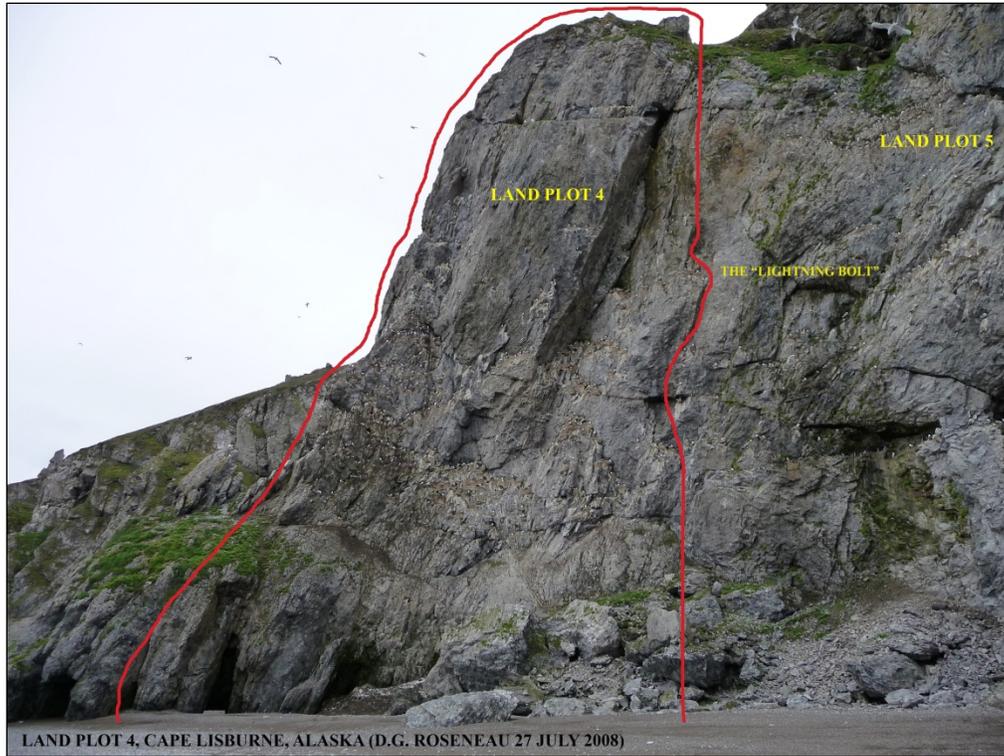


Figure C11. Land-based plot 4 at Cape Lisburne, Alaska.

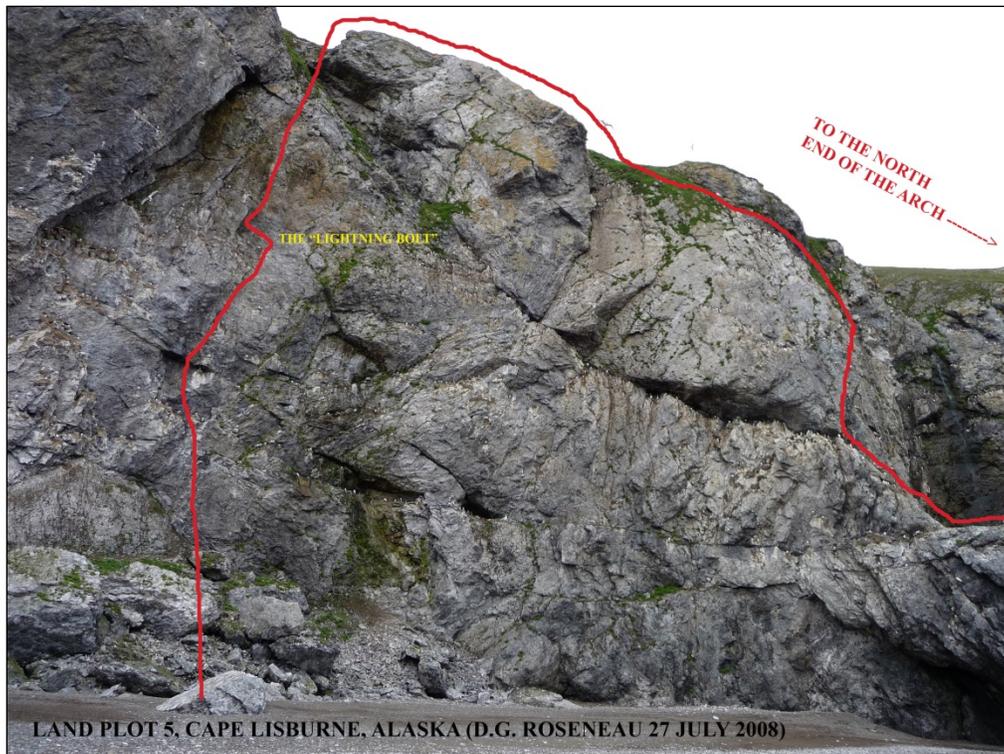


Figure C12. Land-based plot 5 at Cape Lisburne, Alaska.



Figure C13. Land-based plot 6 at Cape Lisburne, Alaska.

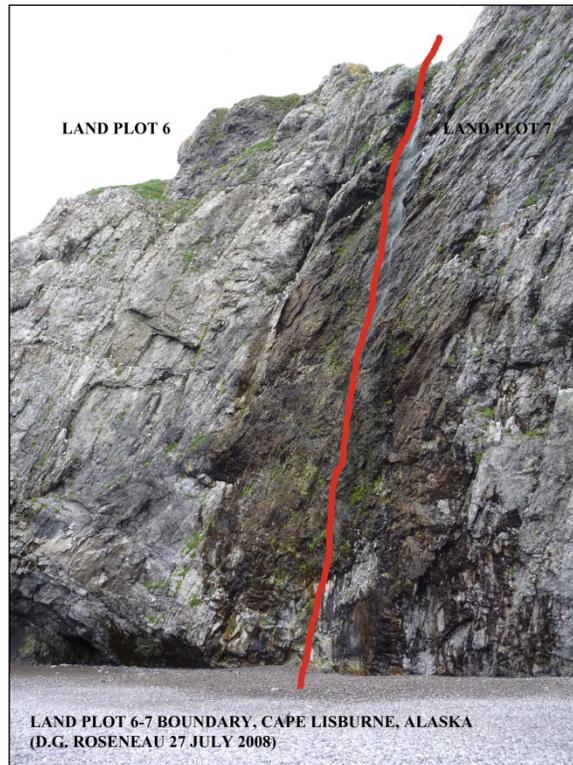


Figure C14. Boundary between land-based plots 6 and 7 at Cape Lisburne, Alaska.

