Deer Management Report and Plan, Game Management Unit 8:

Report Period 1 July 2016–30 June 2021, and

Plan Period 1 July 2021–30 June 2026

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Alaska Department of Fish and Game   Division of Wildlife Conservation

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

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Purpose of this Report

This report provides a record of survey and inventory management activities for Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) in Unit 8 for the 5 regulatory years 2016–2020 and plans for survey and inventory management activities in the next 5 regulatory years, 2021–2025. A regulatory year (RY) begins 1 July and ends 30 June (e.g., RY16 = 1 July 2016–30 June 2017). 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 Sitka black-tailed deer management report of survey and inventory activities that was previously produced every 2 years.

I. RY16–RY20 Management Report

Management Area

Unit 8 covers 5,097 mi^2 of land located in the Kodiak Archipelago within the Gulf of Alaska (Fig. 1). It comprises all islands southeast of the centerline of Shelikof Strait, including Kodiak, Afognak, Whale, Raspberry, Shuyak, Spruce, Marmot, Sitkalidak, Amook, Uganik, and Chirikof islands, the Trinity Islands, the Semidi Islands, the Barren Islands, and other adjacent islands. Additionally, it encompasses all seaward waters and lands within 3 mi of the coastlines of these islands. The archipelago is approximately 177 mi long and 50 mi wide, consisting of a rugged, fjord-carved landscape with elevations ranging from sea level to approximately 4,500 ft. The archipelago has a wet maritime climate with minimal seasonal temperature variation and abundant precipitation. Vegetation composition varies throughout the archipelago and is highly influenced by past glaciation (Fleming and Spencer 2006).

The archipelago comprises 3 primary ecological regions: 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 as well as Afognak and Shuyak islands. The lower elevations in this region include primarily Sitka spruce (*Picea stichensis*) with a dominant understory consisting of salmonberry (*Rubus spectabilis*), devil's club (*Echinopanax horridum*), cow parsnip (*Heracleum lanatum*), ferns (*Athrium* spp.), and high-bush blueberry (*Vaccinium ovalifolium*) along with dispersed pockets of elderberry (*Sambucus racemosa*). Other plant communities in this region include forb-grass meadows containing willows (*Salix* spp.), birch (*Betula kenaica*), and alder (*Alnus crispa sinuata*). Much of Kodiak Island is classified as part of 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 comprising willow, birch, cottonwood, and alder can be found in lowland areas along rivers and streams. Similar to the Sitka spruce region, much of the landscape is covered by salmonberry, ferns, cow parsnip, blueberry, and fireweed (*Epilobium angustifolium*), along with various grass and forb assemblages. At higher elevations, plant communities include alpine forb meadows and alpine tundra. Alpine forb meadows consist of sedges (*Carex* spp.), lupine (*Lupinus nootkatensis*), and Indian paintbrush (*Caltilleja unalalaschensis*). In contrast, the alpine
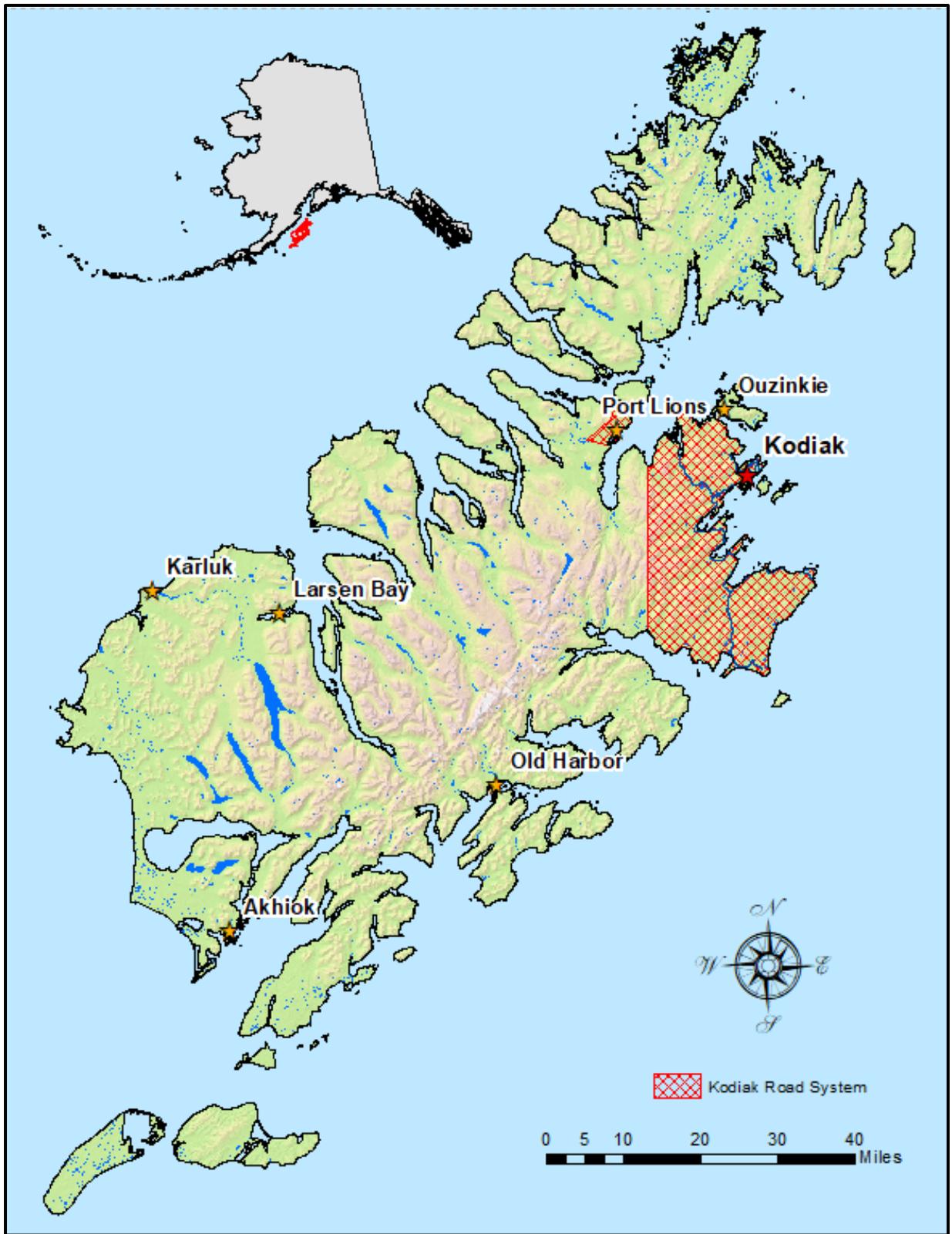
Figure 1. A map showing most of Unit 8, Kodiak Archipelago, Alaska, regulatory years 2016–2020.

tundra consists of crowberry (*Empetrum nigrum*), partridgefoot (*Luetkea pectinata*), alpine blueberry (*Vaccinium uliginosum*), various lichens (*Cladina* spp. and *Cetraria* spp.), and dwarf shrubs. The southern ecological region encompasses the glacial refugium and subarctic heathlands (Fleming and Spencer 2006). This region consists of crowberry, dwarf willows (*Salix* spp.), fireweed, blueberry, cranberry (*Vaccinium vitis-idaea*), goldenrod (*Solidago lepida*), Labrador tea (*Ledum palustre*), kinnikinnik (*Arctostaphyos uva-ursi*), and various forbs and mosses (Fleming and Spencer 2006).

