CALIFORNIA DEPARTMENT OF FISH AND GAME

PENINSULAR BIGHORN SHEEP RECOVERY

2010 ANNUAL REPORT

Photo by Janene Colby

This report presents information on the status, distribution, and management of peninsular bighorn sheep in eastern San Diego County and portions of Riverside and Imperial Counties, California from January 1, 2010 through December 31, 2010.

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SUMMARY

This report highlights information collected by the California Department of Fish and Game (CDFG) over the reporting period, 1 January 2010 through 31 December 2010 relating to bighorn sheep (*Ovis canadensis*) in the Peninsular mountain ranges of southern California. The Peninsular bighorn sheep population contains nine designated recovery regions occupying portions of western Riverside and Imperial Counties and eastern San Diego County. CDFG conducted monitoring activities in seven of the nine recovery regions located east of Highway 74 and conducted capture and population surveys in all nine recovery regions. CDFG conducted monitoring in the Central Santa Rosa Mountain (CSRM), Southern Santa Rosa Mountain (SSRM), Coyote Canyon (CoC), North San Ysidro Mountain (NSYM), South San Ysidro Mountain (SSYM), Vallecito Mountain (VM), and Carrizo Canyon (CC) recovery regions. CDFG jointly monitored CSRM with the Bighorn Institute (BI), while the Northern Santa Rosa Mountain (NSRM) and San Jacinto Mountain (SJM) recovery regions located west of Highway 74 were monitored solely by BI.

CDFG conducted ground monitoring of radio-collared sheep in the CoC, NSYM, SSYM, and VC recovery regions two to three days per week. Ground monitoring of collared sheep in the CSRM, SSRM, and CC recovery regions occurred as opportunity allowed. Ground monitoring efforts were focused on: 1) detection of mortality signals from collared sheep; 2) recording locations of collared sheep moving between recovery regions; and 3) observation of lambs associated with collared ewes to determine survival. Aerial telemetry monitoring was conducted from either a Cessna 185 or Volcun Air Partenavia P68 Observer fixed-winged aircraft for all recovery regions two to three times per month. Aerial flights were used to monitor collared sheep for mortality and track movement.

During October 2010, CDFG in conjunction with BI, United States Fish and Wildlife Service (USFWS) and California Department of Parks and Recreation (CDPR) conducted aerial helicopter population surveys covering the entire range of peninsular bighorn sheep. Survey results indicated that range-wide, bighorn sheep were stable to slightly increasing in distribution and number. As of 31 December 2010, an estimated 849 adult bighorn sheep occupied the seven recovery regions located east of Highway 74 and the range-wide population was estimated at 955.

Between 14 and 16 December 2010, CDFG in conjunction with USFWS, CDPR, and BI conducted two separate capture operations to fit new radio-collars on adult male and female bighorn sheep. A total of 10 bighorn sheep (1M/9F) were captured during these operations. Captures were conducted in Riverside County on 14 December and in San Diego County on 16 December 2010. Recovery regions where captures occurred and number/sex of captured sheep were: NSRM (*n*=4F), SSYM (*n*= 4F), and VM (*n*=1M/1F).

The number of radio-collared sheep occurring east of Highway 74 at the beginning of 2010 was 95 (6M/89F) and as of 31 December 2010 the number of collared sheep was 86 (4M/82F).

PERSONNEL

CDFG Resource Management and Air Services Divisions

Oversight for recovery of peninsular bighorn sheep in 2010 was provided by Mr. Steve Torres, Senior Environmental Scientist with the Department's Resource Management and Policy Division. Statewide Bighorn Sheep Program management was carried out by the Resource Management and Policy Division's Dr. Ben Gonzales, Senior Wildlife Veterinarian. Dr. Gonzales also managed Bighorn Sheep Program funding and was the statewide bighorn sheep veterinary coordinator. Mr. Tom Evans, Warden/Pilot for the Department's Air Services Division piloted all aerial telemetry flights.