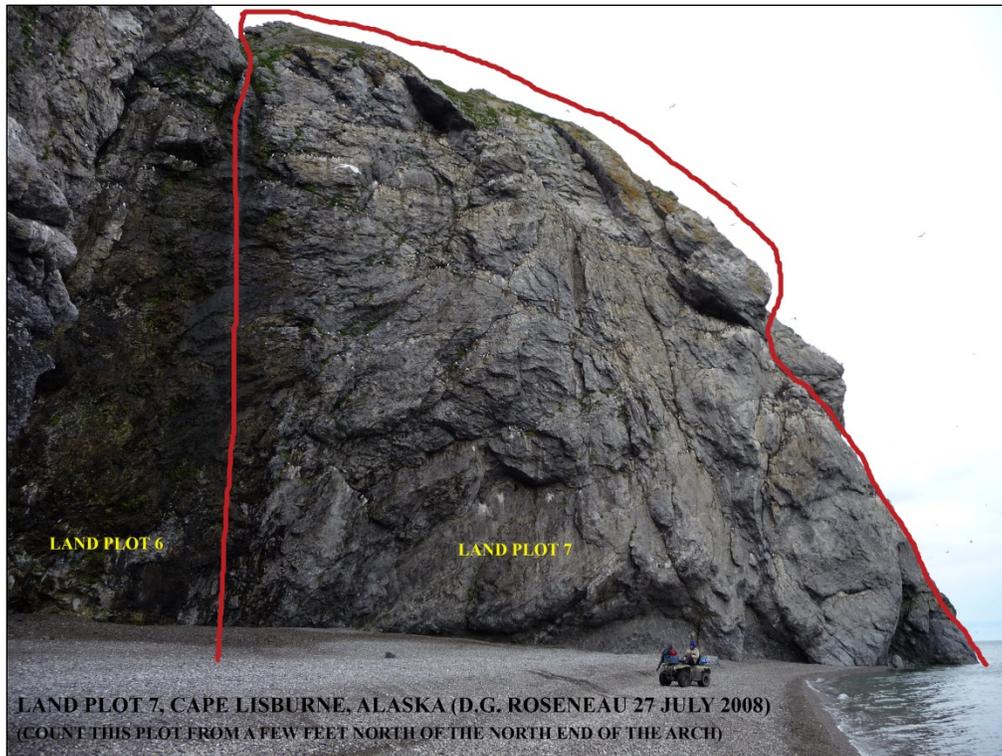


Figure C15. Land-based plot 7 at Cape Lisburne, Alaska.

Attachment D. Chowiet Island specifics (includes Figures D1-3 and Tables D1-2)

## BACKGROUND SPECIFIC TO CHOWIET

Population counts for northern fulmars, black-legged kittiwakes, and common and thick-billed murre are conducted at Chowiet every year. A total of 30 plots, viewed from 8 of the 12 ledge­nester stakes, have been delineated (Figure D1 and Tables D1-2). Plots are accessed by trail #4 (Figures D2-3).

On Chowiet, ledge­nester population plot names begin with "A", followed by the stake number, a letter indicating the bird being counted ("N" for northern fulmar, "B" for black-legged kittiwake, and "M" for either murre species), and finally a number indicating the specific plot under the aforementioned groupings (e.g. A03B02 is the second kittiwake plot delineated at stake 3). As noted above, plots have unique names for fulmars, kittiwakes and murre, even if the plot boundary is the same (e.g. murre plot A06M01 has the same boundary as kittiwake plot A06B02). However, unique names are not used to distinguish common from thick-billed murre plots; thus for murre, the plot name does not distinguish which species is counted (e.g. only common murre are counted at A03M03, but both species are counted at A03M05). For these reasons, there are 25 unique names used for 30 species counts (i.e. "plots") that occur within 24 spatial boundaries. Information on the species counted at each plot and stake are presented in Table D1. In addition to counts of adult fulmars, counts of fulmar chicks are conducted late in the season at the same plots. Although chick counts are a measure of productivity, because the counts follow the same protocol as counts of adults, they are included in the population protocol.

## PROCEDURE DETAILS SPECIFIC TO CHOWIET

Count protocol for Chowiet is based on methodology developed by Hatch (1987). Use stake coordinates (Table D2), map (Figure D1) and plot photographs (archived at AMNWR headquarters in Homer) to locate plots and to determine boundaries. Survey plots as follows:

1. Count adult birds on all plots during each of 10 replicate counts. You will probably be able to survey all plots on the same day, but if not, try to complete all counts on consecutive days, in order to reduce variability (the sample unit is a single count of birds or nests on **all plots**, ideally all counted the same day). To save some time, you can conduct population counts on the same day productivity is monitored. Five replicates are adequate for late season fulmar chick counts.
2. For **adult fulmars**, the census period is 30 days extending from 11-40 days after the first egg was observed anywhere on the island (on Chowiet, fulmars are most likely to flush and reveal eggs at locations away from the population plots). For **kittiwakes**, the census period is 50 days extending from first egg through final hatching (Hatch & Hatch 1988). Start counts as soon as possible after the first egg in a plot is seen and continue until a little after final hatching. It is better to have too many counts than not enough. If no eggs have been laid by 25 June, begin population counts and continue until ~19 July. For **murre**, the census period is 43 days extending from 20 June to 01 August (Hatch & Hatch 1989). **Fulmar chicks** are counted as late in the season as possible.
3. Make all counts between 11:00 - 18:00 hrs on days when wind velocities are below 25 knots; avoid counting during periods of poor visibility (e.g. fog or rain that coats optics).
4. At each plot, count the appropriate species (only adults unless the count is for end-of-the-season fulmar chicks) until two counts are within 5% of each other (i.e. at least two counts, more if totals are not within 5%). Record the two counts within 5% of each other in the field notebook and calculate the average of the two counts in the excel spreadsheet for population counts. This average constitutes one replicate for the plot.
5. For kittiwake plots, count both adult kittiwakes and nests (**any structure to which vegetation has been added in the current year**).

