

**FEDERAL AID  
ANNUAL 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-28 **Segment Number: 1**  
**Project Number:** 1.0  
**Project Title:** A comprehensive approach to identify relationships among dusky Canada goose (*Branta canadensis occidentalis*) sub-populations.  
**Project Duration:** May 1, 2013 – May 31, 2017  
**Report Period:** May 1, 2013 – May 31, 2014  
**Report Due Date:** June 29, 2014  
**Principle Investigator:** Michael Petrula  
**Project Location:** Region II, GMUs 7, 6A-D, Copper River Delta, Prince William Sound and Middleton Island. Also, British Columbia, Washington and Oregon, as these are areas that we anticipate geese will spend the winter.

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**I. PROBLEM OR NEED THAT PROMPTED THIS RESEARCH**

Dusky Canada geese (*Branta canadensis occidentalis*; hereafter dusks) are one of the least abundant goose populations in North America. They nest primarily on the Copper River Delta (CRD) AK, but also nest in Prince William Sound (PWS) and on Middleton Island (MI). Because of habitat changes resulting from the 1964 earthquake, dusky numbers on the CRD have declined (*in* Bromley and Rothe 2003). Thus MI and PWS geese currently comprise a greater proportion of the total dusky population than they did historically. Unfortunately, we know little of the abundance, productivity and annual distribution of MI and PWS dusks. Quantifying the degree of interchange among the 3 sub-populations may prove to be important in the long-term conservation of CRD dusky geese. Additionally, circumstances on the wintering grounds have also complicated dusky management efforts. Numbers of non-dusky Canada geese in Oregon, especially cackling Canada geese (*Branta hutchinsii minima*) have increased to such an extent that crop depredation has resulted in substantial economic losses to local farmers. This has led to complex harvest regulations to protect the vulnerable dusky population while still allowing cackler hunting as a means to reduce crop depredation (Pacific Flyway Council 1998).

A continued decline in CRD dusky numbers has managers, politicians and the public concerned about a possible federal endangered species listing and the closure of Canada goose hunting in southern Alaska, Oregon and Washington.

**II. REVIEW OF PRIOR RESEARCH AND STUDIES IN PROGRESS ON THE PROBLEM OR NEED**

Dusks have been cooperatively managed among wildlife agencies through formal management plans of the Pacific Flyway Council (Pacific Flyway Council 2008). Numerous management and

regulatory actions throughout the dusky's geographic range have been implemented to increase dusky numbers. These measures include: establishing federal refuges to provide wintering habitat in Oregon and Washington; implementing restrictive hunting regulations and quotas in Alaska, Washington and Oregon to reduce harvest; construction of artificial nesting islands on the CRD to increase nest success; conducting research activities on the CRD to identify limiting factors responsible for the declining population; perform genetics analysis to clarify relationships among Canada goose populations in south-central Alaska; quantify abundance and quality of foraging habitat on the wintering grounds, and conduct annual surveys to estimate abundance and productivity.

### III. APPROACHES USED AND FINDINGS RELATED TO THE OBJECTIVES AND TO PROBLEM OR NEED

We designed a comprehensive study that uses a combination of satellite telemetry, genetic sequencing, and traditional marking techniques (leg bands, neck collars) to investigate the relationships among CRD, MI and PWS Canada geese. Satellite transmitters (hereafter PTTs; platform transmitting terminal) deployed in this study will supplement our current sample of PTTs deployed in PWS and on MI in 2011. With an expected battery life of up to 3 years, we will be able to monitor geese from the 3 regions simultaneously. With this combined, “multimarker” approach we will be able to quantify historical and ongoing factors that will best infer population patterns (Avisé et al. 1992, Kendall and Nichols 2004).

To monitor annual movements of dusky Canada geese (*Branta canadensis occidentalis*), the Alaska Department of Fish and Game Waterfowl Program deployed 66 implantable satellite transmitters (hereafter PTTs) and 2 backpack harness mounted PTTs in females nesting in Prince William Sound (PWS), Middleton Island (MI), and on the Copper River Delta, Alaska (Table 1). Female geese (n=67) were captured on the nest in late May-early June using remotely detonated bow traps, and one flightless female was captured in July during the molt (CRD backpack). Clutches were removed to simulate an unsuccessful nesting attempt to determine whether birds travel to molt locations away from breeding areas. Eggs will also provide genetic material for future study. Females were captured throughout the nesting range of dusky Canada geese to ensure a broadly distributed sample (Fig. 1).

Table 1. Summary of satellite transmitter (PTT) deployment for female dusky Canada geese.