CDFG South Coast Region, Wildlife Management Program

Mr. Randy Botta, Associate Wildlife Biologist for the South Coast Region, provided oversight for field and aerial monitoring, assisted with aerial monitoring flights and mortality investigations, and supervised one field position working east of Highway 74. Mr. Botta also served as lead for capture and population survey plan development and field operations for the entire Peninsular Ranges. Field telemetry monitoring and mortality investigation and reporting were carried out by Ms. Janene Colby, Scientific Aid with the South Coast Region. Ms. Colby also provided assistance during capture and population survey efforts for the entire Peninsular Ranges.

RECOVERY PROGRAM OVERVIEW

Activities conducted during 2010 were tied to recovery elements contained in Section 2 of the recovery plan for peninsular bighorn sheep. Section 2 of the recovery plan addresses the need to "Initiate or continue research programs necessary to monitor and guide recovery efforts". Activities conducted in 2010 are covered in sections II.D.2.1 (Monitor population status), II.D.2.1.2 (Monitor distribution), and II.D.2.1.4 (Monitor survivorship and cause-specific mortality) of the recovery plan.

Population Monitoring

As recommended in the recovery plan for peninsular bighorn sheep, CDFG maintains, to the extent possible, active VHF radio-collars on approximately 25-30% of all females in each recovery region. The number of new collars to be fitted in each recovery region to maintain this ratio of marked (radio-collared) females is based on aerial helicopter surveys conducted during the fall of even numbered years. Capture operations to fit needed collars on sheep are conducted during the fall of the proceeding survey year. At the beginning of the 2010 reporting period the seven recovery regions east of Highway 74 contained a total of 94 (6M/88F) active collars. The number of collars fitted to males and females and percentage of marked females in each recovery region were:

- CSRM = 12 (1M/11F) : 16%
- SSRM = 11 (0M/11F) : 13%
- CoC = 12 (1M/11F) : 24%
- NSYM = 16 (1M/15F) : 38%

- SSYM = 15 (2M/13F) : 36%
- VM = 9 (1M/8F) : 10%
- CC = 19 (0M/19F) : 14%

By the end of 2010 the seven recovery regions located east of Highway 74 contained a total of 86 (4M/82F) radio-collared adult sheep. Collars were lost through mortality in the NSYM, SSYM, and CC while collars became non-functional in the CSRM, SSRM, and VM. The number of collars in each recovery region and the number fitted to males and/or females and percentage of marked females in each recovery region at the end of 2010 were:

- CSRM = 10 (0M/10F) : 14%
- SSRM = 7 (0M/7F) : 8%
- CoC = 12 (1M/11F) : 24%
- NSYM = 14 (0M/14F) : 25%
- SSYM = 15 (2M/13F) : 36%
- VM = 10 (1M/9F) : 11%
- CC = 18 (0M/18F) : 13%

Specific monitoring objectives for 2010 as described in the recovery plan for peninsular bighorn sheep were:

(1) Monitor the status, dynamics, and trends of bighorn sheep.

(2) Determine distribution and movement patterns of adult sheep. Identify whether or not there is significant movement of ewes within, and between recovery regions.

(3) Monitor adult survivorship and cause-specific mortality. Continue to collect data in a manner that will allow comparison of survivorship and cause-specific mortality among recovery regions, years, and management strategies.

(4) Identify and monitor disease, pathogens and vectors that may be limiting adult productivity and lamb survivorship.

