MEMORANDUM

State of Alaska

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SUBJECT: GMU 2 Wolf Population Estimate Update, Fall 2014

Since 2012, the Alaska Department of Fish and Game (ADF&G) and the U.S. Forest Service (USFS) have collaborated on new procedures for estimating the wolf population in the Game Management Unit (GMU) 2 study area (Fig. 1) using a DNA-based, capture-mark-recapture (CMR) technique. We collected DNA from hair follicles using hair traps in our study area on northcentral Prince of Wales Island (POW) during late autumn 2012–2014. Individual wolves were identified via DNA genotyping which enables the estimation of wolf densities using a spatially-explicit, capture-recapture technique (SECR; Efford et al. 2004). This method requires multiple recaptures of individual wolves in different locations.

Data collected during 2012 proved insufficient to allow the application of the SECR technique because of too few recaptures. Improvements to the hair sampling method allowed for collection of sufficient data during 2013 to calculate a density estimate for a defined study area within the northcentral part of POW Island (Fig. 1). In autumn 2014, we conducted another population estimate in a similar area as 2013 (Fig. 1, 2). Based on our results in 2013, the area sampled in 2014 was expanded and the density of hair traps was increased to improve the precision of our 2014 population estimate (Fig. 1, 2).

2014 Estimates for the POW Study Area

The density estimate for the research study area in northcentral POW Island (Fig. 1, 2) using data collected during autumn 2014, is 9.9 wolves/1000 km^2 (95% CI = 5.5–17.7/1000 km^2; Table 1). This estimate is significantly lower than the autumn 2013 estimate of 24.5 wolves/1000 km^2 (95% CI = 14.4–41.9/1000 km^2) for the smaller study area in northcentral POW Island (Fig. 1).

The proportion of females in the captures in 2013 was close to 0.50 (0.57 ± 0.13). The proportion of females in the captures was much lower in 2014 (0.25 ± 0.11; Table 1). We summarized the capture statistics (Table 2) and the number of detections (Table 3) for the 2014 survey.

A decline in the population density estimate within the study area (Fig. 1) was somewhat anticipated based on harvest reports and observations from staff and the public. At least one wolf pack, previously known to be in the study area, was believed to no longer be present. This assertion was corroborated by harvest records documenting 6 wolves taken from wildlife analysis areas within this pack's home range during the 2013-2014 regulatory year and one radiocollared wolf taken during autumn 2014.

There are various potential reasons for the lower wolf estimate for the study area in 2014. The known take of wolves from the study area prior to the 2014 estimate contributed to the lower estimate. Other factors that may have reduced wolf numbers include, decreases in deer abundance, availability of non-ungulate prey, increases in disease in wolves, and increases in unreported wolf take. However, there is no indication that any of these factors are present. One other possibility is a decrease in the vulnerability of deer to wolf predation causing subsequent decreases in recruitment and survival of wolves. There is evidence from other deer-wolf systems that wolves are less efficient in capturing deer during mild winters. This is possibly indicated by the relatively mild winters deer have experienced in recent years; however there are no empirical data to support the hypothesis.

Wolves recolonize vacant pack areas. We believe that as long as harvest remains low and other factors like prey availability and habitat suitability remain unchanged, wolves will recolonize the vacant pack territory within the study area and future density estimates will be higher.

