



Distribution, morphology, and habitat use of the red fox in the northern Yellowstone ecosystem
by Robert Todd Fuhrmann

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Fish and Wildlife Management
Montana State University
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Abstract:

The distribution, morphology, and habitat use of the red fox (*Vulpes vulpes*) was examined in the northern Yellowstone ecosystem during the winters of 1994-1995 and 1995-1996. National Park Service sighting records were examined to indicate the overall abundance of red foxes within Yellowstone National Park.

Morphological and genetic samples were collected on live-captured and dead foxes to identify the presence and distribution of potential red fox subspecies across an elevational gradient. In the examination of morphological measurements on 22 red foxes captured at elevations of 1350-3350 m, shorter tail length at higher elevations was the only significant parameter. Other parameters indicated trends of beneficial adaptations to climatically harsh environments at high elevations. At elevations above 2300 m, there was a significant higher frequency of observations of a light gray coat color. It appeared through genetic analysis that the population of foxes above 2100 m was genetically isolated from lower elevations. This occurred without a geographic barrier between subpopulations.

By snow tracking foxes using GPS and GIS technology, the habitat use compared to availability in a coyote-dominated canid assemblage was determined. Habitat characteristics were measured at 699 habitat points, 75 forage sites, and 9 bed sites along 77 km of fox tracks. Foxes were distributed across the study area and in a wide range of forest cover types and habitat components. In all categories, foxes selected (use significantly greater than availability) habitat that was <25 m from an ecotone. They preferred mesic meadows and spruce-fir habitats at low angle slopes with a wide range of aspects. Sagebrush communities were also frequently used. Foxes foraged in mesic meadows, sagebrush communities, and spruce-fir forests close to ecotones. Below 2100 m, foxes were more general in their use of habitat compared with availability and foraged in mesic meadows and sagebrush. Above 2100 m foxes preferred spruce-fir forests and mesic meadows were also used extensively. Foxes foraged in mesic meadows and spruce-fir and older lodgepole pine forests above 2100 m.

Conclusions indicated that red fox populations were contiguous across the study area and were classified as a forest carnivore. Foxes above 2100 m used different habitats, were genetically isolated, had a different color morph, and were to some degree different in body size.

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IN THE NORTHERN YELLOWSTONE ECOSYSTEM**

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**A thesis submitted in partial fulfillment
of the requirements for the degree**

of

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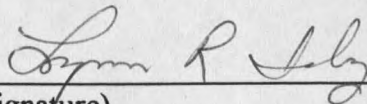
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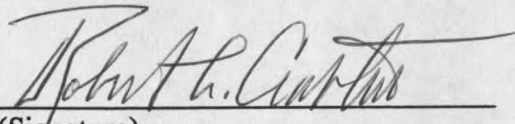
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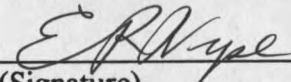
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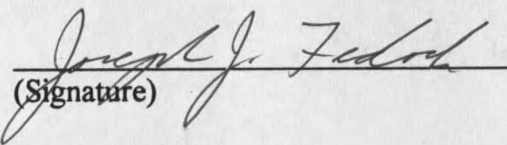
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To Jeanne Johnson who stood by my side through all of the ups and downs of this project (and not just the skiing). I couldn't have done it without you rafiki.

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ABSTRACT

The distribution, morphology, and habitat use of the red fox (*Vulpes vulpes*) was examined in the northern Yellowstone ecosystem during the winters of 1994-1995 and 1995-1996. National Park Service sighting records were examined to indicate the overall abundance of red foxes within Yellowstone National Park.

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CHAPTER 1

INTRODUCTION

Sighting records from Yellowstone National Park indicate that red foxes have an unusual variety of coat colors and have undergone several population fluctuations. From 1881 to 1900, sighting records indicated that foxes were observed relatively frequently (Varley and Brewster 1992). According to Yellowstone's second superintendent, P. W. Norris, foxes were "...numerous and of various colors, the red, grey, black and the cross varieties (most valuable of all) predominating in the order named" (Norris 1881). This level of detail is impressive as are the sightings themselves because today many long-time residents (e.g., M. Kolence, pers. comm.) of the area say they have never seen a fox in their travels in and around Yellowstone.

Shortly after the turn of the century, reports of red foxes became sporadic, and sightings were uncommon. Although these sightings were scarce and were from many different areas of the Park (Figure 1.1), accounts consistently reported lighter and gray colored foxes, especially at higher elevations. Fox sightings remained infrequent until the late 1980's. The increase that occurred around 1986 was most likely the result of increased interest rather than an actual increase in population. Two events, an official rare mammal sighting program begun in 1986 and an intensive coyote study initiated in 1989, marked the beginning of a period in which the number of red fox sightings steadily grew. Since then,