Population Size and Estimation

As of 31 December 2010, the seven recovery regions located east of Highway 74 contained an estimated 849 adult and yearling bighorn sheep and the range-wide population estimate was 955. Bighorn sheep helicopter surveys were conducted by CDFG in the Peninsular Ranges of San Diego, Riverside and Imperial Counties during October 12-29, 2010 in two separate survey efforts. The bighorn sheep habitat surveyed ranged from Blaisdell Canyon in the San Jacinto Mountains south to the Jacumba Mountains at the U.S. border with Mexico. Twenty-six of twenty-seven predetermined survey polygons (Figure 1) were surveyed; Polygon 22 (Carrizo Wash to Blackwater Canyon) was not flown and Polygon 23 (Carrizo Gorge to Tule Canyon) was only partially flown due to high winds. Surveys were coordinated and funded by the CDFG Bighorn Sheep Program and South Coast Region. Logistic and personnel support was provided by the CDPR and BI. A total of 681 bighorn sheep including 567 adults

(211M/356F) and 114 lambs were observed in 166 groups during a total of 45.35 rotor hours of survey time (Table 1). A total of 69 (68 females, 1 male) marked (collared) bighorn sheep were seen out of 120 (108F/12M) present in the range, for an overall observation percentage of 0.58. Overall population ratios for the nine recovery regions are provided in Table 2.

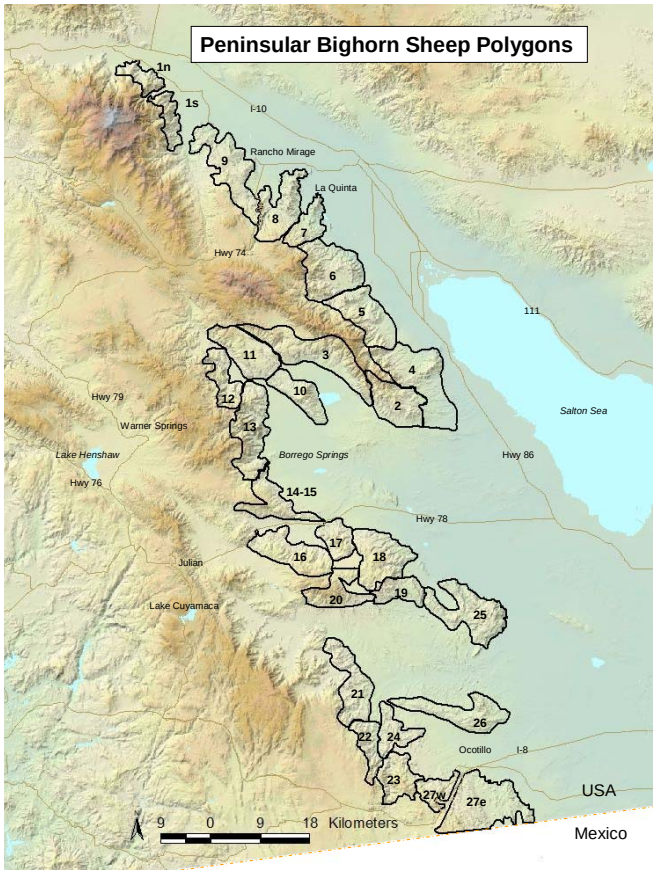


Figure 1. Peninsular Ranges Bighorn Sheep Survey Polygons.

The first survey effort was conducted during October 12-14 and October 16-17, 2010 in CoC, NSYM, SSYM, VM, and CC in cooperation with CDPR. Within these recovery regions bighorn habitat in 16 polygons was surveyed in 29.3 hours of flight time and 66 marked sheep were distributed throughout the surveyed polygons. A total of 321 adult sheep (117M/204F), 61 lambs, and 36/66 (55%) of the marked sheep were observed. Individual recovery region adult population estimates were: CoC = 66; NSYM = 72; SSYM = 55; VM = 142; and CC = 232.

A second survey effort was conducted during October 26-29, 2010 in SJM, NSRM, CSRM, and SSRM in cooperation with BI. Within these recovery regions bighorn habitat in 9 polygons was surveyed in 16.0 hours of flight time and 54 marked sheep were distributed throughout the recovery regions. A total of 246 adult bighorn (94M/152F), 53 lambs, and 33/54 (61%) of the marked sheep were observed. Individual recovery region population estimates were: SJM = 16; NSRM = 90; CSRM = 133; and SSRM = 149.