Year	Location	Number of PTTs deployed	Number of PTTs active <sup>a</sup>	Average # days transmitting <sup>c</sup>
2011	Pr. William Sound	12	2	651
2011	Middleton Island	6 <sup>b</sup>	2	465
2011	Copper R. Delta	1 <sup>b</sup>	0	unknown
2013	Copper R. Delta	28	21	286
2013	Pr. William Sound	5	2	195
2014	Middleton Island	16	16	all active

<sup>a</sup> still transmitting as of June 26, 2014.

<sup>b</sup> one PTT attached with backpack harness..

<sup>c</sup> Does not include PTTs currently transmitting, or 2 PTTs with backpack harness attachment.

## PRELIMINARY FINDINGS

### Movement to Molting Areas

Molting areas used by geese that successfully hatch a clutch are synonymous with brood rearing areas and are located in the general vicinity of the nest site. Unsuccessful nesting geese are not constrained by broods and may travel to molting areas substantial distances from nesting locations. By removing clutches from nests of females in this study and deploying PTTs, we increased the likelihood of identifying distant molting areas if they exist, and investigated whether common molting areas are used by dusky among the 3 nesting regions (PWS, MI and CRD).

Forty-one percent (9/22 females) of PTT-marked females nesting on MI moved significant distances to molting areas; 8 to PWS and 1 to the Martin River, east of the Copper River (Fig. 2).

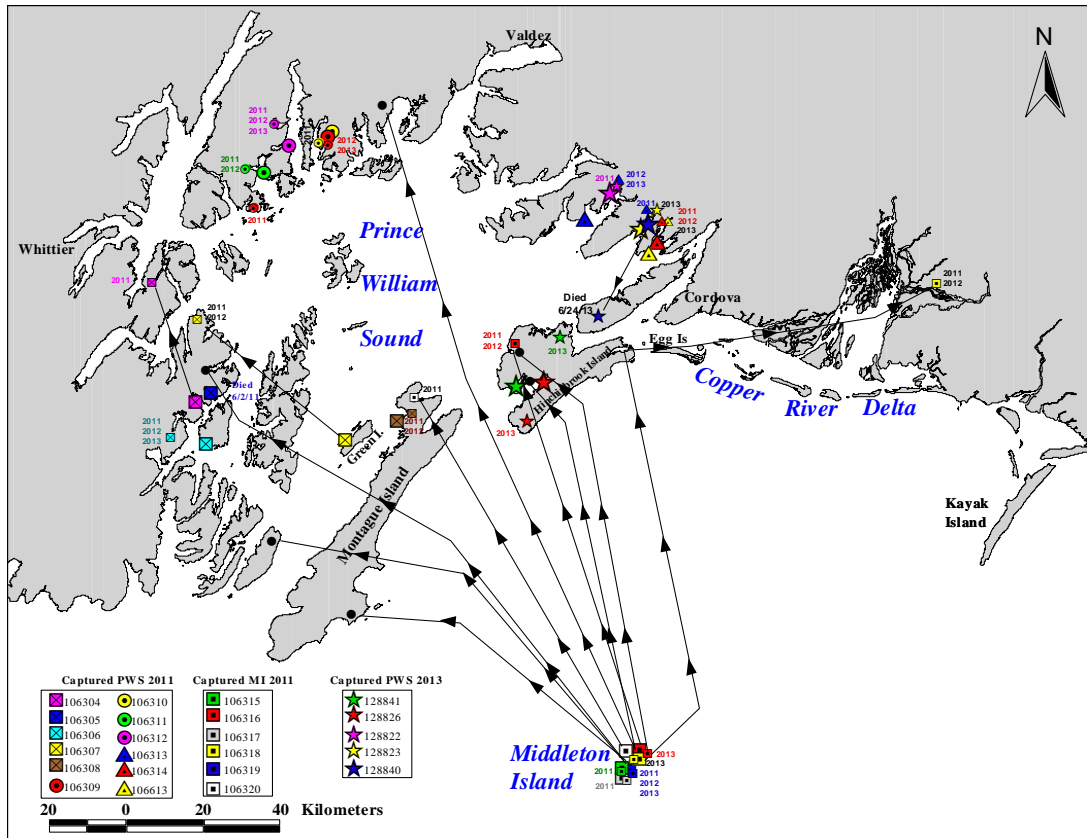


Figure 1. Nest locations (large symbols), molting areas (small symbols) and year molt location used for female dusky Canada geese marked with satellite transmitters in Prince William Sound and on Middleton Island (MI), Alaska. Arrows lead from nest sites to molting areas when not near each other. For Middleton Island geese captured in 2014, only molt locations away from MI are presented (black circles).

