Species Management Report and Plan ADF&G/DWC/SMR&P–2022–28

Elk Management Report and Plan, Game Management Unit 8:

Report Period 1 July 2013–30 June 2018, and

Plan Period 1 July 2018–30 June 2023

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Alaska Department of Fish and Game Division of Wildlife Conservation

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Hunters are important founders of the modern wildlife conservation movement. They, along with trappers and sport shooters, provided funding for this publication through payment of federal taxes on firearms, ammunition, and archery equipment, and pay state hunting license and tag fees. These taxes and fees fund the federal Wildlife Restoration Program and the State of Alaska's Fish and Game Fund, which provided funding for the work reported on in this publication.

Species management reports and plans provide information about species that are hunted or trapped and management actions, goals, recommendations for those species, and plans for data collection. Detailed information is prepared for each species every 5 years by the area management biologist for game management units in their areas, who also develops a plan for data collection and species management for the next 5 years. This type of report is not produced for species that are not managed for hunting or trapping or for areas where there is no current or anticipated activity. Unit reports are reviewed and approved for publication by regional management coordinators and are available to the public via the Alaska Department of Fish and Game's public website.

This species management report and plan was reviewed and approved for publication by Jeff Selinger, Management Coordinator for Region II for the Division of Wildlife Conservation.

Species management reports and plans are available via the Alaska Department of Fish and Game's public website (www.adfg.alaska.gov) or by contacting Alaska Department of Fish and Game's Division of Wildlife Conservation, PO Box 115526, Juneau, AK 99811-5526; phone: (907) 465-4190; email: dfg.dwc.publications@alaska.gov. The report may also be accessed through most libraries, via interlibrary loan from the Alaska State Library or the Alaska Resources Library and Information Services (www.arlis.org). To subscribe to email announcements regarding new technical publications from the Alaska Department of Fish and Game, Division of Wildlife Conservation please use the following link: http://list.state.ak.us/mailman/listinfo/adfgwildlifereport.

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Please contact the authors or the Division of Wildlife Conservation at (907) 465-4190 if you have questions about the content of this report.

Cover Photo: Radio-collared female Roosevelt elk on Afognak Island, Alaska. ©2018 ADF&G. Photo by Nathan Svoboda.

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Purpose of this Report

This report provides a record of survey and inventory management activities for elk (*Cervus elaphus roosevelti*) in Game Management Unit 8 for the 5 regulatory years 2013–2017 and plans for survey and inventory management activities in the next 5 regulatory years, 2018–2022. A regulatory year (RY) begins 1 July and ends 30 June (e.g., RY14 = 1 July 2014–30 June 2015). This report is produced primarily to provide agency staff with data and analysis to help guide and record agency efforts but is also provided to the public to inform it of wildlife management activities. In 2016 the Alaska Department of Fish and Game's (ADF&G, the department) Division of Wildlife Conservation (DWC) launched this 5-year report to report more efficiently on trends and to describe potential changes in data collection activities over the next 5 years. It replaces the elk management report of survey and inventory activities that was previously produced every 3 years.

I. RY13–RY17 Management Report

Management Area

Game Management Unit 8 (5,097 mi^2, Fig. 1) is located in the Kodiak Archipelago in the Gulf of Alaska. It encompasses all islands southeast of the centerline of Shelikof Strait, including Kodiak, Afognak, Whale, Raspberry, Shuyak, Spruce, Marmot, Sitkalidak, Amook, Uganik, Chirikof, the Trinity Islands, the Semidi Islands, the Barren Islands, other adjacent islands, and all seaward waters and lands within 3 miles of these coastlines. The archipelago is approximately 177 miles long and 50 miles wide consisting of a rugged, fjord-carved landscape with elevations ranging from sea level to approximately 4,500 feet. The archipelago has a wet maritime climate with little seasonal temperature variation and abundant precipitation. Vegetation composition varies throughout the archipelago and is highly influenced by past glaciation.

There are 3 primary ecological regions comprising the archipelago: the Sitka spruce region, the central ecological region, and the southern ecological region (Fleming and Spencer 2006). The Sitka spruce region encompasses northeastern Kodiak Island and includes Afognak and Shuyak Islands. The lower elevations in this region are comprised primarily of Sitka spruce (*Picea stichensis*) with a dominant understory consisting of salmonberry (*Rubus spectabilis*), devils club (*Echinopanax horridum*), cow parsnip (*Heracleum lanatum*), ferns (*Athrium* spp.) and high-bush blueberry (*Vaccinium ovalifolium*), with dispersed pockets of elderberry (*Sambucus racemosa*). Other plant communities in this region include forb-grass meadows containing willow (*Salix* spp.), birch (*Betula kenaica*), and alder (*Alnus crispa sinuata*). Much of Kodiak Island is classified as the central ecological region and is dominated by rugged, mountainous topography with steep ravines, deep valleys, and fast-moving glacial streams and rivers. Bands of deciduous forests comprised of willow, birch, cottonwood, and alder can be found in lowland areas along rivers and streams. Similar to the Sitka spruce region, salmonberry, ferns, cow parsnip, blueberry, and fireweed (*Epilobium angustifolium*) cover much of the landscape, along with

