FEDERAL AID
INTERIM PERFORMANCE REPORT

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 115526
Juneau, AK 99811-5526

Alaska Department of Fish and Game
State Wildlife Grant

Grant Number: **T-1** **Segment Number: 3**

Project Number: **2.10**

Project Title: Field testing alternative survey methods for monitoring marbled murrelet populations in Southeast Alaska

Project Duration: July 1, 2006 – June 30, 2009

Report Period: July 1, 2007 – June 30, 2008

Report Due Date: September 30, 2008

Partner: Alaska Department of Fish and Game

Project Objectives:

OBJECTIVE 1: Evaluate the strengths and weaknesses of alternative survey protocols to monitor trends in marbled murrelet populations in Southeast Alaska. Merit shall be reflected in statistical power to detect trends versus relative cost, including equipment, manpower, and time.

JOB/ACTIVITY 1A: Assess sources of variability in flyway count data, including temporal patterns (daily and seasonal), environmental effects (weather, visibility), equipment-related (optics quality) and observer.

JOB/ACTIVITY 1B: Assess error in distance estimation for strip and line transects.

JOB/ACTIVITY 1C: Compare line-transect and strip-transect survey methods for measuring marbled murrelet densities at sea.

OBJECTIVE 2: Assess spatial variation in marbled murrelet numbers between watersheds and across the region and relate to upland and marine habitat attributes.

JOB/ACTIVITY 2A: Survey murrelets using different methods at multiple watersheds in Southeast Alaska.

Summary of Project Accomplishments

OBJECTIVE 1: We conducted surveys using flyway counts, strip transects, and line transects in Glacier Bay and Icy Strait during this reporting period. We documented temporal and spatial patterns of abundance and variability, and used that information to recommend survey protocols that yielded the highest power to detect population trends. For at-sea surveys, line transects are superior to strip transects; and surveys conducted in July have lower variability, and higher power to detect trends, than surveys conducted in June or August. Observer bias with respect to distance estimation was low. For flyway surveys, activity appears closely tied to time of day and stage of tide. Surveys conducted between 0500 and 0900, and between 1800 and 2200, capture the peaks of Murrelet flyway activity. More detail on methods and results are included under the Job/Activity statements that follow. A progress report is in review.

JOB/ACTIVITY 1A: Assess sources of variability in flyway count data, including temporal patterns (daily and seasonal), environmental effects (weather, visibility), equipment-related (optics quality) and observer.

Accomplishments: From 9-13 July, 2007, flyway surveys were conducted from the western shore of Young Island, at Sitakaday Narrows in lower Glacier Bay. Alternating 2-person crews conducted 15 minute flyway surveys every half hour from sunrise to sunset. At the start of each survey, the observer recorded his or her name, the date, time of day, stage of tide, scope and power setting, cloud cover (%), ceiling height, precipitation, sea state, and visibility. A digital timer/alarm was used to mark the 15 minute survey period. A multiple tally counter was used to keep count of *Brachyramphus* murrelets going in (northbound) and going out (southbound) through the narrows. Surveys were discontinued when visibility declined to “poor” (half or more of the distance not viewable) due to fog, rain, shimmer, or low light.

Over 108 surveys, we counted an average of 331 murrelets per 15 minute survey (SE = 32.8) flying North into Glacier Bay. Birds arrived in two main pulses, mid morning and mid day, with the highest peak at mid-day (1300 hrs) averaging over 700 birds per 15 minute survey. The lulls between those two incoming pulses were balanced by two pulses of birds flying south, out of the Bay. Over 108 surveys, the mean number of birds counted (in plus out) was 521 per survey (SE = 30.13). The coefficient of variation for total number of birds (north and south) was low, at 0.06.

Tides appear to strongly influence the timing of these pulses. Birds moved in and out of the Bay counter to the direction of tidal flow. The daily peak count of incoming birds occurred 1.5 hours after high tide (x = 97 minutes, SE=6.6, N=4). As the tide ebbs, large volumes of water from Glacier Bay flow through this constriction, creating strong currents and tide rips. It was not uncommon to see many murrelets, and other seabirds (including thousands of Northern Phalaropes [*Phalaropus lobatus*]) actively foraging there.

The maximum number of birds coming into the Bay occurred during moderate stages of ebbing tides (1.5-2 hours past high); and the maximum number of birds flying out of the Bay coincided with maximum flooding tidal volume (3-4 hours past low tide). Because significantly more murrelets are entering the Bay than leaving it during our daylight surveys, the difference is presumably leaving Glacier Bay sometime during the evening hours, after the last survey is conducted. Marbled Murrelets in Port Snettisham show a similar diurnal movement pattern (ADF&G, unpubl. data).