6. In the field, record data in Rite-in-the-Rain® notebooks with the fields specified in the Excel spreadsheet "CHOW\_20XX\_pop\_counts\_all\_spp". At the cabin, record data directly into the spreadsheet.
7. In addition to the regular counts, a 4<sup>th</sup> of July BLKI nest and bird count should be conducted. This count is conducted with the same methodology as other counts, but should occur within a few days of 4 July. If a regular count occurs during this period, that count also can be used for the 4<sup>th</sup> of July (i.e. make sure one of your kittiwake counts is conducted close to 4 July to avoid extra counting).

On Chowiet, it is often possible to conduct population counts on the same days as productivity monitoring, but this can make for long hours (keep in mind that population counts have a temporal limit, but productivity monitoring does not). Having one person conduct counts at Stakes 2 and 3 (and possibly 4, 6, and 7, depending on workload) while the second person conducts the other counts is recommended. Winds approaching the 25 knot limit can cause optics to shake which can make counting distant plots difficult. Plots at higher elevations and with more distant vantage points are more susceptible to being obscured by fog. On questionable days, it is recommended to begin with counts at stakes 9, 6, and 7 (in that order) before proceeding to plots less likely to become obscured. Fulmar chick counts are best conducted on overcast days; bright conditions can cause areas of high light contrast that can make it difficult to locate chicks obscured by tall vegetation.

The use of binoculars or a spotting scope to conduct counts is dependent on the plot and conditions (Table D2). All plots at stakes 3, 4, 7 and fulmar plots at stake 10 can easily be counted with binoculars. Kittiwake counts at stakes 2, 6, and 9 can be done with binoculars, but a spotting scope can be useful in determining if nest sites contain vegetation added in the current year. Murre plots at stakes 9 and 6 are best counted with a spotting scope. Counts of adult fulmars at stake 12 can be done with binoculars on days with good visibility, but a scope can be useful in locating birds obscured by thick vegetation, and is imperative for accurate chick counts. Murre counts at stake 10 are the most difficult on Chowiet. Both plots contain a large number of birds in non-linear masses. The more distant plot, A10M02, is best counted by scope; A10M01 is close enough that the field of view of a scope covers only a small section of the plot and keeping track of which birds have been counted is difficult, but far enough that binoculars, especially when being shook by the process of using a tallywhacker, may be inadequate.

**Safety note:** The trail from stake 1 to stakes 2 and 3 is steep and can be slippery when wet. Ropes have been anchored along the route to assist with descent and ascent to and from these stakes. Always check the stability of anchor and conditions of ropes before descending each visit.

### ***Specific Requirements for Chowiet***

**Dates:** *fulmar adults:* 11-40 days after the first egg is noted

*kittiwakes:* 50 days from first egg through final hatching; If no eggs have been laid by 25 June, begin population counts and continue until ~19 July.

*murres:* 20 June to 1 August

*fulmar chicks:* as late in the season as possible

**Optimal sample size:** 10 replicate counts of all plots for adult population counts; 5 replicates for fulmar chick counts

**Time of day:** 1100-1800h.

**Weather:** Winds less than 25 knots, good visibility (no fog!).

**Equipment needed:** Binoculars, spotting scope, tripod, tally counters, Rite-in-the-Rain® notebook, two pencils, plot photos (laminated or with clear plastic photo protectors with tops taped closed).

**Equipment suggested:** Crazy creek chair, lens cleaning cloths.

Table D1. Ledgenester population plots at Chowiet Island.

Stake	Northern fulmar	Black-legged kittiwake	Thick-billed murre	Common murre	Total plots	Suggested optics
1					0	
2		A02B01,2			2	Binos/scope
3	A03N01	A03B01,2,3	A03M04,5	A03M01,2,3,4,5	11	Binoculars
4	A04N01				1	Binoculars
5					0	
6		A06B01,2	A06M01	A06M01	4	Binos (BLKI)/scope (murre)
7	A07N01				1	Binoculars
8					0	
9		A09B01,2	A09M02	A09M01,2	5	Binos (BLKI)/scope (murre)
10	A10N01,2			A10M01,2	4	Binos (NOFU)/Scope (COMU)
11					0	
12	A12N01,2				2	Binos/scope
<b>Total</b>	<b>7</b>	<b>9</b>	<b>4</b>	<b>10</b>	<b>30</b>	

Table D2. Coordinates and notes on locations of ledgenester stakes at Chowiet Island.

Stake	Coordinates	Notes
1	N56.03293 W156.74459	Top of ridge, marks top of trail down to stakes 2 and 3
2	N56.03310 W156.74643	On top of boulders above stake 3, visible from stake 1
3	N56.03313 W156.74660	Below and northwest of stake 2
4	N56.03483 W156.74733	Edge of cliff on top of ridge; not visible from trail
5	N56.03540 W156.74883	Top of ridge near cliff edge
6	N56.03600 W156.75001	Top of ridge; better view of the plots from below the stake
7	N56.03633 W156.75050	Short distance below and northwest of stake 6
8	N56.03709 W156.75058	Near ridge top; marks trail down to stake 9
9	N56.03733 W156.75050	Just downhill from stake 8
10	N56.03883 W156.75017	Distantly visible from stake 9, follow trail around cove
11	N56.03933 W156.75083	Northwest of stake 10
12	N56.04067 W156.75017	North of stake 10, follow trail around cove



Figure D1. Current waypoint names and locations of ledgenester stakes on Chowiet Island.

