



# Crater Lake National Park High Elevation Red Fox Inventory

*Annual Accomplishment Report 2013*



**ON THE COVER**

High-elevation red fox near Munson Valley Road in Crater Lake National Park  
Photograph by: Elena Thomas, 2009

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# **Crater Lake National Park Red Fox Inventory**

## *Project Annual Accomplishment Report 2013*

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## Abstract

Red fox (*Vulpes vulpes*) are found throughout the Pacific Northwest but not all subspecies occurring within the region are native to North America. The Sierra Nevada red fox (*Vulpes vulpes necator*), a native red fox subspecies, was listed by the state of California as “Threatened” in 1980, and is now being considered for federal listing as threatened or endangered. As of 2012, there were only two confirmed populations of Sierra Nevada red fox, both in California. However, genetic testing completed as part of this project has confirmed that a population exists in Crater Lake National Park. The objectives of the 2013 field effort were to 1) assess presence of red fox in areas adjacent to the caldera rim and 2) collect genetic samples to confirm the presence of the Sierra Nevada red fox subspecies in the park. Remote camera surveys were conducted using a grid of points spaced 1.6 km apart, based on the Public Land Survey System. Survey points were located above 6,000 ft. to optimize sampling of preferred habitat. Of the 32 camera sets deployed, one red fox was detected. Though fox detections were low, it is important to remember surveys were focused on areas away from the caldera rim which is where we already know red fox occur. Efforts to use hair snares to collect genetic samples was discontinued early on because of the opportunistic collection of three genetic samples that were used to confirm the presence of this subspecies in the park.

## Introduction

Red fox (*Vulpes vulpes*) are found throughout the Pacific Northwest and have become a species of interest to wildlife managers due to possible population declines in recent years. All red fox species in North America are taxonomically grouped into the same species but several subspecies, both native and nonnative, have been identified (see Immel 2013 for a full review of relevant literature and discussion of local taxonomy). Because the Columbia River is thought to block southern dispersal of the Cascade subspecies (*V. v. cascadenis*; Aubry 1983), found primarily in Washington State, the foxes inhabiting Crater Lake National Park are now thought to be the Sierra Nevada subspecies (*V. v. necator*).

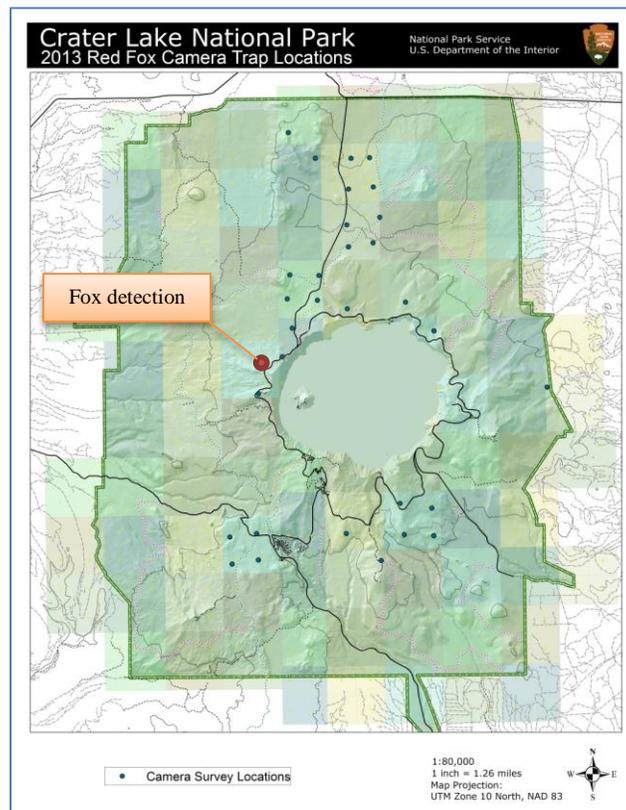
The Sierra Nevada red fox (SNRF), a native subspecies, was listed by the state of California as threatened in 1980, and is now being considered for federal listing as threatened or endangered. Prior to 2013, the only confirmed populations of Sierra Nevada red fox were located in Lassen Volcanic National Park and the Sonora Pass area near Kings Canyon National Park (Perrine et al. 2010, Statham et al. 2012). A 2009 analysis of a fox specimen collected at Crater Lake National Park in 1939 established the historic occurrence of Sierra Nevada red fox in the park. As part of this project, in 2012 a hair sample was collected that produced DNA which had the cytochrome b haplotype 'A' which is the most common one in the historical SNRF population. This suggested the SNRF was currently present in the park but without microsatellite data it could not be confirmed.