Geese captured on their nest in PWS molted in PWS (Fig. 2), and most geese nesting on the CRD molted on the CRD, however, several birds moved away from the CRD to molt (Fig. 3). Most notably was a CRD female that traveled 565 km to Glacier Bay in southeast Alaska (Fig. 3, inset).

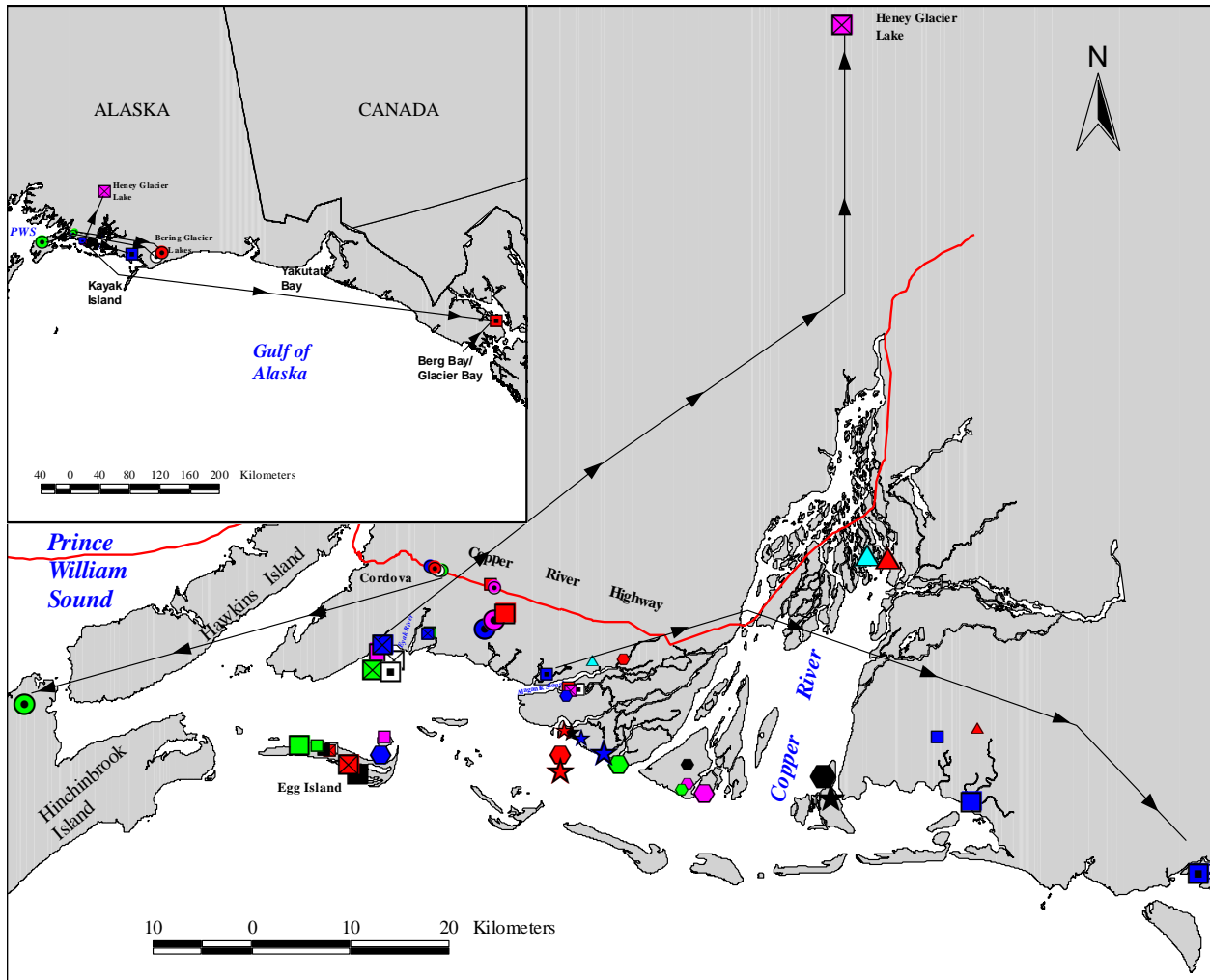


Fig. 3. Nest (small symbols) and molt (large symbols) locations used by female dusky Canada geese marked with satellite transmitters on the Copper River Delta, Alaska. Arrows lead from nest sites to molting areas when not near each other.

### Post-Molt Staging Areas

After the molt, most (20/28) females marked with PTTs on the CRD staged in the lower Orca Inlet/Hawkins Island cutoff area (Fig. 4). Two females that were PTT-marked on MI also staged in this area in multiple years. All PWS females remained in PWS after the molt.