Simultaneous double-count methodology was also employed to estimate the number of bighorn sheep groups missed and to generate an additional range-wide estimate of the minimum number of bighorn sheep present within the surveyed areas. The resulting simultaneous double-count population estimate was 1,044 bighorn sheep (including lambs) present in the surveyed polygons.

Capture and Radio-Collaring

During December 2010 two bighorn capture and radio-collaring efforts were conducted by CDFG to fit new radio-collars on sheep in three of the nine recovery regions to support on-going monitoring efforts. Specific capture locations included Magnesia Canyon (Magnesia Springs Ecological Reserve) in the NSRM of Riverside County,

Table 1. Summary of bighorn sheep observed during helicopter population surveys

Subpopulation	Lambs	Yrlg Ewes	Adult Ewes	Cl. I Rams	Cl.II Rams	Cl. III Rams	Cl. IV Rams	Total
San Jacinto Mtns.	1	0	7	1	1	2	0	**12**
N. Santa Rosa Mtns.	7	1	34	1	4	4	5	**56**
C. Santa Rosa Mtns.	33	2	63	1	9	26	5	**139**
S. Santa Rosa Mtns.	12	5	40	3	6	20	6	**92**
Coyote Canyon	4	3	25	2	1	5	1	**41**
N. San Ysidro Mtns.	1	3	18	2	3	4	8	**39**
S. San Ysidro Mtns.	6	0	29	0	3	2	4	**44**
Vallecito Mtns.	20	6	56	8	4	13	12	**119**
Carrizo Canyon	30	8	56	10	8	13	14	**139**
Total	**114**	**28**	**328**	**28**	**39**	**89**	**55**	**681**

Table 2. Ratios observed during helicopter population surveys

Subpopulation	Lamb:Ewe[a]	Lamb: Ewe[b]	Yearling:Ewe[c]	Ram:Ewe[d]	Ram:Ewe[e]
San Jacinto Mtns.	0.14	0.14	0.14	0.43	0.57
N. Santa Rosa Mtns.	0.21	0.20	0.06	0.38	0.40
C. Santa Rosa Mtns.	0.52	0.51	0.05	0.63	0.63
S. Santa Rosa Mtns.	0.30	0.27	0.20	0.80	0.78
Coyote Canyon	0.16	0.14	0.20	0.28	0.32
N. San Ysidro Mtns.	0.06	0.05	0.28	0.83	0.81
S. San Ysidro Mtns.	0.21	0.21	0.00	0.31	0.31
Vallecito Mtns.	0.30	0.32	0.25	0.52	0.60
Carrizo Canyon	0.54	0.47	0.32	0.63	0.70
Overall	**0.35**	**0.32**	**0.17**	**0.54**	**0.58**

[a] lambs per adult ewe.
[b] lambs per ewe (yearling and adult females combined)
[c] yearlings per adult ewe (male and female yearlings combined).
[d] adult ram per adult ewe (excludes yearling females and yearling males).
[e] includes yearling ewes and yearling rams

Pinyon Ridge in the SSYM of San Diego County, and Sunset Mountain in the VM of San Diego County.

Capture and field processing crews consisted of personnel from CDFG and Landells Aviation, while base camp processing crews included personnel from CDFG, CDPR, and BI. A total of 10 bighorn sheep (*n*=1M/9F) were captured during the two operations. Of these, four (4F) were captured and fitted with radio-collars and ear tag(s) in the NSRM, four (4F) were captured and fitted with radio-collars and/or ear tags in the SSYM, and two (1M/1F) were captured and fitted with radio-collars and ear tag(s) in the VM (Table 3). All ten bighorn sheep were released without incident. Post-capture ground monitoring east of Highway 74 was conducted at least three times per week by CDFG personnel. Aerial telemetry monitoring was conducted by CDFG once per week for the first three weeks following capture. No post-capture mortalities of collared bighorn sheep were detected.

