

Wildlife Inventory Plan  
Alaska Maritime National Wildlife Refuge  
Protocol #16

Version 1.2

Parameter: Populations

Species: Least auklets

## PURPOSE

To detect differences in the numbers of least auklets attending plots of 30% over 15 years (power = 90% at 0.1 level of significance). A decline of such magnitude classifies a population “Vulnerable” under IUCN guidelines (IUCN 2001).

## BREEDING BIOLOGY

Least auklets (*Aethia pusilla*) are small, crevice-nesting seabirds that breed in often massive colonies on islands in the Bering Sea, Sea of Okhotsk, and Aleutian Islands. They occur on 17 islands in Alaska, as well as many colonies in Russia. Although they are one of the most abundant seabirds in Alaska (Stephensen and Irons 2003), they nest in concealed breeding sites in rock crevices, making them difficult to count.

During the breeding season, adults are typically present on land during two daily activity periods (morning and evening) when they socialize on the colony surface above their nesting crevices. Timing and duration of activity periods vary among colonies and sometimes within a season at a colony. As chick-rearing progresses, adults gradually spend less time socializing on the surface (Jones 1993).

Most fundamental demographic variables are difficult to obtain for auklets (see Renner et al. 2006) because they nest in usually inaccessible rock crevices. Counting birds socializing on the surface is one of the few ways to monitor population trends in auklets. By counting standardized sample plots at systematic times throughout the day and season over many years, surface counts can detect biologically relevant declines in the attending auklet population (Renner et al. 2010a).

## PROCEDURE

**Data collection.**—Early in the season, visit the count location to relocate plots and ensure they are clearly marked. Make plot corner markers more visible by wrapping stakes with fresh flagging tape or painting stakes with brightly colored spray paint. It is helpful if plot boundaries are also marked at the midpoints between plot corners (i.e., by painting on the rocks). Bring historic plot photos with you in case corner stakes or painted boundaries are missing. To minimize disturbance, try to remark plots outside the auklet activity period when birds are not present on the surface of the colony (e.g., very early morning or late afternoon). If you cannot see an entire plot within one field of view of your binoculars, practice counting plots before you conduct your first survey so you get to know what the plot boundaries look like through binoculars (which provide a different perspective from the broader plot photos).

Conduct three to five counts during the mid-incubation to early chick-rearing periods (20 days before to 10 days after the mean annual hatch date) when daily variation in auklet attendance is smallest (Renner et al. 2010b). Aim for five counts; a minimum of three counts in a year is necessary for sufficient statistical power (if you won't be able to conduct three counts, it isn't worth doing any). All plots must be counted at the same time on all count days. One person can feasibly count up to five plots at a time; depending on the number of plots (typically 10 to 15), you will need multiple observers to complete each survey.

On each count day, each observer counts every least auklet on the surface of each plot at 15 minute ( $\pm 5$  min.) intervals during the peak attendance period (usually 5-6 hours). Counting at 15 minute

intervals simply ensures that counts are taken with some measure of periodicity. The idea is to get a representative count of the number of auklets present on a plot throughout the day: if a predator happens to momentarily flush all birds from a plot just before the 15-minute mark, recording zero for that plot at that time is not a good representation of auklet presence. Ideally, begin counting a few minutes before the 15-minute mark if auklets are present, and delay counting for a few minutes if a predator flushes auklets in order to allow them time to settle down again. (That being said, at some colonies auklets take 30 to 60 minutes to return to a plot after being flushed by a predator; in these cases, zero would be an accurate record of the number of birds on the surface over that time).

Use binoculars and tally counters to count auklets (click the tally counter for every bird you count so you don't have to keep track in your head) and record data in a Rite-in-the-Rain<sup>®</sup> notebook. Auklets rarely stand still and as you count they may be hopping in and out of rock crevices, moving in and out of the plot boundaries, or landing on or flying away from the plot. Just do the best you can; it isn't necessary to count plots multiple times in a count interval. All least auklets should be counted; it is not necessary to distinguish between adults and sub-adults.