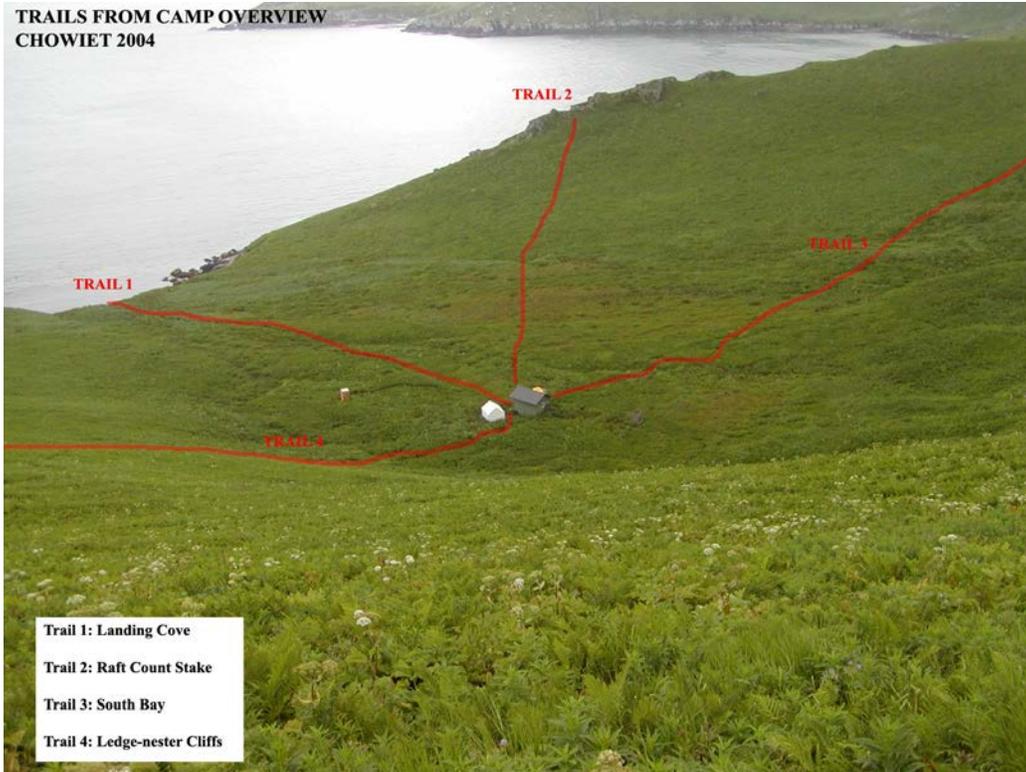


Figure D2. Location of trail to ledge-nester cliffs (trail #3) from camp on Chowiet Island.



Figure D3. Location of trail to ledge-nester cliffs (trail #4) from camp on Chowiet Island.

Attachment E. St. George Island specifics (includes Figure E1 and Tables E1-E2)

## PROCEDURE DETAILS SPECIFIC TO ST. GEORGE

Population counts at St. George are conducted every three years (with St. Paul). Species counted are black-legged and red-legged kittiwakes (and nests), common and thick-billed murres, northern fulmars, and red-faced cormorants (and nests). In rare instances, pelagic cormorants may be present and should be counted as well. If kittiwake nests are abandoned, make a judgment call as to species: red-legged kittiwake nests tend to be smaller, are often under ledges, and are more likely present in areas of higher red-legged kittiwake abundance.

Counts occur on 54 population plots, which are located in 7 areas around the island: High Bluffs, First Bluff, Rosy Finch, Village, Tolstoi, Red Bluffs/Cascade, and Zapadni (Figure E1 and Tables E1-2). Some plots are divided into subsections to facilitate counting. Depending on the plot, birds are counted with binoculars from a single observation point on top of the cliffs or from beach while walking along a plot (see Table E2). See plot photos on the island for plot boundaries.

The count window at St. George (mid-incubation to early chick-rearing) is typically from early July until early August. Use timing information from productivity plots to adjust if necessary in early or late years. All counts should be conducted between 1200 and 2100h. An expanded crew (usually five people) is needed for population counts on St. George. You will not be able to survey all plots on the same day, but try to count the areas on consecutive days, in order to reduce variability. You must count all plots within each of the 7 geographic areas on the same day. Try to complete one replicate before starting the second (it is okay to finish one replicate and start another on the same day as long as counts are of different geographic areas). The counting schedule will be dictated by the weather: High Bluffs and Red Bluffs are the most difficult to count because they are often fogged in.

Fur seals are a special consideration at St. George, both because they can be aggressive and because we don't want to cause them disturbance. When walking down any beaches (plots at Rosy Finch Cove, Village Cliffs, and Tolstoi Point), watch out for any animals, especially those hauled out and sleeping that may startle when awoken. Seals can be a particular problem at the rope access down to Tolstoi, where they congregate in some years. Ask your Unit Biologist for current guidelines for accessing counting beaches with fur seals.

### ***Specific Requirements for St. George***

Dates: *Early June:* Find (and remark if necessary) all plots using map and GPS locations.

*Early July–early August:* Conduct 5-7 replicate counts of all plots.

Optimal sample size: 5-7 replicate counts of all plots (may not be possible in foggy years).

Time of day: 1200-2100h.

Weather: Winds less than 20 knots, good visibility (no fog!).

Equipment needed: Binoculars, spotting scope, tripod, tally counters, Rite-in-the-Rain® notebook, two pencils, plot photos (laminated or with clear plastic photo protectors with tops taped closed).

Equipment suggested: Crazy Creek chair, thermos with a hot drink, lots of snacks, lens cleaning cloths, plenty of warm clothes.