The Kodiak Road System Management Area is contained within Unit 8 and includes only portions of the main island. It comprises 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) and east of a line from the outlet of Crescent Lake to Mount Ellison Peak, then from Mount Ellison Peak to Pokati Point at Whale Passage. Also, this management area encompasses the portion of Kodiak Island east of a line extending from the mouth of Saltery Creek to the mouth of Elbow Creek, as well as adjacent small islands in Chiniak Bay.

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

The Sitka black-tailed deer population in Unit 8 likely originated from 3 transplants between 1924 and 1934, totaling 25 deer (Paul 2009). In May 1923, the U.S. Secretary of Agriculture authorized the first transplant of deer to Kodiak, and the project commenced the following year when 14 animals were captured near Sitka and released on Long Island just east of what is now the city of Kodiak. Soon after the Alaska Game Commission was established in 1925, it endorsed the project and adopted regulations to protect the newly established population. In 1930, 2 additional deer were captured from Prince of Wales Island and released on Long Island. There was little movement from Long Island to Kodiak, as noted in a March 1931 report from the Alaska Game Commission to the legislature stating that only 3 does and 2 bucks had been observed on Kodiak Island (Burris and McKnight 1973). Transplant efforts were renewed in 1934 due to the lack of movement of deer from Long Island to Kodiak Island, and 9 deer were captured in the Rocky Pass area near Petersburg and released on Kodiak.

Other evidence suggests deer have been on the archipelago since at least the beginning of the twentieth century. A letter dated 15 March 1919 (ADF&G files, Kodiak Area Office) from the Office of the U.S. Marshal to the Alaska Territorial Governor states, "The Alaska Commercial Company planted some deer on Kodiak Island some 20 years ago, and up to the time of the Katmai eruption [1912] they were increasing very nicely…" The correspondence noted that ash from the eruption had decimated the deer population on Kodiak, and hunters had killed all the deer on Long Island. A note from the U.S. Department of Agriculture to the governor on 26 April 1919 states, "I note your request that protection be continued on deer on Kodiak and Long Islands and will reinsert this in the regulations." The department has not found any further information on the date, source, or size of this "original" transplant of deer to Kodiak.

By the early 1940s, deer were abundant on Long Island and occupied northeastern Kodiak Island (Van Daele et al. 2013). In 1950, they were a common sight near the city of Kodiak, and the first officially sanctioned hunt was held in 1953 (Burris and McKnight 1973). The deer population

continued to expand into unoccupied habitats, and by the late 1960s, deer had dispersed throughout Kodiak, Afognak, and adjacent islands (Smith 1979). The expansion of deer in the southern part of Kodiak Island continued for the next several decades, eventually allowing population expansion to Sitkinak and Tugidak islands in the early 1980s.

Winter mortality proved to be the most significant factor limiting the deer population. Deer herds suffered high mortality during the 1968–1969 and 1970–1971 winters, causing declines in harvest and hunter success (Alexander 1970, 1973). The population rebounded from 1972 to the mid-1980s, when it reached peak numbers, exceeding 100,000 animals unitwide (Smith 1989). Severe winter conditions prevailed from 1987 through 1992, and deer in the northern part of the archipelago were hit especially hard. There was a short reprieve from 1993 to 1996, but the population declined again in 1997. During the winter of 1998–1999, the Unit 8 deer population declined precipitously (Van Daele 2003). The 5 successive winters, 1999–2000 through 2005–2006, were relatively mild. Harsh winter weather returned in 2006–2007 and 2008–2009, along with increased deer mortality. Mild winters were observed during 2009–2010 through 2010–2011. The winter of 2011–2012 was again harsh, and an estimated 40% of the deer herd perished partly due to record snowfall conditions. Temperate winters continued for the next 3 years (2012–2013 through 2014–2015), allowing the deer population to recover. Not until the winter of 2015–2016 was the deer population again negatively impacted by severe winter conditions. Following the winter of 2015–2016, temperate winters continued for the next 3 years, allowing the deer population to largely recover in many of the areas that experienced high mortality; however, during the winter of 2019, reports from hunters, guides, and transporters suggested that deer again experienced high winter mortality in response to extended cold temperatures and precipitation and prolonged winter conditions lasting into early spring.

Deer has become an important resource for residents and visitors of the Kodiak Archipelago. Venison has surpassed marine mammals as a primary source of mammalian protein for village residents, and income generated from services provided to deer hunters is a major factor in the local economy. Despite the significance of this resource, we have not yet developed an objective method of measuring population size or density. Annual hunter harvest surveys have been used to assess trends in the deer population since 1989. We assessed winter mortality by searching for and examining deer carcasses in selected coastal wintering areas and periodically used aerial surveys to assess winter conditions and physical appearance of deer. From 1990 through 1998, the U.S. Fish and Wildlife Service (USFWS) experimented with various aerial and ground surveys to monitor deer population trends at the Kodiak National Wildlife Refuge (NWR; Zwiefelhofer and Stovall 1992). Additionally, refuge staff experimented with browse transects, Forward Looking Infrared Radar (FLIR), and range exclosures to investigate deer population trends. Refuge staff have also attempted to obtain a population estimate for deer in the nonforested habitats of the island, specifically in the Olga flats and Ayakulik areas and along the Aliulik Peninsula, using aerial mark-recapture distance sampling techniques (Cobb 2014) with limited success.

Seasons and bag limits were liberal during the past 3 decades. Seasons ranged from 153 to 184 days, and bag limits ranged from 3 bucks to 7 deer. Most regulatory changes were initiated in response to perceived population trends and hunting efforts. Unit 8 has typically been divided into 2 or 3 hunt areas. The road system emanating from the city of Kodiak and Port Lions has had the most restrictive regulations, while more remote areas have been more liberal. Gender

restrictions are usually predicated on protecting maternal does while their fawns still depend on them or restricting doe harvests when the population is recovering from declines. Because of the subjective nature of much of the data used in deer management, close cooperation between ADF&G, USFWS, the Kodiak Fish and Game Advisory Committee, local Native organizations, and the general public is critical.

Management Direction

EXISTING WILDLIFE MANAGEMENT PLANS

Unit 8 deer were not addressed in the 1976 Southcentral Alaska wildlife management plans developed by the department and adopted by the Alaska Board of Game (BOG, the board; ADF&G 1976). No other specific and separate formal plan has been developed; however, management direction and objectives for the Unit 8 deer population have been informed and revised based on public input and board action. These management directions and objectives have been reported in previous management reports.