### Fall Migration Chronology, Route and Stopping Areas

On average for all years, PTT-marked females in PWS and MI began fall migration November 2 (S. D. = 14 days; earliest = Sep. 22, 2011; latest = Nov. 26, 2012), later than females on the CRD

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in 2013 (average = Oct. 23; S. D. = 9 days; earliest = Sep. 29; latest = Nov. 16). Birds followed a coastal route arriving in the Pacific Northwest in mid-November (PWS and MI females all years, average Nov. 12; S.D. = 11 days; earliest = Oct. 20, 2011; latest = Dec. 8, 2011) (CRD females 2013, average = Nov. 1; S.D. = 10 days; earliest = Oct. 10; latest = Nov. 19). Ten geese stopped in the Haida Gwaii archipelago from 2 – 90 days. One bird died there in mid-January and another moved from Haida Gwaii to the Saanich Peninsula, BC in mid-January where it remained until April.

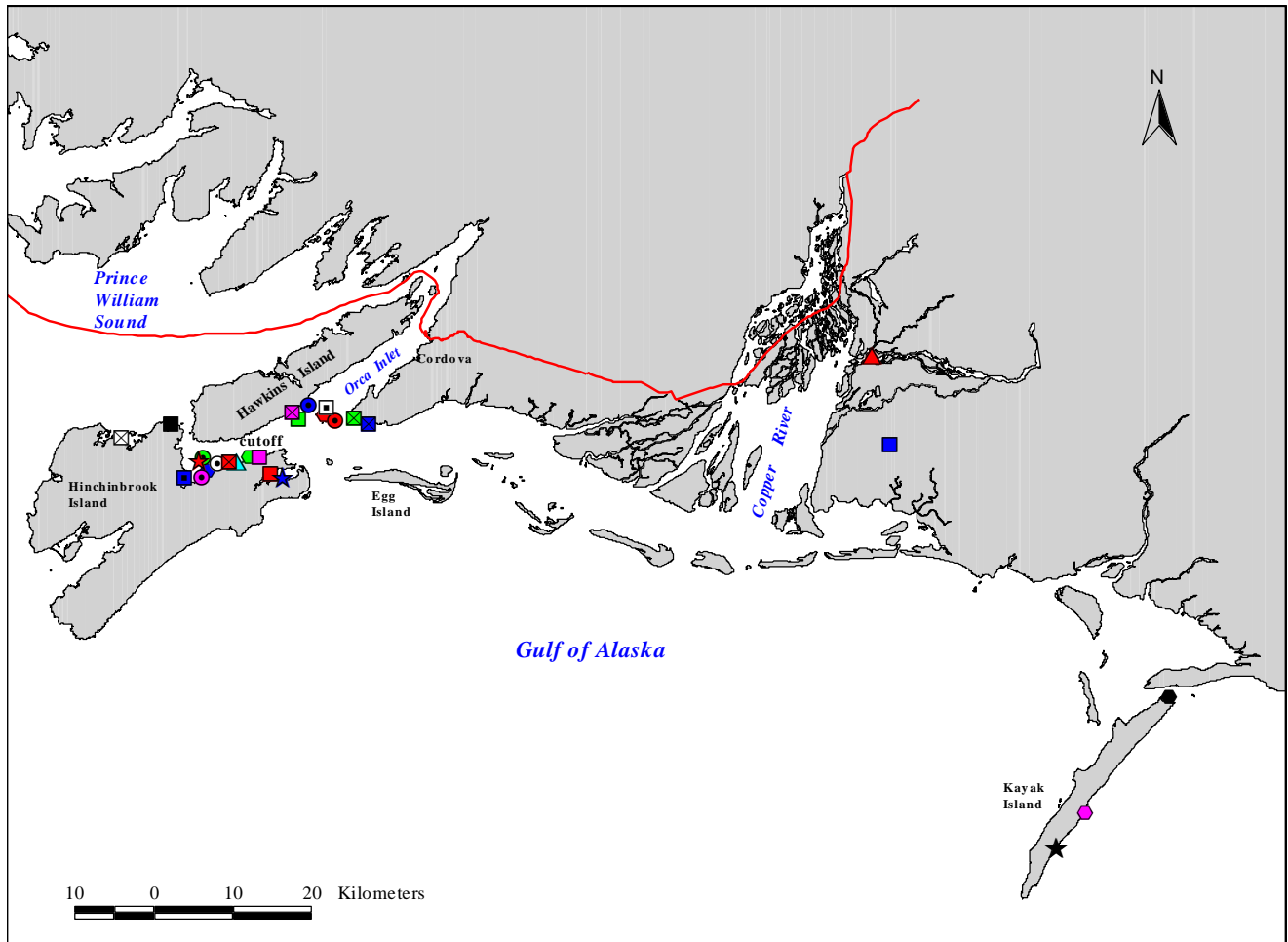


Fig. 4. Post-molt staging areas for PTT-marked dusky Canada geese captured during the nesting period on the Copper River Delta, Alaska.