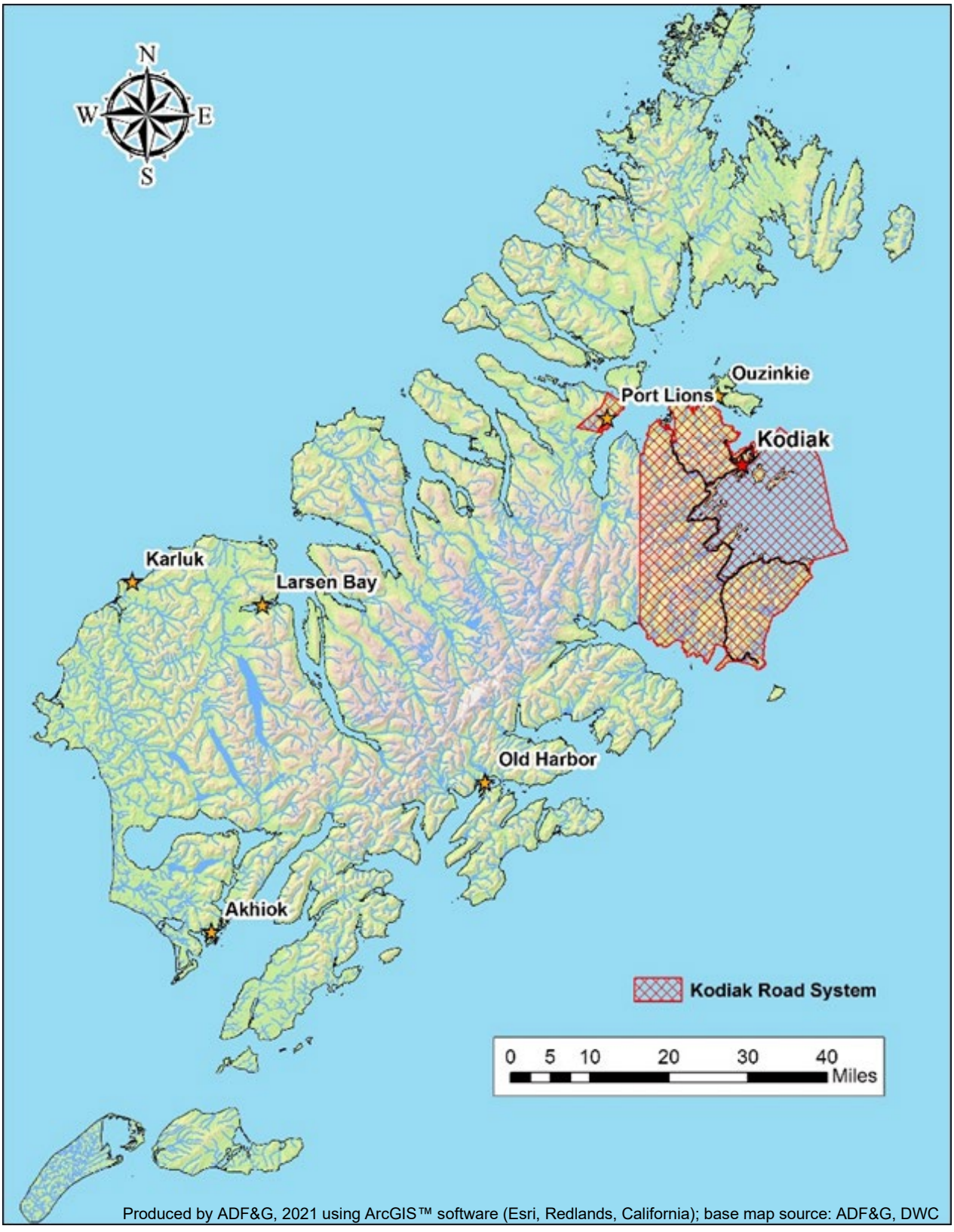

Figure 1. A map showing Game Management Unit 8, Kodiak Archipelago, Alaska.

various grass and forb assemblages. At the higher elevations plant communities include alpine-forb meadows and alpine tundra. Alpine-forb meadows consist of sedges (*Carex* spp.), lupine (*Lupinus nootkatensis*), and Indian paint brush (*Caltilleja unalalaschensis*); while the alpine tundra is comprised of crowberry (*Empetrum nigrum*), partridgefoot (*Luetkea pectinata*), alpine blueberry (*Vaccinium uliginosum*), various lichens (*Cladina* spp., *Cetraria* spp.) and dwarf shrubs. The southern ecological region encompasses the glacial refugium and subarctic heath lands (Fleming and Spencer 2006) and consists of crowberry, dwarf willow (*Salix* spp.), fireweed, blueberry, cranberry (*Vaccinium vitis-idaea*), goldenrod (*Solidago lepida*), Labrador tea (*Ledum palustre*), Kinnikinnick (*Arctostaphylos uva-ursi*), and various forbs and mosses (Fleming and Spencer 2006).

The Kodiak Road System Management Area is contained within Unit 8 and only includes portions of the main island comprising that portion of Kodiak Island north of a line from the head of Settlers Cove (including Peregrebni Point) to Crescent Lake (57°52′N, 152°08′W), east of a line from the outlet of Crescent Lake to Mount Ellison Peak, from Mount Ellison Peak to Pokati Point at Whale Passage, that portion of Kodiak Island east of a line from the mouth of Saltery Creek to the mouth of Elbow Creek, and adjacent small islands in Chiniak Bay.

Summary of Status, Trend, Management Activities, and History of Roosevelt Elk in Unit 8

On 29 June 1925, the Alaska territorial governor approved a program to transplant Roosevelt elk (*Cervus elaphus roosevelti*) to the Kodiak-Afognak islands group (Paul 2009). In late August 1928, under a goat-elk exchange program with the State of Washington, 8 elk calves (3 males and 5 females) were captured from Ho Valley on the Olympic Peninsula and shipped from Port Angeles, Washington to Kodiak Island, Alaska. Upon arrival the calves spent their first year at the U.S. Agricultural Experiment Station at Kalsin Bay, on Kodiak Island. Because of grazing concerns from local ranchers, elk were removed from the Kalsin Bay Experiment Station and released near Litnik Bay on Afognak Island in the spring of 1929 (Troyer 1960). In the spring of 1930, 5 calves were reported on the island and in 1933 the Alaska Game Commission reported 30 or more elk, suggesting a flourishing population (Burris and McKnight 1973). An estimate made in September 1934 placed the population at 50 to 60 animals, and a 1937 commission report estimated 100 elk that January (Burris and McKnight 1973). On 3 December 1948, 162 elk were observed during an aerial survey and the total population was estimated to be no less than 212 (Batchelor 1965).

By 1948 the population exceeded 200 elk, thanks in part to protection by local residents, sufficient habitat, and minimal predation (Van Daele and Crye 2012). In the early 1950s the Afognak population was estimated at 300 animals, and in 1951, 2 elk were observed on nearby Raspberry Island. The first hunt occurred on Afognak Island in 1950 with a harvest of 27 bulls (Elkins and Nelson 1954). The season was closed in 1951 but resumed in 1952 and 1953. Following a season closure in 1954, a 15-day bull-only elk season was opened for Afognak Island in 1955 and hunting has been allowed annually since. The season length was increased to 20 days in 1957 and 31 days in 1958, and in 1959 the first either-sex hunt was initiated. The population continued to prosper with an estimated 1,100 animals by 1961 (Batchelor 1965).

As the elk population grew, hunting seasons and bag limits were liberalized. In 1963 a 153-day season was established with a bag limit of 2 in the Tonki Cape area. By 1965 the population was estimated at 1,200–1,500 elk in 9 separate herds on Afognak Island and 1 herd on Raspberry Island. Despite a 153-day season and a 2-elk bag limit, harvest of Afognak elk was modest. However, excessive harvest of the highly accessible Raspberry Island herd prompted managers to close the hunting season on Raspberry Island in 1968 (Alexander et al. 1968). A series of severe winters with heavy snow accumulation ending in 1972 caused extensive mortality, and reduced calf production and survival (Alexander 1973), reducing the population to about 450 (Burris and McKnight 1973). Hunting permits were reduced islandwide to allow the population to recover.

Management strategies were strongly influenced by population size, hunter access, and herd vulnerability. Drawing and registration permit hunts, with harvest quotas regulated by emergency order closures, characterized management strategies for the most accessible herds of southwestern Afognak Island and Raspberry Island from the mid-1970s to the late 1980s. Initiation of commercial logging in 1977 marked a new management era, with increased vulnerability of elk to hunting because of logging road access and loss of cover (Van Daele and Crye 2012). By the mid-1980s, shorter seasons were imposed in east-central Afognak Island where logging was concentrated. The herd recovered to a high of 1,400 by the late 1980s and remained relatively stable through the 1990s with minor fluctuations correlated with winter severity (Van Daele and Crye 2012).

Beginning with the 1993 season, the road-accessible eastern and central portions of Afognak Island were merged with southwestern Afognak to form a single management area regulated by staggered drawing permit hunts, followed by a registration hunt. North Afognak was included in the registration hunt, while elk on Raspberry Island were subject to staggered drawing hunts. A harsh winter in 1998–1999 severely impacted ungulate populations on the archipelago, and elk herds on western Afognak and Raspberry islands declined (Van Daele 2000). As a result of winter mortality, the population fell below the management objective of 1,000, where it remained until 2017–2018 when aerial survey estimates reached 1,000 elk in 8 herds.

