

**Lynx Update
May 25, 2009**

INTRODUCTION

In an effort to establish a viable population of Canada lynx (*Lynx canadensis*) in Colorado, the Colorado Division of Wildlife (CDOW) initiated a reintroduction effort in 1997 with the first lynx released in February 1999. From 1999-2006, 218 lynx were released in southwestern Colorado.

REINTRODUCTION

Effort

From 1999 through 2006 218 lynx were reintroduced into southwestern Colorado (Table 1). Lynx released were captured in Alaska, British Columbia, Manitoba, Quebec and Yukon. All lynx were released in the Core Release Area of southwestern Colorado. Lynx were released with dual VHF/satellite radio collars so they could be monitored for movement, reproduction and survival. The CDOW did not release any additional lynx in 2007, 2008 or 2009 and there are no plans to release any additional animals in the near future.

Table 1. Lynx released in Colorado from February 1999 through May 25, 2009.

Year	Females	Males	TOTAL
1999	22	19	41
2000	35	20	55
2003	17	16	33
2004	17	20	37
2005	18	20	38
2006	6	8	14
TOTAL	115	103	218

Mortality Factors

Of the total 218 adult lynx released, we have 115 known mortalities as of May 25, 2009 (Table 2). Starvation was a significant cause of mortality in the first year of releases only. Mortalities occurred throughout the areas through which lynx moved. The primary known causes of death included 30.4% human-induced deaths which were confirmed or probably caused by collisions with vehicles or gunshot. Malnutrition and disease/illness accounted for 18.3% of the deaths. Other mortality factors included predation or probable predation by mountain lions, bobcat and lynx as well as other trauma-caused deaths. An additional 37.4% of known mortalities were from unknown causes.

Table 2. Causes of death for lynx released into southwestern Colorado from 1999-2006 as of May 25, 2009.

Cause of Death	Number of Mortalities
Unknown	43
Shot	16
Hit by Vehicle	14
Starvation	11
Other Trauma	8
Plague	7
Probable Shot	5
Predation	5
Probable Predation	3
Illness	3
Total Mortalities	115

Current Status

Reintroduced Lynx

We are currently tracking 42 of the 103 reintroduced lynx still possibly alive. We have 62 reintroduced lynx that we have not heard signals on since at least May 25, 2008 and list these animals as ‘missing’ (Table 3). One of these missing lynx is the unknown mortality, thus only 61 are truly missing. A number of these lynx are now missing because their collar batteries have died and we can no longer pick up radio signals. Some of the missing lynx may still have functioning collars but are outside the research area. Our expanded flights outside the research area during the summer and fall months may yield locating these missing lynx.

Table 3. Status of adult lynx reintroduced to Colorado as of May 25, 2009.

	Females	Males	Unknown	TOTALS
Released	115	103		218
Known Dead	63	51	1	115
Possible Alive	52	52		103 ^a
Missing	29	33		62 ^a
Tracking	23	19		42

^a 1 is unknown mortality

Colorado Lynx

Through trapping efforts to either replace malfunctioning or old radio collars on reintroduced lynx or collar Colorado-born lynx, we have captured 16 Colorado-born lynx as adults and fitted them with dual VHF-satellite transmitter collars (Table 4). These animals were identified by the PIT-tags placed subcutaneously at the back of the neck when found as kittens in their dens. Of these 16 we are currently tracking 7; 7 are known dead and 2 are missing (signals not heard since May 25, 2008).

Table 4. Status of Colorado-born telemetry collared lynx as of May 25, 2009.

	Females	Males	TOTALS
Collared	9	7	16
Known Dead	5	2	7
Possible Alive	4	5	9
Missing	1	1	2
Tracking	3	4	7

In addition, 3 young adult (< 3 years old) lynx were captured that did not have either a telemetry collar or a PIT-tag. These animals could be from litters of reintroduced lynx that we did not find, they could be native Colorado lynx, or immigrants from naturally occurring northern population outside of Colorado. They include 2 females and 1 male, all currently being tracked.

Reproduction

Reproduction was first documented in 2003 when 6 dens and a total of 16 kittens were found in the lynx Core Release Area in southwestern Colorado. Reproduction was also documented in 2004, 2005 and 2006. No dens were found in 2007 or 2008 (Table 5). We are just beginning our search for dens for 2009. Two of the Colorado-born females that we are tracking in the 2009 reproduction season were paired during breeding season with Colorado-born and telemetered-collared males. A third Colorado-born radio-telemetered male is paired with one of the radio-telemetered females captured in Colorado but of unknown origin.