Predicted Population Estimates for Most of GMU 2

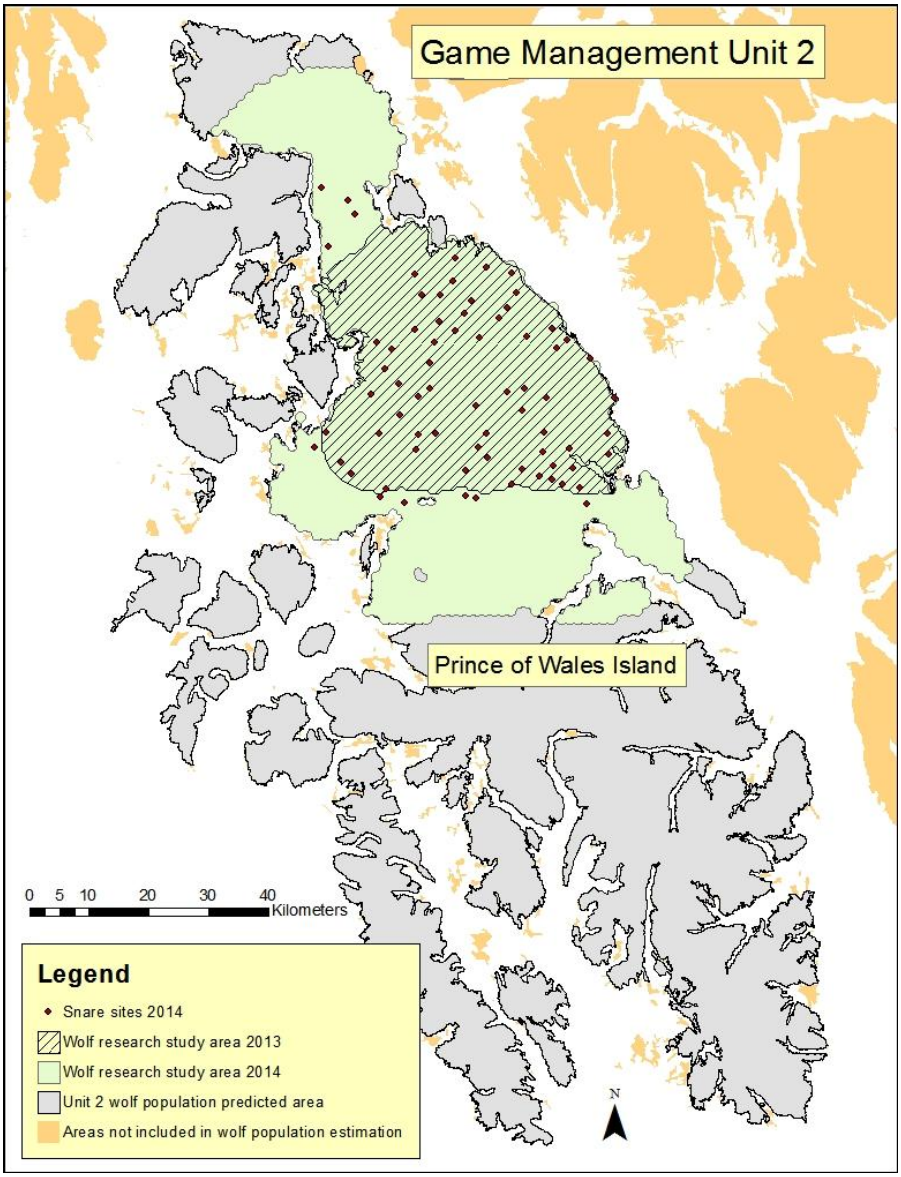
In 2013, we projected the density estimate from our study area to most of GMU 2 (9,025 km^2) (Fig. 1; ADF&G 2014). Based on a smaller study area (1,683 km^2), we predicted a population size of 221 wolves (95% CI = 130–378) in GMU 2 for autumn 2013. These GMU-wide population size estimates assume that the density of wolves throughout the unit is similar to that of the study area.

A similar prediction for 2014 data to most of GMU 2 (9,025 km^2) results in a population estimate of 89 wolves (95% CI = 50–159). This year, the study area represents 36% of the entire GMU 2. Since we conducted the survey in 2013, 57 wolves were reported taken by trapping and hunting in regulatory year 2013 (autumn/winter of 2013–2014) across GMU 2. This level of harvest does not account for the magnitude of the predicted estimated decline at the GMU level. The reported harvest of 57 wolves in 2013 would have resulted in a harvest rate of approximately 26% (57/221) which should not be high enough to cause the wolf population to decline at all (Fuller 1989, Person and Russell 2008) much less account for an estimated decrease of 132 wolves. This exercise illustrates the problematic nature of extrapolating wolf densities for a large area using data from a small study area; however, it is the best information available with which to set harvest quotas at the GMU level.