Starting in regulatory year 2003, Afognak Island was divided into 3 drawing hunt areas while Raspberry Island remained a separate drawing hunt area. Hunt areas on Afognak Island were designed to address concerns associated with access fees on private lands, decreased bull and calf percentages, and unclear hunt boundaries (Van Daele and Crye 2012). This hunt management strategy has continued through this reporting period. Each hunt area on Afognak Island opened for drawing hunts from 25 September–22 October. In an effort to disperse hunting pressure, increase hunter satisfaction, and avoid hunter conflict, a staggered season for drawing hunts was implemented. The first season in each of the Afognak Island drawing hunts commences on 25 September and ends on 9 October; the second season begins 8 October and ends 22 October. If harvest objectives are not achieved for individual herds during the drawing hunt, the area is reopened as a registration hunt. Registration hunts occur from 23 October–30 November or until harvest objectives for individual herds are reached at which time the registration hunt (or a portion of) is closed by emergency order. Raspberry Island remains a drawing-hunt-only area and is comprised of 3 staggered drawing hunts occurring from 1 October–30 November.

Management Direction

Existing Wildlife Management Plans

Guidelines for elk management were first outlined in the Alaska Wildlife Management Plans – Southwestern Alaska (ADF&G 1976) and have been modified over time based on public comment, department recommendations, Alaska Board of Game action, the latest research, and survey-and-inventory estimates.

Goals

- Provide continued sustainable elk harvest opportunities for residents and nonresidents.
- Provide an opportunity to view, photograph, and enjoy elk in aesthetically pleasing conditions.

Codified Objectives

Amounts Reasonably Necessary for Subsistence Uses

There is a negative customary and traditional use determination for Roosevelt elk; therefore, no predetermined number of elk are necessary for subsistence uses.

Intensive Management

Roosevelt elk are not designated as intensive management species; therefore, no intensive management objectives have been determined.

Management Objectives

The management objective is to maintain a combined minimum population of 1,000 elk on Afognak and Raspberry islands. Elk are managed for sport and subsistence hunting opportunities for all user groups, with emphasis on managing the Raspberry Island population for trophy-sized bulls. ADF&G staff strive to manage the Raspberry Island elk herd at a maximum of 150 animals with a minimum bull-to-cow ratio of 15:100. The Afognak Island elk population is managed by a combination of drawing and registration hunts until the desired harvest quotas are reached. We attempt to maintain at least 2–3 active radio collars in each elk herd to facilitate composition counts and gather recruitment information.

Management Activities

1. Population Status and Trend

Activity 1.1. Conduct aerial composition counts of each herd to estimate elk abundance, distribution, and cow-to-calf ratios.

Data Needs

Annual composition surveys are necessary to determine the current population status and to assess fluctuations in population trends and demographics. Maintaining consistent monitoring methods will ensure management goals are being met and allow managers to set sustainable harvest goals that maintain a healthy, viable, sustainable elk population that meets the needs of the public.

Methods

Surveys were conducted using fixed-wing aircraft with 2 experienced observers (biologist and pilot). Surveys were focused in established elk hunt areas on Afognak and Raspberry islands and are generally conducted in July and September. July surveys occur shortly after calving and are intended to gather information on calf production (i.e., calf counts) while September surveys occur during or near the rut when bulls and cows congregate for reproductive purposes. Radiocollared elk were located using radio telemetry and provided general location information for most herds. Although radiocollared elk provide locations for most herds, which maximize the number of elk identified, a comprehensive survey of the hunt area is still conducted when weather conditions and funding allow. Surveys were flown at various altitudes to maximize elk sightability and identification. Once located, the pilot-observer team circles the herd until a reliable count can be established and consensus between observers is achieved. Adults and calves were counted independently by the pilot and biologist and, when possible, observers differentiated between adult bulls and cows and reported observations accordingly. Observers recorded a global positioning system (GPS) waypoint when the aircraft was directly above the herd (group or individual) or when the herd was perpendicular to the aircraft's flight path. When necessary, a digital photograph may be taken to confirm documented observations. It is important to note detection can be compromised due to vegetation (i.e., thick forest) and complete counts are rarely obtained for each herd.

Results and Discussion

Population Size – Aerial composition surveys indicate a growing trend in the Unit 8 elk population during RY13–RY17 (Table 1). The total elk population on Raspberry and Afognak islands combined was estimated at approximately 950 and 1,000 animals in RY16 and RY17, respectively. These estimates are noticeably higher than the previous reporting period (approximately 710 and 685 in RY11 and RY12, respectively); and exceed the 5-year average ($\bar{x}$ = 910). During the previous 5 years (RY08–RY12) population estimates ranged from 575–625 in RY09 to 660–710 in RY12. Prior to 2017, elk population estimates have been below the management objective for nearly 20 years, likely due to multiple factors including reduced habitat and food resource availability and high winter mortality. Increased snow accumulation combined with extended periods of cold weather during the harsh winters of RY06, RY08, and RY15 likely contributed to a reduction in herd size. However, relatively mild winters between RY09 and RY14, as well as mild winters during RY16 and RY17, likely resulted in increased calf recruitment and adult survival.

Table 1. Unit 8 aerial elk composition counts and estimated population, regulatory years 2013–2017, Alaska.

Regulatory year	Bulls	Cows	Calves	Percent calves	Bulls: 100 cows	Calves: 100 cows	Total elk observed	Estimated population
2003	1	458	93	16.8	0.2	20.3	552	840–890
2004	51	368	67	13.8	13.9	18.2	486	865–915
2005	47	354	70	14.9	13.3	19.8	471	935–985
2006	42	269	27	8.0	15.6	10.0	338	895–945
2007[a]	–	–	–	–	–	–	–	–
2008	21	334	64	15.3	6.3	19.2	419	615–665
2009	12	115	28	18.1	10.4	24.3	155	575–625
2010	16	250	65	19.6	6.4	26.0	331	585–635
2011	35	383	103	19.8	9.1	26.9	521	685–735
2012	39	321	76	17.4	12.1	23.7	436	660–710
2013	41	309	96	21.5	13.3	31.1	446	740–790
2014	36	308	30	8.0	11.7	9.7	374	860–910
2015	60	385	80	15.2	15.6	20.8	525	925–975
2016	63	380	24	5.1	16.6	6.3	467	925–975
2017	88	401	54	9.9	21.9	13.5	543	975–1,025

[a] No surveys conducted due to poor weather.