Table 3. Distribution and number of radio-collars east of Highway 74 prior to and after captures (1 January 2010 – 31 December 2010)

	CSRM		**SSRM**		**CoC**		**NSYM**		**SSYM**		**VM**		**CC**	
	Ewe	Ram	Ewe	Ram	Ewe	Ram	Ewe	Ram	Ewe	Ram	Ewe	Ram	Ewe	Ram
1/1/2010	**11**	**1**	**11**	**0**	**11**	**1**	**15**	**1**	**13**	**2**	**8**	**1**	**19**	**0**
new collars	0	0	0	0	0	0	0	0	**3**	0	**1**	**1**	0	0
re-collars	0	0	0	0	0	0	0	0	0	0	0	0	0	0
mortalities	0	0	0	0	0	0	1	1	3	0	0	0	1	0
non-functional	1	1	4	0	0	0	0	0	0	0	0	1	0	0
12/31/2010	**10**	**0**	**7**	**0**	**11**	**1**	**14**	**0**	**13**	**2**	**9**	**1**	**18**	**0**

Distribution and Range Expansion

During 2010, CDFG monitored between 86 and 94 adult radio-collared bighorn sheep in seven recovery regions located east of Highway 74 to document habitat use, distribution, and movement. Field staff detected collared and un-collared bighorn sheep of various age classes and sex regularly moving between recovery regions and between different geographic areas in the same recovery region. Movement across natural landscapes and two lane highways were documented and collared sheep inhabited areas anywhere from a few days to several months.

Central Santa Rosa Mountains: CDFG monitored 12 (1M/11F) adult VHF radio-collared bighorn sheep in this recovery region. Aerial and ground monitoring of collared sheep was conducted as opportunity allowed. As in previous reporting periods collared sheep were primarily documented inhabiting the La Quinta and Martinez Canyon areas of the CSRM during 2010. Collared sheep in the La Quinta area were detected in Sheep, Coyote, Bear, Devil, and Guadalupe Canyons. Collared sheep in the La Quinta area continued to use the lower elevations of Bear and Guadalupe Canyons just west and southwest of Lake Cauhilla as in 2009. To the south, collared sheep were detected in Martinez, Toro, and Agua Alta Canyons. One collared female was detected moving seasonally between La Quinta and Martinez Canyon.

Southern Santa Rosa Mountains: CDFG monitored 11 (11F) adult VHF radio-collared bighorn sheep in this recovery region. Aerial and ground monitoring was conducted as opportunity allowed. As in previous reporting periods collared sheep were regularly detected in or adjacent to either Sheep Canyon or Rattlesnake Canyon. Three of the collared ewes primarily used Sheep and Barton Canyons but were detected using Travertine Wash, Wonderstone Wash, and Big Wash. Use of these washes coincided with periods of vegetation green up and/or availability of surface water. The remaining collard ewes regularly used Rattlesnake and Palo Verde Canyons but occasionally used Coachwhip and Smoke Tree Canyons as well as Palm Wash. Due to the presence of year round water in Rattlesnake Canyon, collared sheep were consistently detected in or adjacent to the upper portion of this canyon. Use of adjacent canyons and washes coincided with periods of vegetation green up and/or surface water availability.

Coyote Canyon: CDFG monitored 12 adult VHF and GPS radio-collared sheep (1M/11F) in this recovery region. Aerial monitoring was conducted two to three times per month with ground monitoring occurring at least once per week. In November of 2009, GPS collars were placed on 5 adult female sheep in CoC. The GPS component of two collars malfunctioned soon after placement, one female died during this reporting period, and the remaining 2 GPS collars functioned through 2010. Monitoring of VHF/GPS and VHF collared sheep revealed three use patterns: 1) use of Coyote Peak during the lambing season (October through May) with subsequent movement and use during summer and fall (June through September) in the Lower Willows/Box Canyon area of CoC or the Henderson Canyon area of NSYM; 2) use Coyote Peak during the lambing period with subsequent movement and use during summer and fall on the east slopes above Upper Willows in CoC; and 3) use of the area surrounding Henderson Canyon in the NSYM during the lambing season with movement and use during summer and fall at Lower Willows, Cougar, Sheep, and Salvador Canyons of CoC. During

summer, collared sheep obtained water from Coyote Creek between Lower and Upper Willows and from springs located in the referenced canyons.