Attendance periods vary by colony (see island-specific details); if timing of peak attendance at a colony is unknown, crews may need to make an initial count over an extended period (e.g., 0700-1700h) to determine best count window. Also be aware that the daytime activity period of least auklets tends to start and end later as the season progresses.

**Data analysis.**—Auklet counts are summarized using the maximum count per plot each count day. For a daily count index, sum the maximum counts on all plots. See Figure 1 for an example. For an annual count index, calculate the average value of daily count indices across all counts conducted that year. Mean values should be rounded to the nearest whole number (round up when  $\geq .5$ , round down when  $< .5$ ).

#### Literature Cited

- IUCN. 2001. Red List categories and criteria. Version 3.1. Prepared by the IUCN Species Survival Commission, Gland, Switzerland.
- Jones, I.L., F.M. Hunter, and G.J. Robertson. 2002. Annual adult survival of least auklets (Aves, Alcidae) varies with large-scale climatic conditions of the North Pacific Ocean. *Oecologia* 133:38-44.
- Renner, H.M., M. Renner, J.H. Reynolds, A.M.A. Harding, I.L. Jones, D.B. Irons, and G.V. Byrd. 2006. Colony mapping: a new technique for monitoring crevice-nesting seabirds. *Condor* 108:423-434.
- Renner, H.M., J.H. Reynolds, M. Sims, and M. Renner. 2010a. Evaluating the power of surface attendance counts to detect long-term trends in populations of crevice-nesting auklets. *Environmental Monitoring and Assessment*. Online: DOI 10.1007/s10661-010-1664-4.
- Stephensen, S.W. and D.B. Irons. 2003. Comparison of colonial breeding seabirds in the eastern Bering Sea and Gulf of Alaska. *Marine Ornithology* 31:167-173.

Time	Plot															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14		
1000	31	41	1	28	20	22	0	13	12	98	41	107	72	14		
1015	18	26	0	46	26	7	16	22	42	84	82	75	37	10		
1030	42	29	26	55	16	39	1	14	16	33	193	43	70	46		
1045	18	39	19	23	19	30	20	22	9	82	114	88	64	83		
1100	39	27	3	32	56	10	36	23	11	48	164	100	135	79		
1115	30	35	5	42	52	25	18	38	25	81	141	110	125	105		
1130	31	29	11	37	33	22	19	14	16	91	133	139	143	124		
1145	62	17	4	53	14	34	9	29	2	78	130	162	153	126		
1200	30	19	1	28	24	35	31	48	6	112	165	128	178	106		
1215	34	21	16	39	45	9	26	28	8	131	137	214	129	138		
1230	23	42	17	25	35	13	22	34	10	119	215	218	193	156		
1245	20	32	14	22	32	13	18	24	18	111	164	190	136	85		
1300	23	25	23	23	31	16	35	36	21	115	172	185	140	103		
1315	53	32	21	28	55	26	24	41	28	124	154	223	142	121		
1330	11	7	13	36	71	27	22	33	21	80	101	176	120	104		
1345	6	12	15	51	69	3	0	0	1	82	116	195	154	87		
1400	32	21	13	29	36	10	25	26	19	129	146	208	175	121		
1415	21	20	23	38	46	18	27	42	18	76	111	135	142	63		
1430	18	48	23	30	56	23	33	37	19	72	97	133	113	71		
1445	31	32	15	23	50	23	21	26	22	79	113	172	130	85		
1500	18	39	17	22	28	18	23	27	15	93	120	145	129	112		
1515	20	27	20	27	48	18	27	36	39	121	172	191	140	94		
1530	11	23	14	25	40	16	33	41	17	85	167	184	135	85		
1545	11	21	9	26	43	21	21	24	8	45	82	71	34	50		
1600	15	17	15	19	36	5	18	22	4	30	62	54	40	16		
Daily Max	62	48	26	55	71	39	36	48	42	131	215	223	193	156	Sum	1345

Figure 1. Example data from an auklet surface count (14 plots counted from 1000-1600h). To summarize data, calculate the maximum count that day on each plot, then sum across all plots for the daily count index. The annual count index is the average of all daily sums from all counts conducted that year.