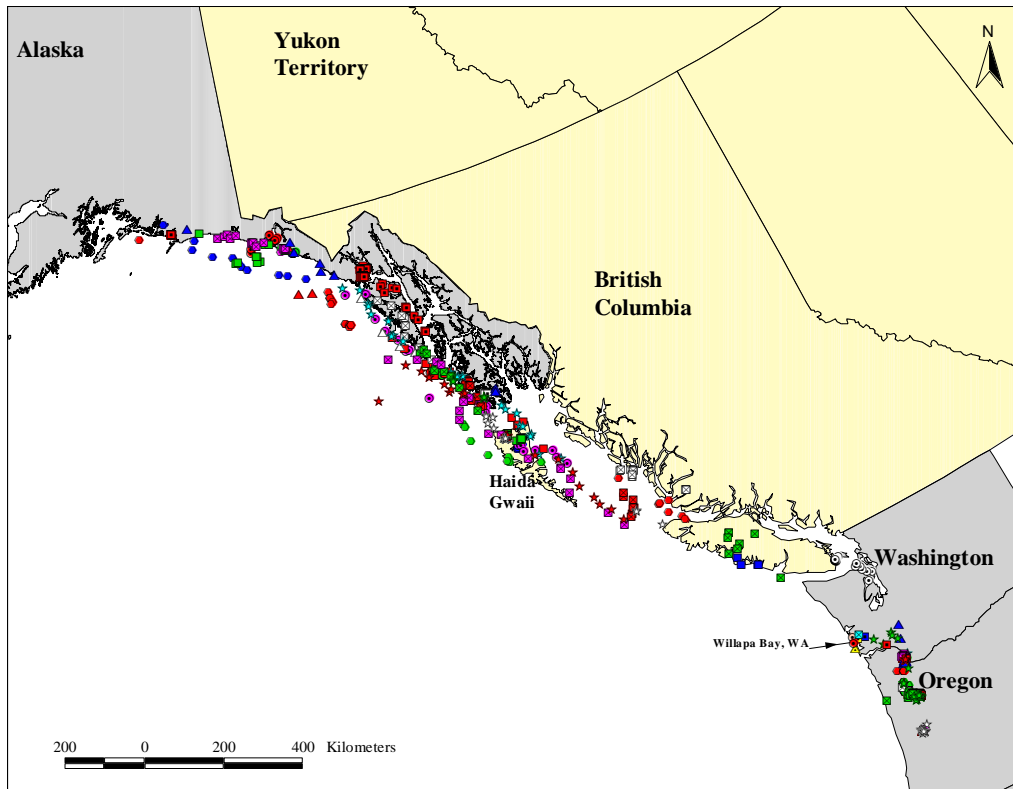


Fig. 5. Fall migration route for PTT-marked dusky Canada geese.

Two geese captured in Port Gravina, PWS and possibly another from southwestern PWS did not migrate, but remained in PWS through the winter.

### Winter Distribution

Seventy-five percent (9/12), 63% (5/8) and 50% (5/10) of PTT-marked females capture in PWS and MI overwintered in or near Willapa Bay, WA in 2011-12, 2012-13 and 2013-14, respectively (Fig. 6). PTT-marked geese captured on the CRD were only detected in or near Willapa Bay for brief periods during migration (Fig. 7). Most CRD birds wintered in Oregon, 12 in or near Sauvie Island on the Columbia River (Fig.7). Two birds wintered on the Saanich Peninsula, Vancouver Island, B. C. (Fig. 7).

### Spring Migration

PTT-marked dusky geese departed the Pacific Northwest in early April (PWS and MI females all years, average = Apr. 2; S.D. = 6 days; earliest = March 19, 2013; latest = Apr. 12, 2014) (CRD females 2014, average = Apr. 3; S.D. = 6 days; earliest = March 22; latest = Apr. 15) following a route similar to the fall arriving back in Alaska soon after departure (PWS and MI females all years, average = Apr. 8; S.D. = 7 days; earliest = March 26, 2013; latest = Apr. 23, 2013) (CRD females 2014, average = Apr. 8; S.D. = 7 days; earliest = March 27; latest = Apr. 21). All birds returned to the vicinity of their capture location.