GOALS

No goals specific to Unit 8 deer had been formally reported before this report; however, management of deer statewide, including in Unit 8, has always been based on Article 8 of the Constitution of the State of Alaska, which directs that wildlife will be utilized, developed, and maintained on the sustained yield principle. Deer in Unit 8 have been managed to maintain a population of 70,000–75,000 deer with an annual harvest of 8,000–8,500 deer as outlined in 5 AAC 92.108.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

In January 1993, BOG made a positive customary use determination for deer in Unit 8 and set the amounts reasonably necessary for subsistence uses at 3,600–4,100 deer unitwide.

Intensive Management

At its March 1999 meeting, BOG identified the Sitka black-tailed deer population on the Kodiak Archipelago as important for providing high levels of harvest for human consumptive use under 5 AAC 92.106 and established deer in Unit 8 as an intensive management (IM) species. These were the IM objectives established by the board (5 AAC 92.108):

- Population objective: 70,000–75,000.

- Harvest objective: 8,000–8,500.

MANAGEMENT OBJECTIVES

The current management objectives are the codified objectives listed above.

MANAGEMENT ACTIVITIES

Methods for data collection and results for all activities during RY11–RY15 are explained in Svoboda and Crye (2018).

1. Population Status and Trend

No population status and trend activities occurred for deer in Unit 8 during RY16–RY20.

2. Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1. Conduct coastal mortality surveys each spring to estimate annual winter mortality and analyze data in association with temperature and snowfall weather data.

Data Needs

Sitka black-tailed deer are considered an IM species necessary for subsistence purposes; therefore, it is necessary to determine annual and seasonal mortality throughout the archipelago to assess whether a sufficient population exists to support subsistence harvest. Coastal mortality surveys provide a relative index of deer mortality in different sections of the archipelago. However, current methods to determine archipelago-wide mortality are insufficient to provide conclusive findings, so alternative methods are being explored.

Methods

Coastal deer mortality transects were established in 1992 in areas with increased deer concentration during winter and early spring months. Transects comprise the area from the high tide line to approximately 200 yards inland from the high tide mark and extend distances ranging from 1.0 to 4.8 miles (1.6–7.8 km) in length, depending on habitat type and terrain. The 3 primary index areas include Chief Cove (CCN/CCS), North Sitkalidak Strait (NSS), and West Olga Bay (OGB); however, beginning in RY12, only Chief Cove (CCN/CCS) was surveyed and reported. Observers were transported to survey sites by local air taxi operators.

A 2-person observer team walked mortality survey routes. Both observers walked parallel transects while searching for deer carcasses. Observer 1 navigated the predetermined route, traveling parallel to the shoreline and maintaining an approximately 100 ft (30 m) distance from the high-water line. Observer 2 walked parallel to Observer 1, approximately 100 ft (30 m) inland; however, vegetation and terrain often resulted in variations in the distance separating observers. When observers reached the end of each transect, they turned around, readjusted their positioning to cover a new area within the transect boundary, and returned toward the initial starting point while making sure to cover a new portion of the transect on their return. A carcass determined to have died during the previous winter or early spring was enumerated, and a Global Positioning System (GPS) waypoint was recorded. Deer carcasses were identified using remains, including bones, hair, and tissue. A carcass determined to be older than 1 year was visually differentiated from recent carcasses using various physical and environmental characteristics (e.g., moss growth, bleached bones, leaf litter). A carcass identified as older than 1 year was not included in mortality estimates.

For each carcass determined to have died within the year, information was collected on GPS coordinates, distance from the beach, general appearance, bone marrow coloration and consistency, and, when possible, sex and age. Bone marrow condition was indexed to estimate the nutritional condition prior to death (Cheatum 1949). The overall size of the pelvic girdle was used to differentiate between fawn and adult age classes. When possible, a yearling age class was estimated from lower jawbone tooth eruption and wear (Severinghaus 1949).

Weather data recorded for each survey and summarized by year were compiled from the Alaska Climate Research Center and obtained from the weather station at the Kodiak Benny Benson State Airport (Fig. 2 and Fig. 3).
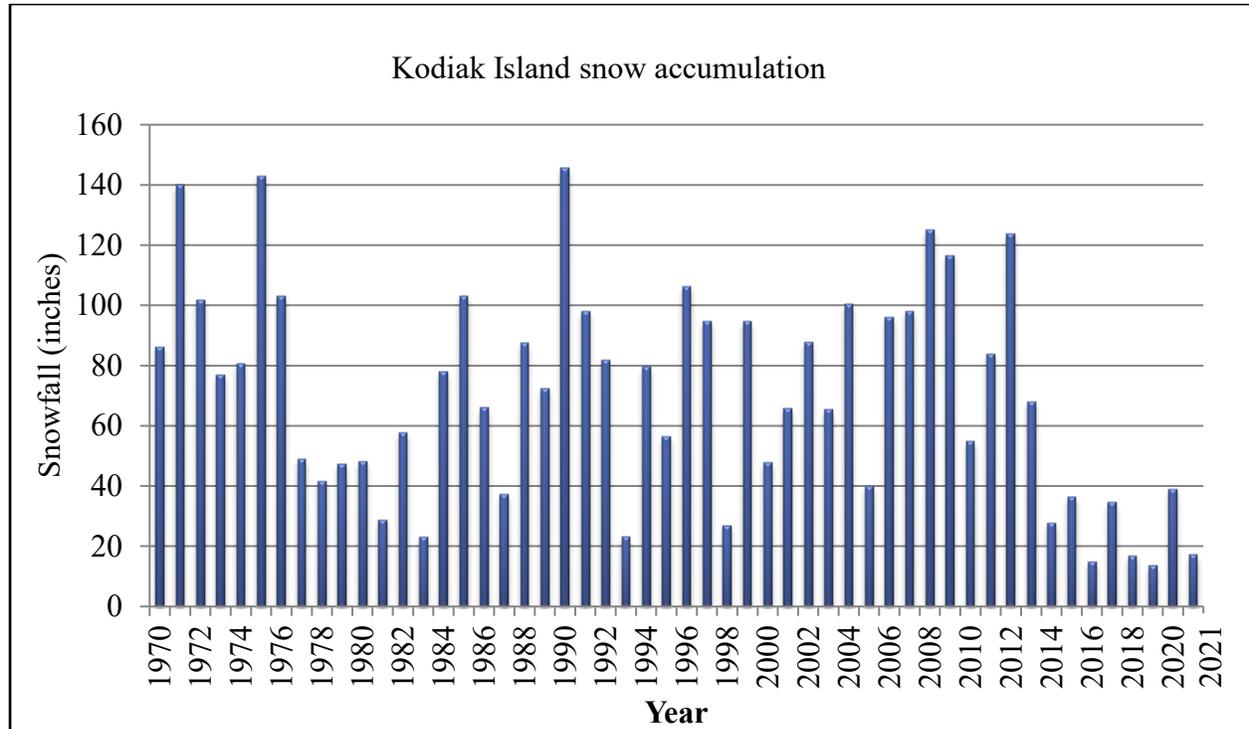
Source: Alaska Climate Research Center, Kodiak Benny Benson State Airport.