Attachment A. St. George Island specifics (includes Table A1, Figures A1-6)

## **BACKGROUND AND STUDY AREA DESCRIPTION**

On St. George Island, approximately half of the least auklets breeding on the island nest in a large, inland colony on Ulakaia Ridge, about 1 km from the sea. The colony is approximately 1 km long and contains about 90,000 auklets (Renner and Renner 2010b). The remaining birds nest in scattered pockets in the sea cliffs and beach boulders around much of the island. Rubble from recent construction on the southern harbor has created additional new habitat for least auklets on St. George.

Index plots for monitoring auklet populations are located at the Ulakaia colony (Figure A1). A system of 14 plots (10 x 10 m), subjectively established to include high, medium, and relatively low density areas (Table A1, Figures A2-5), was set up in 1985 and surveyed annually through 1987; after a gap, annual surveys began again in 2002. Plots are counted from three observation stations. The observation stations and most plot corners are permanently marked with carsonite stakes; where stake placement is not possible, a few plot corners are designated with spray-painted symbols on rocks. Spray paint is also used to clarify plot boundaries where the potential for confusion may occur. Plot markers for surface count plots are sometimes removed or destroyed by local children over the fall and winter, so you may need to replace them at the beginning of the season.

Arctic foxes are common predators at the Ulakaia colony and are frequently observed catching birds throughout the season. Large groups of auklets will flush from the colony surface as a fox comes through but birds usually return relatively quickly. Aerial predators at Ulakaia are relatively rare: there are occasionally snowy owls but no gulls, which prey heavily at many auklet colonies in the Aleutian Islands. The local community is permitted to harvest eggs for subsistence at the colony and the degree to which this happens varies from year to year.

## **PROCEDURE DETAILS SPECIFIC TO ST. GEORGE**

Counts at St. George should be conducted from 20 days before and 10 after mean hatch. Mean hatch 2007-2010 was around mid-July, so counts should be conducted from late June to late July (however, there is anecdotal evidence that suggests these years may have been unusually snow years resulting in delayed auklet phenology – if mean hatch dates are earlier in future years, timing of these counts may be shifted in the future). If it appears to be an early or late year for auklet phenology (based on data from productivity nests), adjust counts accordingly. The peak auklet socialization period at the Ulakaia colony is typically 1000h to 1600h but can vary somewhat between years and during the season (birds may end socialization by about 1400h early in the season but may stay until 1600-1700h as the season progresses). Crew members resighting auklets early in the season should be able to provide any updates to colony attendance patterns in the current year. All observers should begin counting at the same time. The observer at the high density observation point (C) determines when the activity period is over at each count and rounds up the other observers (by walking to the other count locations or communicating over VHF radios). With 14 surface count plots counted from three observation stations, it takes three observers (one for each observation point) to complete each count at St. George.

When foxes run over the talus, most or all of the auklets will flush; birds usually return quickly within a few minutes, but occasionally stay away for up to 30 minutes.

### Special considerations for working at the Ulakaia colony at St. George

The Ulakaia Ridge colony is about a half-hour hike over the tundra from town (on a clear day, you can see the ridge from town). To get to the trailhead from the Washhouse or Cottage C, go behind the health clinic, cross the empty lot with the large standing pole (used for the grease for the 4<sup>th</sup> of July), cross the boardwalk made of pallets, and head for the last arch of houses before the tundra begins. The trailhead is located in between two houses (Figure A6). The trail deteriorates once you get up over the first ridge, so it isn't the end of the world if you aren't able to find the trailhead (and some people make their own trails). Simply walk straight south towards Ulakaia Ridge and look for plot markers and painted rocks (you can also use the coordinates for the plot locations (Table A1) to orient to the surface count areas, see Figures 3-6). In some past years, crews have driven up to the Conex by the water tower and

walked from there, but the community asks that we do not leave vehicles there; either get someone to drop you off or walk the whole way.

Young kids from town are often curious about where you're going when heading off into the tundra and will sometimes attempt to follow you to the colony. While it is great to educate them with the biology that the refuge is doing on their island, you should not let them tag along to Ulakaia Ridge. Few kids in town hike much around the island off the road system, so they can get lost easily when trying to find their way back to town on their own. Even though it may seem that kids roam free unsupervised, never take children anywhere without first speaking to their parents.