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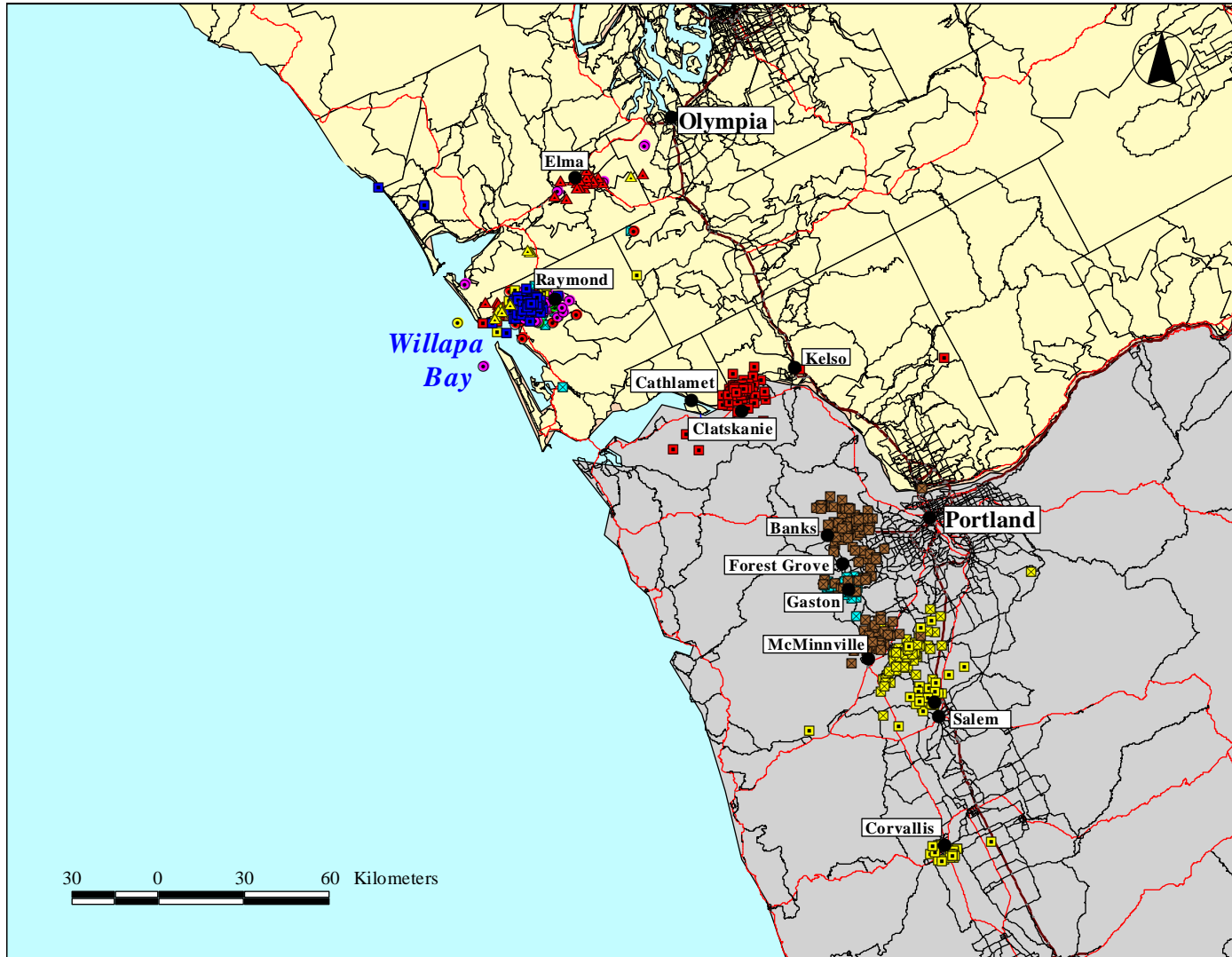


Fig. 6. Winter distribution of PTT-marked dusky Canada geese captured in Prince William Sound and on Middleton Island, Alaska. Locations are for the 2011-12, 2012-13 and 2013-14 winter periods. Non-clustered symbols represent birds on the move and are generally the first locations recorded during spring migration.