Recommendations

Following adjustments in regulation and application of harvest quotas, 29 wolves were reported taken in regulatory year 2014. This results in estimated harvest rate of approximately 33% after the current autumn survey in 2014. Current regulations require that harvest not exceed 20% of the most recent estimate. Therefore, the harvest quota will be substantially reduced for the 2015 regulatory year. Future research efforts will be focused on improving our predicted population estimates at the GMU level by expanding the study area and improving the precision of the estimate. Additional information concerning the fall 2014 GMU 2 wolf abundance estimate will be available in a final wildlife research report scheduled to be completed by July 2015.

Figure 1. Game Management Unit 2 showing the wolf population research study area used in 2013 (1,683 km^2), 2014 (3,280 km^2), and the prediction area (9,025 km^2). We expanded the research study area in 2014.



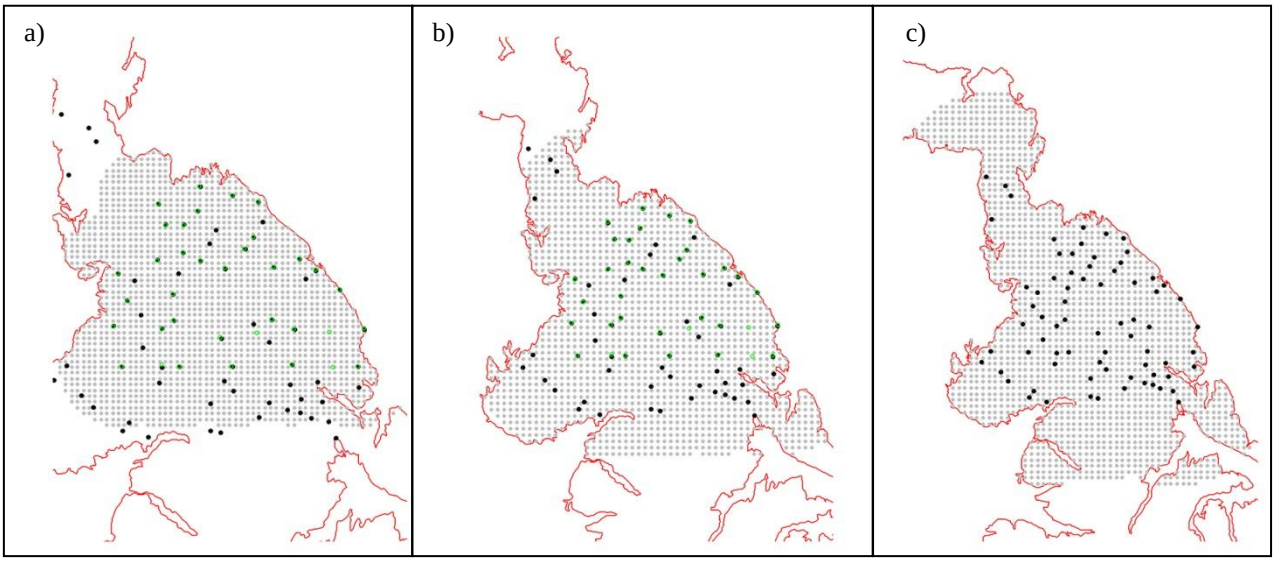


Figure 2. Study area used for 2014 analyses: a) 10-km buffer around 2013 node locations (1,682 km^2, equivalent to 2013 analysis area), b) 20-km buffer around 2013 node locations (2,457 km^2, extended to account for larger movements in 2014 data), and c) 20-km buffer around all 2014 node locations (3,280 km^2). Solid black dots are the 2014 node locations and open green circles represent 2013 node locations.

Table 1. Population density and size estimates for wolves on northcentral Prince of Wales study area in autumn 2014. These estimates are based on spatially-explicit, capture-recapture procedures (SECR) within a study area defined by a 20-km buffer around all 2014 node locations. Values are presented ± SE (95% CI). The top model (16) was selected based on small-sample Akaike's Information Criterion (AIC_c) and used for determining the wolf estimate. Sex ratio is the proportion of females measured in the population.