Population Composition – Obtaining calf-to-cow and bull-to-cow ratios continues to be challenging. Distinguishing yearling (spike) bulls in velvet from cows and estimating elk numbers in dense cover can be difficult during aerial surveys. Dense vegetation and challenging terrain complicate yearling bull identification and prevent reliable estimates of elk occupying thick cover. During RY13–RY17 aerial survey results indicate that calf percentages ranged from a high of 21.5% calves in RY13 to a low of 5.1% calves in RY16. The 5-year average prior to RY13–RY17 (RY08–RY12) was 18.0%, which was 5% higher than calf estimates observed during RY13–RY17 ($\bar{x}$ = 12.0%). The ratio of calves to 100 cows ranged from 31.1 in RY13 to 6.3 in RY16 with an average calf-to-cow ratio of 16.3 calves per 100 cows. The 5-year average prior to RY13–RY17 (RY08 through RY12) was 24.0 calves per 100 cows, indicating decreased calf production during RY13–RY17. However, it is important to note, due to the difficulty in distinguishing spike bulls from cows, survey results may overestimate cow numbers (misidentify yearling bulls as cows) thereby underestimating the calf-to-cow ratio. In addition, some years pilot availability and severe weather prevent calf counts from occurring in spring. As a result, calf counts must be determined during the fall when calves can be difficult to distinguish from adults. During these years, a reduction in calf counts is likely, thereby resulting in lower calf-to-cow ratios. During RY13–RY17 the bull-to-100-cow ratio ranged from 11.7 in RY14 to 21.9 in RY17 with a mean of 15.8 bulls per 100 cows. This is almost double the previous 5-year average (RY08 through RY12) of 8.9 bulls per 100 cows. It is important to note that as bull counts increase, cow herds tend to disperse into smaller groups potentially compromising herd estimates by preventing complete counts of each herd.

Recommendations for Activity 1.1

A more robust survey schedule should be implemented if pilot availability and resources exist. Frequency of spring surveys should also increase to ensure that accurate calf counts are obtained. Although informative for most herds, annual aerial composition surveys provide limited information in some areas that elk occur. Identifying alternative survey techniques for elk herds in low visibility areas (e.g., thick forest cover) and/or determining a sightability index for elk in areas with thick cover would be valuable and provide more robust information than currently available. Lastly, composition accuracy could potentially be improved with the use of photographs to classify age group (e.g., adult versus calf) and sex.

2. Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor Roosevelt elk harvest and mortality through hunter harvest reports, field observations, contact with hunters, guides, and transporters, and reports of other causes of mortality.

Data Needs

Collecting and analyzing harvest data is vital for the continued, sustainable harvest of elk in Unit 8. The analysis of harvest data is necessary to ensure that managers are able to make informed management decisions and establish appropriate hunt conditions (e.g., season length, number of permits, methods of take).

Methods

Elk harvest is monitored via hunt reports submitted to the department by hunters or through information collected by in person reporting at the Kodiak office. Harvest reports are summarized by regulatory year (RY) and include such metrics as total harvest, hunter residency and success, transportation method, and harvest chronology.

Season and Bag Limit

Area	Season and bag limits	Hunt no.	Resident and nonresident open seasons
Unit 8, Raspberry Island:	1 bull by drawing permit	DE702, DE704	1 Oct–22 Oct
	1 antlerless elk	DE706	23 Oct–30 Nov
Unit 8, Southwest Afognak, that portion of Afognak Island and adjacent islands south and west of a line from the head of Back Bay to Hatchery Peak, to the head of Malina Bay:	1 bull elk by drawing permit only	DE711	25 Sep–9 Oct
	1 antlerless elk by drawing permit	DE713	8 Oct–22 Oct
	1 elk by registration permit only	RE755	23 Oct–30 Nov

-continued-

Season and Bag Limit continued

Area	Season and bag limits	Hunt no.	Resident and nonresident open seasons
Unit 8, Eastern Afognak, that portion of Afognak Island east of the main logging road (1100 road) from the Danger Bay logging camp north to its terminus at Discoverer Bay:	1 elk by drawing permit only	DE721, DE723	25 Sep–22 Oct
	1 elk by registration permit only	RE755	23 Oct–30 Nov
Remainder of Unit 8:	1 elk by drawing permit only	DE715, DE717	25 Sep–22 Oct
	1 elk by registration permit only	RE755	23 Oct–30 Nov

Results and Discussion

Harvest by Hunters-Trappers

Mean annual elk harvest during this reporting period (RY13–RY17) was 73. Harvest increased considerably compared to the previous 5-year period (RY08–RY12), with a mean of 49 elk (Table 2). Mean hunter success was 29.9% during RY13–RY17, which was greater than the RY08–RY12 mean of 21.1%. The percentage of bulls in the harvest during RY13–RY17 was 53.6% which is above the previous 5-year mean of 44.5% (Table 2).

Since the inception of the federal subsistence hunt in RY98, 8 elk have been harvested. However, prior to RY13–RY17 only 2 elk had been harvested under subsistence regulations (1 female in RY03 and 1 female in RY10). Subsistence elk hunts appear to be becoming more popular as 6 bull elk were harvested during the subsistence hunt during RY13–RY17.

Permit Hunts

The administration of drawing and registration hunts on Raspberry Island and Afognak Island remained mostly unchanged during RY13–RY17. During this period (RY13–RY17) over half (54.2%) of the permittees receiving permits did not hunt, continuing the pattern observed during RY08–RY12 (56.5%; Table 2). Registration permit hunts commenced following the drawing hunts for all hunt areas except Raspberry Island. The mean number of registration permits issued annually increased slightly to 223 during RY13–RY17 compared to the RY08–RY12 mean of 213 (Table 2).

Table 2. Unit 8 elk harvest data by permit hunt, regulatory years 2007 through 2017, Alaska.

Hunt area and number	Regulatory year	Permits issued	Percent hunters did not hunt	Percent of unsuccessful hunters	Percent of successful hunters	Bulls	Percent bulls	Cows	Percent cows	Unk	Illegal	Total harvest
Raspberry Island drawing hunts (DE702–DE706)	2007	80	52.5	80.0	20.0	3	42.9	4	57.1	0	0	7
	2008	100	53.0	72.7	27.3	8	53.3	4	26.7	0	3	15
	2009	50	50.0	64.0	36.0	6	66.7	3	33.3	0	0	9
	2010	36	55.6	62.5	37.5	3	50.0	3	50.0	0	0	6
	2011	36	69.4	70.0	30.0	2	66.7	1	33.3	0	0	3
	2012	36	52.8	75.0	25.0	3	75.0	1	25.0	0	0	4
	2013	36	63.9	41.7	58.3	5	71.4	2	28.6	0	0	7
	2014	56	53.6	73.1	26.9	4	57.1	3	42.9	0	0	7
	2015	95	54.7	61.0	39.0	9	56.3	7	43.8	0	0	16
	2016	84	60.7	50.0	50.0	10	62.5	6	37.5	0	0	16
	2017	84	51.2	68.3	31.7	8	61.5	5	38.5	0	0	13
SW Afognak Island drawing hunts (DE711 and DE713)	2007	115	60.0	87.5	12.5	3	60.0	2	40.0	0	0	5
	2008	115	73.9	79.3	20.7	1	14.3	5	71.4	0	1	7
	2009	85	62.4	78.1	21.9	3	42.9	4	57.1	0	0	7
	2010	85	72.9	85.7	14.3	2	66.7	1	33.3	0	0	3
	2011	85	60.0	71.9	28.1	4	44.4	5	55.6	0	0	9
	2012	85	68.2	80.8	19.2	1	20.0	4	80.0	0	0	5
	2013	85	76.5	77.8	22.2	0	0.0	4	100.0	0	0	4
	2014	85	67.1	59.3	40.7	3	27.3	8	72.7	0	0	11
	2015	106	64.2	64.9	35.1	4	30.8	9	69.2	0	0	13
	2016	115	80.0	73.9	26.1	2	33.3	4	66.7	0	0	6
	2017	115	63.5	75.0	25.0	4	40.0	6	60.0	0	0	10
Remainder of Unit 8 drawing hunts (DE715 and DE717)	2007	150	59.3	75.0	25.0	14	93.3	1	6.7	0	0	15
	2008	150	53.3	77.6	22.4	9	60.0	6	40.0	0	0	15
	2009	70	58.6	83.3	16.7	1	25.0	3	75.0	0	0	4
	2010	70	55.7	78.6	21.4	4	66.7	2	33.3	0	0	6
	2011	70	54.3	61.3	38.7	8	66.7	4	33.3	0	0	12
	2012	70	58.6	51.7	48.3	8	57.1	6	42.9	0	0	14
	2013	70	54.3	71.9	28.1	6	66.7	3	33.3	0	0	9