Between June 27 and June 30, 2008, we conducted 15-minute flyway surveys at Pt. Adolphus in Icy Strait. Surveys were conducted on the hour, every hour, starting at 0500 and ending at 2200. Similar weather and environmental variables were recorded as in Glacier Bay (see above). The temporal pattern of activity differed from Glacier Bay (in 2007) in that the highest counts occurred just after dawn, and tapered off through the morning. Incoming birds (flying westward) past Pt. Adolphus were much more numerous than eastbound birds in the evening hours, which suggests a significant proportion of the population is flying east after dusk.

We had insufficient replicates in either location to test for effect of scope, magnification, observer, and weather. The final report will combine surveys at point Adolphus from before July 1 with those after July 1 to examine effects of covariates on counts.

JOB/ACTIVITY 1B: Assess error in distance estimation for strip and line transects.

Accomplishments: We conducted 367 accuracy trials from 8-15 July 2007. A trial consisted of an observer making a distance estimate to a Marbled Murrelet sitting on the water, followed by a measurement of the true distance using a laser rangefinder. The true distance to the bird in these trials ranged from 15-242 m, with a mean of 94.8 m (SD = 46.3). We trained and tested 6 observers for this exercise. Mean error overall was -2.6 m, and mean percent error was -2.1%. The absolute error ranged from 9.4-15.8 m by observer, and averaged 13.9 m across observers. Although absolute error was relatively high, the under-estimates largely cancelled out the over-estimates, and a slight (2%) underestimate in distance estimation resulted. This will bias strip transects approximately 4% low because the underestimate applies to both sides of the strip. In contrast, if distances are underestimated in line transects, there will be a positive bias in the density estimate. The best way to control for this is to adjust distance estimates for individual observers, based on these trials, and re-compute the density estimates.

We conducted 293 accuracy trials with 4 observers from 30 May-30 June 2008. A trial consisted of an observer making a distance estimate to a Marbled Murrelet sitting on the water, followed by a measurement of the true distance using a laser rangefinder. The true distance to the bird in these trials ranged from 20-300 m, with a mean distance of 101.8 m (SD = 46.3). The mean error (for all observers) was 0.62 meters. The mean percent error was 3.0 percent. The mean absolute error (16.5 m). For individual observers, the mean error ranged from -1.59 to 4.50; the mean percent error ranged from 0.4 % to 7.4 %, and the mean absolute error ranged from 12.1 to 21.8 m. Although there was a degree of error in all the distance estimates, those errors tended to cancel one another out over time, with the net percent error being very low. On this basis we decided no adjustment were necessary in counts based on observer.

JOB/ACTIVITY 1C: Compare line-transect and strip-transect survey methods for measuring marbled murrelet densities at sea.

Accomplishments: From 9-15 July, 2007, we conducted simultaneous line and strip transects in Glacier Bay. We randomly selected 48 transect throughout the non-wilderness waters of the Bay, with lines running from mid-channel to the nearest shore. The observers switched duties after each transect, so observer effects were cancelled out. Line transects returned substantially higher population densities, and lower coefficients of variation, than strip transects. Line transects returned population estimates of 31, 318 Marbled Murrelets and 4,207 Kittlitz's Murrelets on the water. If both line and strip transects return unbiased estimates of murrelet abundance, simultaneous surveys of the same transect lines should yield similar results. In this study, line transects returned a population estimate for *Brachyramphus* murrelets that was 33 % higher than strip transects. Based on line transects, the number of *Brachyramphus* murrelets on the water was 36,627, with Marbled Murrelets numbering 31,318 and Kittlitz's Murrelets numbering 4,299. Coefficients of variation were 0.18 and 0.38 for the 2 species respectively

Although it is commonly assumed that no birds are missed within the width of a strip transect, some birds are inevitably missed, especially when seas are rough. The maximum detection distance from the centerline was 218 m, and the effective strip width was 97 m. The CV for the population *Brachyramphus* murrelet population estimate was 17 %, which is a little more than half the CV for strip counts on the same lines.

From May 30-June 31, 2008, we completed 3 surveys of the western half of Icy Strait. The survey consisted of 14 transect segments, and duplicated the survey tracks of John Lindell (USFWS 1993). Survey protocols were the same for these Icy Strait surveys in 2008 as they were for Glacier Bay in 2007. The data from these surveys has been entered and the strip transect data analyzed. The line transect data has not been analyzed, but will be in the next reporting period.

OBJECTIVE 2: There was no progress made on this Objective during this reporting period.

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Date: 26 September 2008