Northern San Yisdro Mountains: CDFG monitored 16 adult VHF and VHF/GPS radio-collared bighorn sheep (1M/15F) in this recovery region. Monitoring was conducted by air two to three times per month with ground monitoring occurring at least two times per week. Three general patterns of use were detected in the NSYM during the reporting period: 1) use of Palm Canyon throughout most of the year with some use in Hellhole/Dry Canyon areas to the south; 2) use of Dry Canyon during the lambing season (and as a nursery ground) with use during the summer and fall in areas surrounding Hellhole Canyon; and 3) use of the area surrounding Henderson Canyon during the lambing season with subsequent movement and use of Hellhole Canyon and Palm Canyon during the summer and fall.

Monitoring during the reporting period revealed that collared sheep in the NSYM utilized water sources at Palm and Hellhole Canyons and occasionally moved across Highway S22 on Montezuma Grade into Tubb Canyon in the SSYM. Additionally, collared sheep along with a large number of non-collared sheep were documented briefly using the DeAnza Country Club and Golf Course development that abuts Palm Canyon.

Southern San Ysidro Mountains: CDFG monitored 15 adult VHF and VHF/GPS radio-collared bighorn sheep (2M/13F) in this recovery region. Monitoring was conducted by air two to three times per month with ground monitoring occurring at least two times per week. In 2009, GPS collars were deployed on 3 females in the SSYM; 3 additional collars were placed on females in December of 2010. The GPS component on one collar became non-functional in 2010. There were two main patterns of movement and use in the recovery region during the reporting period: 1) use of Pinyon and Yaqui Ridges during the lambing season with subsequent movement and use during summer and fall in Tubb Canyon; and 2) use of Pinyon and Yaqui Ridges throughout the year.

Movement of one GPS collared female from the SSYM across Highway S22 on Montezuma Grade to Hellhole Canyon in the NSYM was documented in late 2010. Additionally, regular movement of collared sheep between Pinyon Ridge and Yaqui Ridge across Highway S-3 at Yaqui Pass were documented.

Vallecito Mountains: CDFG monitored 10 adult VHF and VHF/GPS radio-collared bighorn sheep (1M/9F) in this recovery region. GPS units were fitted to sheep in December of 2010 in the VM so the majority of location data collected during 2010 was obtained from VHF collared sheep. Monitoring was conducted by air two to three times per month with ground monitoring occurring as opportunity allowed. There appeared to be two main patterns of movement and use within the recovery region during 2010: 1) use concentrated on Sunset Mountain with occasional movement and use of adjacent canyons and washes and/or movement across Highway 78 at the Narrows to Yaqui Ridge in the SSYM; and 2) use of Split Mountain during the summer and fall months with subsequent movement and use of the Fish Creek Mountains during the lambing season.

Additionally, one collared female (along with several non-collared females) was documented regularly using the Lizard Wash and Plum Canyon areas west of Sunset

Mountain. As in previous years this female was documented moving across Highway 78 to the SSYM prior to lambing season. Multiple crossings of Highway 78 at Stag Cove and the Narrows were documented during 2010.