Field crews weighed, photographed, PIT-tagged the kittens and checked body condition. Beginning in 2005, we also collected blood samples from the kittens for genetic work in an attempt to confirm paternity. Kittens were processed as quickly as possible (11-32 minutes) to minimize the time the kittens were without their mother. While working with the kittens the females remained nearby, often making themselves visible to the field crews. The females generally continued a low growling vocalization the entire time personnel were at the den. In all cases, the female returned to the den site once field crews left the area. At all dens the females appeared in excellent condition, as did

the kittens. The kittens weighed from 270-500 grams. Lynx kittens weigh approximately 200 grams at birth and do not open their eyes until they are 10-17 days old.

Females tracked in any given year include reintroduced females, telemeter-collared Colorado-born females and the 2 telemeter-collared females of unknown origin (see above). The percent of tracked females during May and June found with litters in 2006 was lower (0.095) than in the 3 previous years (0.413, SE = 0.032, Table 5). However, all demographic and habitat characteristics measured at the 4 dens that were found in 2006 were comparable to all other dens found. Mean number of kittens per litter from 2003-2006 was 2.78 (SE = 0.05) and sex ratio of females to males was equal ($\bar{x} = 1.14$, SE = 0.14).

Table 5. Lynx reproduction summary statistics for 2003-2008.

Year	# Females Tracked	# Dens Found in May/June	% Tracked Females with Kittens	Additional Litters Found in Winter	Mean # Kittens/Litter (SE)	Total Kittens Found	Sex Ratio M/F (SE)
2003	17	6	0.353	0	2.67 (0.33)	16	1.0
2004	26	11	0.462	2	2.83 (0.24)	39	1.5
2005	40	17	0.425	1	2.88 (0.18)	50	0.8
2006	42	4	0.095	0	2.75 (0.47)	11	1.2
2007	34	0	0.0	0		0	
2008	28	0	0.0	0		0	
2009	22						
TOTAL						116	1.14 (0.14)

Den Sites.--A total of 37 dens were found from 2003-2006. All of the dens except one were scattered throughout the high elevation areas of Colorado, south of I-70. In 2004, 1 den was found in southeastern Wyoming, near the Colorado border. Dens were located on steep ($\bar{x}_{\text{slope}} = 30^\circ$, SE=2°), north-facing, high elevation ($\bar{x} = 3354$ m, SE = 31 m) slopes. The dens were typically in Engelmann spruce/subalpine fir forests in areas of extensive downfall of coarse woody debris. All dens were located within the winter use areas used by the females.

Distribution and Movement Patterns

The majority of surviving lynx from the entire reintroduction effort continue to use high elevation (> 2900 m), forested areas from New Mexico north to Independence Pass, west as far as Taylor Mesa and east to Monarch Pass. Most movements away from the Core Release Area were to the north.

Numerous travel corridors have been used repeatedly by more than one lynx. These travel corridors include the Cochetopa Hills area for northerly movements, the Rio Grande Reservoir-Silverton-Lizardhead Pass for movements to the west, and southerly movements down the east side of Wolf Creek Pass to the southeast through the Conejos River Valley. Lynx appear to remain faithful to an area during winter months, and exhibit more extensive movements away from these areas in the summer. Such movement patterns have also been documented by native lynx in Wyoming and Montana.

Home Range

Reproductive females had the smallest 90% utilization distribution annual home ranges ($\bar{x} = 75.2$ km², SE = 15.9 km², n = 19), followed by attending males ($\bar{x} = 102.5$ km², SE = 39.7 km², n = 4). Non-reproductive females had the largest annual home ranges ($\bar{x} = 703.9$ km², SE = 29.8 km², n = 32) followed by non-reproductive males ($\bar{x} = 387.0$ km², SE = 73.5 km², n = 6). Combining all non-reproductive animals yielded a mean annual home range of 653.8 km² (SE = 145.4 km², n = 38).

HABITAT USE

Landscape-scale daytime habitat use was documented from 10,935 aerial locations of lynx collected from February

1999-August 27, 2008. Throughout the year Engelmann spruce / subalpine fir was the dominant cover used by lynx. A mix of Engelmann spruce, subalpine fir and aspen (*Populus tremuloides*) was the second most common cover type used throughout the year. Various riparian and riparian-mix areas were the third most common cover type where lynx were found during the daytime flights. Use of Engelmann spruce-subalpine fir forests and Engelmann spruce-subalpine fir-aspen forests was similar throughout the year. There was a trend in increased use of riparian areas beginning in July, peaking in November, and dropping off December through June.

Site-scale habitat data collected from snow-tracking efforts indicate Engelmann spruce and subalpine fir were also the most common forest stands used by lynx for all activities during winter in southwestern Colorado. Comparisons were made among sites used for long beds, dens, travel and where they made kills. Little difference in aspect, mean slope and mean elevation were detected for 3 of the 4 site types including long beds, travel and kills where lynx typically use gentler slopes ($\bar{x} = 15.7^\circ$) at an mean elevation of 3173 m, and varying aspects with a slight preference for north-facing slopes.