Figure 2. Total annual snowfall, Kodiak Island, Alaska, 1970–2021.

Results and Discussion

Coastal deer mortality surveys were not conducted from 2019 to 2021 due to concerns about the COVID-19 pandemic and lack of pilot availability.

Deer mortality estimates were generally higher following colder winters with increased snowfall and ground ice (Fig. 2 and Fig. 3; Table 1). This is consistent with findings in other northern ungulate populations experiencing similar winter conditions (Hovey and Harestad 1992), particularly those in the Arctic regions (Hansen et al. 2010). The cold temperatures observed during the 2016–2017 winter months (Fig. 3) were compounded by high winds, abundant snow at high elevations, and extended periods of cold temperatures at lower elevations, leading to persistent ground ice accumulation. Despite moderate snow amounts observed at lower elevations, an increase in ground ice accumulation was observed, resulting in higher deer mortality in RY16 than in previous milder winters. Prior research suggests that an accumulation
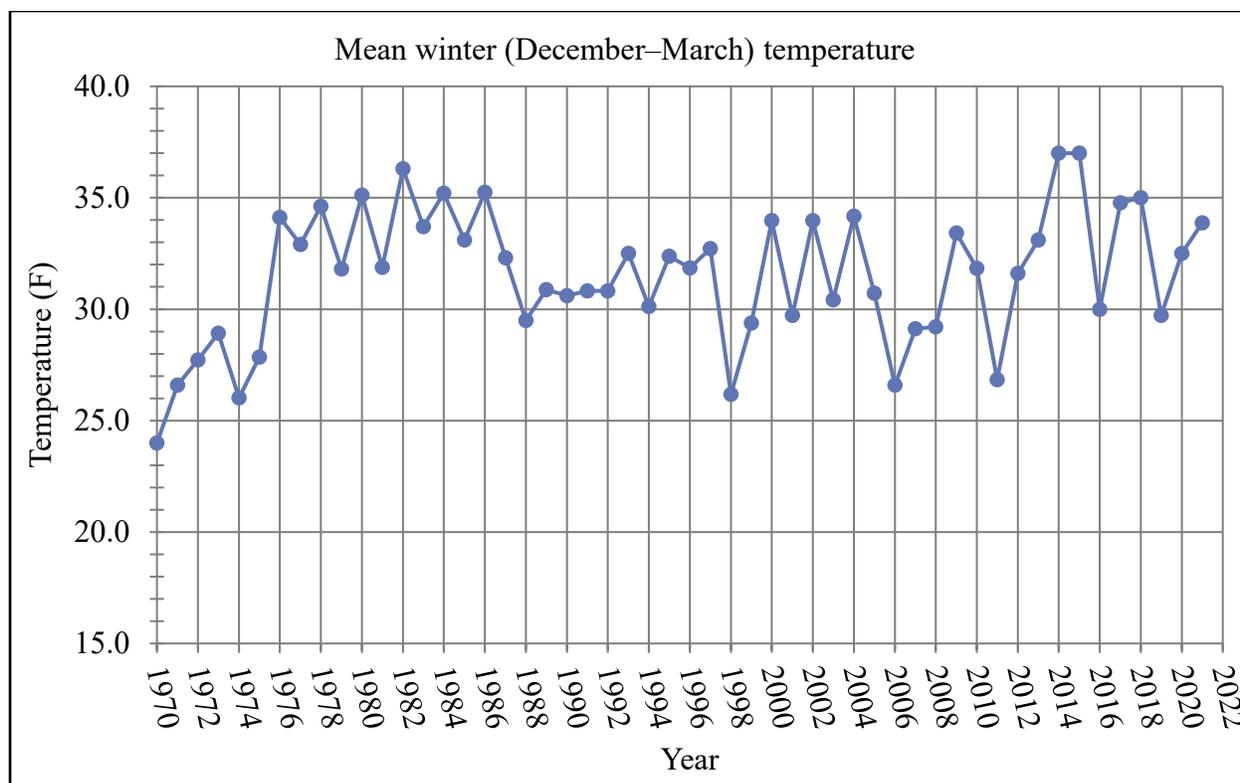
Source: Alaska Climate Research Center, Kodiak Benny Benson State Airport.

Figure 3. Mean winter (December–March) temperature, Kodiak Island, Alaska, 1970–2021.

of ground ice can increase winter mortality rates of ungulates by limiting access to forage (Hansen et al. 2010); however, the maritime climate of the Kodiak Archipelago may reduce the impacts of heavy snowfall and ground ice on forage accessibility by providing access to alternate marine-derived nutrients (i.e., kelp) along the shorelines (Martin et al. 2010). Although this phenomenon has been observed anecdotally in deer on Kodiak Island, additional work is needed to understand this relationship fully.

Recommendations for Activity 2.1

Modify current mortality survey protocols by increasing the distribution and frequency of surveys. Alternative methods are currently being explored because recent surveys to estimate deer mortality are insufficient to provide conclusive islandwide inferences. At a minimum, deer mortality surveys should be more widely distributed across the island to provide a larger geographic extent of deer mortality across the archipelago.

ACTIVITY 2.2. Quantify and analyze harvest data.

Data Needs

Sitka black-tailed deer have a positive customary and traditional use finding and are considered an IM species necessary for subsistence purposes; therefore, it is necessary to assess annual harvest to ensure harvest objectives are met. It is important to note, however, that annual harvest is not an appropriate trigger mechanism for corrective action on estimated abundance. Sitka

Table 1. Unit 8 sex and age composition of Sitka black-tailed deer identified during coastal mortality surveys on Kodiak Island, Alaska, regulatory years 2011–2020.

Regulatory year	Adult				Juvenile[a]				Unknown	Totals				Surveyed km	Deer per km
	M	F	Unk	Total	M	F	Unk	Total	Age and sex	M	F	Unk	Total		
2011	3	5	2	10	6	5	10	21	0	9	10	12	31	5.9	5.2
2012	2	0	6	8	2	0	3	5	2	4	0	11	15	6.0	2.5
2013	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2014	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2015	0	1	0	1	0	0	2	2	5	0	1	7	8	15.7	0.5
2016	11	6	1	18	3	1	5	9	5	14	7	11	32	13.9	2.3
2017	3	1	1	5	0	0	0	0	0	3	1	1	5	14.6	0.3
2018	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2019	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2020	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

[a] Includes fawns and yearlings.
Note: En dashes indicate no survey was conducted.

black-tailed deer populations in the Kodiak Archipelago are driven primarily by winter severity and fluctuate predominantly in response to winter and spring weather patterns. Annual harvest appears to have little impact on annual survival or perceived abundance.

Methods

Harvest data are summarized by regulatory year (RY). From RY89 to RY10, questionnaires were mailed to hunters annually to assess trends in hunting effort and harvest. Questionnaires were sent to a random sample of deer harvest ticket holders, and harvest estimates were derived from data collected from returned questionnaires. Because response rates were low, harvest estimates were expanded to account for nonresponse. In RY11, a statewide deer harvest ticket system was implemented and all individuals obtaining deer harvest tickets were required to report their harvest and a summary of hunting effort. Harvest information was summarized by RY for total harvest, hunter residency and success, transportation method, and harvest chronology. In addition, guides and transporters frequently submitted voluntary summaries of hunting activities, which served as anecdotal information for biologists assessing hunting and deer population trends. The reporting system implemented in RY11 is still in operation and reflected in this report.