Carrizo Canyon: CDFG monitored 18 adult VHF and GPS radio-collared bighorn sheep (0M/18F) in this recovery region. Monitoring was conducted by air two to three times per month with ground monitoring occurring as opportunity allowed. Three of the nine GPS components on collars fitted to sheep in 2009 became non-functional in 2010. Two main patterns of movement and use were documented in the recovery region: 1) use of Carrizo Canyon during the summer months with subsequent movement and use of the Coyote Mountains during the lambing season; and 2) use of the Mountain Spring (north of Interstate-8) and In-Ko-Pah Gorge (island created by divergence of the Interstate-8 east and west-bound lanes) throughout the year with brief movements of several collared sheep to the Jacumba Wilderness (south of Interstate-8) or Carrizo Canyon during the lambing season.

Twelve radio-collared females used Carrizo Canyon in the Jacumba Mountains from June through October then moved to the Coyote Mountains for the remainder of the reporting period. Sheep crossed from Carrizo Canyon to the Coyote Mountains at or near Sweeney Pass on Highway S2. Two collared females did not move to the Coyote Mountains but instead spent the entire year within Carrizo Canyon. The six collared sheep in the In-Ko-Pah Gorge area were generally detected within the Interstate-8 island during winter and spring; and the remainder of the year near Mountain Spring located along the north side of the west-bound lane of Interstate-8. Movement in and out of the island was documented at numerous locations which included sheep crossing directly over the freeway as well as using underpasses at two locations along Devils Canyon. Movement of a GPS collared female from Mountain Spring to Goat Canyon in Carrizo Canyon occurred in February. By the beginning of April the female had returned to the Mountain Spring area. Brief movement of a second GPS collared female between Mountain Spring and Myers Valley south of Interstate-8 was recoded during February and September.

Survivorship

In 2010, CDFG detected and investigated 6 (1M/5F) adult radio-collared and 5 (4M/1F) non-collared adult and lamb bighorn sheep mortalities east of Highway 74 (Table 4). Radio-collared mortalities by recovery region were: NSYM = 2; SSYM = 3; and CC = 1. Causes of mortality and percentage of all mortalities were: lion predation = 3 (50%); probable lion predation = 1 (17%); and unknown = 2 (33%). Causes and percentage

Table 4. Cause of death for radio-collared and non-collared bighorn sheep – January 1 to December 31, 2010

Sheep ID	Location	Sex	Age (yrs.)	month	cause
241	SSYM	F[a]	4	February	Lion
242	SSYM	F[b]	5	February	Lion
None	NSYM	M[c]	4 weeks	February	Vehicle
None	CC	M	8	February	Strangulation*
190	CC	F	10	March	Unknown (non-predation)
222	NSYM	M	8	March	Lion
None	Vallecito	M	8	April	Injury/Fall
None	SSYM	M	6	August	Vehicle
254	NSYM	F	7	September	Unknown
None	NSYM	M	6	October	Injury/Fall
169	SSYM	F	12	December	Lion (possible)

[a] Ewe and her newborn lamb were killed and consumed.
[b] Ewe was killed and consumed but her newborn lamb was not preyed upon and most likely died of starvation a few days after the ewe was killed.
[c] Lamb of radio-collared ewe 137 was struck and killed by a vehicle on Montezuma Grade (S-22).
* Ram became tangled in old downed telephone line along the Carrizo Canyon railroad track.

of documented radio-collar mortalities in 2010 were generally consistent with that documented since 1993 (Figure 2). Non-collared mortalities by recovery region were: NSYM = 2; SSYM = 1; VM = 1; and CC =1. Causes of mortality were: vehicle = 2; injury/fall = 2; and miscellaneous = 1.

Of the 6 mortalities involving radio-collared sheep documented in 2010, 5 (83%) occurred during winter and spring (November through May). This timing pattern was consistent with known sheep mortalities documented since 1993 (Figure 3). The number of collared sheep mortalities in 2010 was similar to that documented in 2009 and consistent with the range of four to eight mortalities documented over the previous five years.

Figure 2. Number of sheep mortalities by cause from 1993 – 2010.