Mean percent total overstory was higher for long bed and kill sites than travel or den sites. Engelmann spruce provided a mean of 35.87% overstory for kills and long beds, with travel sites averaging 28% and den sites having the lowest mean percent overstory of 23% . Mean percent subalpine fir or aspen overstory did not vary across use sites. Willow overstory was highly variable and no dens were located in willow overstory.

A total of 1841 site-scale habitat plots were completed in winter from December 2002 through April 2005. The most common understory species at all 3 height categories above the snow (low = 0-0.5m, medium = 0.51 - 1.0 m, high = 1.1 - 1.5 m) was Engelmann spruce, subalpine fir, willow (*Salix* spp.) and aspen. Various other species such as Ponderosa pine (*Pinus ponderosa*), lodgepole pine (*Pinus contorta*), cottonwood (*Populus sargentii*), birch (*Betula* spp.) and others were also found in less than 5% of the habitat plots. If present, willow provided the greatest percent cover within a plot followed by Engelmann spruce, subalpine fir, aspen and coarse woody debris for long beds, kills and travel sites. Areas documented in willow used by lynx are typically on the edge of willow thickets as tracks are quickly lost within the thicket. Den sites had significantly higher percent understory cover for all three height categories. Understory at den sites was primarily made up of coarse woody debris.

The most common tree species documented in the site-scale habitat plots was Engelmann spruce. Subalpine fir and aspen were also present in >35% of the plots. Most habitat plots were vegetated with trees of DBH < 6". As DBH increased, percent occurrence decreased within the plot. Although decreasing in abundance as size increased, most lynx use sites had trees in each of the DBH categories, indicating mature forest stands except for dens. Den sites had a broad spectrum of Engelmann spruce tree sizes, including > 18" but no large subalpine fir or aspen trees. While Engelmann spruce and subalpine fir occurred in similar densities for kills, long beds and travel sites, den sites had twice the density of subalpine firs found at all other sites.

DIET AND HUNTING BEHAVIOR

Winter diet of lynx was documented through detection of kills found through snow-tracking. Prey species from failed and successful hunting attempts were identified by either tracks or remains. Scat analysis also provided information on foods consumed. A total of 604 kills were located from February 1999-April 2009. We collected over 1000 scat samples from February 1999-April 2009 that will be analyzed for content. In each winter from 1999-2007-08 the most common prey item was snowshoe hare, followed by red squirrel. During these years, the percent of snowshoe hare kills found however, varied annually from a low of 55.56% in 1999 to a high of 90.77% in winter 2002-2003. During the 2008-09 winter, the percent of red squirrel kills found (66%, $n = 56$ kills) exceeded the percent snowshoe hare kills found (30%).

A comparison of percent overstory for successful and unsuccessful snowshoe hare chases indicated lynx were more successful at sites with slightly higher percent overstory, if the overstory species were Englemann spruce, subalpine fir or willow. Lynx were slightly less successful in areas of greater aspen overstory. This trend was repeated for percent understory at all 3 height categories except that higher aspen understory improved hunting success. Higher density of Engelmann spruce and subalpine fir increased hunting success while increased aspen density decreased hunting success.

LYNX IDENTIFICATION NUMBERS

The nomenclature for the lynx are 2 letters to note area of origin (YK = Yukon, AK = Alaska, BC = British Columbia, QU = Quebec and MT = Manitoba), 2 numbers to demarcate year released (99 = 1999, 00 = 2000 etc.), 1 letter for sex (M, F) and then animal number for each year and location. So, for example, lynx YK00F02 was the second female lynx captured in the Yukon and released in Colorado in spring 2000. Lynx known to be born in Colorado are denoted by the first 2 letters 'CO' the next 2 numbers denote the year of their birth '05', then sex, then the order of each individual by sex as found that year (e.g., CO05F01). Lynx first captured as adults in Colorado with no PIT-tags or telemeter-collars are denoted by the first 2 letters 'CO' the next 2 numbers denote the year of their first capture '07', then an 'A' for adult, then either 'F' or 'M' for sex, then the order of each individual by sex as found that year (e.g., CO07AF01).

WEB SITE

These updates and other lynx reports are being posted on the CDOW web site
<http://wildlife.state.co.us/WildlifeSpecies/SpeciesOfConcern/Mammals/Lynx/LynxOverview.htm>.

SIGHTINGS

Thanks again to all of you who have called or e-mailed in sightings - these really help us when we fly for lynx. We now have a standardized sighting form that can be used to report sightings. The form is found on our website. Please know that even if we do not contact you, we follow-up on all these sightings, usually with flights in the area of the sighting as soon as possible. Please contact me if you have specific questions or concerns. My office phone number is 970 472-4310 and my e-mail address is tanya.shenk@state.co.us.