Remote camera and hair snare surveys were conducted in 2012 to document the existence of red fox in the park and to try and confirm the presence of the SNRF subspecies. Based on this effort, it was determined that a population of red fox likely occurred along the caldera rim during the summer months. Based on this knowledge, the objectives of the 2013 field effort were to 1) assess presence of red fox in non-rim areas above 1820 meters and 2) confirm through DNA analysis the presence of the SNRF subspecies in the park.

## Methods

Initially, we planned on using a combination of hair snares and remote cameras to document red fox and to try and capture hair samples for genetic analysis. Early on in the survey effort two incidental fresh red fox scat samples and 1 fresh red fox carcass (motor vehicle accident) were obtained and sent in for genetic testing. Since we were able to obtain these samples for genetic testing, we stopped trying to collect hair samples and instead focused on using remote cameras to determine distribution of red fox in high elevation areas of Crater Lake National Park.

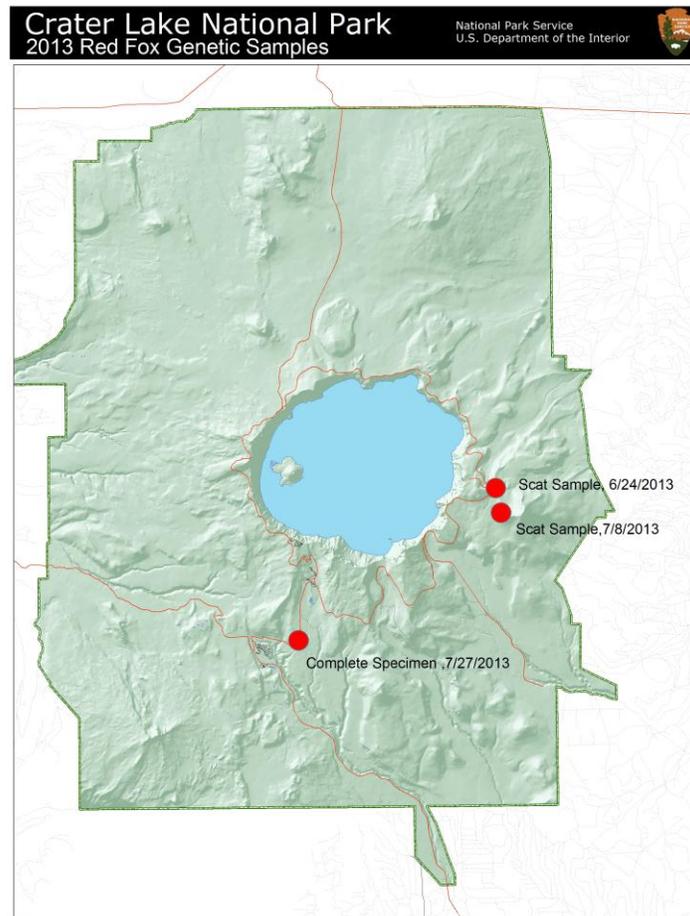
Camera trap surveys were conducted from July to September in locations above 1820 m and spaced 1.6 km apart based on the Public Land Survey System to ensure independence of detections (Figure 1). Cameras were deployed in pairs at each survey site for no less than 14 days and up to 21 days with one camera recording still photos and the other recording videos to maximize potential detections and minimize missed visits due to odd approach angles or other environmental factors. At a given survey site, each camera was strapped to a separate tree in a north facing direction and both were aimed toward a single vial of Gusto scent lure that was stapled to a tree 5-12 m away from the camera locations. While not strictly followed, the sampling designed we implemented closely followed the methods recommended by Zielinski et al. 1995 for sampling marten, fisher, lynx, and wolverine (Zielinski and Kucera 1995).



