Coeur d'Alene Tribe

Natural Resource Department

Wildlife Program

Project Completion Report

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Detecting the Presence of Fishers and Lynx on the Ceded Territory of the Coeur d'Alene Tribe

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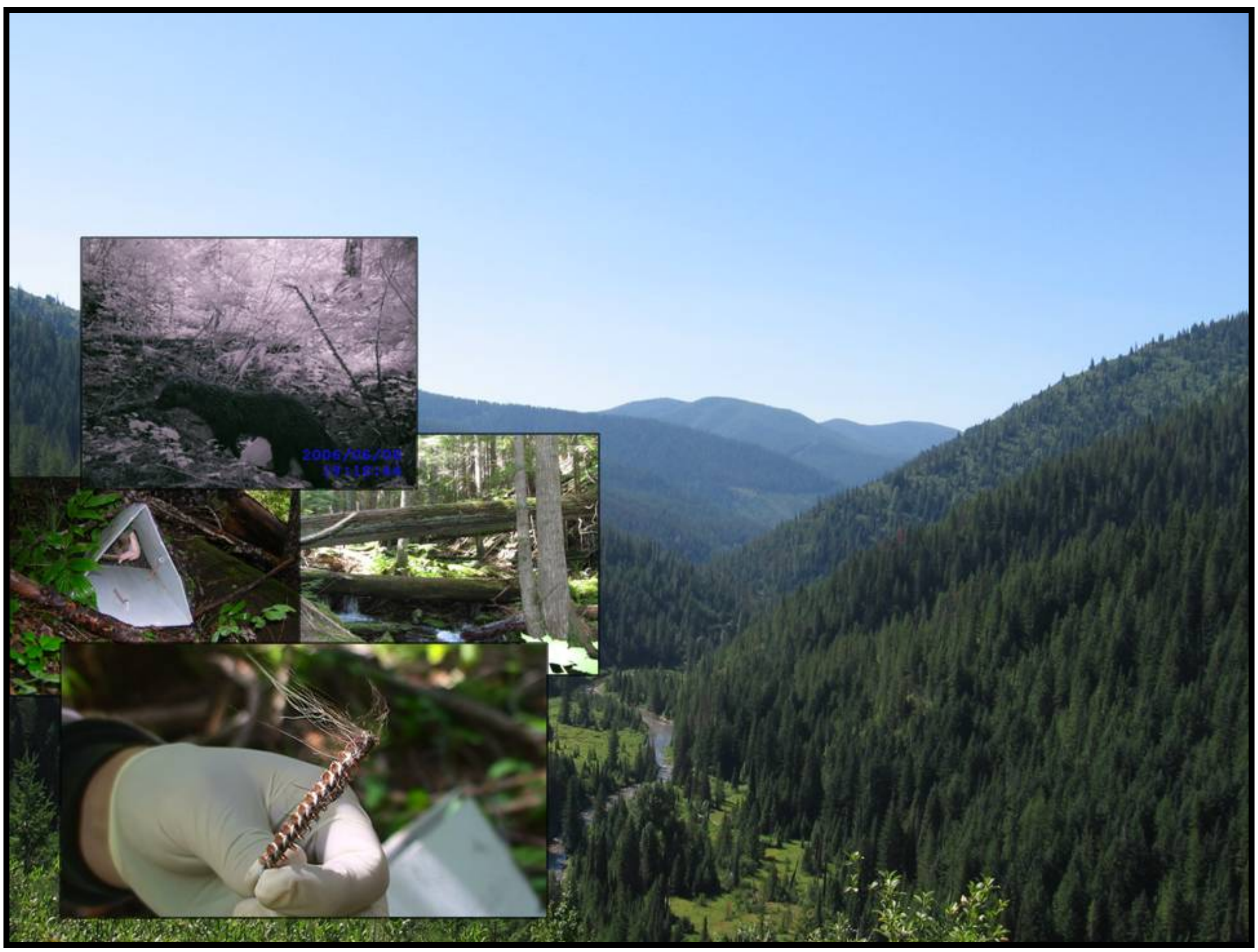

The **Wildlife Program** of the Coeur d'Alene Tribe's Natural Resources Department is responsible for protecting and preserving the wildlife resources throughout the aboriginal lands of the Coeur d'Alene Tribe. It is important that the wildlife resources that the Coeur d'Alene people are dependent upon for subsistence, religious, cultural, and recreational purposes are perpetuated for future generations. Protection and enhancement of wildlife habitats to support the needs of various wildlife species as well as Tribal members is the primary strategy employed by the Program. Other activities undertaken by the Program include species population inventory, monitoring and management, incident management, administration and enforcement of Tribal hunting programs (both on and off Reservation), publication and distribution of Tribal regulations, the monitoring of State hunting programs, and the promotion of wildlife interests in all land management activities on the Reservation.

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Abstract

Fisher (*Martes pennanti*) and lynx (*Lynx canadensis*) populations in the northern Rocky Mountains have declined substantially in the past century. Various small-scale survey efforts have been conducted in northern Idaho and western Montana in order to determine their presence and distribution, but no large-scale comprehensive surveys. We performed a DNA-based forest carnivore survey effort throughout a large portion of northern Idaho geared at locating fishers and lynx. We divided the study area into a grid and chose our snare locations based on habitat. We used hair-snare boxes with bait and commercial lure to attract carnivores to the site, where the animal's hair was caught on wire brushes. Slightly different methods were used in the 2 different study areas due to logistical factors, but all the fieldwork was conducted during the non-snow months. A total of 625 snares were deployed during the 2 years of the study, resulting in 52 fisher samples and 2 lynx samples. Fisher detections were scattered throughout the study area, but rarely occurred in the vicinity of marten (*Martes americana*) detections. The fisher detections came from a minimum of 10 different individual fishers, representing 4 different genetic haplotypes. While 2 lynx detections are significant in this area, it's difficult to know whether they represent breeding populations or transient individuals. Fishers are definitely present in the study area, and may represent a stronghold for the northern Rockies population. More study efforts, particularly random surveys, would be needed to address the lack of detections in certain areas, as well as to learn more about the population attributes and habitat selection of fishers in the region. A comparison of survey methods suggests that summertime carnivore surveys have some distinct advantages over winter surveys, based largely on logistics. In addition, a road-based approach may be more efficient when the presence of fishers or lynx is unknown for a given area, but a survey that ignores logistical considerations may be more thorough.

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Introduction

Project Context

The fisher (*Martes pennanti*) and lynx (*Lynx canadensis*) are medium sized carnivores that live in forested ecosystems, and are generally associated with remote wilderness. Due to their reliance on remote habitat with multi-layered forest stands, they are excellent indicators of the overall integrity of an ecosystem. In the past century, distributions of these species have declined due to a combination of land development, timber harvest, trapping, and increased road densities in forested areas (Koehler and Aubry 1994, Banci 1994, Buskirk and Ruggiero 1994). As a result, both of these species are considered to be sensitive in the northwest, and are considered "critically imperiled" in the state of Idaho. In addition, lynx are a federally listed threatened species (IDFG 2005).

It has been reported that fisher and lynx occur in scattered sub-populations, which are particularly subject to extirpation (Weaver 1993). Petitions to list these species as "endangered" in portions of their historical range have been denied, largely due to a lack of information regarding the current distribution of their populations. Fisher and lynx have relatively low reproductive rates, occur at relatively low densities throughout their historical range, and are significantly affected by the land-use practices of humans. What is not known is the current distribution of these species or many of their population attributes. This project represents the first step in this process, namely, beginning to identify the current distribution of these forest carnivores in a portion of northern Idaho. Once this information is established, the possibility of conducting more intensive research to identify specific population attributes will be much more feasible.

Past and Current Studies in the Area

The Aboriginal Territory of the Coeur d'Alene Tribe (CDAT) encompasses a large area that contains suitable habitat for fisher and lynx. This is evident in the GAP analysis of Idaho, performed by the United States Geological Survey (USGS), which shows the predicted distribution of fisher and lynx based on suitable habitat as including most of northern Idaho (Scott et al. 2002). Land ownership is a mixture of federal, state, tribal, industrial, and non-industrial forest, which is managed in a variety of ways.

Scattered surveys to determine the presence or absence of fisher and lynx have been and are currently being conducted by various agencies and organizations in the panhandle of Idaho and western Montana. However, at the time that this project was initiated, very little was being studied in the majority of the Idaho portion of the CDAT's Aboriginal Territory, also known as the Ceded Territory. In addition, various methods had been used in these studies. Traditionally, many forest carnivore surveys were conducted in the winter when animals are easier to track, carnivores may be more susceptible to baiting (Carman 1975, Schlexer 2008), and bears are not around to interfere (Schlexer 2008). The primary limiting factor in these studies lies in the difficulty in reaching fisher and lynx habitat in the winter months. Much of this habitat lies in areas that have few, if any, roads, and the roads that do exist may be too dangerous to travel due to the deep snow conditions. This results in research projects that are relatively small in scale, and that are closely linked to accessible forest roads, thereby much of the potential quality forest carnivore habitat is not being surveyed.

A variety of methods have been used in these studies, making it difficult to combine results in a scientifically significant way. There is a substantial amount of scientific literature on the different methods for detecting the presence of forest carnivores, much of which is summarized in Zielinski and Kucera (1995). The traditional methods included photographic bait stations, track plates, and snow tracking. These methods were all based on gathering some evidence that the target animal had been there, whether that was a photograph, a track, or some scat or fur that was left behind. The main problem with these types of studies was that in the end, they were all subjective. Even the best trackers acknowledge they cannot always make correct species identifications from tracks (Halfpenny and Biesiot 1986, Liebenberg 1990, Heinemeyer et al. 2008), and the same can be said for identification from photographs, patches of fur, or pieces of scat. At the time, these survey methods, though limited, were the best that could be conducted with the resources that were available.