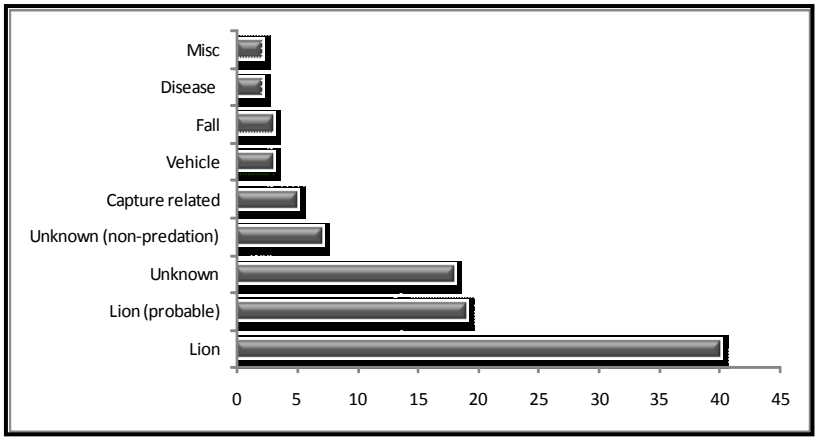
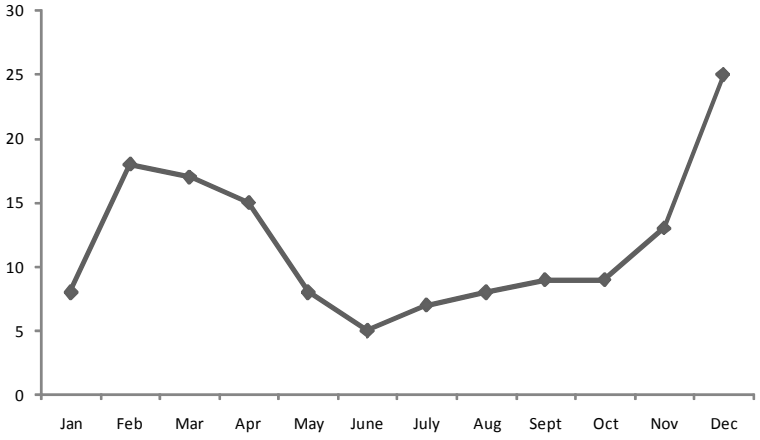


Figure 3. Number of radio-collared sheep mortalities by month from 1993 – 2010



Lamb Mortality Monitoring

In 2007, CDFG documented several sick lambs and lamb deaths in Borrego-Palm Canyon located in the NSYM. Results from the 2007 ABDSP waterhole count held in July indicated a low lamb: ewe ratio of 7% in Borrego-Palm Canyon relative to other locations (12% for the SSYM, 26% for CoC, and 78% for Rattlesnake Springs in the SSRM). Numerous hikers had also reported finding sick or dead lambs in Borrego-Palm Canyon during the spring of 2007. As a result of anecdotal evidence of high lamb mortality, CDFG initiated a pilot study in 2008 in order to test the feasibility and logistics of monitoring the NSYM, SSYM, and CoC. The main objective was to examine lamb survival to 3 and 6 months and examine the timing of parturition, lamb production, lamb: ewe ratios, and timing of sick lambs and lamb deaths. The field portion of the study will be completed December 2011. A full report for the lamb mortality monitoring effort will be submitted to USFWS and CDPR upon completion anticipated by June 2012.

2011 CDFG Proposed Activities

In 2011, CDFG will continue on-going monitoring activities involving:

(1) Monitoring the status, dynamics, and trends of bighorn sheep.

(2) Determining the distribution and movement patterns of adult sheep and identifying whether or not there is significant movement of ewes within, and between recovery regions.

(3) Monitoring adult survivorship and cause-specific mortality and data collection in a manner that will allow comparison of survivorship and cause-specific mortality among recovery regions, years, and management strategies.

(4) Identifying and monitoring disease, pathogens and vectors that may be limiting adult productivity and lamb survivorship.