Model	g_0[a]	σ[a]	AIC_c	ΔAIC_c	$AICc_{wt}$	Density (per 1000 km^2)	Expected N[b]	Sex ratio
16	k	1	414.301	0	0.3781	9.9 ± 3.0 (5.5, 17.7)	32.4 ± 10.1 (17.9, 58.7)	0.25 ± 0.11
5	bk	1	414.830	0.529	0.2903	8.7 ± 2.5 (5.1, 15.0)	28.6 ± 8.2 (16.5, 49.6)	0.25 ± 0.11
14	Bk	1	417.179	2.878	0.0897	8.3 ± 2.3 (4.9, 14.0)	27.3 ± 7.6 (16, 46.5)	0.25 ± 0.11
19	K	1	417.685	3.384	0.0696	8.6 ± 2.4 (5.1, 14.6)	28.2 ± 7.9 (16.5, 48.4)	0.25 ± 0.11
17	k	Sex	417.826	3.525	0.0649	10.1 ± 3.2 (5.6, 18.4)	33.3 ± 10.6 (18.1, 61.3)	0.33 ± 0.14
6	bk	Sex	418.534	4.233	0.0455	9.0 ± 2.6 (5.2, 15.7)	29.6 ± 8.8 (16.8, 52.2)	0.33 ± 0.14
15	Bk	Sex	420.567	6.266	0.0165	8.6 ± 2.4 (5.0, 14.7)	28.1 ± 8.0 (16.3, 48.6)	0.32 ± 0.14
20	K	Sex	420.929	6.628	0.0138	8.8 ± 2.5 (5.1, 15.2)	29.0 ± 8.4 (16.7, 50.4)	0.32 ± 0.14
1	1	1	422.241	7.940	0.0071	8.0 ± 2.1 (4.8, 13.3)	26.1 ± 7.0 (15.6, 43.9)	0.25 ± 0.11
11	B	1	422.287	7.986	0.0070	9.0 ± 2.6 (5.2, 15.6)	29.5 ± 8.6 (16.9, 51.7)	0.25 ± 0.11

[a] An explanation of the symbols used for g_0 (baseline detection probability) and σ (range parameter): b = learned response, global response, step change after first detection; B = transient response; global response, depends on detection at preceding occasion (Markovian response); bk = animal × site response, site-specific step change; Bk = animal × site response, site-specific transient response; k = site learned response, site effectiveness changes once any animal caught; K = site transient response, site effectiveness depends on preceding occasion; sex = sex of the animal.

[b] The expected number of wolves in the study area predicted from the study area's density.

Table 2. Summary of 2014 capture effort (full data set).

Occasion	1	2	3	4	5	6	7	8	9	10	Total	Mean ± SD
Animals detected	3	2	5	3	0	2	4	2	8	0	29	2.9 ± 2.4
Unique animals detected	3	1	4	2	0	0	2	0	4	0	16	1.6 ± 1.6
Repeat detection frequency	10	2	2	1	1	0	0	0	0	0	16	1.6 ± 3.1
Cumulative detections	3	4	8	10	10	10	12	12	16	16	16	N/A
Total detections	4	2	5	4	0	3	6	2	10	0	36	3.6 ± 3.0
Detectors visited	3	2	5	3	0	2	3	1	8	0	27	2.7 ± 2.4
Detectors used	72	72	72	72	72	72	72	72	67	1	644	64.4 ± 22.3
Mean occasion length (days)	5.8	6.8	6.9	7.0	7.0	7.0	7.8	6.5	6.5	0.1	4420	6.2 ± 2.2

Table 3**.** Summary of 2014 detection rate (full data set).

Occasion	1	2	3	4	5	6	7	8	9	10	Mean ± SD
Detection rate (detections / trap / 100 trap days)	0.95	0.41	1.01	0.80	0.59	1.07	0.43	0.43	2.29	0	0.76 ± 0.66
Detection rate (unique animals / trap / 100 trap days)	0.71	0.20	0.81	0.40	0	0	0.36	0	0.92	0	0.34 ± 0.36

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