With the onset of modern molecular genetics, the potential for surveying for rare mammals changed significantly (Schwartz and Monfort 2008). Now instead of relying on subjective identification methods, mammal species could be identified by their DNA. This DNA can potentially be gathered by hair, tissue, or scat samples. New survey methods have now been developed that use devices designed for gathering these samples. It is this type of device that was used in this project.

Project Goal and Objectives

Since different methods were used to survey for fishers as opposed to lynx, and due to the fact that the scope of the results were vastly different, the remainder of this report will focus on fishers. Discussion of the lynx portion of this project is contained in

Appendix 1 at the end of this report. The overall goal of this portion of the project was to obtain a solid information base on the presence of fishers within the Ceded Territory of the CDAT. This would be accomplished by surveying the best potential fisher habitat in this area. To achieve this goal it was important to establish a systematic approach that could be replicated and combined with other surveys in the area. This type of effort could only be accomplished by engaging the major landowners and researchers in the area in order to develop a protocol, and then implementing it throughout the region. While the overall goal is basic, the information that has been gathered along the way may be useful to other organizations and agencies that manage fishers and their habitat.

Methods

Study Area

The traditional territory of the Coeur d' Alenes extended from Lake Pend Oreille in the north to the Bitterroot Range of Montana in the east to the Palouse and North Fork of the Clearwater Rivers in the south to Steptoe Butte and up to just east of Spokane Falls in the west. These areas are currently referred to as the Aboriginal Territory of the CDAT, and the Idaho portion of this territory is referred to as the Ceded Territory, which is the focus of this study (Figure1).

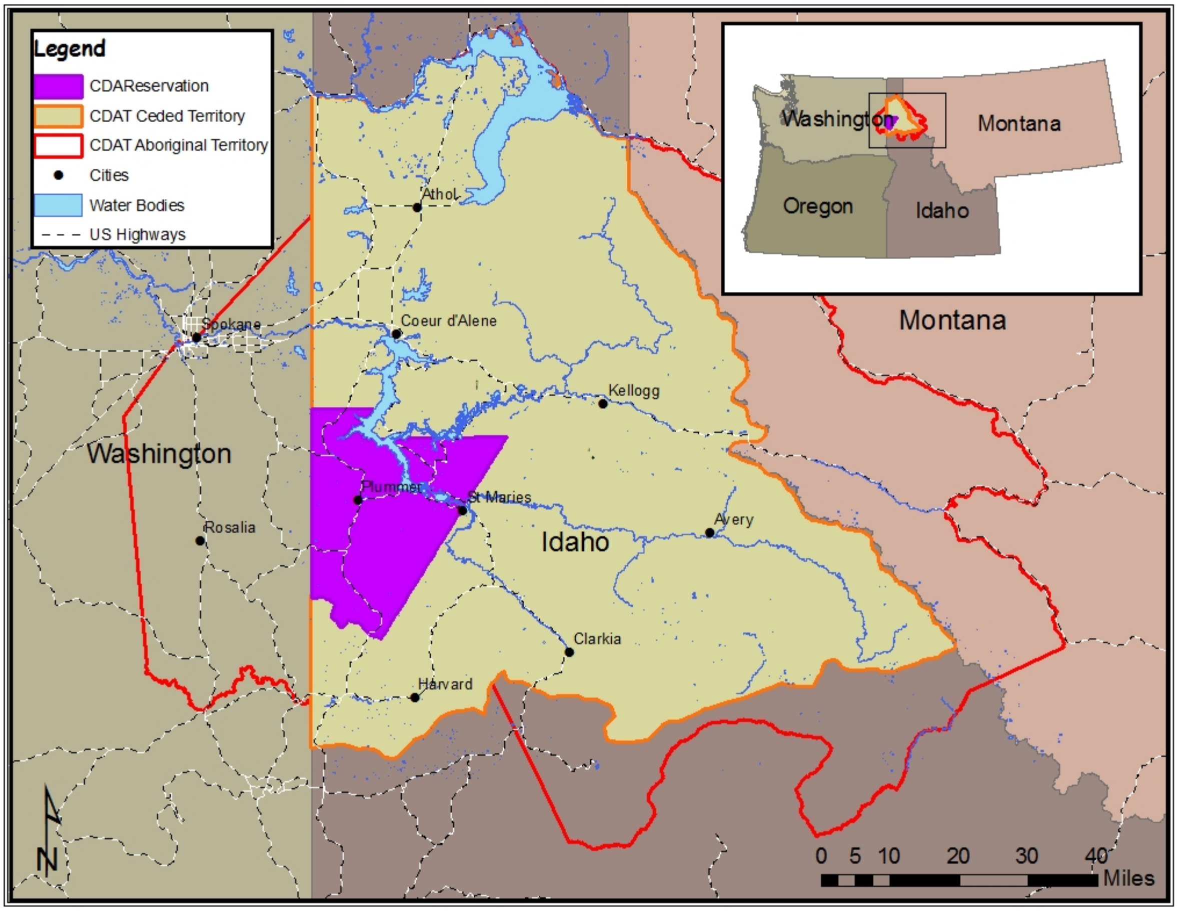

Figure 1. Traditional territory and current reservation of the CDAT.

The study area lies in the region between the Interior Basin of Washington and the Bitterroot divide, which makes up the border between Montana and Idaho. This region includes Lake Coeur d'Alene and Lake Pend Orielle, as well as the St.Joe and Coeur d'Alene River drainages. Elevations range from 2400 feet to over 7000 feet. The western portion of the area is primarily rolling hills with gentle slopes and deep rich soils. Much of this portion has been converted to cropland and pasture with interspersed blocks of timber. The eastern portion of the study area is generally mountainous with steep, timbered slopes.

The Ceded Territory is bisected by Interstate-90, which runs through the Idaho cities of Wallace, Kellogg, Coeur d'Alene, and Post Falls. The primary north-south corridor is US-95 which runs along the western portion of the territory. Interstate 90 divides the study area into 2 distinct portions. The portion north of I-90 is comprised of the Coeur d'Alene Mountains, and is drained primarily by the Coeur d'Alene River system. The area south of I-90 contains the St.Joe, Bitterroot, and Clearwater mountains, and is drained primarily by the St.Joe River. The exceptions are the extreme northern edge of the study area which is drained by the Clark Fork system, and the extreme south which is part of the Clearwater drainage.

Forests are composed of a variety of species. Species typically found on the north and east facing slopes include western hemlock (*Tsuga heterophylla)*, western red cedar *(Thuja plicata)* and western larch (*Larix occidentalis)*, as well as smaller amounts of western white-pine *(Pinus monticola)* and lodge pole pine (*Pinus contorta)*. On the south and west facing slopes, Douglas fir *(Pseudotsuga menziesii)*, grand fir *(Abies grandis)* and ponderosa pine *(Pinus ponderosa)* are typically present. The higher elevation forests are comprised primarily of sub-alpine fir (*Abies lasiocarpa)*, lodge pole pine and Engelmann spruce (*Picea engelmannii)*. The most common upland shrub species present include ocean-spray (*Holodiscus discolor),* snowbrush *(Ceanothus velutinus)*, huckleberry *(Vaccinium spp.)*, serviceberry *(Amelanchier alnifolia)*, chokecherry (*Prunus emarginata)*, ninebark (*Physocarpus capitatus)*, snowberry (*Symphoricarpos albus)* and wild rose (*Rosa spp.)* .Within riparian areas species composition ranges from black cottonwood (*Populus balsamifera)*, willow (*Salix spp.)*, aspen *(Populus tremuloides)* and alder (*Alnus rubra)* in the overstory, to red-osier dogwood (*Cornus sericea)*, willow and Douglas spirea *(Spiraea douglasii)* in the shrub layer.

Much of the habitat within and surrounding the study area has been altered from historical conditions. Impacts from agriculture are pervasive on the western side of the study area, which encompasses the eastern edge of the Palouse Prairie. These impacts include the conversion of Palouse Prairie and forests to agricultural land and the modification of streams to create more room for farming practices. Throughout the region there has also been a decline in the early seral forest species such as ponderosa pine, western white pine and western larch, and a shift to late seral species such as Douglas-fir, grand fir and western hemlock. Large diameter trees, snags and down woody material have also decreased and been replaced with younger, smaller stands of dense, mixed species. This has mixed results for wildlife, benefiting species that use younger stands, and causing a decline in species that favor old growth-type conditions, such as the fisher.

There are, however, pockets throughout the study area that still contain many of the components that constitute quality fisher habitat. Much of this habitat is located in the eastern and northern portions of the territory, which are primarily USFS land, namely the St. Joe and Coeur d'Alene Ranger Districts of the Idaho Panhandle National Forest. It is within these pockets of habitat that much of this research is focused.

This project was initially designed to survey the area south of Interstate 90, hereafter referred to as the St.Joe. This was due to the fact that the funding for the project was provided for a 2-year study, and the time estimated to complete the St.Joe was about 2 years. The fieldwork in the St.Joe, however, was completed with 2 months left in the field season. We determined that the best use of this time would be to extend the project north of I-90, hereafter called the Coeur d'Alene's. Due to the relatively short amount of time available to complete this portion, we used alternate methods in the Coeur d' Alenes. A portion of methods will therefore be differentiated between the St.Joe and the Coeur d'Alenes.

Survey Units

St.Joe - The first step in selecting the locations where the survey effort would be focused was to divide the project area into a grid. We selected Public Land Survey townships (6 mi X 6 mi), identified by township and range numbers, due to their familiarity among cooperating partners. This yielded a total of 102 townships (Figure 2). Aerial photographs were used to exclude townships that did not contain at least 2 contiguous sections (section = 1-mi^2) with potential fisher habitat. Townships containing primarily agricultural land, residential areas, clear cuts, and urban areas were eliminated. In addition, townships that had been surveyed extensively for forest carnivores in the past, or that were scheduled to be surveyed by one of the cooperating partners were eliminated. This coarse filter was used to bring the survey area down to 71 townships, or 2556-mi^2.