Season and Bag Limit

The open season for resident and nonresident hunters was 1 August–31 October along the Kodiak Road System Management Area. The bag limit was 1 buck. A special weapons hunt (archery and muzzleloaders) was open in this area from 1 November to 14 November with a bag limit of 1 deer (either sex). Hunters were required to successfully complete a special weapons hunter education course before participating in the hunt. In the fall of 2011, a special-weapons youth hunt was opened within the 1-deer bag limit area along the Kodiak Road System Management Area. From 15 November through 31 December, youth hunters aged 10–17 who had successfully completed a basic hunter education course and an archery or muzzleloader course could participate in the hunt. The bag limit was 1 deer of either sex.

The open season for resident, nonresident, and federal subsistence hunters in the remainder of Unit 8 was 1 August–31 December. The bag limit was 3 deer. Hunters could harvest only bucks from 1 August to 30 September, and deer of either sex could be taken from October through December.

Federal subsistence hunting regulations mirrored state regulations, except that residents of Unit 8 could continue to hunt on the Kodiak NWR throughout January. On Kodiak NWR lands, hunters could harvest deer for other qualified subsistence users if they first obtained a designated hunter permit. Proxy hunting under state regulations was restricted to resident hunters who had obtained the necessary state permit and were hunting for other Alaska residents who were ≥65 years old, legally blind, or ≥70% disabled.

Results and Discussion

Harvest by Hunters

Harvest during RY16 (8,138 deer) was the highest recorded harvest in nearly 20 years in the Kodiak Archipelago (Fig. 4), as the deer population flourished following 2–3 relatively mild winters (Fig. 2 and Fig. 3).
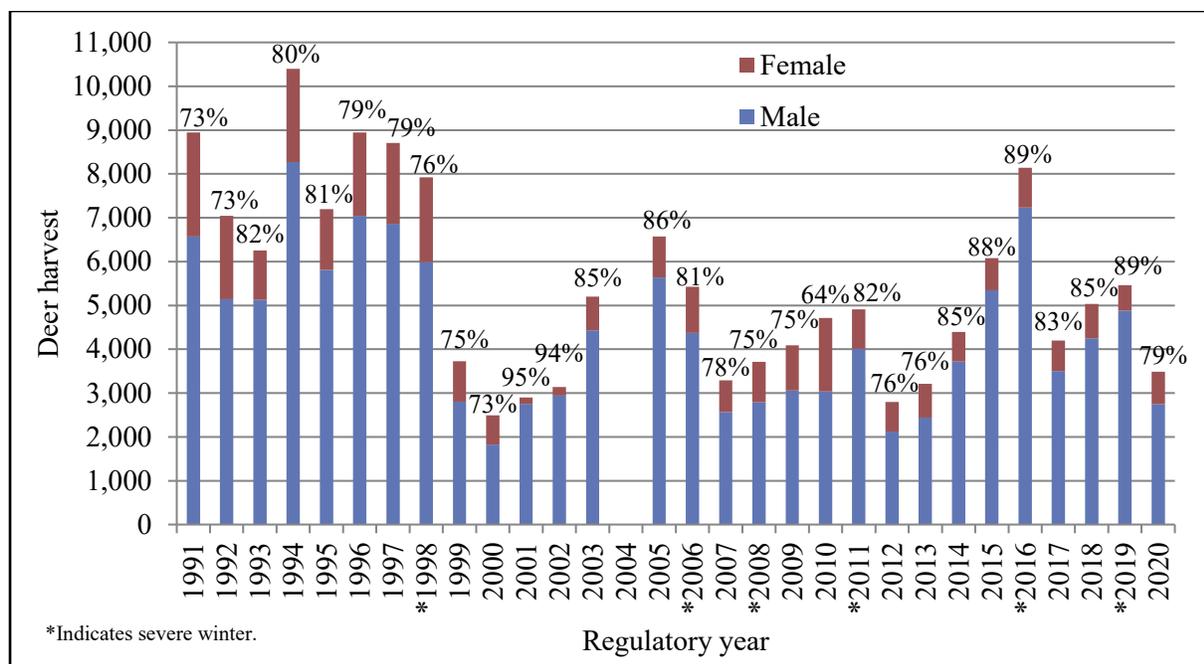
Figure 4. Estimated Sitka black-tailed deer harvest in Unit 8 by sex, Kodiak Archipelago, Alaska, regulatory years 1991–2020. Percentages indicate male harvest. No estimate was available for regulatory year 2004. In regulatory year 2011, harvest reporting was converted from a random questionnaire to mandatory harvest ticket reporting.

Historical data suggests hunter effort, participation, and success increase gradually as deer numbers rebound in the years following a severe winter. The high harvest in RY16 can likely be attributed to increased snow accumulation at higher elevations, forcing deer to lower elevations in search of food. As deer concentrate in areas with increased food accessibility (i.e., beaches), they become more vulnerable to hunter harvest. In contrast, harvest during RY17 (4,200 deer) was considerably lower than in RY16, amounting to just over half of the RY16 harvest (Fig. 4). This decline was presumably due to the severe winter in RY16, its resulting reduction in deer density, and reduced hunter effort (Table 2). Hunter effort and the number of hunters participating in deer hunts often decline immediately following a harsh winter as reports of increased winter deer mortality and reduced densities discourage hunters from going afield. As the deer population gradually rebounded after RY17, harvest increased annually until RY20, when hunter harvest fell considerably during the COVID-19 pandemic (Fig. 4). Like hunter harvest, hunter participation during RY20 was the lowest in 7 years, presumably in response to the COVID-19 pandemic and its associated travel restrictions (Fig. 4; Table 2). The reduction in hunter participation was particularly noticeable in nonresident and nonlocal resident hunters (i.e., Alaska residents not living on Kodiak Island). In RY20, the total reported harvest was estimated at 3,486 deer, considerably lower than the previous 5-year (RY15–RY19) mean annual harvest of 5,781 deer.

The percentage of males in the harvest exceeded 79% each year of this reporting period. The highest percentage of male harvest occurred in RY16 and RY19 (89%) and the lowest in RY20 (79%). The 5-year (RY16–RY20) average was 86% male harvest (Fig. 4).

Table 2. Unit 8 Sitka black-tailed deer hunter residency and success, Kodiak Archipelago, Alaska, regulatory years 2002–2020.