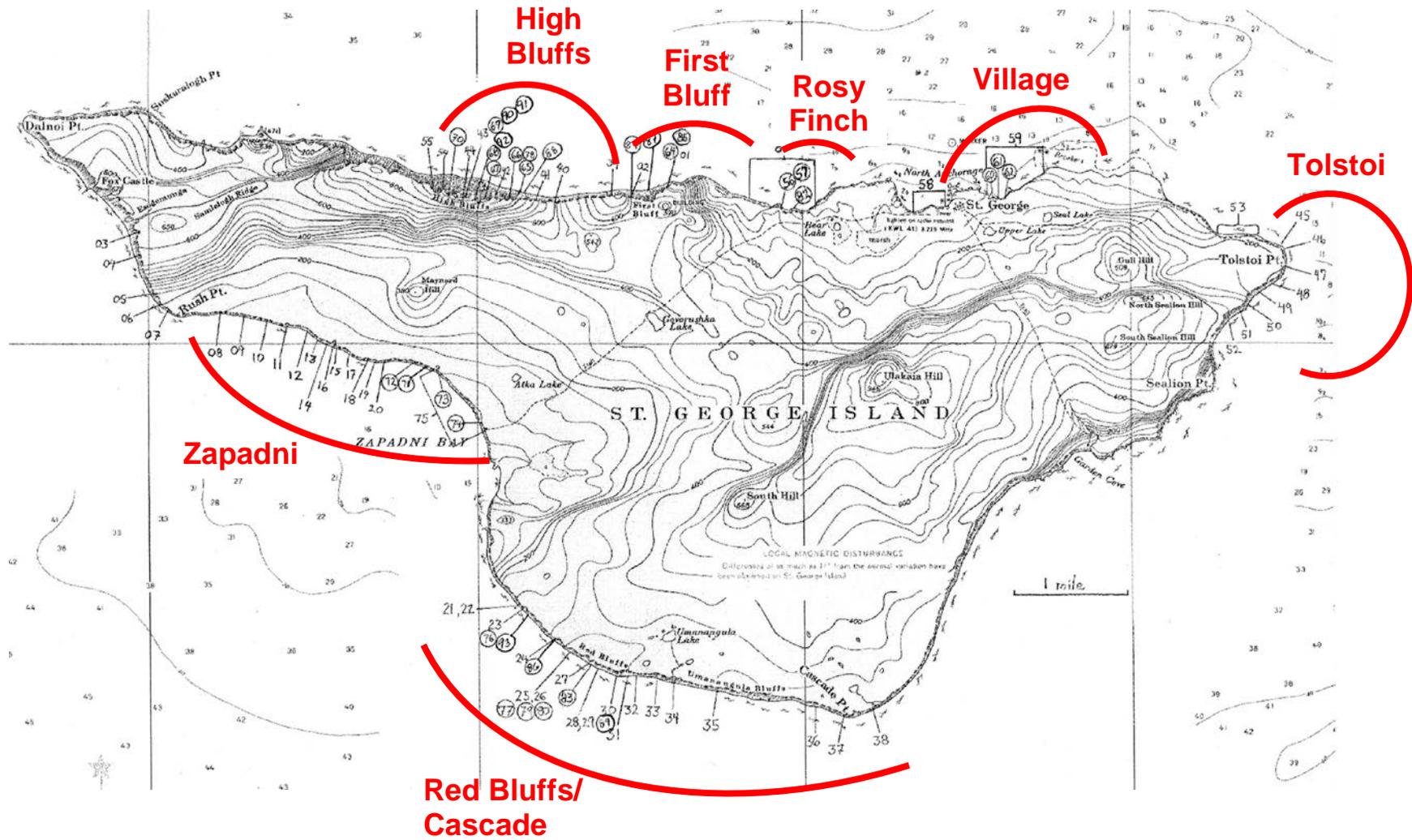


Figure E1. Locations of ledgenester population plots at St. George Island. Numbers indicate plot numbers; uncircled numbers are population plots (circled numbers are productivity plots).

Table E1. Population plot areas and count descriptions at St. George Island.

Area	Plot numbers	How counted	Counting descriptions
First Bluff	1, 2, 39	Cliff top	Plots are easy, takes one person 1.5 hours. 30-45 min. hike each way.
High Bluffs	40-44, 54, 55	Cliff top	Takes two to three people (4 hours with two, 3 hours with three). Need great weather, plots often in fog. These plots will probably be the limiting factor; take lots of people and do productivity or resighting until the fog clears.
Red Bluffs/ Cascade	21-38	Cliff top	Long day for two to three people. Have people start at each end and work towards middle. Three people makes more doable day (takes only ~6 hours with three people: one person does plots 35-38, other two people start at opposite ends and work towards each other). 45 min. hike to west end (plots 21/22), 2 hour hike to east end (Cascade Point). Need relatively good weather, plots often in fog.
Rosy Finch	81 (A-D)	Beach	Takes one person about 4-5 hours. Low elevation, usually countable when foggy at higher elevations. Need to do at relatively low tide.
Tolstoi	45-53	Beach	Usually low numbers of birds, one person can do easily. Beach accessed by rope; lots of seals on beach. Suggest hiking to far end (takes about 2 hours) before 1200h and then count going back to rope.
Village	58 (A-C), 59	Beach	Takes one to two people: one person can do whole thing, but makes for a very stiff neck. With two people, one counts each plot and it only takes about half the time. Low elevation, usually countable when foggy at higher elevations. Need to do at relatively low tide. Watch out for fur seals on beach.
Zapadni	8-20, 75	Cliff top and beach	One beach plot (75), rest cliff top. Zapadni section is flat but a long hike (1-1.5 hours one way). With one person, takes most of count period to complete: suggest hiking to far end before 1200h and then count going back east (save beach plot 75 for last and another person who had a shorter day can do it if they finish earlier). Some plot numbers are not clear from what is written on stakes. Rush Point plots (3-7) are not done anymore. Usually countable when foggy at higher elevations unless fog stacked up against south side of island (as happens with south wind).

Table E2. Locations of population plot observation points at St. George Island. All coordinates are in WGS84.