As with other places on St. George, foxes are present at the auklet colony and will happily mark anything you leave on the ground away from your direct supervision. Never walk away from your pack or anything else, even for a short time, unless you are prepared for foxes to pee on it.

You will likely get sweaty hiking over the tundra to the auklet colony, so consider bringing a complete change of clothes. You will be much happier and collect better data if you are warm and dry instead of shivering in damp clothes for a long surface count session.

### **Literature Cited**

Renner, H.M. and M. Renner. 2010b. Counting the countless: estimating the number of least auklets attending the colony at St. George Island, Alaska. *Western Birds* 41:168-173.

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

Dates: Late May to early June: relocate and mark plots.

Late June to late July: conduct counts.

Optimal sample size: 3 to 5 surveys between late June and late July (20 days before to 10 days after mean hatch).

Time of day: Peak activity period: usually 1000-1600h at the Ulakaia colony (but confirm with early-season resighting).

Weather: Winds less than 20 knots, minimal precipitation, and no fog on ridge.

Equipment needed on initial visit: Plot photos and/or diagrams, rebar/carsonite stakes, flagging tape, brightly-colored spray paint, GPS unit, tape measure, and camera.

Equipment needed for counts: Binoculars, tally counters, watch (ideally with timer set to beep every 15 minutes), Rite-in-the-Rain<sup>®</sup> notebook, at least two pencils, crazy creek chair, warm clothes and raingear, plenty of food and water.

Equipment suggested/optional for counts: VHF radio (for communicating with other crew members), thermos with hot drink, hand warmers, something to pass the time between counts (music, book, etc.).