Regulatory year	Successful					Unsuccessful					Total hunters
	Local resident	Nonlocal resident	Nonresident	Total	%	Local resident	Nonlocal resident	Nonresident	Total	%	
2002	705	693	207	1,605	63.7	523	195	195	913	36.3	2,518
2003	1,065	1,027	308	2,400	80.9	356	105	105	566	19.1	2,966
2004[a]	–	–	–	–	–	–	–	–	–	–	–	–
2005	1,268	1,350	430	3,048	84.2	292	139	139	570	15.8	3,618
2006	1,154	1,135	433	2,722	74.8	429	245	245	919	25.2	3,641
2007	583	630	588	1,801	60.3	360	412	412	1,184	39.7	2,985
2008	882	732	206	1,820	70.5	447	158	158	763	29.5	2,583
2009	725	968	291	1,984	80.9	296	86	86	468	19.1	2,452
2010	767	876	302	1,945	72.1	347	202	202	751	27.9	2,696
2011	1,026	1,119	408	2,567	80.1	309	303	172	785	19.9	3,352
2012	619	709	224	1,560	62.9	475	458	234	1,171	37.1	2,732
2013	772	824	183	1,787	69.7	457	397	185	1,044	30.3	2,831
2014	970	1,158	361	2,493	68.5	447	470	232	1,152	31.5	3,645
2015	1,270	1,399	650	3,329	78.5	329	394	186	909	21.5	4,237
2016	1,586	1,682	951	4,223	83.5	287	343	205	837	16.5	5,060
2017	766	1,045	717	2,534	61.2	505	688	415	1,607	38.8	4,141
2018	1,052	1,178	699	2,933	72.6	367	430	310	1,109	27.4	4,042
2019	1,015	1,293	856	3,171	74.9	330	422	310	1,063	25.1	4,234
2020	761	773	563	2,102	64.3	413	467	286	1,168	35.7	3,271

[a] No deer harvest estimate was available in 2004.

Note: In 2011 and forward, total successful hunters, total unsuccessful hunters, and total hunters include hunters of unknown residency. Prior to 2011, an expansion factor was used to account for unknown residency, as hunter reports were not solely relied on.

Permit Hunts

None.

Hunter Residency and Success

The number of hunters afield annually during this reporting period varied considerably. This annual variation can likely be attributed to winter weather patterns, seasonal conditions, public perceptions of deer abundance, and impacts of the COVID-19 pandemic. The greatest number of deer hunters occurred in RY16 and was the highest number of hunters on record in the last 27 years. However, the number of hunters decreased more than 35% from a reported 5,060 hunters in RY16 to 3,271 hunters in RY20, presumably in response to the COVID-19 pandemic. The mean number of hunters afield annually during the past 5 years (RY16–RY20) was 4,150 (Table 2), significantly higher than the previous 5-year average (RY11–RY15) of 3,359.

Unit 8 residents composed 30.7–37.0% of deer hunters in Unit 8 during RY16–RY20 (annual mean = 34.1%), lower than the previous 5-year (RY11–RY15) annual mean of 40.0%. Nonlocal residents made up 37.9–41.8% of the hunters during RY16–RY20 (annual mean = 40.0%), lower than the previous 5-year annual mean of 43.0%. However, nonresidents composed 22.8–27.5% of deer hunters RY16–RY20 (annual mean = 25.7%), notably higher than the previous 5-year mean of 16.6%. Nonlocal resident and nonresident participation often decrease in years following severe winters as deer become sparse and hunter success declines. Of note, participation from all user groups decreased following the severe winter of RY16. Yet, the proportion of nonresident hunters participating in the hunt increased compared to the participation of Alaska residents.

During this reporting period, hunter success by residency was similar among user groups, with local residents having, on average, a 71.9% success rate and harvesting 1,859 deer annually (Table 3). Nonlocal residents, on average, had a slightly lower success rate (70.9%) and harvested 2,310 deer annually. Notably, nonresidents had the same average success rate (70.9%) and harvested 1,084 deer annually. Overall annual mean hunter success for all user groups this reporting period averaged 71.2%, which is higher than the previous 5-year average of 67.2%.

Harvest Chronology

November is consistently the peak month of harvest in Unit 8. During RY16–RY20, 37.4–47.2% of deer were harvested in November each year (mean = 42.0%), slightly lower than the previous 5-year annual mean of 44.4% (Table 4). Hunters prefer to hunt during October and November on Kodiak as the onset of snow in higher elevations forces deer to move to lower elevations, increasing exposure to hunters. In addition, deer typically enter the rut in November, increasing the vulnerability of males to hunters.

Table 3. Unit 8 number of Sitka black-tailed deer harvested by residency, Kodiak Archipelago, Alaska, regulatory years 2011–2020.

Regulatory year	Number of deer harvested				
	Alaska resident	Unit 8 resident	Nonresident	Unknown	Total
2011	2,298	1,986	597	28	4,909
2012	1,320	1,159	298	19	2,796
2013	1,540	1,406	250	16	3,212
2014	2,253	1,676	455	7	4,391
2015	2,851	2,300	914	13	6,078
2016	3,572	3,089	1,468	9	8,138
2017	1,893	1,268	1,028	11	4,200
2018	2,180	1,907	934	10	5,031
2019	2,504	1,751	1,195	10	5,460
2020	1,401	1,279	795	10	3,485

Table 4. Unit 8 chronological Sitka black-tailed deer harvest listed as percentage of harvest by month, Kodiak Archipelago, Alaska, regulatory years 2002–2020.

Regulatory year	Percentage of harvest by month						Unk	n
	Aug	Sep	Oct	Nov	Dec	Jan		
2002	6.0	5.8	22.7	37.7	25.8	2.0	0.0	3,031
2003	7.1	6.5	20.8	39.1	25.3	1.3	0.0	4,955
2004[a]	–	–	–	–	–	–	–	–
2005	7.4	6.4	23.6	45.3	17.0	0.3	0.0	6,360
2006	5.7	6.0	21.6	46.3	19.7	0.8	0.0	5,305
2007	7.5	5.0	19.5	43.8	22.7	1.5	0.0	3,273
2008	5.7	7.1	21.7	44.9	17.7	2.9	0.0	3,600
2009	5.6	3.3	19.3	46.4	23.1	1.8	0.6	4,034
2010	6.8	8.6	20.7	39.9	21.7	1.6	0.7	3,989
2011	6.2	3.7	22.3	44.4	21.2	0.5	1.6	5,102
2012	6.2	3.9	24.7	44.8	19.3	0.9	0.4	2,855
2013	5.2	3.1	21.0	49.2	20.4	0.7	0.3	3,247
2014	7.6	5.7	33.1	41.5	10.8	1.0	0.4	4,391
2015	8.1	7.1	27.1	42.1	15.4	0.0	0.2	6,078
2016	7.3	6.0	25.3	39.7	20.6	0.9	0.2	8,138
2017	7.0	4.8	27.0	47.2	13.7	0.3	0.0	4,200
2018	7.0	4.7	28.8	37.4	21.1	0.7	0.2	5,030
2019	7.9	5.8	27.6	42.3	15.8	0.3	0.3	5,461
2020	9.0	3.7	21.3	43.1	20.7	2.1	0.1	3,485

[a] No deer harvest estimate was available in 2004.
Note: Percentages may not sum to 100% due to rounding error.