Plot	Coordinates	Area	Marker
1 (A,B)	56 36.19 N 169 37.94 W	First Bluff	Metal stake stamped USFWS 64 (same obs. as for prod. plot 64)
2	56 36.19 N 169 37.94 W	First Bluff	Brown carsonite stake
8	56 32.25 N 169 44.03 W	Zapadni	Brown carsonite stake with sprayed red 8; also UAF metal stake SW28
9	56 35.22 N 169 43.74 W	Zapadni	Brown carsonite stake with sprayed red 9; also UAF metal stake SW27
10	56 35.19 N 169 43.46 W	Zapadni	Brown carsonite stake with sprayed red 10
11	56 35.16 N 169 43.25 W	Zapadni	Brown carsonite stake with sprayed red 11 (after 12 cross 3 stream beds)
12 (near)	56 35.15 N 169 43.02 W	Zapadni	Unmarked brown carsonite
13 (old)	56 35.11 N 169 42.85 W	Zapadni	Metal stake with cap OLD 13, sprayed red
13 (new)	56 35.07 N 169 42.74 W	Zapadni	Brown carsonite stake with sprayed red 13
14	56 35.01 N 169 45.52 W	Zapadni	Brown carsonite stake with sprayed red 14
15	56 34.96 N 169 42.29 W	Zapadni	Metal stake with cap 15, sprayed red; 5 feet east of 16 (plot is out of order, between plots 17 and 16)
16	56 34.96 N 169 42.30 W	Zapadni	Metal stake with cap 16, sprayed red; 5 feet west of 15 (plot is out of order, between 15 and 14)
17	56 34.94 N 169 42.23 W	Zapadni	Brown carsonite stake with sprayed red 17; 40 meters beyond 3 rebar to right of east of trail
18	56 34.86 N 169 41.82 W	Zapadni	Metal stake with cap 18, sprayed red; also UAF metal stake SW10
19	56 34.87 N 169 41.61 W	Zapadni	Brown carsonite stake with sprayed red 19; also UAF metal stake SW09
20	56 34.87 N 169 41.51 W	Zapadni	Brown carsonite stake with sprayed red 20; also UAF metal stake SW08
21-22	56 32.83 N 169 39.61 W	Red Bluffs	Metal stake stamped 21 and 22; 200m north of prod. plot 76
23	56 32.81 N 169 39.54 W	Red Bluffs	USFWS plot marker for prod. plot 76
24	56 32.44 N 169 38.70 W	Red Bluffs	Metal pipe; plot faces south, across cliff from prod. plot 86
25-26	56 32.48 N 169 38.81 W	Red Bluffs	USFWS plot marker for prod. plots 77,79,80
27	56 32.40 N 169 38.59 W	Red Bluffs	Brown carsonite stake; across cliff from plots 28-29
28	56 32.40 N 169 38.59 W	Red Bluffs	Brown carsonite stake; plot faces north, 50m from prod. plot 83
29	56 32.36 N 169 38.51 W	Red Bluffs	No marker; next cliff south of plot 28, across cliff from plot 30
30	56 32.38 N 169 38.48 W	Red Bluffs	No marker, opposite cliff from plot 29; faces north
31	56 32.29 N 169 38.12 W	Red Bluffs	Metal pipe and stake stamped 31
32 (upper, lower)	56 32.30 N 169 37.97 W	Red Bluffs	Metal pipe; next open cliff south of plot 31
33	56 32.27 N 169 37.55 W	Red Bluffs/ Cascade	Metal stake with cap, marked 33
34	56 32.25 N 169 37.30 W	Red Bluffs/ Cascade	No marker
35 (upper, lower)	56 32.156 N 169 36.498 W	Cascade	Unmarked carsonite stake and metal stake stamped 35
36	56 32.083 N 169 35.533 W	Cascade	Unmarked carsonite stake; eastern edge of amphitheater

Table E2 (continued). Locations of population plot observation points at St. George Island. All coordinates are in WGS84.

Plot	Coordinates	Area	Marker
37 (upper, lower)	56 32.041 N 169 35.197 W	Cascade	Unmarked carsonite stake
38 (upper, lower)	56 31.965 N 169 34.491 W	Cascade	Unmarked carsonite stake and metal stake stamped 38
39	56 36.191 N 169 38.119 W	First Bluff	Carsonite stake and small pole
40	56 36.15 N 169 38.99 W	High Bluffs	Carsonite stake; east of plot 41
41	56 36.15 N 169 39.14 W	High Bluffs	Carsonite stake; east of prod. plot 65
42	56 36.11 N 169 39.75 W	High Bluffs	Metal stake stamped USFWS 42; near resighting area
43	56 36.185 N 169 40.121 W	High Bluffs	
44	56 36.159 N 169 40.255 W	High Bluffs	
rope to Tolstoi	56 35.942 N 169 29.079 W	Tolstoi	
45	56 35.722 N 169 27.959 W	Tolstoi	No markers; beach plot
46	56 35.588 N 169 27.998 W	Tolstoi	No markers; beach plot
47	56 35.522 N 169 28.092 W	Tolstoi	No markers; beach plot
48	56 35.458 N 169 28.265 W	Tolstoi	No markers; beach plot
49	56 35.418 N 169 28.355 W	Tolstoi	No markers; beach plot
50	56 35.348 N 169 28.461 W	Tolstoi	No markers; beach plot
51	56 35.266 N 169 28.598 W	Tolstoi	No markers; beach plot
52	56 35.181 N 169 28.791 W	Tolstoi	No markers; beach plot
53E (on 45 side)	56 35.835 N 169 28.253 W	Tolstoi	No markers; east end of beach plot 53
53W (rope side)	56 35.882 N 169 28.441 W	Tolstoi	No markers; west end of beach plot 53
54	56 36.229 N 169 40.782 W	High Bluffs	
55	56 36.298 N 169 41.086 W	High Bluffs	
58 (start A)	56 36.169 N 169 32.971 W	Village Cliffs (West)	No markers; west of village
58 (A/B)	56 36.104 N 169 33.161 W	Village Cliffs (West)	No markers; west of village
58 (B/C)	56 36.100 N 169 33.382 W	Village Cliffs (West)	No markers; west of village
58 (end C)	56 36.107 N 169 33.706 W	Village Cliffs (West)	No markers; west of village
59 (start A)	56 36.19 N 169 32.35 W	Village Cliffs (East)	No markers (paint in some years), east of village
59 (A/B)	55 36.20 N 169 32.15 W	Village Cliffs (East)	No markers (paint in some years), east of village
59 (B/C)	56 36.28 N 169 31.91 W	Village Cliffs (East)	No markers (paint in some years), east of village
59 (end C)	56 36.34 N 169 31.71 W	Village Cliffs (East)	No markers (paint in some years), east of village
75 start	56 34.54 N 169 40.49 W	Zapadni	No markers; beach plot - starts where cliffs start east of harbor.
75 end	56 34.79 N 169 41.01 W	Zapadni	No markers; beach plot - end point is after you round the corner where big boulders start. Beach boulders change--note cliff rock formations.