**Figure 1.** Remote camera survey locations for red fox in Crater Lake National Park, 2013.

## Results

Three red fox genetic samples were obtained and genetic analysis completed by Ben Sacks, University of California, Davis confirmed that all three were Sierra Nevada red fox. One scat sample was collected by Elena Thomas, seasonal botanist near Mt. Scott. One scat sample was collected by the wildlife field crew based on an observation by seasonal law enforcement officer Paul Schauer near Cloud Cap. Finally, a muscle tissue sample from 1 individual that was killed in a vehicular accident on Munson Valley road near Godfrey Glen was collected. Figure 2 shows the locations where the samples were collected.



**Figure 2.** Location of red fox genetic samples used to confirm the presence of Sierra Nevada red fox at Crater Lake National Park.

Of the 32 camera sets deployed, one red fox was detected. A variety of non-target species were documented including badger, birds, black bears, coyotes, squirrels, elk, mule deer, pine marten, and porcupine. In total, we captured 493 photographs which represented 132 unique events and an estimated 170 individuals. For video, we captured 421 ten second video segments which represented 113 unique events and an estimated 145 individuals. Table 1 provides a breakdown of the estimated number of species that were observed from the photographs and video.

**Table 1.** Total number of individuals observed and number of sites occupied by species for camera surveys at Crater Lake National Park, 2013.

Species	# Individuals Photograph	# Individuals Video	# Sites Species Observed (% of sites)
Mule Deer	105	92	23 (72%)
Elk	32	26	9 (28%)
Black Bear	16	10	9 (28%)
Coyote	7	10	8 (25%)
Pine Marten	7	3	8 (25%)
Bird spp.	1	1	2 (6%)
Badger	0	1	1 (3%)
Porcupine	1	0	1 (3%)
Red Fox	0	1	1 (3%)
Douglas Squirrel	1	1	1 (3%)
Total	170	145	

## Discussion

Genetic test from the 3 samples collected in 2013 confirmed that at least some of the high elevation red fox species at Crater Lake National Park are the Sierra Nevada red fox subspecies (Figure 2). In response to the petition submitted by the Center for Biological Diversity for listing this subspecies as threatened or endangered the USFWS determined this subspecies is worth reviewing for listing and will make a final decision in 2015 (personal communication, Tia Adams, USFWS, 2013). With the knowledge that there are now only three known populations of this subspecies in the world, we believe there is a high likelihood that this species will be listed at the very least as a “Candidate” species. Taking a proactive approach to understanding the distribution and ecology of this subspecies at Crater Lake National Park prior to listing will be beneficial to the park staff and our ability to make informed management decisions now and in the future.

The purpose of the 2013 sampling effort was to try and determine presence of red fox in areas above 1829 meters (6000 feet) that were not close to the caldera rim. The 2012 sampling effort was focused along the caldera rim and concluded that red fox occur in this area which is why we chose to avoid this area in 2013. Only one red fox was documented during the 2013 effort and this site was one of the sites closest to the rim (Figure 1). While we did not observe high elevation red fox using areas adjacent to the caldera rim, it is important to remember that these species are secretive and the population located in CRLA is probably small making it difficult to document. Even though we only documented one red fox during this survey effort we do not recommend immediately jumping to the conclusion that high elevation red fox only occur along the caldera rim during the summer months. It is recommended that additional surveys be completed in areas adjacent to the rim using the same sampling frame used in 2012 and 2013 and using the sampling protocol developed in 2013.

Beyond documenting the distribution of high elevation red fox during the summer months there are many other data gaps that occur when trying to understand the ecology of Sierra Nevada red fox at CRLA. While this project has shown red fox occur along the caldera during the summer, it is unclear if these species migrate to lower elevations during the winter months. We do not have a clear picture as to what affect (positive or negative) visitor activities (e.g., snowmobile, dog friendly and heavily used trails, general areas with heavy visitor use) may have on this population. We do not have knowledge of some of the basic ecology (e.g., home range, population size, habitat use) of this species at Crater Lake National Park. A detailed studying using GPS collars and genetic sampling would go a long way in better understanding this subspecies at CRLA and additional funds will be sought to help support this type of project. Because the USFWS is currently considering listing this subspecies, the wildlife team will be wrapping up a five year pika occupancy project next year (thought to be a major food source for the red fox), the park staff are currently developing a new trails plan that includes new trails in red fox territories, and a high level of disturbance is expected along the caldera rim as the park repairs and reroutes the rim road over the next several years it is a good time to try and get more information on this rare species.

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