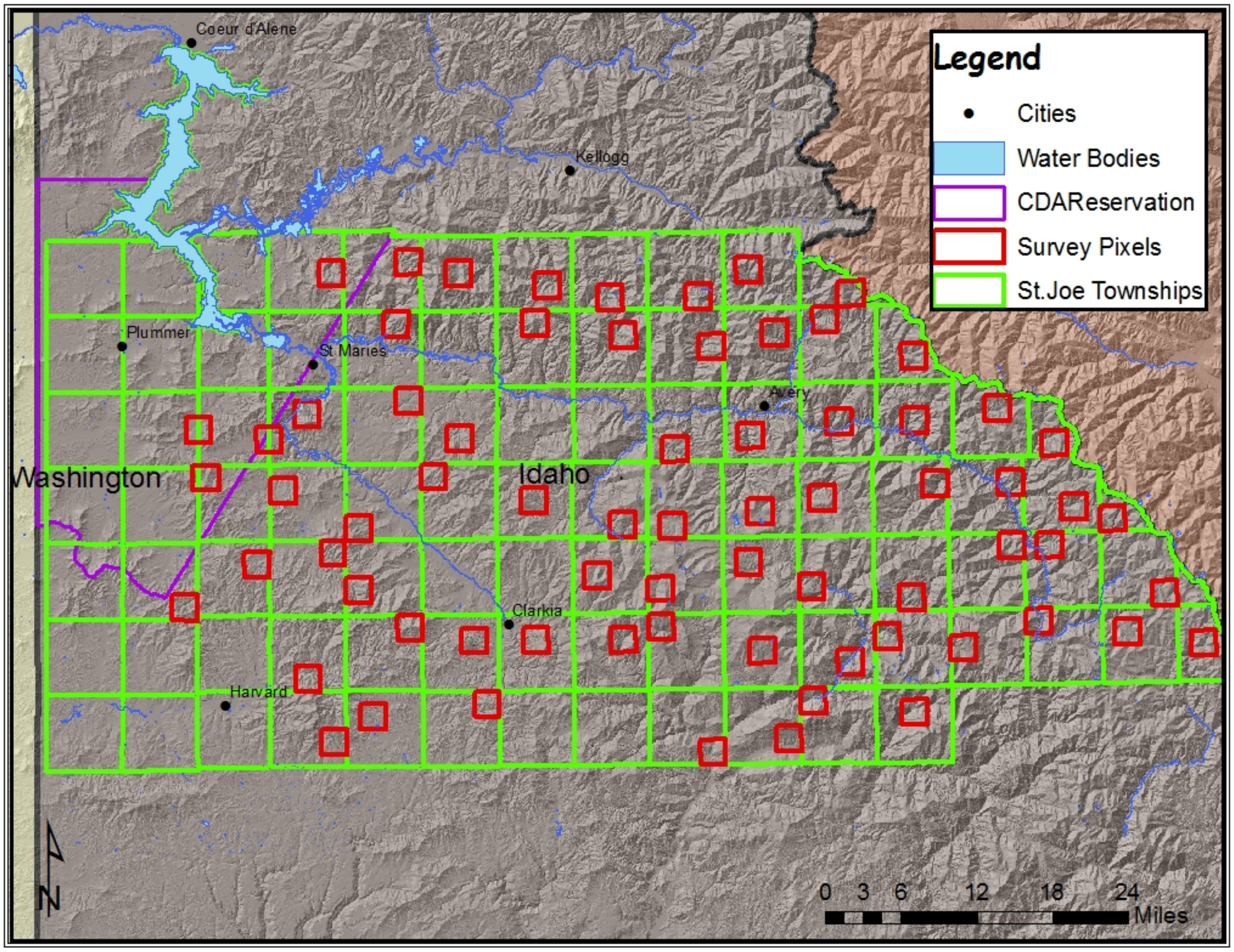

Figure 2. Survey grid of St.Joe study area with townships and pixels.

The next step involved analyzing the habitat within these 71 townships for potential fisher habitat. This was largely a geographical information system (GIS) exercise using Arc Map 9.2 (2006). The goal of this process was to select a sample unit, or pixel, within each township that had the highest probability of containing a fisher. We chose a pixel size of 4-mi^2, as outlined by Zielinski and Kucera (1995). The orientation of the pixel within each township was based largely on the research of Jones (1991), Powell and Zielinski (1994) and Jones and Garton (1994), since these focused on the habitat-use of fishers in the same geographical region. When available, we used forest stand data obtained from the applicable land management organization to select stands that consisted of trees averaging > 24" diameter at breast height (dbh), had a canopy cover of > 61%, contained perennial streams, and were in the western red cedar, western hemlock, or grand-fir vegetation classes. The pixel was then oriented over the 4-mi^2

area within each township that had the highest percentage of these habitat attributes. To avoid bias based on access, we did not use any transportation layers in the analysis of the habitat. The selection of each pixel was based solely on the best available habitat.

Coeur d'Alene's - The portion of the study area north of I-90 was divided in much the same way as the St.Joe. We first divided it into townships, yielding a total of 70. After the process of elimination as outlined, we were left with 25 townships (900-mi^2) to survey (Figure 3). Instead of using the habitat information to select a 4-mi^2 pixel within each township, the township itself was used as the survey unit. We delineated the best potential habitat in each township, and then used the forest road system to select the areas that could be easily accessed by pickup or all-terrain vehicle (ATV). This protocol was a modified version of the methods outlined in Schwartz et al. (2007) and Squires et al. (2004).

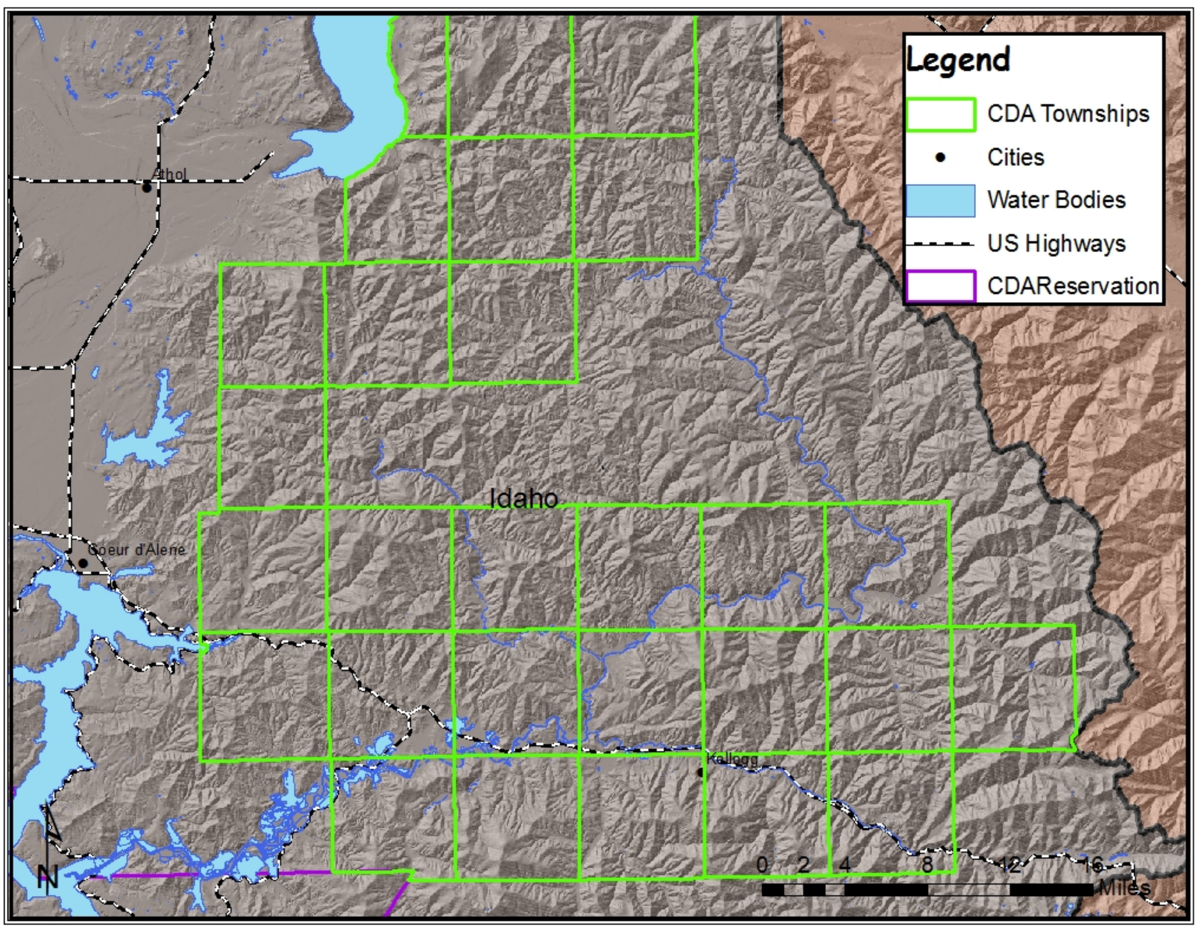

Figure 3. Survey townships of the Coeur d'Alene project area.

Snares

St.Joe - We used a triangular hair snare (Schwartz et al. 2007) made from corrugated plastic sheets (*Coroplast:* Laird Plastic, Spokane WA) (Figure 4). Each side of the box was 12” x 24”, and was held together at the top by plastic ties. The back of the snare was closed off with hardware fabric, and the front end left open. Inside the open end, we placed wire gun-cleaning brushes 6” in on each side, attached with terminal lugs and bolts. The brushes were pointed toward the inside of the snare, so that a fisher could not enter without brushing past at least one of them. A patch of carpet was wired to the hardware fabric on the inside of the snare. A commercial trapping lure, namely beaver castor, was soaked into the carpet patch. A chicken wing was then hung inside the snare behind the gun brushes.