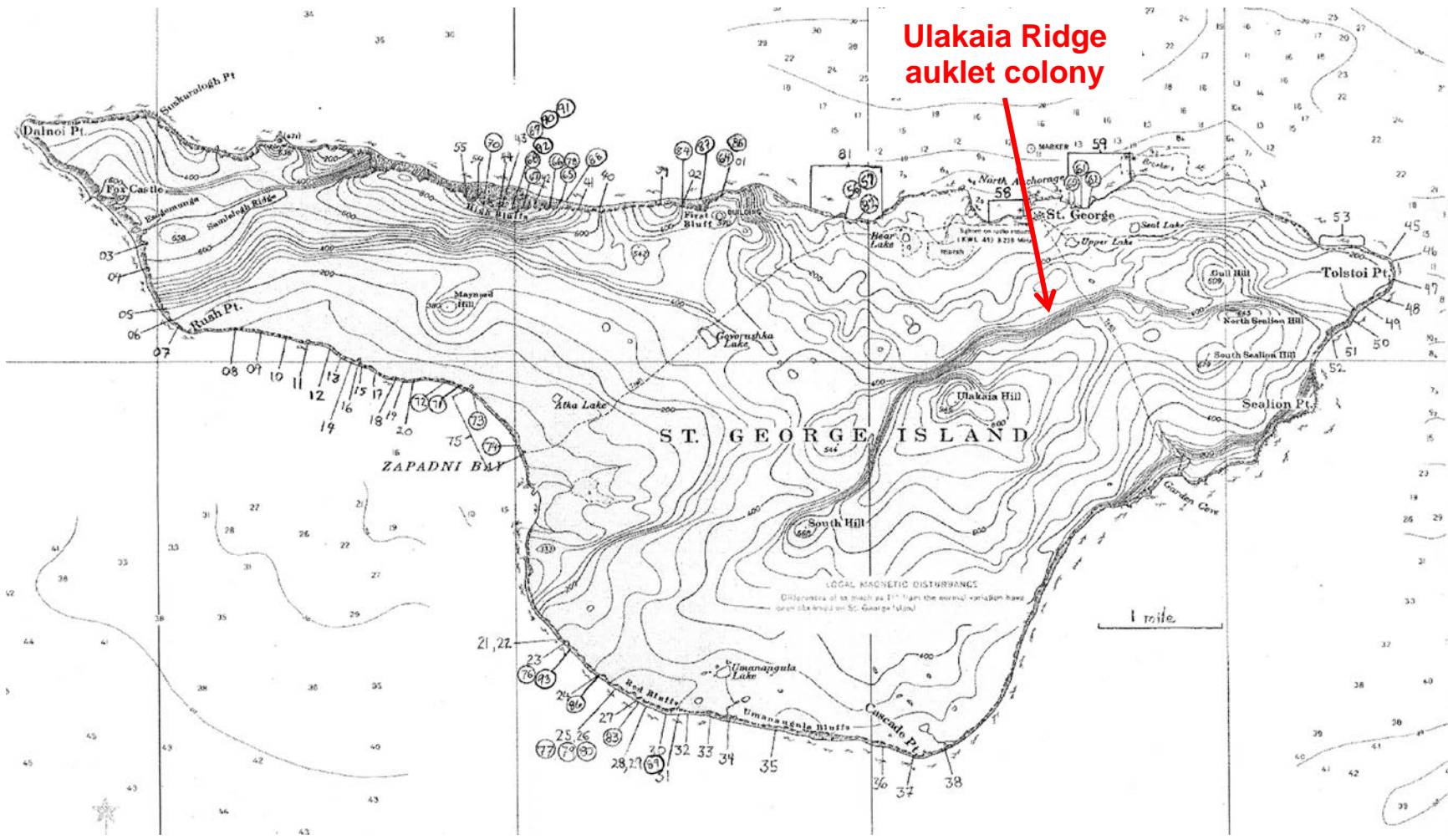


Figure A1. Map of Ulakaia Ridge colony location on St. George Island.



Figure A2. Diagram of Ulakaia auklet surface count plot locations (1-14) with three observation points (A,B,C).

Table A1. Coordinates for surface count plots and observation points at Ulakaia Ridge, St. George Island, Alaska. Plot coordinates are taken from the center of plots (datum WGS 84).

Plot	Lat. (N)	Long. (W)
Observation Point A (low density)	56° 35.42	169° 32.49
Plot 1	56° 35.42	169° 32.45
Plot 2	56° 35.41	169° 32.45
Plot 3	56° 35.39	169° 32.48
Plot 4	56° 35.39	169° 32.51
Plot 5	56° 35.41	169° 32.51
Observation Point B (medium density)	56° 35.37	169° 32.66
Plot 6	56° 35.36	169° 32.62
Plot 7	56° 35.36	169° 32.65
Plot 8	56° 35.35	169° 32.65
Plot 9	56° 35.34	169° 32.69
Observation Point C (high density)	56° 35.25	169° 32.94
Plot 10	56° 35.23	169° 32.91
Plot 11	56° 35.23	169° 32.93
Plot 12	56° 35.24	169° 32.89
Plot 13	56° 35.22	169° 32.94
Plot 14	56° 35.22	169° 32.96





Figure A3. Auklet surface count plots 1-5 counted from observation point A (low density area) at Ulakaia Ridge, St. George Island.



Figure A4. Auklet surface count plots 6-9 counted from observation point B (medium density area) at Ulakaia Ridge, St. George Island.



Figure A5. Auklet surface count plots 10-14 (approximate area shown with dashed line, exact location of each plot not marked on photo) counted from observation point C (high density area) at Ulakaia Ridge, St. George Island.

**NOTE FOR CURRENT CREW: Please take a new photo (when plots are marked) and draw plots on photo to improve this protocol.**

**Trailhead to Ulakaia Auklet Colony**

N 56.59926°

W 169.54727°

Datum WGS84

(trail ends when you reach tundra at top of first ridge)



Figure A6. Trailhead to Ulakaia Ridge colony, St. George Island. Walk straight south (by compass or GPS) from here to the colony.

**Protocol Revision History Log**

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Revision Date	Changes made	New version #
April 2017	Minor grammatical 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 table and figures in island attachment, changed page number format to include protocol #, made minor grammatical edits, specified that mean values should be rounded to the nearest whole number	1.1
May 2011	Protocol developed in standardized format from historic protocols, includes St. George attachments	1.0

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