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Table 2. Page 2 of 3.

Hunt area and number	Regulatory year	Permits issued	Percent hunters did not hunt	Percent of unsuccessful hunters	Percent of successful hunters	Bulls	Percent bulls	Cows	Percent cows	Unk	Illegal	Total harvest
Remainder of	2014	70	50.0	66.7	33.3	10	90.9	1	9.1	0	1	12
Unit 8 drawing	2015	89	49.4	63.6	36.4	13	81.3	3	18.8	0	0	16
hunts (DE715	2016	90	56.7	54.1	45.9	16	94.1	1	5.9	0	0	17
and DE717)	2017	90	46.7	46.7	53.3	19	79.2	5	20.8	0	0	24
East Afognak	2007	148	58.8	63.3	36.7	12	54.5	10	45.5	0	0	22
drawing hunts	2008	151	63.6	65.5	34.5	11	57.9	8	42.1	0	0	19
(DE721 and	2009	70	57.1	75.9	24.1	2	28.6	5	71.4	0	0	7
DE723)	2010	70	77.1	66.7	33.3	4	80.0	1	20.0	0	0	5
	2011	70	62.9	80.0	20.0	4	80.0	1	20.0	0	0	5
	2012	70	61.4	57.7	42.3	7	63.6	4	36.4	0	0	11
	2013	70	60.0	76.9	23.1	3	50.0	3	50.0	0	0	6
	2014	70	67.1	69.6	30.4	7	100.0	0	0.0	0	0	7
	2015	79	59.5	81.3	18.8	5	83.3	1	16.7	0	0	6
	2016	79	57.0	66.7	33.3	8	72.7	3	27.3	0	0	11
	2017	80	53.8	69.4	30.6	8	72.7	3	27.3	0	0	11
Remainder of	2007	289	36.7	81.7	18.3	25	78.1	7	21.9	0	0	32
Unit 8	2008	229	41.5	71.0	29.0	9	23.7	29	76.3	0	1	39
registration	2009	254	45.3	91.1	8.9	5	41.7	7	58.3	1	0	13
hunt (RE755)	2010	229	47.2	94.0	6.0	0	0.0	7	100.0	0	0	7
	2011	171	60.8	81.5	18.5	0	0.0	12	100.0	0	0	12
	2012	182	52.2	91.9	8.1	0	0.0	7	100.0	0	0	7
	2013	256	44.5	89.0	11.0	0	0.0	15	100.0	0	0	15
	2014	234	44.9	77.3	21.8	0	0.0	26	100.0	0	0	26
	2015	194	53.6	65.5	31.0	16	59.3	11	40.7	0	0	27
	2016	228	45.6	70.2	29.8	17	47.2	19	52.8	0	0	36
	2017	203	43.3	68.5	31.5	24	68.6	11	31.4	0	0	35

-continued-

Table 2. Page 3 of 3.

Hunt area and number	Regulatory year	Permits issued	Percent hunters did not hunt	Percent of unsuccessful hunters	Percent of successful hunters	Bulls	Percent bulls	Cows	Percent cows	Unk	Illegal	Total harvest
Total all hunts	2007	788	50.0	78.3	21.7	57	70.4	24	29.6	0	0	81
	2008	748	54.8	72.6	27.4	38	42.2	52	57.8	0	5	95
	2009	529	51.8	84.1	15.9	17	43.6	22	56.4	1	0	40
	2010	491	57.6	85.8	14.2	13	46.4	15	53.6	0	0	28
	2011	432	60.6	74.8	25.2	18	43.9	23	56.1	0	0	41
	2012	443	57.8	77.6	22.4	19	46.3	22	53.7	0	0	41
	2013	522	54.4	81.1	18.9	16	37.2	27	62.8	0	0	43
	2014	516	53.1	72.1	27.5	25	39.7	38	60.3	0	1	64
	2015	567	55.6	66.4	33.2	49	61.3	31	38.8	0	0	80
	2016	596	57.6	65.0	35.0	53	61.6	33	38.4	0	0	86
	2017	573	50.4	65.9	34.4	64	68.1	30	31.9	0	0	94

Hunter Residency and Success

During RY13–RY17, elk hunters were mostly residents of Alaska (95.9%; Table 3). The average number of Alaska resident hunters was 239 during RY13–RY17. Nonlocal residents accounted for 44.6% of all elk hunters and local residents made up 51.3% of elk hunters. Nonresidents made up the difference with 4.1% of hunters coming from out of state. The number of nonresident hunters increased annually during RY13–RY17 from <1.0% in RY13 to 3.7% in RY15, and then 6.6% in RY17 (Table 3). On average, local residents had the highest success rate during RY13–RY17 compared to nonlocal residents and nonresidents, with an annual average local resident success rate of 37.7%, compared to 35.7% for nonresidents and 21.5% for nonlocal residents. Interestingly, both the annual average number of nonresident elk hunters and the annual success rate of nonresident elk hunters increased during RY13–RY17.

Table 3. Unit 8 elk hunter residency and success, Kodiak Archipelago, Alaska, regulatory years 2007–2017.

	Successful					Unsuccessful					
Regulatory year	Local resident	Nonlocal resident	Nonresident	Total	(%)	Local resident	Nonlocal resident	Nonresident	Total	(%)	Total hunters
2007	49	24	8	81	21.7	152	125	16	293	78.3	374
2008	60	26	4	90	27.4	135	89	14	238	72.6	328
2009	22	15	2	39	16.0	107	91	7	205	84.0	244
2010	23	2	3	28	14.2	82	82	5	169	85.8	197
2011	27	13	1	41	25.2	45	70	7	122	74.8	163
2012	21	20	0	41	22.5	64	74	3	141	77.5	182
2013	35	8	0	43	18.9	108	74	2	184	81.1	227
2014	37	25	2	64	28.0	82	80	4	166	72.0	230
2015	48	29	3	80	36.7	62	71	5	138	63.3	218
2016	54	25	7	86	35.0	59	93	8	160	65.0	246
2017	53	30	11	94	34.4	75	97	7	179	65.6	273

Harvest Chronology

During RY13–RY17 hunters were most successful during the middle of the season with 63% of the Afognak Island harvest and 79% of the Raspberry Island harvest occurring in October (Table 4).