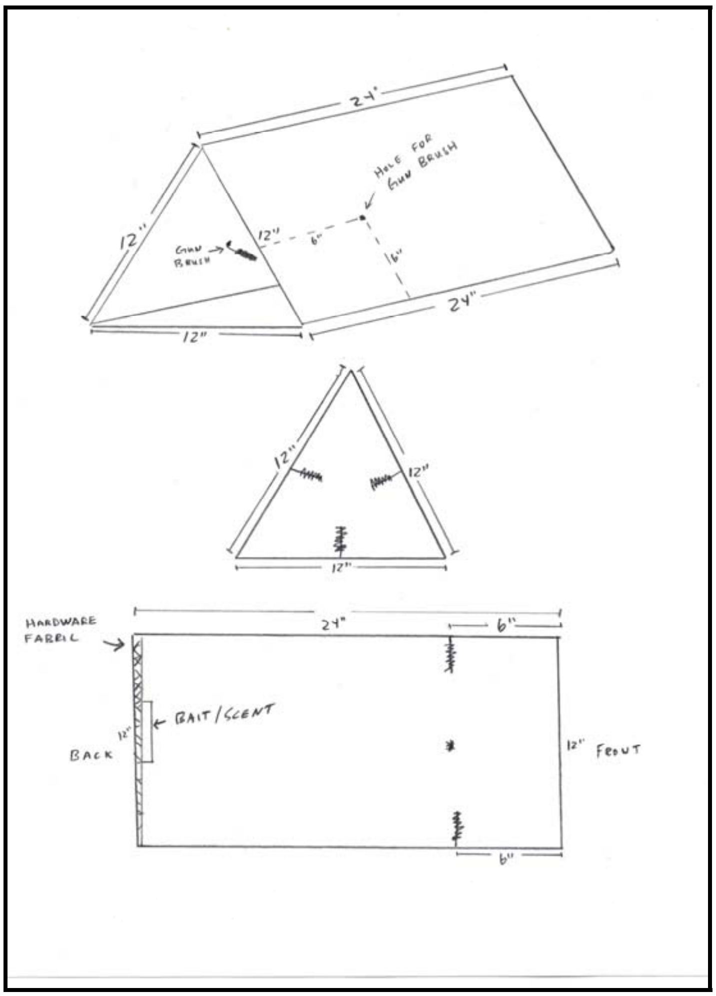

Figure 4. Schematic of hair snare device.

Based on Zielinski and Kucera (1995), 6 snares were place within each pixel. Snares were distributed throughout the pixel, spaced a minimum of .5 mi from each other. We oriented snares within 300' of perennial water whenever possible. Snares were generally set near pieces of large-woody debris, and partially covered with debris and vegetation from the site (Figure 5). We used a sponge soaked with skunk essence and hung from a nearby tree as a long-distance attractant. We used motion-sensing cameras at 1 snare site per pixel, in order to gather photographic evidence of what animals used the snare site. We gathered a variety of data at each snare site including date, site number, coordinates, overstory, aspect, and distance to water. In addition a photograph was taken of the snare as well as the surrounding habitat.

Figure 5. Photograph of a hair snare set.

Coeur d'Alene's – We used the same hair-snare devices in the Coeur d'Alenes as we used in the St.Joe, as well as the same baits and lures. The placement of the snares however was based on access in the Coeur d'Alenes (Squires et al. 2004, Schwartz et al. 2007). Technicians drove forest roads through the delineated fisher habitat and placed snares along streams whenever possible. Snares were generally placed within 300' of the road, and were spaced a minimum of .5 mi from each other. We still deployed a total of 6 snares per township, and the same data was collected at each site. However, no motion-sensing cameras were deployed in this region.

Sample Collection

St.Joe - Since the objective of this study was to efficiently survey a large area for the presence of fisher, we did not want to expend more effort into a specific pixel than was required to detect a fisher. Therefore, latency to first detection was analyzed in order to determine the optimum duration that a snare should be set. Past research on similar studies with forest carnivores estimates latency to first detection from < 5 days (Zielinski et al. 1997) to >11 days (Jones and Raphael 1991). Zielinski and Kucera (1995) suggest a duration of 12 days for track plates and camera traps. We chose a duration of 14 days based on these studies and discussions with regional trappers and biologists.

Upon arrival at the snare site after 14 days, we first took a photograph of the snare. If a snare had been moved or disturbed, it was noted, and we used our discretion to determine whether a bear had been the cause of the disturbance. Generally, if the snare was crushed and chewed significantly, it was labeled as a bear disturbance. We used latex gloves to avoid contaminating the samples. If there were hairs in the gun brushes, the entire brush was placed into a 50 mL polyethylene vial along with some silica desiccant. If there were hairs anywhere else in the snare, they were collected with a forceps that had first been cleaned with 95% ethanol. These hairs were then placed together in a similar vial. In addition, scat samples were collected whenever present. Any scat present at the site that was not obviously rodent or ungulate was collected. The maximum number of samples per trap was 5: 1 from each gun brush, 1 from the loose hairs and 1 from scat. All vials were then individually labeled and sent to the laboratory for analysis. When sufficient DNA was present in a sample, it was analyzed to determine if it came from a mustelid. All positive mustelid, felid and canid samples were then further analyzed to determine species. Samples from other mammals were not identified to the species classification and were classified as unknown. All fisher samples were then analyzed to determine individuals, including their sex and haplotype.

Coeur d'Alene's – We used the same sample collection methods in the Coeur d'Alene's as we used in the St.Joe.

Clustering

The original methods as outlined in the project proposal included a portion on using an adaptive clustering method to focus the efforts on the area where fisher were positively identified. This was based on the assumption that fisher detections would be relatively few, and that DNA results would be received in time to allow the clustering to take place in the timeframe of the project. Since neither of these assumptions were met, the clustering portion of this project was abandoned.

Results

Snares and Samples

St.Joe - Snares were deployed from April 6 through September 26 in 2006, and from March 15 through August 23 in 2007. A total of 479 snares were set for a total of 7041 trap nights and a mean of 14.69 (± 5.02) trap nights per snare (Table 1, Figure 6). Mean elevation for the snares was 3788 (± 870 ft), and the mean distance to perennial water was 110 (± 268 ft). Snares were deployed primarily on USFS land, with 342 (71.4%) being located within the St. Joe or Clearwater National Forests.

Table1. Hair snare result comparison for the St. Joe and Coeur d'Alene study areas.

Snare / Sample data	*St. Joe study area*	*Coeur d'Alene study area*
Total snares set	479	146
Trap nights	7041	2037
Total samples collected	496	119
Total samples analyzed	456	115
Total samples with DNA	369	86
Fisher samples	47	5
Marten samples	93	33

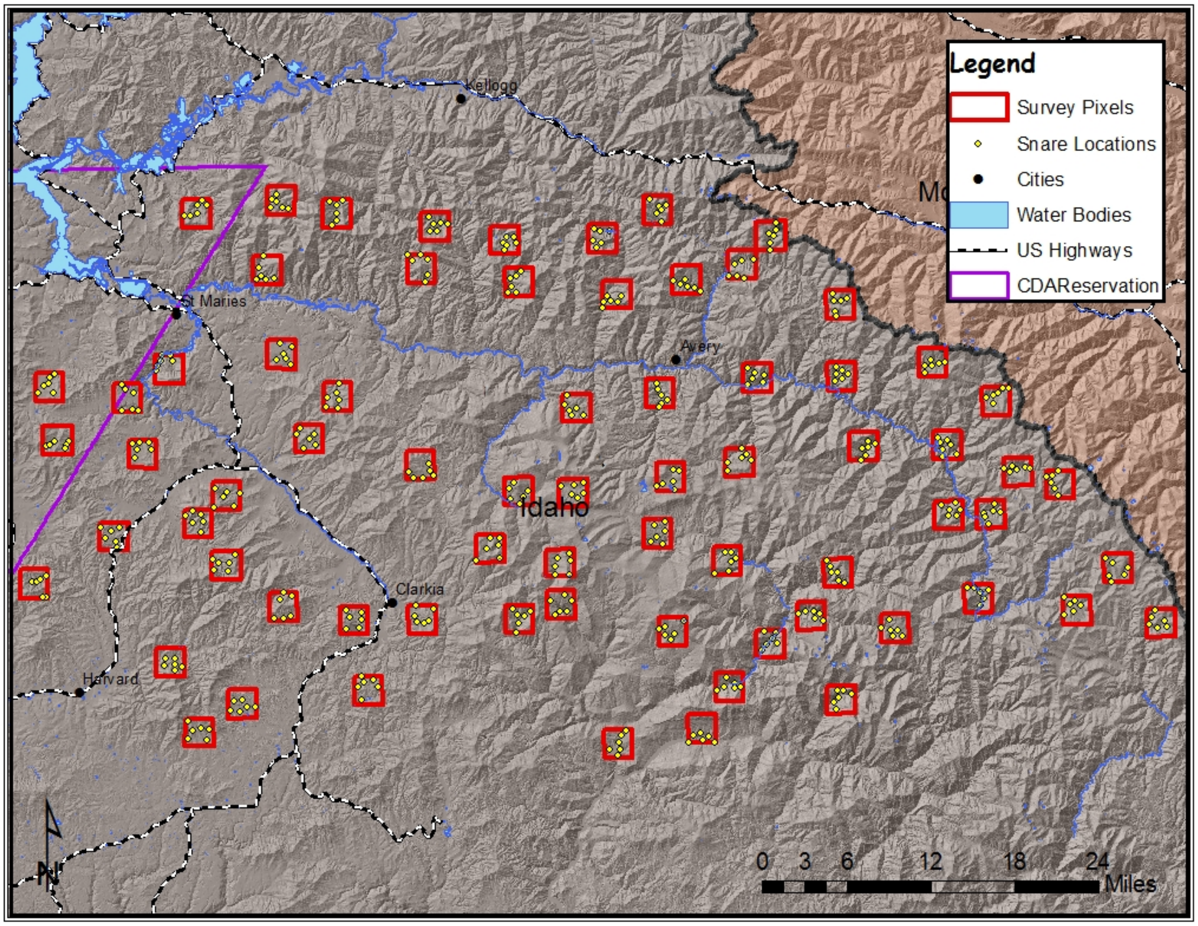

Figure 6. Snare locations in the St.Joe study area.