Transcript Methods

Similar to previous years and due to the remote setting, inaccessibility, and lack of roads throughout much of the Kodiak Archipelago, hunters primarily used boats (5-year mean = 43.2%) or airplanes (5-year mean = 28.3%; Table 5) to hunt deer during RY16–RY20. Some hunters traveled by highway vehicle (5-year mean = 15.1%), foot (5-year mean = 3.1%), or used a 3- or 4-wheeler (5-year mean = 7.2%). Charter boats are consistently common modes of transportation for deer hunters throughout the archipelago; however, the number of boat hunters from Homer and other off-island locations appears to fluctuate with deer density and availability. Other modes of transportation included travel by horse, snowmachine, or off-road vehicle; however, these modes of transportation were used considerably less (5-year mean = <1%).

Table 5. Unit 8 percentage of Sitka black-tailed deer harvest by transport method, Kodiak Archipelago, Alaska, regulatory years 2002–2020.

	Percentage of harvest by transport method								
Regulatory year	Aircraft	Horse	Boat	3- or 4-wheeler	Snowmachine	ORV[a]	Highway vehicle	Foot	Unk
2002	16.0	0.2	40.4	7.3	0.0	0.7	13.8	17.1	4.5
2003	19.5	0.6	42.1	7.2	0.0	1.5	13.8	12.0	3.3
2004[b]	–	–	–	–	–	–	–	–	–
2005	20.8	0.4	42.5	9.6	0.0	0.9	15.2	10.6	0.0
2006	17.7	0.2	38.8	9.3	0.0	2.4	17.5	14.1	0.0
2007	21.1	0.2	40.2	8.9	0.0	1.2	16.6	11.8	0.0
2008	14.7	1.2	36.8	13.5	0.0	0.4	16.6	15.7	1.1
2009	20.1	0.4	46.3	6.6	0.0	1.4	11.6	12.5	1.1
2010	17.8	0.0	43.9	6.8	0.0	1.2	14.6	12.1	3.6
2011	24.2	0.4	43.9	6.9	0.1	1.6	12.4	6.5	4.0
2012	25.0	0.4	41.2	7.6	0.1	1.1	13.9	7.2	3.5
2013	24.1	0.5	42.6	7.9	0.0	1.5	16.8	3.5	3.1
2014	26.1	0.2	42.9	6.9	0.0	1.2	16.8	3.8	2.1
2015	26.3	0.1	43.2	7.6	0.1	2.0	17.2	2.6	0.9
2016	27.4	0.0	43.3	7.3	0.0	1.9	15.9	3.2	1.0
2017	30.0	0.1	39.6	7.9	0.0	2.7	15.5	2.6	1.5
2018	26.5	0.1	44.9	7.4	0.0	2.1	14.7	3.4	0.9
2019	27.9	0.1	45.1	6.6	0.1	1.7	14.7	2.8	0.9
2020	29.6	0.1	43.0	6.7	0.0	2.0	14.7	3.2	0.7

[a] *ORV* refers to off-road vehicle.
[b] No deer harvest data was collected in 2004.
Note: Percentages may not sum to 100% due to rounding error.

Other Mortality

The severe winter of RY16 resulted in high deer mortality and a noticeable decline in the deer population throughout most of the archipelago (Table 1). The winters of RY17 and RY18 were comparatively mild, and abundant food resources were readily available throughout much of the winter, resulting in a reduction in winter mortality across the archipelago. However, severe winter conditions returned in RY19, resulting in a reported increase in deer mortality islandwide.

Free-roaming dogs can be significant predators of deer near communities and isolated residences (Van Daele et al. 2013). Deer–motor vehicle collisions kill an estimated 40–50 deer annually along the Kodiak Road System. Brown bear predation of deer occurs predominantly in late winter and early spring as bears emerge from dens and deer exhibit reduced body condition and increased vulnerability. However, bears do not appear to be an important factor limiting the deer population.

Alaska Board of Game Actions and Emergency Orders

The board met in March 2019 but did not adopt any regulation changes related to Unit 8 deer hunting.

Recommendations for Activity 2.2

Continue and modify the activity to account for nonresponse bias.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Investigate movement, distribution, and resource use of deer on the Kodiak archipelago.

No investigation of deer movements, distribution, or resource use occurred for deer in Unit 8 during RY16–RY20 due to lack of time and resources. If time and resources permit, we recommend continuing this activity in RY21–RY25.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

As we continue to identify issues and address concerns related to the deer harvest reporting system, it is imperative that the department strive to develop an appropriate method to estimate unreported hunter harvest. As we address these challenges, it would be valuable to continue contacting hunters and encouraging their submission of harvest report cards.

Similar to previous years, hunters continue to report harvested males with malformed antlers caused by abnormal testicular development (referred to as *steer deer*), particularly from the south end of Kodiak. Hunter questionnaires indicated that about 3% of male deer taken in 1999 were steer deer, with the highest prevalence being on the Hepburn Peninsula (13%). From 1999 to 2010, a local big game guide collected samples from normal and abnormal deer harvested on the Aliulik and Hepburn peninsulas. Staff at the University of Guelph in Ontario, Canada, and researchers at Colorado State University analyzed these samples. Results suggest an unusual occurrence of underdeveloped testes and testes that had not descended in adult males (unilateral and bilateral cryptorchidism; Bubenik et al. 2001). The cause of this phenomenon has not been determined, but it is likely caused by an environmental factor rather than a genetic anomaly (Veeramachaneni et al. 2006, Latch et al. 2008). Despite increasing reports of abnormal deer, harvest data from the affected areas do not indicate discernable changes in the population. We feel that no management action is practical or necessary at this time.

Data Recording and Archiving

All data, survey memos, and forms are located at the Kodiak office.

Agreements

Although no formal agreements are in place, various surveys, including deer mortality surveys and some habitat assessment efforts, are cooperative projects between ADF&G and the Kodiak NWR.

Permitting

None.

Conclusions and Management Recommendations

Alaska Statute 16.05.255 mandates that population and harvest objectives be established for Unit 8 deer because of their importance as a human food source. ADF&G, in close cooperation with the Kodiak Fish and Game Advisory Committee, Kodiak NWR, local Native organizations, commercial operators, and individual hunters, attempted to satisfy this requirement by using the best available data to estimate population size and harvest. We recognize considerable room for improvement in the current estimates and data-gathering techniques.

Several techniques for assessing the deer population in Unit 8 have been considered and attempted (Van Daele 2003, Cobb 2014); however, hunter harvest reports and anecdotal evidence collected from hunters, guides, and transporters continue to be the primary tools available, and these are insufficient. The implementation of deer harvest information collected by hunter harvest report cards provided some objective data and helped us refine our management program. That reporting system has been improved with online reporting capabilities and provides managers with up-to-date harvest information. However, other more rigorous population estimation and population monitoring techniques are needed as reliable and objective data do not exist. We anticipate changes in management objectives as new rigorous population assessment techniques are developed, implemented, and refined.

II. Project Review and RY21–RY25 Plan

Review of Management Direction

MANAGEMENT DIRECTION

Provide hunting opportunities that allow for the continued sustainable harvest of Kodiak deer.