Table E2 (continued). Locations of population plot observation points at St. George Island. All coordinates are in WGS84.

Plot	Coordinates	Area	Marker
81 (A start)	56 36.096 N 169 35.139 W	Rosy Finch	No markers (paint in some years); beach plot
81 (A/B)	56 36.090 N 169 35.398 W	Rosy Finch	No markers (paint in some years); beach plot
81 (B/C)	56 36.118 N 169 35.706 W	Rosy Finch	No markers (paint in some years); beach plot - birdless stretch east of small kittiwake amphitheater, where big boulders pile up high against cliff
81 (C/D)	56 36.118 N 169 35.874 W	Rosy Finch	No markers (paint in some years); beach plot - just east of trail/rope to beach
81 (D end)	56 36.171 N 169 35.151 W	Rosy Finch	No markers (paint in some years); beach plot

## Attachment F. St. Lazaria Island specifics (includes Figures F1-3)

**PROCEDURE DETAILS SPECIFIC TO ST. LAZARIA**

Population counts at St. Lazaria are conducted every year for common and thick-billed murres, both from land and from boat. The count window at St. Lazaria (mid-incubation to early chick-rearing) is typically from mid-July until mid-August; if egg laying is late, adjust timing of counts appropriately.

Counts are conducted in three areas: land-based Southwest Cliff Colony, boat-based Southwest Cliff Colony, and boat-based Murre Cave Colony. All plots within an area need to be counted in a single day between 1100 and 1800h; however, each of those three areas do not need to be counted on the same day (i.e., it is too rough to boat but land-based counts can still be done). Aim for 5-7 replicates of each; in years of rough weather, it will not be possible to get that many replicates of boat-based areas. Species discrimination is not generally possible for either land-based or boat-based observations so simply lump all murres together.

**Land-based counts:**

For land-based counts, murres are counted on 11 plots at the Southwest Cliff Colony (Figure F1). Plots include the productivity plots 1-9 (with plot 6 divided into two plots: 6A and 6B) and an additional population-only plot 10 (Figure F2). All plots are counted from the same fixed observation point marked with rebar, approximately three meters to the west from the murre productivity observation point (Figure F3).

It is most efficient on St. Lazaria to separate plots and have two crew members count the land-based plots simultaneously (each person counts 11 plots). It is not necessary for the same person to count the same plots for all replicates (feel free to switch it up for variety). Prior to beginning your first count of the season, the two counters should visit the observation point together with plot photos and descriptions to ensure that each person is familiar with the plot boundaries.

**Boat-based counts:**

For boat-based counts, murres are counted from a skiff at the Murre Cave Colony and the backside of the Southwest Cliff Colony (Figure F1). The Murre Cave Colony consists of six plots: Arch, Deep Pocket, Up & to the Right, Upper Bowl, Back Wall, and Guano Slide. The backside of the Southwest Cliff Colony comprises plots 1-9 (note: these are the same plots 1-9 counted from land-based observation point; however, from the skiff, plot 10 is not counted and plot 6 is not divided into A and B).

Never boat in questionable weather and abort any counts if conditions deteriorate during your survey. Always submit a float plan a day in advance of the survey (in order to ensure float plan approval) and bring your VHF and all boat safety gear.

***Specific Requirements for St. Lazaria***

Dates: *June or early July:* Familiarize crew with plots and observation points.

*Mid-July to mid-August:* Conduct 5-7 replicate counts of all plots.

Optimal sample size: 5-7 replicate counts of all plots.

Time of day: 1100-1800h.

Weather: Land-based counts: Winds less than 25 knots, good visibility (no fog!).

Boat-based counts: Calm winds and calm seas (winds less than 15 knots and seas less than 3 ft), clear visibility, little to no precipitation.

Equipment needed: Binoculars, tally counters, Rite-in-the-Rain® notebook, two pencils, plot photos (laminated or with clear plastic photo protectors with tops taped closed), inflatable skiff (for boat-based counts) with all safety gear (don't forget to bring your satellite phone and VHF!).

Equipment suggested (land-based counts): Crazy creek chair, lens cleaning cloths, umbrella.



Figure F1. Locations of murre population count areas (shown in red) at St. Lazaria Island.



Figure F2. Plot boundaries of ledgenester population plots 1-10 on the SW Cliff at St. Lazaria Island.