Hair or scat samples were collected at 221 (46.1%) of the snare sites, for a total of 496 samples that were sent in for analysis. Of these, 456 samples were analyzed for the target species, and 369 (80.9%) had adequate DNA for species identification (Table 1). A total of 47 samples (12.7%) were identified as fisher. The only other mustelid species identified was the American marten (*Martes ameriacana*), which accounted for 25.2% of the samples. The remainder of the samples were identified as cougar (*Felis concolor*), bobcat (*Lynx rufus*), lynx (*Lynx canadensis),* coyote (*Canis latrans),* wolf/dog (*Canis lupus/familiaris)* and red fox (*Vulpes vulpes),* along with various other unknown species-only mustelids, felids and canids were identified to species. We obtained photographs of the majority of these species from the motion-sensing cameras, as well as from other non-target species. Bears disturbed 94 (19.6%) of the snares that were deployed in the St.Joe. Bear disturbance generally started in May and rose slowly through the summer with a high in August, before dropping off substantially in September. In all, 22 snares successfully detected fisher (4.6%), while 60 snares detected marten (25.2%) (Figure 7). Marten detections were fairly widespread, while fisher detections were more concentrated in the northern half of the St. Joe region.

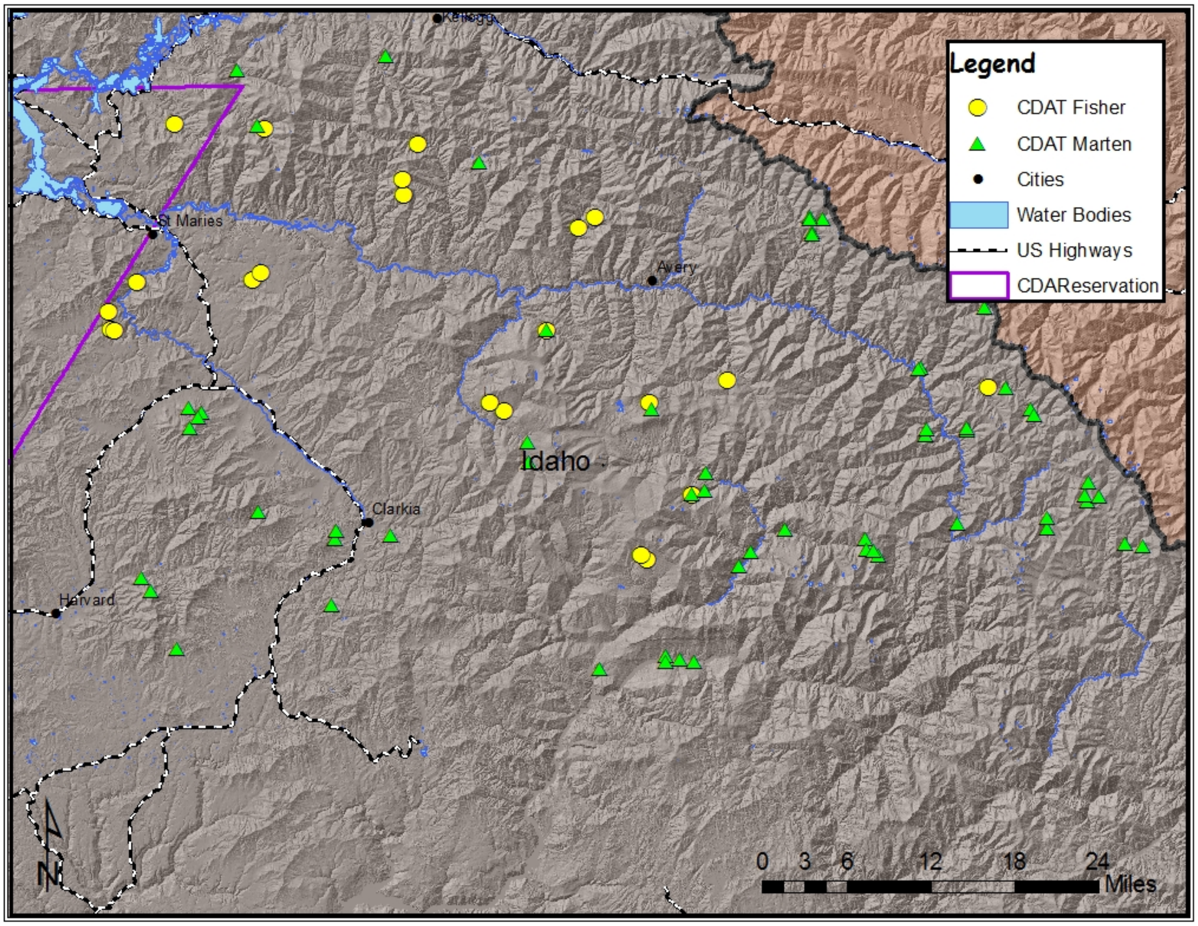

Figure 7. Fisher and marten detections in the St.Joe study area.

Of the 47 fisher samples from the St.Joe study area, we were able to detect a minimum of 7 separate individual fishers, 5 males and 2 females. The remainder of the samples did not contain high quality DNA, and therefore could not be used for individual or gender analysis. We were, however, able to determine the haplotypes of all 47 samples (Table 2).

Table 2. Individual DNA results for fisher samples.

Study area	*# Fisher Samples*	*# Individuals Detected*	*# Males*	*# Females*	*Haplotype 4*	*Haplotype 6*	*Haplotype 7*	*Haplotype 12*
St.Joe	47	7	5	2	19	8	13	7
CDA	5	3*	0	1	1	2	0	2
TOTAL	52	10	5	3	20	10	13	9

* Two individuals were detected through haplotype only and contained poor DNA for individual and gender analysis.

Coeur d'Alene's – The snaring season in the region north of I-90 ran from August 1 through October 9 of 2007. During this time a total of 146 snares were deployed for a total of 2037 trap nights and a mean of 13.95 (± 1.99) trap nights per snare (Table 1, Figure 8). Mean elevation for the snares was 3212 (± 572 ft), and the mean distance to perennial water was 180 (± 481 ft). Snares were deployed primarily on USFS land, with 120 (82.2%) being located within the Coeur d'Alene district of the Idaho Panhandle National Forest.

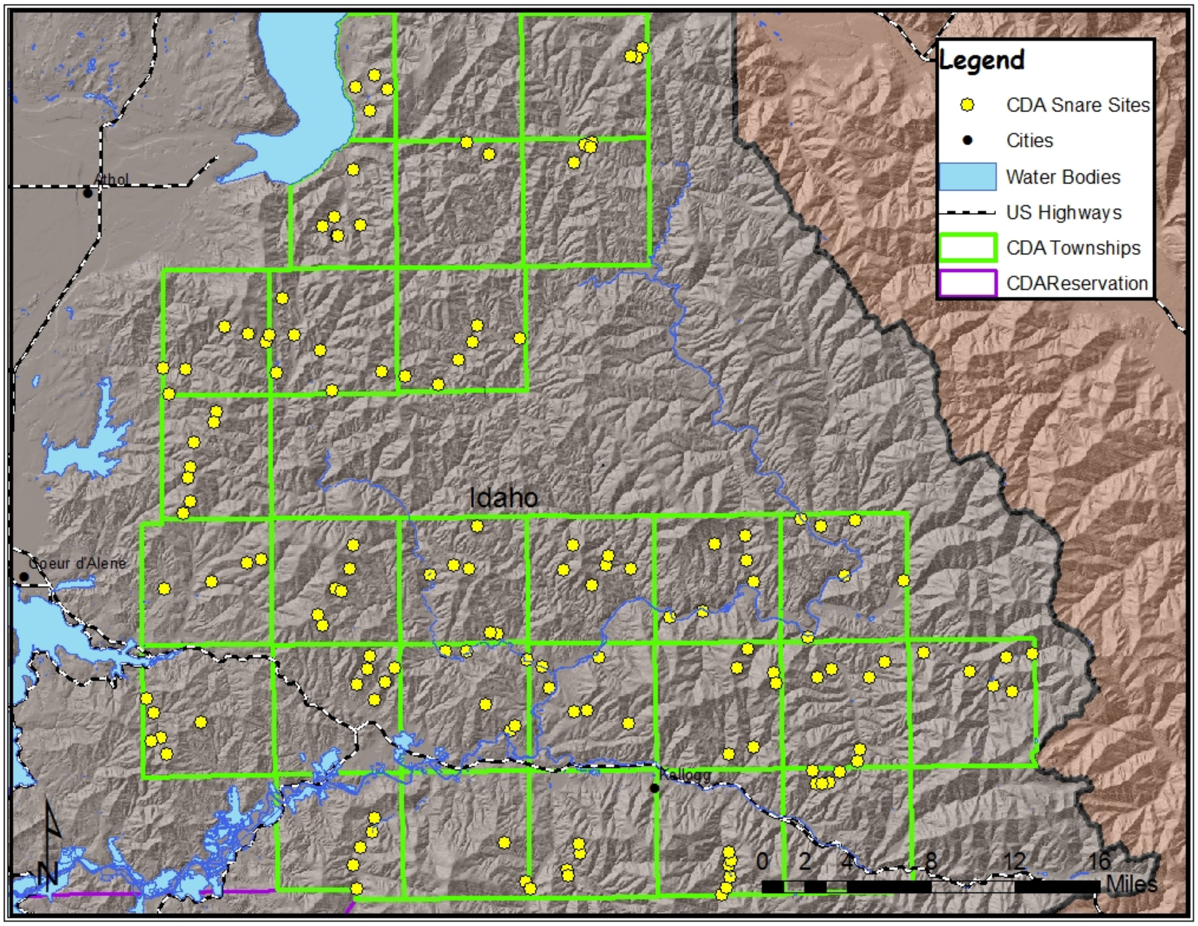

Figure 8. Snares locations in the Coeur d'Alene study area.