GOALS

The deer management goal for Unit 8 is to maintain a healthy, viable population that provides sufficient sport and subsistence harvest opportunities for Alaska residents and nonresidents.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

In January 1993, BOG made a positive customary use determination for deer in Unit 8 and set the amounts reasonably necessary for subsistence uses at 3,600–4,100 deer unitwide.

Intensive Management

It is expected that IM objectives set by BOG will remain the same:

- Population objective: 70,000–75,000.

- Harvest objective: 8,000–8,500.

MANAGEMENT OBJECTIVES

The codified objectives will continue to be the management objectives.

REVIEW OF MANAGEMENT ACTIVITIES

Management activities conducted during RY16–RY20 will continue during RY21–RY25 with changes to methods as noted below. In addition, new population assessment activities may be developed.

1. Population Status and Trend

ACTIVITY 1.1. Work with our colleagues at Koniag Native Corporation to investigate the accuracy, reliability, and feasibility of various new population assessment methods (e.g., camera traps and unmanned aerial vehicle surveys) beginning in RY23.

Data Needs

Reliable methods are needed to determine the current population status and assess fluctuations in population trends and demographics, particularly because deer in Unit 8 are classified as an IM species. A robust method for gathering information on population demographics, including gender, age structure, and survival, would be useful and provide the department with a tool to monitor population fluctuations and annual survival. Using consistent monitoring methods will ensure that management goals are being obtained and that managers can set sustainable harvest levels to maintain a healthy, viable deer population that meets the subsistence needs of the community.

Methods

Various methods are being considered, including the implementation of camera surveys and unmanned aerial vehicle surveys using FLIR.

2. Mortality-Harvest Monitoring

ACTIVITY 2.1. Conduct coastal mortality surveys each spring to estimate annual winter mortality and analyze data in association with temperature and snowfall weather data.

Data Needs

Estimates of annual winter mortality and an understanding of weather patterns are necessary to understand what impact severe winters have on local deer populations and forage availability. Developing a winter severity index would be useful and provide insight into the impact of winter severity on deer survival.

Methods

Although current methods provide a broad index of winter mortality, the current survey design is too limited in scope and distribution. We intend to increase the distribution and frequency of coastal mortality surveys and develop a winter severity index that incorporates daily mean snow depth, mean wind speed, rainfall, minimum ambient temperature, and other relevant weather characteristics that may impact deer survival. Mean daily winter severity can be estimated by averaging the sum of snow depth, wind speed, and rainfall and subtracting the derived value from daily minimum temperature (*in sensu* Duquette et al. 2014). Snow depth and temperature can also be assessed by deploying snow stakes or I-buttons that provide relevant weather information. Currently, reliable weather data is only available at the Kodiak Benny Benson State Airport; therefore, expanding weather stations across the archipelago would be valuable and may provide further insight into the impacts of variable weather conditions on deer. We will also investigate alternative methods to estimate sources of deer mortality (i.e., predation). Current methods are insufficient to provide conclusive findings, and alternative methods will continue to be explored.

ACTIVITY 2.2. Quantify and analyze harvest data.

Data Needs

No change from the RY16–RY20 reporting period.

Methods

Harvest tickets will continue to be used to track trends in harvest over time. Hunters will be issued 6 harvest tickets and a hunt report card. Hunt report cards will be submitted by hunters to report hunting activity and hunt information to the department. This information includes whether they hunted or not, how many hunt trips were taken, success on each hunt trip, what GMU was hunted, number of bucks or does killed, method of take, method of transport, and if commercial services were used. Hunters are required to report either in person, online, or by mail within 15 days after the close of the season.

Although the harvest ticket system may provide more reliable harvest estimates, developing a robust method to estimate nonresponse bias is critical.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Investigate movement, distribution, and resource use of deer on the Kodiak Archipelago.

Data Needs

Determine seasonal and annual fluctuations in movement, distribution, and resource use throughout the archipelago to provide information on resource needs or limiting factors impacting deer at various times of year.

Methods

We will aerially capture, immobilize, and attach GPS radio collars to approximately 50 adult deer (25 male, 25 female) across Kodiak and Afognak Islands to identify seasonal movements, distribution, and resource selection. Collars will attempt relocations at 60-minute intervals for at least 24 months continuously. Seasons will be based on deer behavior and biology and defined as winter (1 December–30 April), pre-fawning/fawning (1 May–30 June), summer (1 July–30 August), and rut/post-rut (1 September–30 November). We will use available satellite imagery to develop a land cover layer for resource use modeling. We will use ArcGIS (Environmental Systems Research Institute, Redlands, California, USA) to create and overlay a grid with predetermined grid cell sizes (based on deer movements and home range size) across the island. We will then extract resource attributes and deer location data. For each cell, we will determine proportional land cover type and other relevant covariates using ArcGIS (Belant et al. 2010). We will also calculate 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 deer resource use, we will use 3 generalized linear mixed models (GLMMs) with seasonal location data and compare their performance using Akaike's Information Criterion adjusted for small sample size (AICc) to select the random model structure most appropriate for final analyses. Each random model structure will contain a different random effect variable: animal ID, year, or animal ID nested within a year. GLMMs with the appropriate random structure used for final analyses of seasonal deer resource use will include season, land cover, and distance from the nearest road and habitat edge as fixed effects and number of animal locations during each season as the response variable. We will include the global and the null (intercept only) models and use all combinations of model parameters to determine the best-supported model. We will use AICc to compare model performance. Models with AICc scores within 2 of the best-supported models will be considered similarly supported (Burnham and Anderson 1998). We will calculate Akaike weights (*w*) to measure model support and model selection uncertainty (Burnham and Anderson 1998). If appropriate, we will use model averaging to estimate model parameters with 95% confidence intervals (Burnham and Anderson 1998). We will also calculate pseudo R^2 values to determine the percent variation in deer locations explained by the best-supported models (Hardin and Hilbe 2007). Relative use of land covers will be assessed based on model parameter estimation.

Before running models, we will test for multicollinearity between covariates. For covariate pairs with a Spearman rank test value of $\rho \geq 0.70$, we will exclude the variable thought to be the least biologically important from analyses. We will evaluate candidate models using AICc, where

models with AICc values of 2 or less of the best-supported model are considered equally plausible (Burnham and Anderson 2002). We will also compare candidate models using Akaike weights (w_i), which represent the relative likelihood that a specific model is best (Burnham and Anderson 2002).

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Data Recording and Archiving

All data, survey memos, and forms will be located at the Kodiak office.

Agreements

Various surveys, including deer mortality surveys and some habitat assessment efforts, are cooperative projects between ADF&G, Koniag Native Corporation, and the Kodiak NWR. A data-sharing agreement has been developed for collaborative projects between ADF&G and Koniag Native Corporation.

Permitting

None.

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Several volunteers contribute their time each spring to participate in deer mortality surveys. Their efforts are critical to ensuring surveys are completed in a timely manner. Without specific attribution, this report incorporates descriptions and explanations written by previous Unit 8 area biologists, including Larry Van Daele and Roger Smith.

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