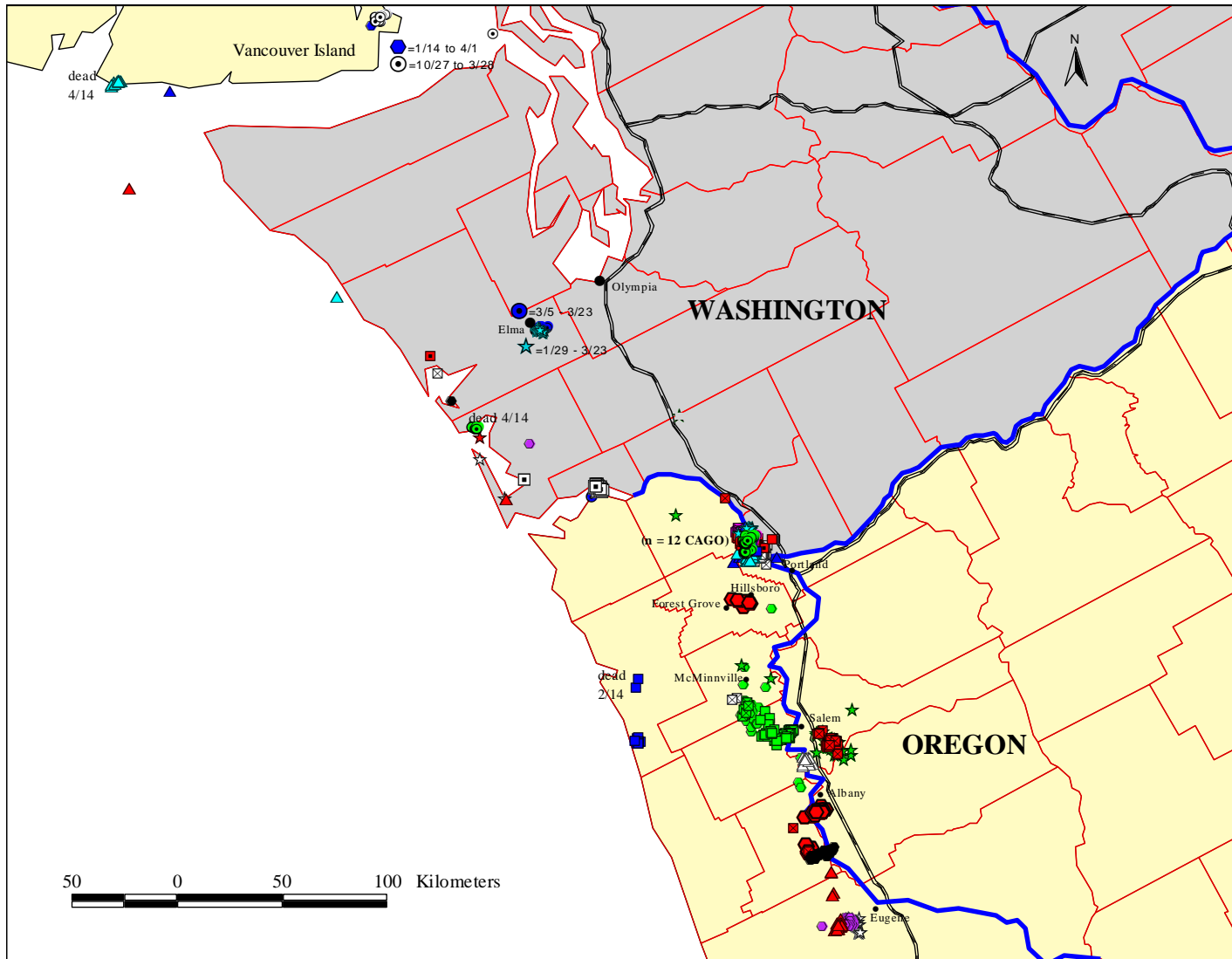


Fig. 7. Winter distribution of PTT-marked dusky Canada geese captured on the Copper River Delta, Alaska. Locations are for the 2013-14 winter period. Non-clustered symbols represent birds on the move and are generally the first locations recorded during spring migration.



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## IV. MANAGEMENT IMPLICATIONS

Because a large proportion of our PTTs are still transmitting results presented here are preliminary. Little can be said for MI birds that recently received PTTs, and CRD birds have only completed one annual cycle. Final results, conclusions and management recommendations will be made available in the future.

## V. SUMMARY OF WORK COMPLETED ON JOBS FOR LAST SEGMENT PERIOD ONLY

**Objective 1:** Because of declining numbers regulations have been implemented to reduce harvest of dusky Canada geese. We will use distribution data from satellite-marked birds to monitor fall migration chronology and adjust hunting periods in Alaska if needed, and determine if restrictive hunting zone boundaries are appropriately designated in Washington and Oregon.

**Job/Activity 1a:** Capture female dusky geese on the nest on the CRD (n=25) and PWS (n=5) in June 2013, and on MI (n=10) in May 2014 and using an experienced veterinarian surgically implant satellite transmitters in the abdominal cavity of each bird.