Samples were collected at 57 (39.0%) of the snare sites, for a total of 119 samples that were sent in for analysis. Of these, 115 samples were analyzed for the target species, and 86 (74.8%) had adequate DNA for species identification (Table 1). Fisher were identified in 5 (5.8%) of the samples, while marten were identified in 33 (38.4%) of the samples. The other species identified were the same as those identified on the St. Joe. Bears disturbed 20 (13.7%) of the snares that were deployed in the Coeur d'Alene's. A total of 5 snares successfully detected fisher (3.4%), while 16 snares detected marten (11.0%) (Figure 9). The majority of the fisher detections were located near the North Fork of the Coeur d'Alene River, while marten detections were widespread.

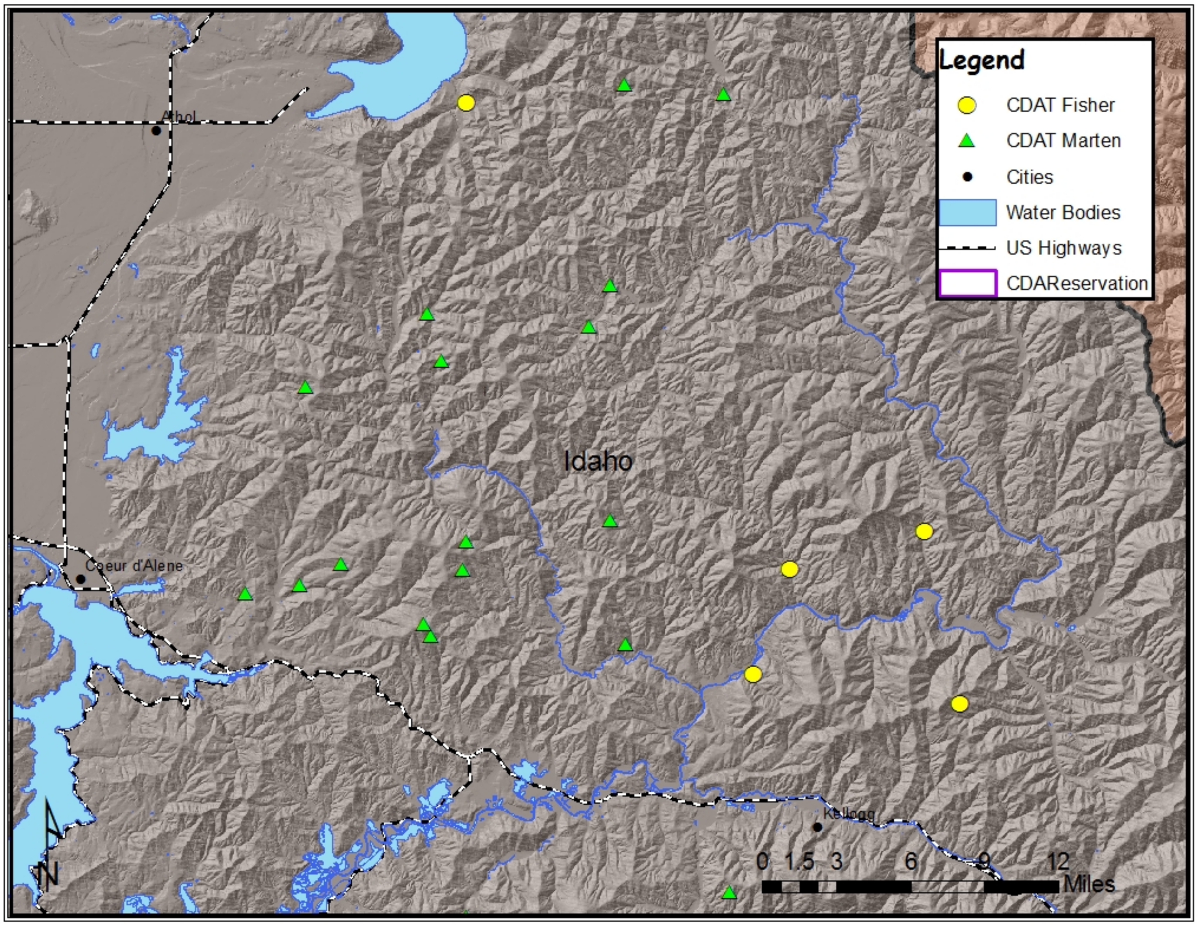

Figure 9. Fisher and marten detections in the Coeur d'Alene study area.

Of the 5 fisher samples that were collected in the Coeur d'Alene study area, only one of the samples contained enough quality DNA for individual and gender analysis. We were able, however, to determine the haplotype for all of the samples (Table 2). Since 3 different haplotypes were detected, we knew that at least 3 different fishers were present in the study area.

Snaring Efficiency

Since we used different methods in the St. Joe as opposed to the Coeur d'Alenes, we decided that it may be valuable to report the amount of time spent in each area, and the efficiency in which this time was spent. These results are summarized in Table 3. For this project, a crew consisted of 2 technicians, and for this reason these results were measured in “crew days”.

Table 3. Comparison of snaring efficiency for the St. Joe and Coeur d’Alene study areas

Snare / Sample data	*St. Joe study area*	*Coeur d'Alene study area*
Crew days [a]	255	23
% of total time	93.4	8.4
Snares / crew day [b]	1.9	6.3
% of total snares	76.6	23.4
Samples / crew day	1.9	5.2
% of total samples	80.7	19.3
Fisher detections / crew day [c]	0.09	0.22
Marten detections / crew day [d]	0.24	0.7

[a] A crew consisting of 2 technicians.

[b] The mean amount of snares that the crew could deploy and collect per day.

[c] A fisher detection defined as a snare that successfully detected a fisher.

[d] A marten detection defined as a snare that successfully detected a marten.

The methods used in the Coeur d’Alenes allowed for more efficient use of time than the methods used in the St.Joe. While only 8.4% of the total project time was spent in the Coeur d’Alenes, we were able to deploy 23.4% of the total snares there. We were also able to deploy more snares per day (mean = 10.70 $\pm$ 9.10) in the Coeur d’Alene’s than in the St. Joe (mean = 5.13 $\pm$ 3.80). The same can be said for collecting snares, where we retrieved a mean of 14.50 ($\pm$ 12.39) snares per day in the Coeur d’Alene’s, and a mean of 6.76 ($\pm$ 2.45) snares per day in the St.Joe.

We obtained .22 fisher detections per crew day in the Coeur d’Alenes, while obtaining only .09 fisher detections per crew day in the St.Joe. Similar ratios are evident in marten detections, with .70 detections per crew day in the Coeur d’Alenes and .24

detections per crew day in the St.Joe. Snare success, however, was similar in both areas with .003 fisher detections per trap night in the St.Joe, and .002 fisher detections per trap night in the Coeur d'Alene's.

Discussion

Analysis of the results of this project must be tempered with the awareness that this broad-scale survey was not a random sample, and therefore is inherently biased. We deliberately surveyed only habitat types where we thought we would find fishers, based on the best available knowledge of fisher habitat-use. We used this type of method because the distribution of fishers in the study area was unknown; therefore the most efficient use of the resources was to focus the effort in areas with the highest probability of finding fishers. As a result, we can obviously document the presence of fishers, but can derive little about their absence. The lack of detections in a given township could be a result of sampling the wrong habitat, trap avoidance, a mixture of environmental variables or a lack of fishers in the area.

The focus of the results, therefore, should be on the fisher detections themselves, as well as the methods we used to detect them. While all of the snare locations are biased by the type of habitat that we decided to survey, several variables were not included in this habitat analysis, and therefore may be useful to note. Some of these variables, (i.e. elevation, aspect, and slope) can be linked to habitat type, but were not considered when selecting snare sites. Other variables such as trapping period, road density, land ownership, and adjacent habitat are less tightly linked to habitat type, and may also be useful to consider. In addition, the use of different methods in the St. Joe as opposed to the Coeur d'Alenes, as well as the choice to conduct summer surveys in an area where winter surveys have been the norm could lend valuable information to regional resource managers.

Fisher Detections

The frequency and distribution of fisher detections throughout this project was unexpected. Trapping records obtained from the Idaho Department of Fish and Game (IDFG) showed that on average only 5.4% of the annual reported mustelid harvest comes from the study area (Kemner and Crea 2007, 2006, Kemner et al. 2005). This suggested that hair snaring for mustelids in this area would yield similarly meager results. In an attempt to maximize our potential for success, we used stand data, trapping records, and past detections to identify the areas in each township that had the best potential of having fishers. This analysis consistently showed that most of this habitat was located on USFS land, and was concentrated in the eastern half of the St. Joe. This portion of the project area is characterized by more contiguous stands of timber, more stands of large diameter trees with mixed age classes, and areas with limited access. The western half contains more urban areas, has a higher road density, and a mixed ownership which has resulted in a patchwork of habitat-types. What we found is that mustelid detections were not uncommon, with 17.1% of the snares and 37.9% of the analyzed samples coming from mustelids. While we expected to detect marten relatively frequently, the percentage of samples (12.7%) that came from fishers was unexpected. In addition, we found that only 36% of the fisher detections on the St.Joe were located on USFS land, and that 64% were located on a mixture of state, tribal, and industrial forest land. Similar results occurred in the Coeur d'Alene's, a district which has one of the higher road densities in the region, and in which fisher sightings and unintended harvests were virtually non-existent. In this area, 44% of the samples came from mustelids and 5.8% were from fisher. While the lack of detections in much of the better available habitat does not necessarily imply the lack of fishers, their presence in some of the assumed "marginal" areas is noteworthy.

While many of the general areas where we detected fishers were unexpected, the micro habitat of the actual snare sites where they were detected was generally what one would expect. The scientific literature has given us an understanding of what quality fisher habitat should look like (Powell et al. 2003, Buskirk and Powell 1994). Based on this, and as described in the methods, if a township had virtually no quality fisher habitat, it was not surveyed. All townships that were surveyed had at least pockets of relatively good potential habitat. What we found is that some of these remnant pockets contained fishers, regardless of adjacent land-use practices.