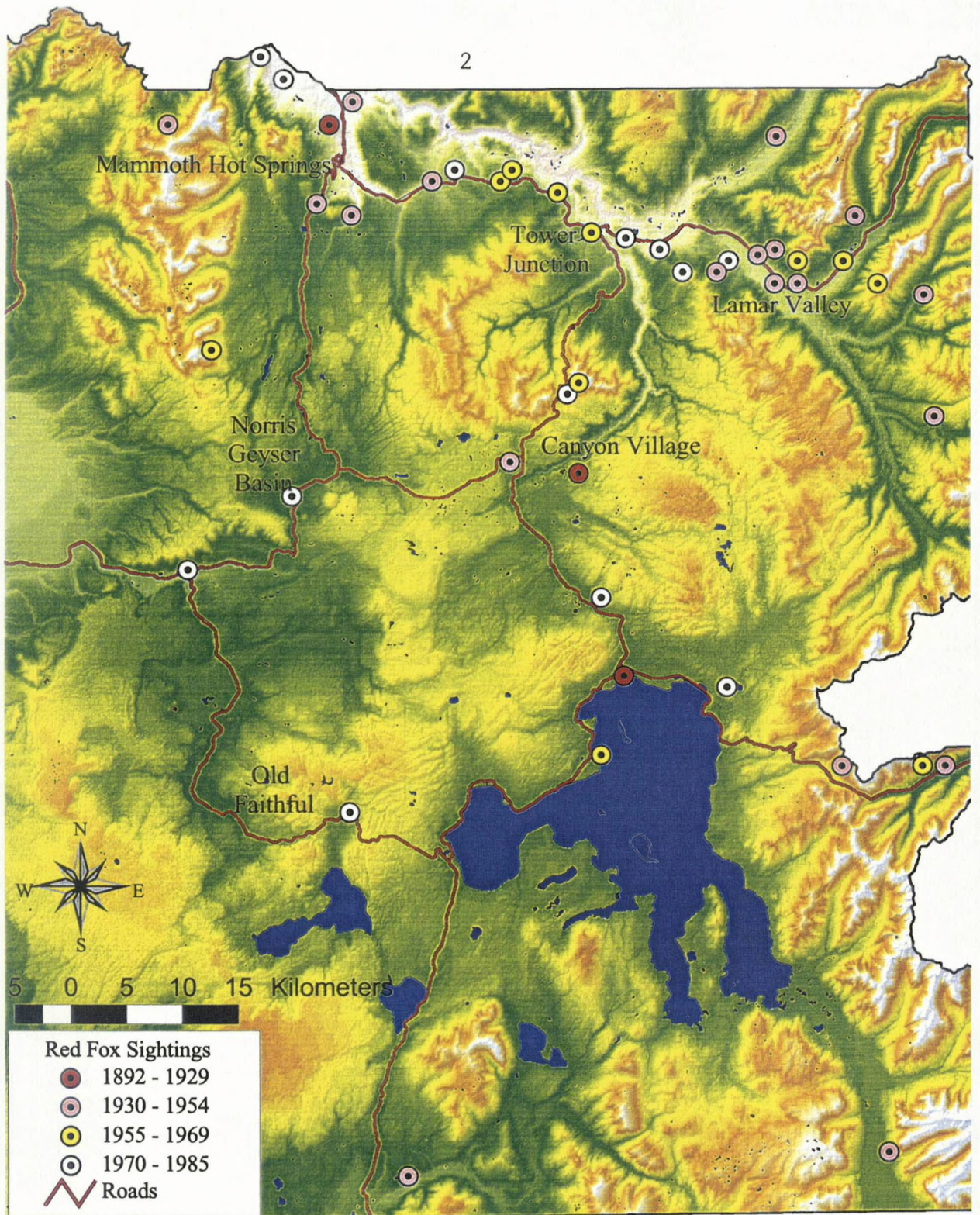


Figure 1.1. Red fox sightings in Yellowstone National Park from 1892-1985.

red foxes have been reported throughout the Greater Yellowstone Ecosystem in all months of the year in areas ranging from riparian communities at low elevations (1500 m) to alpine tundra at elevations exceeding 3000 m (Figure 1.2). During February and March 1993, I routinely observed at least 7 individual foxes in the Lamar Valley alone.

Due to the complete lack of knowledge regarding red fox in the northern Yellowstone ecosystem, I initiated this study to determine which subspecies of red foxes occur in this region and to describe their habitat use patterns. This thesis is divided into 2 chapters that reflect these objectives.

Biogeographic Background of Red Fox

During Lewis and Clark's expedition up the Missouri River heading to the west coast in 1804-1806, many species of plants and animals were catalogued. In the upper Missouri drainage, they reportedly identified a "great-tailed fox" which they presumed to be the Rocky Mountain red fox (*V. v. macroura*) (Cutright 1969). This sighting probably came from north central Montana near the Missouri River. In addition, Audubon notes that a fox similar to what Lewis and Clark described was collected from a trapper before 1850 on the Upper Missouri River (Audubon 1989). This fox was mostly gray and had a rather large tail. This fox was also presumably collected in central or eastern Montana.

Interestingly, Hoffman et al. (1969) indicates that prior to the 1950's, the only red fox that inhabited Montana (*V. v. macroura*) was in the higher elevation forests (e.g., Yellowstone National Park) yet absent from low elevation valleys in Montana. These foxes were restricted only to mountainous areas of extreme western and southwestern parts of the