Transport Methods

Aircraft and boat were the primary methods of transportation for elk hunters in Unit 8 (Table 5). Use of highway vehicles was common in some areas of Afognak Island. However, this varies depending on the level of logging activity and the vehicle use policies of logging companies and landowners. Reported harvest using a highway vehicle can be underrepresented; hunters occasionally record their mode of transportation as the vehicle they used to arrive on Afognak rather than the transportation method used during the actual hunt.

Table 4. Unit 8 chronological elk harvest listed as percentage of harvest by 10-day period, Kodiak Archipelago, Alaska, regulatory years 2007–2017.

Area	Regulatory year	Harvest periods														
		21–30 Sep	(%)	1–10 Oct	(%)	11–20 Oct	(%)	21–31 Oct	(%)	1–10 Nov	(%)	11–20 Nov	(%)	21–30 Nov	(%)	*n*
Raspberry Island	2007	0	0	3	43	0	0	2	29	0	0	0	0	2	29	7
	2008	0	0	6	50	1	8	3	25	0	0	2	17	0	0	12
	2009	0	0	3	33	3	33	3	33	0	0	0	0	0	0	9
	2010	0	0	2	33	1	17	2	33	0	0	1	17	0	0	6
	2011	0	0	2	67	1	33	0	0	0	0	0	0	0	0	3
	2012	0	0	1	25	2	50	1	25	0	0	0	0	0	0	4
	2013	0	0	3	43	2	29	1	14	1	14	0	0	0	0	7
	2014	0	0	3	43	1	14	1	14	1	14	0	0	1	14	7
	2015	0	0	3	19	3	19	8	50	0	0	0	0	2	13	16
	2016	0	0	5	31	5	31	2	13	3	19	1	6	0	0	16
	2017	0	0	7	54	0	0	3	23	2	15	0	0	1	8	13
Afognak Island	2007	23	31	9	12	10	14	12	16	7	9	10	14	3	4	74
	2008	14	18	12	15	15	19	20	26	15	19	2	3	0	0	78
	2009	8	27	6	20	4	13	5	17	2	7	3	10	2	7	30
	2010	7	32	2	9	6	27	0	0	2	9	3	14	2	9	22
	2011	8	21	8	21	9	24	2	5	10	26	0	0	1	3	38
	2012	9	24	13	35	8	22	6	16	0	0	1	3	0	0	37
	2013	7	19	6	17	8	22	1	3	6	17	1	3	7	19	36
	2014	10	18	9	16	10	18	10	18	3	5	10	18	3	5	55
	2015	11	14	17	21	15	19	19	24	10	13	6	8	2	3	80
	2016	11	13	13	15	19	22	22	26	17	20	4	5	0	0	86
	2017	16	17	15	16	21	23	35	38	5	5	0	0	1	1	93

Table 5. Unit 8 number of hunters and percentage of harvest by transport method, Kodiak Archipelago, Alaska, regulatory years 2007–2017.

	Airplane		Horse		Boat		ORV[a]		Highway vehicle		Unknown		
Regulatory year	No. hunters	%	No. hunters	%	No. hunters	%	No. hunters	%	No. hunters	%	No. hunters	%	*n*
2007	32	40.0	0	0.0	28	35.0	0	0.0	20	25.0	1	0.0	81
2008	22	24.7	0	0.0	41	46.1	1	0.1	25	28.0	1	0.0	90
2009	17	43.6	0	0.0	15	38.5	0	0.0	7	17.9	0	0.0	39
2010	4	14.3	0	0.0	14	50.0	0	0.0	10	35.7	0	0.0	28
2011	14	35.0	0	0.0	12	30.0	0	0.0	14	35.0	1	0.0	41
2012	17	41.5	0	0.0	13	31.7	0	0.0	11	26.8	0	0.0	41
2013	11	28.2	0	0.0	17	43.6	0	0.0	11	28.2	2	0.0	41
2014	26	40.6	0	0.0	26	40.6	0	0.0	12	18.8	0	0.0	64
2015	31	40.3	0	0.0	26	33.8	0	0.0	20	25.9	3	0.0	80
2016	27	31.8	0	0.0	33	38.8	3	3.5	22	25.9	1	0.0	86
2017	28	30.1	0	0.0	43	46.2	2	0.2	20	21.5	1	0.0	94

[a] Off-road vehicle.

Other Mortality

Documenting mortality from sources other than hunting is challenging due to the remote setting of Afognak and Raspberry islands. Predation of adult elk by brown bears undoubtedly occurs but is probably uncommon (Zager and Beecham 2006). However, brown bears can be efficient predators of neonatal elk (Zager and Beecham 2006). Unfortunately, the impact of brown bear predation on elk calves is difficult to estimate; also, it has not occurred on Afognak or Raspberry islands. Although wounding loss and illegal harvest likely occur, we estimate the impact on the overall population to be minimal.

Alaska Board of Game Actions and Emergency Orders

The Board of Game took no actions regarding elk hunting in Unit 8 during RY13–RY17. Prior to each hunting season, we analyzed survey results and estimated herd sizes to derive harvest limits for each herd. Harvest limits were established as 10–15% of the population, with modifications to accommodate population trends and the sex ratio of the harvest. When harvest limits for a herd were achieved, we issued emergency orders closing hunting in areas that were occupied by that herd.

Recommendations for Activity 2.1

Continue to monitor harvest, success rates, and modes of transportation; these will provide valuable information regarding hunter effort and success.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Investigate movement, distribution, space use, and resource abundance of Roosevelt elk on Afognak and Raspberry Islands in unharvested and harvested forest stands to identify resource attributes important to elk.

Data Needs

Determine seasonal and annual fluctuations in movement, distribution, and resource use using global positioning system (GPS) locations, biological samples, landcover data, and other relevant information collected throughout Afognak and Raspberry islands. These data provide information on resource needs or other limiting factors (i.e., forage abundance, brown bears) impacting elk.

Methods

Long-term monitoring by ADF&G has identified 8 elk herds on Afognak and Raspberry islands. Our experimental design involves aerial capturing and attaching global positioning system (GPS) radio collars to 5 adult elk (2 male, 3 female; 40 elk total) within each herd (n = 8) to identify seasonal resource selection. To assess potential impacts of brown bear predation, we also captured and collared 40 brown bears (20 male, 20 female). We also monitored seasonal movements, distribution, and resource use. Collars attempt relocations at 60-minute intervals and will continue to do so for at least 24 months continuously. Seasons are based on elk behavior and biology and defined as winter (1 December–30 April), precalving or calving (1 May–30 June), summer (1 July–30 August), and rut or post-rut (1 September–30 November). Available satellite imagery and digital forest-stand harvest data from respective Native corporations and

government agencies on Afognak Island were used to develop a land cover layer that includes land cover and year of timber harvest. ArcGIS (Environmental Systems Research Institute, Redlands, California, USA) was used to create and overlay a grid with 0.4-hectare (1 acre) grid cells (for computational efficiency) across the island. Resource attributes and elk and bear location data were then extracted. For each cell, land cover was determined, whether timber harvest occurred, whether the area was forested, and the age of the stand (using the zonal majority routine in ArcGIS; Belant et al. 2010). We also calculated the distance from the center of each grid cell to the nearest road and the distance to the nearest landcover edge using Patch Analyst 4.0 for ArcGIS.