It is important to note, however, that these remnants of quality habitat in which fishers were detected were not isolated islands of habitat. Instead, they were all connected to some larger area of relatively good habitat. While most of these areas would not be considered "remote wilderness", they did contain many of the most important elements that make up good quality fisher habitat. An example of this is the Evans Creek drainage, which is located just 7 miles northeast of the town of St. Maries, Idaho. The drainage is characterized by a mixture of ownerships and uses. Much of the timber has been, or is currently, being harvested. Many homes, farms, and ranches occur throughout the drainage. Some good fisher habitat remains, primarily along the upper Evans Creek stream corridor and a few of its smaller tributaries, totaling about 2 mi^2, but the habitat seems relatively isolated. It is within these corridors that we obtained a fisher detection. Further analysis of the area revealed that the Evans Creek drainage is connected to a larger contiguous area to the east that is capable of supporting a fisher population, and in which other fisher detections occurred. Similar to this, we detected fishers in other areas that contained checkerboard ownerships of clear-cuts and good habitat. Often these areas of good habitat were still connected by the riparian corridors that remained in the clear-cut sections. While we don't know if these detections imply a local fisher population or a single dispersing individual, it seems unlikely that we would have detected any fishers if these areas were completely isolated.

Marten Detections

While detecting American marten was not a goal of this project, they were detected with a higher frequency, and were more widely spread than fisher detections. This was not unexpected, as marten are frequently trapped in this region, past surveys have detected marten frequently, and marten use similar habitats as fisher (Buskirk and Powell 1994). What was unexpected was the lack of overlap between marten and fisher detections. Only 2 snares (0.42%) detected both fisher and marten, and both species were detected in only 4 (5.6%) pixels in the St. Joe. Similarly in the Coeur d'Alenes, no snares detected both species, and marten and fisher were never even detected together within the same township. Other studies have suggested a lack in fisher and marten overlap as a function of snow depth and competition (Krohn et al. 1995, Krohn et al. 1997). These are based on the idea that deep snow limits dispersal of juvenile fishers (Arthur et al. 1993), female fishers have relatively fixed home-ranges (Arthur et al. 1989), and a male fisher is most likely to establish a territory where there are already resident females. Fishers may outcompete martens for food and den sites (Clem 1977, Krohn e al. 1995), therefore where fishers are present, martens may be generally absent. Since marten are better equipped to travel on deep snow due to their lighter foot loading (Krohn el al. 2004), they can establish themselves at higher elevation/deeper mean snow depth habitats where fishers are absent.

Based on the data from this project alone, it's difficult to hypothesize on the reason for this apparent inverse relationship. The mean elevation of fisher detections (3486 ± 858 ft) is somewhat lower than that of marten (3772 ± 932 ft), but not significantly different ($t = 1.38$, df = 49, $P = .087$). Elevation alone does not dictate snow depth, but without actual snow data, we cannot hypothesize on the fisher/marten/snow interaction. Fisher may be outcompeting marten in areas, but without data on their home ranges or population attributes there is no way to know. Even if both mechanisms were occurring in the area, there is enough space and habitat variability within a township (36 mi^2) to support both species. The distribution of fisher and marten detections in this study may be merely coincidental, and further surveys may have different results. Clearly, more research needs to be done to better understand the interactions between fisher and marten.

Fisher Genetics

The results of the genetic analysis of the fisher samples show that there are at least 10 different individuals in the study area representing 4 different unique haplotypes. Vinkey et al. (2006) evaluated fisher genetics in western Montana, and identified 7 different unique haplotypes, suggesting multiple origins. The 4 unique haplotypes that we documented in our study area were also documented in western Montana. Based on this previous research, the likely origins of the fishers in our study area are from British Columbia (haplotypes 4 and 6), Minnesota (haplotype 7), and Montana (haplotype 12) (Vinkey et al. 2006). These results demonstrate the effectiveness of past fisher reintroduction efforts from British Columbia and the Midwest (Williams 1962, Weckworth and Wright 1968, Roy 1991, Heinemeyer 1993), as well as the connectivity to remnant native populations in Montana. Vinkey et al. (2006) suggest that the stronghold of fisher populations for Montana may be located on the border with Idaho in the Bitterroot Mountains. Our data support this conclusion, and suggest that this stronghold may extend further into Idaho than previously thought. Further analysis of these data in combination with similar subsequent studies in Idaho would give us a better understanding of the connectivity of north Idaho fisher populations to reintroduced and native populations.

Due to the variable quality of the DNA samples, we were only able to detect 10 different individuals from 54 total fisher samples. This combined with the identification of the various haplotypes help us to identify different individuals in a given area. For example, we know that 4 individual fishers were detected in 1 township, and 2 in another, while the remainder only detected 1 haplotype at most. However, we don’t know if multiple detections of the same haplotype are from the same or different individual fishers. Due to these limitations, extrapolating these data to estimates on density or abundance is tenuous at best. These data do provide a good baseline, however, to an understanding of fisher distribution in north Idaho, and will offer a solid starting point for future efforts.

Snaring Season

We found that the benefits to surveying for forest carnivores in the summer months outweighed the disadvantages. The advantages revolve around the ease of access to fisher habitat. We were able to survey the best potential habitat in each township of the study area, without consideration of access. This cannot be said for surveys conducted during the winter in mountainous terrain. Snow conditions in north Idaho are highly variable, making access to many areas difficult and dangerous. In the summer, any area that could not be accessed by a pickup or ATV could be accessed by foot. While hiking in remote mountainous forests can still be quite difficult and at times dangerous, most would agree it is much safer than during the winter.

It is a more efficient use of crew time to survey for carnivores during the summer months. Snare success rates (percent snares with a fisher detection) for summer surveys (mean = 15.5%) were similar to success rates for winter surveys (mean = 8.2%)(Table 4) within the same geographical range, indicating that fishers were not necessarily more difficult to attract in the summer (Carman 1975, Schlexer 2008). In addition, we were able to set more snares per day than in similar winter studies. Without this high of a deployment rate, we would not have been able to survey the large study area of this project in the timeframe available.

Table 4. Summary of fisher and marten detection rates for various studies in the region.

Survey	Season	Region	Fisher Detection Rate	Marten Detection Rate
2004 USFS	Winter	Northern Selkirks	4.3%	7.5%
2004-2005 USFS Lochsa	Winter	Lochsa	20.2%	4.5%
2005 USFS/IDFG	Winter	Northern Selkirks	1.9%	30.3%
2005-2006 Potlatch	Winter	St.Joe, Clearwater	11.1%	0.9%
2005-2006 IDFG Clearwater	Winter	Clearwater	11.3%	12.1%
2006 IDFG/BLM	Winter	Coeur d'Alenes	1.7%	1.7%
2006 WASSERMAN, WWU (Wasserman 2008)	Winter	Purcells, Cabinets, Selkirks	4.3%	65.1%
2007 IDFG/BLM	Winter	S. Selkirks, Cabinets, S. of Pend Orielle River	11.0%	1.2%
2004 USFS Lochsa	Summer	Lochsa	9.3%	2.7%
2006 USFS	Summer	Red River, Elk City	32.7%	10.9%
2006-2007 CDA Tribe	Summer	St. Joe, Coeur d'Alenes, N. Clearwater	4.6%	13.1%

Snare disturbance by bears was the primary disadvantage of conducting our survey during the summer months. Depending on when the bear visited the site, this could reduce the trap detection rate. There were some snares that detected mustelids as well as bears, indicating that the mustelid visited the site first, but this was relatively rare. Bears disturbed 16.7% of the snares overall, and the distribution was somewhat patchy. In some pixels, every snare was disturbed by a bear, while in others; all of the snares were intact. Pixels that only had 1 snare disturbance were rarer. This may indicate that when a bear finds 1 snare, it actively seeks out others in the area. We found that this type of disturbance was acceptable for our study, due to the large scale of our survey. For smaller scale surveys this type of disturbance may be more problematic. For instance, a survey of a specific drainage, where snares are distributed every .25 mile along a stream and some of its tributaries could be significantly affected by a bear that is travelling along that drainage. Researchers need to weigh the costs and benefits of summer surveys for their specific project goals.

Comparison of Methods

We used slightly different methods in the St.Joe than we used in the Coeur d'Alene's, as described previously. The methods we used in the Coeur d'Alene's were more efficient, having deployed 23.4% of the total snares in only 8.4% of the total time (Table 3). This was largely due to 2 factors. First, we chose snare locations based on access. Good potential habitat was mapped for each township, and then roads were selected that could access that habitat. If the potential fisher habitat had poor access, it was not surveyed. In the St.Joe, we ignored access when selecting snare sites, basing their locations solely on the best available habitat. In addition, snare sites were not selected beforehand in the Coeur d'Alene's. Technicians were given maps with various habitat types delineated, and they were allowed to use their discretion to select the actual snare sites within these stands. Snares were all set within 300 feet of the road. In the St. Joe, snare sites were selected in the office, and technicians navigated to their coordinates in the field. As a result, we were able to deploy and collect more than twice as many snares per day in the Coeur d'Alene's as we could in the St. Joe. Trap success as measured by fisher detections per trap night, was similar in both study areas (St.Joe = 0.003, Coeur d'Alene's = 0.002), but since we were able to deploy more traps per crew day in the Coeur d'Alene's, our detection rate was higher there (St. Joe = 0.09 fisher detections/crew day, Coeur d'Alenes = 0.22 fisher detections/crew day). This implies that our selection of fisher habitat was similar in both areas, and that fisher did not avoid areas with road access.

While the methods we used in the Coeur d'Alene's were clearly more efficient, the question is whether or not we obtained the same quality of data. In the St.Joe, we were able to say that we surveyed the best potential habitat within each township. The same cannot be said for the Coeur d'Alene's, where there were frequently areas of excellent potential habitat that were not surveyed due to their lack of access. Therefore, the lack of detections in the St. Joe seems to carry more weight than the lack of detections in the Coeur d'Alene's. Neither necessarily show a lack of fishers in a given area, but the potential reasons for their absence are less ambiguous in the St. Joe. The primary statistically significant way of documenting absence would be to randomly select snare sites throughout the study area, but a project of this scale would be cost-prohibitive for most researchers.