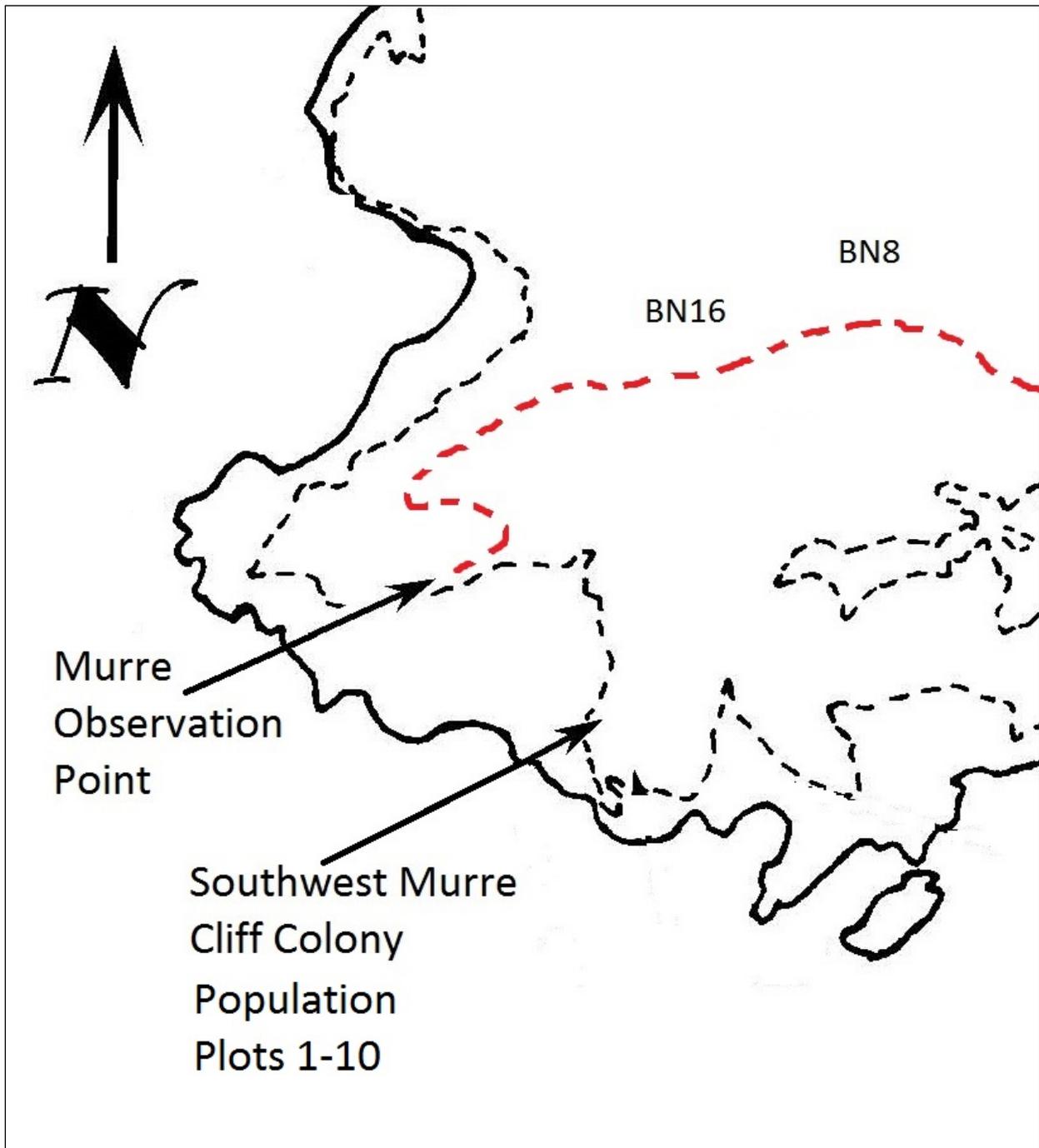


Figure F3. Locations of land-based murre population plots and observation point at St. Lazaria Island. The red dashed line indicates the approximate route to the observation point from burrow nester plots 8 and 16.

Attachment G. St. Paul Island specifics (includes Figure G1)

## PROCEDURE DETAILS SPECIFIC TO ST. PAUL

Population counts at St. Paul are conducted every three years (with St. George). Species counted are black-legged and red-legged kittiwakes (and nests), common and thick-billed murres, northern fulmars, and red-faced cormorants (and nests). In rare instances, pelagic cormorants may be present and should be counted as well. If kittiwake nests are abandoned, make a judgment call as to species: red-legged kittiwake nests tend to be smaller, are often under ledges, and are more likely present in areas of higher red-legged kittiwake abundance (most kittiwakes at St. Paul are black-legged kittiwakes).

Counts occur on 25 population plots, which are located at several areas around the island: High Bluffs, Ridgewall, Zapadni, and Tolstoi (Figure G1). Some plots are divided into subsections to facilitate counting. Depending on the plot, birds are counted with binoculars from a single observation point on top of the cliffs or from beach while walking along a plot. See plot photos on the island for plot boundaries; refer to "STP Plot Descriptions" file for detailed information on each plot.

The count window at St. Paul (mid-incubation to early chick-rearing) is typically from early July until early August. Use timing information from productivity plots to adjust if necessary in early or late years. All counts should be conducted between 1200 and 2100h. An expanded crew (usually three people) is needed for population counts on St. Paul. You will not be able to survey all plots on the same day, but try to count the areas on consecutive days, in order to reduce variability. You must count all plots within each geographic areas on the same day. Try to complete one replicate before starting the second (it is okay to finish one replicate and start another on the same day as long as counts are of different geographic areas).

### ***Specific Requirements for St. Paul***

Dates: *Early June:* Find (and remark if necessary) all plots using map and GPS locations.

*Early July–early August:* Conduct 5-7 replicate counts of all plots.

Optimal sample size: 5-7 replicate counts of all plots (may not be possible in foggy years).

Time of day: 1200-2100h.

Weather: Winds less than 20 knots, good visibility (no fog!).

Equipment needed: Binoculars, spotting scope, tripod, tally counters, Rite-in-the-Rain® notebook, two pencils, plot photos (laminated or with clear plastic photo protectors with tops taped closed).

Equipment suggested: Crazy Creek chair, thermos with a hot drink, lots of snacks, lens cleaning cloths, plenty of warm clothes.



### Protocol Revision History Log

Revision Date	Changes made	New version #
April 2017	Clarified in Aiktak attachment that counts of COMU, TBMU, and UNMU should be recorded as separate count records in field note book	1.4
Dec 2015	Updates to Chowiet section	1.3
April 2015	Made minor typo corrections	1.2
April 2014	Changed font to Arial, added revision history log, replaced revision date with version # on first page, added protocol # to first page, changed number format of tables and figures in island attachments, ordered island attachments alphabetically, changed page number format to include protocol #, made minor grammatical edits, clarified that 10% difference okay for boat-based counts, added murre identification guide (Figure 1), clarified that population counts should be rounded to the nearest whole number, added Cape Lisburne attachment,	1.1
May 2013	Protocol developed in standardized format from historic protocols, includes St. Paul St. George, Aiktak, Buldir, Chowiet and St. Lazaria attachments	1.0