To estimate seasonal elk and brown bear resource use we used 3 generalized linear mixed models (GLMMs) with seasonal location data and compared their performance using Akaike's Information Criterion (AIC) adjusted for small sample size (AICc) to select the random model structure most appropriate for final analyses. Each random model structure contained a different random effect variable: animal ID, year, or animal ID nested within year. Generalized linear mixed models with the appropriate random structure used for final analyses of seasonal elk and bear resource use included season, extent of timber harvest, time since timber harvest, land cover, and distance from the nearest road or habitat edge as fixed effects; the response variable was the number of animal locations during each season. We included a brown bear probability estimate determined by brown bear resource use models for each grid cell in all of the elk models. We included the global and the null (intercept only) models and used all combinations of model parameters to determine the best-supported model. We used AICc to compare model performance. Models with AICc scores within 2 of the best-supported model were considered similarly supported (Burnham and Anderson 1998). We calculated Akaike weights (w) to measure model support and model selection uncertainty (Burnham and Anderson 1998). If appropriate, we used model averaging to estimate model parameters with 95% confidence intervals (Burnham and Anderson 1998). We also calculated pseudo R^2 values to determine the percent variation in elk locations explained by the best supported models (Hardin and Hilbe 2007).

Relative use of land covers and harvested stands were assessed based on model parameter estimation. Elk high-use areas were delineated in ArcGIS and identified; stands of mature spruce forests were identified and selected as potential set-aside areas from timber harvest. Once high use areas are determined and delineated, meetings with stakeholders are then conducted to provide a range of options to develop a long-term management strategy that incorporates sustainable logging, responsible wildlife management, and continued sport and subsistence hunting opportunities.

In addition to habitat and resource-use modeling, we have collected 30 fecal-pellet groups from each of the 8 herds during 2017 and will collect additional samples in 2018, 2019, and 2020. Samples are collected opportunistically in areas elk are known to occupy. Pellets in each pellet group are mixed thoroughly in the field, placed in an individual labeled bags, and transported to our field station. We submit samples to a commercial lab for processing and plant identification which follows standard techniques (Anthony and Smith 1974, Holechek et al. 1982). Fecal samples are oven-dried at 60–70°C (140–158°F), ground separately with an electric grinder, and sieved using 1 mm and 0.3 mm mesh. Contents are retrieved from the 0.3 mm sieve and treated with a 5% concentration of NaOH solution, then boiled each until the samples become

transparent. We cool and rinse samples to remove the remaining NaOH, then place each in an ethyl alcohol bath series (30%, 50%, 70%, 90%, and 100% concentrations) for 15 minutes in each concentration for dehydration. We prepare 2 slides from each fecal sample. We identify plant fragments based on distinguishing features found in reference slides of potential forage plants from the same study area by microscopic examination of whole mounts. We record all fragments found along the central line of the slide. We combine pellet groups across years by season and calculate the percentage frequency of occurrence of each food item to determine common forage species. Important forage identified through pellet analysis is then used to guide reforestation and planting efforts to increase suitable forage cover.

Results and Discussion

Roosevelt Elk Capture

Beginning on 11 June 2017 we captured, radiocollared, and collected samples from Roosevelt elk. Forty-three elk were captured (23 female, 20 male) and 42 were fitted with Telonics GPS radio collars (model TGW-4677) and Gulf Coast Data Concepts (model X16-mini) accelerometers; they were also programmed to obtain a location every 60 minutes from capture-to-collar release. All collars included a mortality mode (12-hour delay) and a CR-2A collar release mechanism programmed to drop-off the animal on 1 September 2019. We attached all collars with a 2-inch by 2-inch piece of leather in the event that the drop-off mechanism were to malfunction. Leather links are designed to degrade over time (3–5 years) to release the collar. After induction, we applied ophthalmic ointment to the posterior border of the lower eyelids and blindfolded each animal to reduce visual stimulation. We then opportunistically weighed the animals with a weigh tarp lifted by the helicopter and transported them to a flat open area for processing. We examined elk for capture related injuries and treated accordingly. When possible, we cleaned dart wounds following ADF&G dart wound cleaning protocols. We measured body temperature as soon as feasible after induction and intermittently throughout immobilization. We visually estimated age based on tooth wear and eruption and determined mean body condition scores based on palpation of soft tissue at the withers, ribs, and rump. Body condition scoring ranged from 1 (emaciated) to 5 (obese) and was obtained by 2 independent observers. We documented evidence of lactation and any previous injuries. We recorded presence of calves or adult elk, herd location, and sex. For each animal captured we attached 2 individually numbered plastic ear tags and attempted to collect morphometric measurements (Table 6). We collected blood, hair, tissue, and vitals. Based on dental inspection, the average age for captured elk was 3.2-years old (standard deviation (SD) ± 1.1 years) for males and 5.8-years old (SD ± 2.6 years) for females. Age range of captured elk was estimated to be between 2 and 6 years old and between 2 and 13 years old, for males and females, respectively. We applied uniquely numbered tattoos to the upper and lower inside lips and opportunistically hand injected oxytetracycline and penicillin (3 cc per 100 lbs) intramuscularly prior to release. We hand injected naltrexone and atipamezole intramuscularly into the rump to antagonize the effects of carfentanil and xylazine, respectively. We released all elk at the capture location.

Table 6. Mean ($\bar{x}$) body measurements and standard deviation (SD) of 65 captured female (n = 23) and male (n = 20) Roosevelt elk, Afognak and Raspberry islands, Alaska.

Estimate	Female $\bar{x}$ ± SD	Male $\bar{x}$ ± SD
Body weight (kg)	264.8 ± 51.6	319.0 ± 68.3
Chest girth (cm)	152.9 ± 7.5	159.5 ± 14.5
Front shoulder (cm)	140.5 ± 5.9	147.0 ± 8.1
Body length (cm)	218.0 ± 8.5	225.1 ± 15.3
Hind foot (cm)	64.8 ± 4.8	68.9 ± 3.6
Body condition[1]	3.0 ± 0.5	3.4 ± 0.6

[1] Body condition scores are objective and range from 1 (emaciated) to 5 (obese).

Collar Collection

During captures we recovered 9 dropped elk collars deployed in 2016 and redeployed them on elk. We closely monitored new collar locations as captures were underway and retrieved any slipped collars and redeployed them as necessary.

Capture Mortality

During 11 June 2017–03 July 2017, 1 female elk mortality occurred. This mortality was due to asphyxiation or drowning, which occurred shortly after induction.

Vegetation Surveys

We established 8 transects for 4 different berry species along Afognak Island's logging road system. We conducted plot-based berry count surveys on 2 salmonberry and 2 highbush blueberry transects to record number of berries, forage availability, and density.

Due to the recent deployment of collars and the recent collection of vegetation data, no analysis has occurred. Data collection will continue for the next 3–4 years and analysis will follow.