Applications of these methods in future survey efforts need to be dictated by the goals of the project. Both methods allow for a large-scale survey effort in a relatively short amount of time. The methods employed in the Coeur d'Alenes may be more appropriate for projects where the presence of fishers is unknown. By using these methods, a researcher may miss several areas that contain fishers, but this is made up for by the amount of area they can cover in a given amount of time. The methods we used in the St. Joe may be more useful if fishers are already known to be present, and the goal is to document specifically where they are. By using these methods, researchers may not be able to survey as large of an area in a given timeframe, but the survey would be more exhaustive, and may be more useful in focusing further efforts in specific areas.

Conclusions

The goal of this project was to gather baseline data on the presence of fishers in the study area. We found that fishers are indeed occupying habitats in portions of the study area, and were detected throughout it. While we cannot extrapolate our fisher detections (or lack of detections) to habitat selection due to the biases of the study design, we can say that the micro-habitats of the sites where we found fishers were primarily multi-layered stands of large diameter cedar, hemlock and grand fir with high amounts of large woody debris, and in close proximity to perennial water. That being said, we failed to detect fishers in the majority of the areas that we surveyed that contained these habitat attributes. These lack of detections could be due to a low fisher density, or due to an array of other variables. Additional site-specific surveys would need to be designed to address the lack of detections.

The genetic analysis of the fisher detections show us that we have multiple individuals representing descendants of reintroduced and native populations. The distribution of the haplotypes help to demonstrate the varying levels of connectivity to these populations. In addition, these results support conclusions from previous studies indicating that the Bitterroot divide between Montana and Idaho may be a stronghold for fisher populations in the northern Rockies, and that this stronghold may extend further into Idaho than previously shown.

While we found fishers and martens throughout the study area, we rarely found them in close proximity to each other. We have suggested some potential reasons for this lack of overlap, but additional research is needed to address this specific issue. Specifically, studies aimed at the habitat-use of both species as well as competition between them could be very beneficial to resource managers.

The benefits of conducting DNA-based carnivore surveys in the summer months in north Idaho are substantial, due to the increased efficiency as compared to winter surveys. In addition, using road based surveys may be the most effective way of surveying for forest carnivores if time and resources are limited and the presence of fishers is unknown. For smaller-scale projects, or projects where it is more important to know where fishers specifically are located, the methods we used in the St.Joe may be more appropriate.

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Appendix 1

Detecting the Presence of Lynx on the Ceded Territory of the Coeur d'Alene Indian Tribe

Introduction

While the main focus of this project was to detect fishers in the study area, a secondary goal was to attempt to locate lynx as well. Our methods that we developed for surveying fishers were based in part on those outlined by Zielinski and Kucera (1995). These methods were designed to target a suite of forest carnivores including fisher, lynx, marten, and wolverine. The methods that we planned to use to detect fishers, therefore, also had the potential to detect lynx as well as other species.

Since fishers and lynx have different habitat requirements and may use the landscape differently, we wanted to increase our chances for detecting lynx within the scope of a fisher survey. An analysis of the habitat types in the study area revealed that many of the pixels that were selected based on good potential fisher habitat, also contained good potential lynx habitat. Many of these pixels were located in remote areas that may be overlooked in the scope of a smaller-scale lynx survey due to difficulty of access. Since we were already going to expend the effort in accessing these areas to detect fishers, we decided to deploy a limited number of felid-based hair snaring stations in these pixels as well. The goal of this portion of the project was simply to detect the presence of lynx within the study area.

Methods

We used the same survey pixels that were selected for the fisher survey. Within each pixel, the habitat was analyzed based on aerial imagery and available forest stand data to delinieate good potential lynx habitat. If a pixel contained lynx habitat, that pixel was targeted for 2 additional hair snaring stations within the lynx habitat, in addition to the 6 snaring stations that were being deployed for fisher detection.

Our lynx snare stations were based on those outlined in the National Lynx Protocol (McKelvey et al. 1999). The stations themselves were the same as those in the protocol, i.e. a station consisting of a carpet pad with nails attached to a tree and lured with beaver castor and catnip, as well as a carpet pad and visual attractant hanging from a branch (Figure 1). We did not use random transects with stations at specific intervals however. Instead, technicians used their discretion to install 2 stations within the delineated lynx habitat while they were already in the pixel to deploy the fisher snares. This resulted in deploying a total of 54 lynx stations over the course of the 2-year study (Figure 2).

Figure 1. Photograph of lynx detection station.

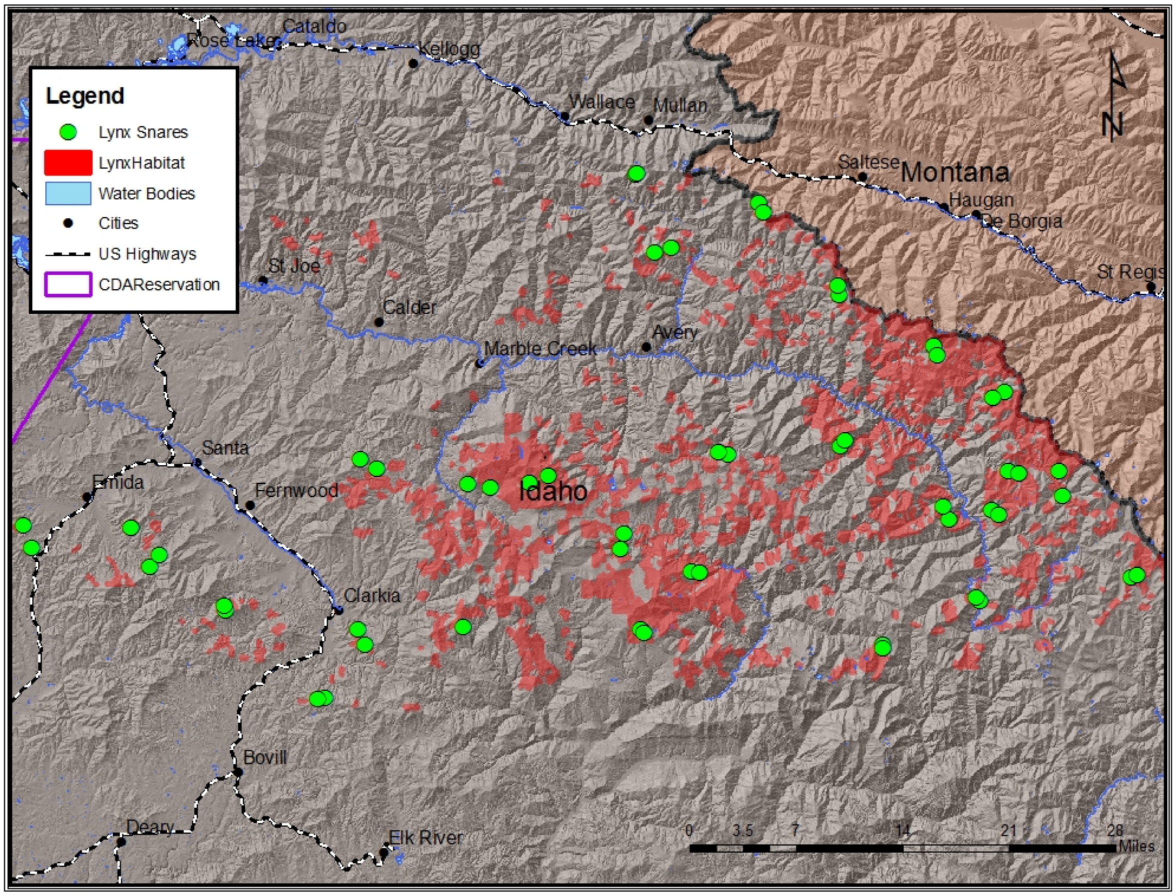

Figure 2. Locations of lynx stations and delineated lynx habitat.

Stations were deployed for approximately 14 days, after which any samples were collected and stations were removed. Sample collection methods were the same as those with the fisher samples. All hairs gathered from the lynx stations were sent to the same lab for DNA analysis. All felid samples were analyzed for species, and any lynx samples were to be analyzed for individual and gender identification.

Results

Snares were deployed from April 6 through September 26 in 2006, and from March 15 through August 23 in 2007. A total of 54 snares were set for a total of 756 trap nights. Mean elevation for the snares was 4651 (± 695 ft). Snares were deployed primarily on USFS land, with 50 (93%) being located within the St. Joe or Clearwater National Forests.

Hair samples were collected at 4 (.07%) of the snare sites. Of these, 3 samples had adequate DNA for species identification, which revealed that 2 of the samples were from bobcat (*Lynx rufus*), and the other was from a cougar (*Felis concolor*). None of the stations appeared to be disturbed by bears. Although none of the lynx stations detected a lynx, we did detect 2 lynx from fisher snares. One of these detections was in the southern half of the St.Joe National Forest and the other was from the Coeur d'Alene National Forest.

Discussion / Conclusions

Our lynx stations were not successful in collecting hair samples, having only a .07% success rate. It is unknown as to whether this is due to a lack of lynx in the area, ineffectiveness of the snares, or some other reason. These stations were designed specifically to attract felids and collect hair samples, and the few samples that we obtained were from a bobcat and a cougar. This may indicate that lynx were not present in the survey area, but the sample size is far too small to make any conclusions.

The fact that 2 lynx were detected is encouraging, as positive lynx detections in north Idaho have become increasingly rare in the past several decades. The detections, however more likely represent a single transient lynx than an established population, as they are relatively isolated and there have been no additional detections in the area. Individual and gender analyses for these 2 samples were unsuccessful, so it is possible that both samples came from the same individual, although they are separated by approximately 60 miles. More intensive studies designed specifically for lynx are needed before we can draw any conclusions about lynx distribution in the study area.

Literature Cited

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