**Job/Activity 1b:** Obtain location data from ARGOS data collection service and import data to GIS software.

**Job/Activity 1c:** Analyze data and produce distribution maps for satellite-marked birds.

**Job/Activity 1d:** Distribute maps and summary data to cooperators and appropriate agencies.

**Job/Activity 1e:** Reevaluate hunting regulations for duskys in Alaska.

**ACCOMPLISHMENTS:** Each job/activity listed above was successfully completed.

Federal Aid funds were used to purchase satellite transmitters, travel to field locations, veterinary salary and supplies and for ARGOS data collection services. Hunting regulations will be reevaluated when the study is complete.

**Objective 2:** Determine the exact migration route duskys take between their nesting and wintering grounds, the habitats they use along the route, and when and to what extent they use them. Define the complete cyclic pattern of movements by individual dusky Canada geese from the 3 sub-populations simultaneously. This will include quantifying habitats used and time spent along coastal British Columbia where little is known about harvest rates, or the likelihood that geese overwinter.

**Job/Activity 2a:** Same as 1a – 1e.

**ACCOMPLISHMENTS:** Maps illustrating migration routes, chronology, and habitat distribution have been prepared for location data gathered thus far (see **III**, above).

**Objective 3:** Quantify the proportion of satellite-marked geese that occur outside the CRD survey area in spring during the U. S. Fish and Wildlife Service population survey. Satellite-marked birds located outside of the survey area during the survey period would indicate adjustments to the survey design would be warranted.

**Job/Activity 3a:** Same as 1a – 1d.

**ACCOMPLISHMENTS:** This objective will be further evaluated when all location data are obtained.

**Objective 4:** Similar to Objective 4, we will quantify the proportion of satellite-marked geese that depart MI before we conduct our population survey of the island.

**Job/Activity 4a:** Same as 1a – 1d.

**ACCOMPLISHMENTS:** Preliminary results suggest that a small proportion of MI geese that do not successfully hatch a clutch leave MI before our population survey.

**Objective 5:** The number of Canada geese in PWS is unknown. We will color mark a large number of individuals with uniquely coded neck collars as an initial step to generate a PWS count that can be added to CRD and MI dusky estimates.

**Job/Activity 5a:** Coordinate with USFS to organize a field crew for conducting molt drives, order neck collars and bands, and schedule an R-44 helicopter for mid-July 2013.

**Job/Activity 5b:** Band, deploy neck-collars, record morphological measurements, and collect blood quills for genetic samples from Canada geese molting on Terentiev Lake and surrounding areas.

**Job/Activity 5c:** Conduct surveys of PWS to estimate proportion of marked Canada geese and estimate abundance.

**ACCOMPLISHMENTS:** A small number of molting geese on Terentiev Lake were net gunned from a helicopter and banded. A hunter recovery in northern California suggests that some of these geese are not dusky. Genetic samples will be analyzed in the future to determine breeding origin. Choice of neck collar color will be determined at that time.

**Objective 6:** We will use the combination of demographic (i. e. banding, collaring, satellite telemetry) and genetic data to reassess predictions and make more robust inferences about the dusky population structure across broad temporal and spatial scales (Pearce and Talbot 2006).

**Job/Activity 6a:** Same as 1a – 1d.

**Job/Activity 6b:** Analyze genetic samples in cooperation with the USGS Alaska Science Center to quantifying the extent of interchange among CRD, PWS and MI geese on nesting, wintering and molting areas.

ACCOMPLISHMENTS: Genetic samples have been acquired and preserved. Analysis of samples will be coordinated with an appropriate lab, perhaps in-house, in the near future.

**Objective 7:** Quantify the proportion of each dusky sub-population in the harvest and estimate number of PWS geese.

**Job/Activity 7a:** Same as 1a – 1d.

**Job/Activity 7b:** Analyze genetic samples from hunter shot birds collected from check stations in AK, WA and OR to determine breeding origin. The proportion of PWS in the harvest will be used to estimate population size.

ACCOMPLISHMENTS: A small number of genetic samples have been acquired and preserved. More samples will be obtained this year. Analysis of samples will be coordinated with an appropriate lab, perhaps in-house, in the near future.

## **VI. PUBLICATIONS**

Deployment of Satellite Transmitters to Monitor Movements of Prince William Sound, Middleton Island and Copper River Delta Dusky Canada Geese. 2014. Preliminary report prepared for Pacific Flyway Technical Committee.

### **I. ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT DURING THIS SEGMENT PERIOD**

None.

### **II. RECOMMENDATIONS FOR THIS PROJECT**

None

**Prepared by:** Michael J. Petrula

**Date:** August 13, 2014