Recommendations for Activity 3.1

Continue. Current research on resource use and availability will provide valuable information for managing the continued sustainable harvest of elk.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Active logging and associated road construction on Afognak Island continued throughout RY13–RY17. These activities altered elk habitat and provided greater access for hunters. In recent years, cooperation with landowners and logging operators has improved tremendously, and we have been able to work together to minimize adverse impacts on wildlife and seek ways to improve elk habitat.

Data Recording and Archiving

All data, survey memoranda, and forms are located at the Alaska Department of Fish and Game office in Kodiak. Data sheets and GPS locations are scanned and stored on the Kodiak ADF&G server (V:\AfognakProject\Elk\GPS Collar Download Files).

Agreements

Various partnerships have been created with local Native corporation landowners as well as other university, federal, and Native entities that allow ADF&G access for surveys and capture operations. These partnerships continue to foster a strong working relationship between state, university, and Native organizations, and highlight the value of cooperative forest and wildlife management on public and private lands that ensure population stability and viability. A cooperative agreement with Mississippi State University was developed for this project (Cooperative Agreement CT 170007728) and is dated 2 February 2017.

Permitting

None.

Conclusions and Management Recommendations

Recent population estimates indicate an increase in the elk population on both Raspberry and Afognak islands in recent years. Historical estimates suggest the elk population has remained around 600–800 elk for the last 7–8 years and has not reached the management goal of 1,000 elk in close to 20 years. Despite this long-term reduction in the population, aerial surveys conducted in 2017 indicate that the total estimated population has reached the combined minimum population objective of 1,000 elk on both islands. This population increase may be due in part to the high calf-to-cow ratios recently observed (up to 21%) combined with a reduction in the number of hunters going afield. In addition, there was historically low harvest during regulatory years RY09–RY14.

Despite the apparent population increase, questions remain on the quantity and quality of suitable elk habitat in some areas of their distribution. In particular, information regarding habitat suitability is needed for certain areas of Afognak Island that have experienced long-term commercial logging. Fortunately, a collaborative research project is currently underway that will provide further insight into potential impacts of logging on elk habitat.

Obtaining accurate herd estimates and sex ratios in some areas remains challenging and needs further examination. The development of an appropriate sightability factor for elk on Afognak Island would be helpful for refining current population estimates.

II. Project Review and RY18–RY22 Plan

Review of Management Direction

MANAGEMENT DIRECTION

- Provide sustainable hunting opportunities for residents and nonresidents that allow for the continued harvest of Roosevelt elk.

- Continue to assess the quality and quantity of suitable elk habitat and work with local landowners to develop appropriate forest management plans that incorporate sustainable logging while improving elk habitat.

GOALS

The elk management goal for Unit 8 is to maintain a healthy, viable population providing sufficient sport and subsistence harvest opportunities for both residents and nonresidents of Alaska.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

Not applicable.

Intensive Management

Not applicable.

MANAGEMENT OBJECTIVES

The management objective is to maintain a combined minimum population of 1,000 elk on Afognak and Raspberry islands. Elk are managed for sport and subsistence hunting opportunities by all user groups with emphasis on managing the Raspberry Island population for trophy-sized bulls. We strive to manage the Raspberry Island elk herd at a maximum of 150 animals with a minimum bull-to-cow ratio of 15:100. The Afognak Island elk population is managed by a combination of drawing and registration hunts until the desired harvest quotas are reached. We attempt to maintain at least 2–3 active radio collars in each elk herd to facilitate composition counts and gather recruitment information.

REVIEW OF MANAGEMENT ACTIVITIES

Management activities conducted during RY13–RY17 will continue during RY18–RY22.

1. Population Status and Trend

ACTIVITY 1.1. Conduct aerial composition counts of each herd to estimate elk abundance, distribution, and cow-to-calf ratios.

Data Needs

There is no specific change in data needs from the RY13–RY17 report.

Methods

There is no specific change in methods from the RY13–RY17 report.

ACTIVITY 1.2. Investigate the feasibility of developing a sightability factor to be applied to future elk survey population estimates.

Data Needs

Due to various factors impacting elk sightability during aerial surveys (e.g., terrain, habitat, weather) there is a need to develop a sightability correction factor to apply to current survey techniques. The application of a sightability factor will improve areawide population estimates by accounting for animals that were potentially missed or not counted during aerial surveys. Correction sightability factors are commonly applied to species in areas where complete and accurate populationwide counts are unattainable.

Methods

To date, there has not been an attempt to derive a correction sightability factor for elk on Afognak or Raspberry islands. Because no attempts have been made to determine a correction factor for elk, we will first need to conduct a thorough literature review to determine if and how correction factors have been developed and applied to elk in other areas of North America, particularly in other areas with similar terrain features. We will search all resources available in Alaska Resources Library & Information Services (ARLIS), as well as any relevant literature obtained through other global search engines such as Google Scholar.

2. Mortality-Harvest Monitoring

ACTIVITY 2.1. Monitor Roosevelt elk harvest and mortality through hunter harvest reports, field observations, contact with hunters, guides, and transporters, and reports of other causes of mortality.

Data Needs

There are no specific changes to monitoring harvest and mortality data needs from the RY13–RY17 report.

Methods

There are no specific changes to monitoring harvest and mortality methods from the RY13–RY17 report.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Investigate movement, distribution, space use, and resource abundance of Roosevelt elk on Afognak and Raspberry islands in unharvested and harvested forest stands to identify resource attributes important to elk.

Data Needs

There is no specific change in data needs from the RY13–RY17 report.

Methods

There is no specific change in methods from the RY13–RY17 report.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Data Recording and Archiving

All data, survey memoranda, and forms will be located at the Alaska Department of Fish and Game office in Kodiak.

Agreements

The various partnerships that have been created with local Native corporation landowners and other university, federal, and Native entities will continue for the foreseeable future. In addition, the Cooperative Agreement with Mississippi State University developed for this project will remain active until the project is finalized in 2023.

Permitting

None.

Acknowledgments

Several organizations, individuals, and groups contribute their time, funding, and resources each year to assist with monitoring and reporting relevant information regarding the Roosevelt elk population. Below is a list of those entities who have contributed to the monitoring and management of Roosevelt elk during this reporting period (RY13–RY17). In addition, this report incorporates without specific attribution descriptions and explanations written by previous Unit 8 Area Biologists, including Dr. Larry Van Daele and Mr. Roger Smith to whom we are grateful for their contributions. Other volunteers and contributors include (in no specific order): Rocky Mountain Elk Foundation, Afognak Native Corporation, Natives of Kodiak Native Corporation, Ouzinkie Native Corporation, Koniag Inc. Regional Native Corporation, Old Harbor Native Corporation, Kodiak Brown Bear Trust, Kodiak Sportsman's Lodge, Koncor Forest Products Co., John Sturgeon, Howard Valley, Alaska Wildlife Troopers, Bill Pyles, Rob Graff, Alan Jones, Keller Wattum, Jay Wattum, Christopher Ramsey, Melissa Berns, Rick Berns, Gerry Engel, Jenell de la Peña, Tyler Petroelje, Andy Christofferson, Jonathan Larivee, Jessica Rich, Janel Day, Cameron Tenorio, Doug Dorner, Matthew Van Daele, Christina Coulter, Keith

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