

Translocation of fishers into the Northern Sierra Nevada of California: Annual Report for 2010

By

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Summary

In late 2009 and early 2010, 9 female and 6 male fishers (*Martes pennanti*) were released onto lands owned by Sierra Pacific Industries (SPI). Through various methods we attempted to monitor fishers daily to confirm their survival, reproduction, movements, and use of available land covers. We documented that all fishers were alive into June of 2010 indicating that survival was high during the months immediately following translocation. During March and April we identified 5 females that showed behaviors consistent with having kits (denning). Subsequent monitoring at each den site demonstrated that 4 females had a minimum of 1 kit each. During summer (June-August) three females were found dead, and at least 2 of these were known to have had dependent kits at the time of their deaths. Throughout 2010 we lost contact (could not locate) 10 animals for long periods of time. We demonstrate that many of these animals remained alive and were lost due to telemetry failure. We provide evidence of at least one juvenile fisher, born on Stirling, which survived until at least fall of 2010. In late 2010 we trapped for fisher at multiple locations throughout northern California in an attempt to translocate an additional 15 animals to the Stirling district. At the end of January, 13 (7 females and 6 males) new fishers were released. Fishers released during late 2010 appeared to avoid areas that were occupied by fishers from the earlier year's animals, but most moved relatively small distances (< 10 km) from their original release points. We trapped selected areas on the Stirling district to capture animals released during the first year's translocation efforts.

Introduction

Concern for the status of the fisher (*Martes pennanti*) in California prompted a cooperative venture among California Department of Fish & Game, US Fish & Wildlife Service, Sierra Pacific Industries (SPI; a private timber company), and North Carolina State University to translocate fishers into the Northern Sierra Nevada. In 2009 the California Department of Fish & Game gave final approval for 40 fishers to be translocated over the next 3 years (2009-2012). Fishers were to be released onto the Stirling District, a 648 km² tract of land owned by SPI, and managed for timber production and harvest. Commensurate with this action, fishers are to be studied intensively for the first 7 years post-translocation. The primary objectives of this research are:

- 1) Document survival, reproduction and use of land cover by released fishers as well as their descendants during the first 5 years following release.
- 2) Predict use of habitat by fishers using 4 existing models and a model that we develop.
- 3) Predict placement, sizes, and shapes of home range using models of optimal home range choice.
- 4) Predict patterns of breeding by males from home range placement and familiarity with landscapes.

5) To use the results of items 1-4 above to provide the foundation for understanding the results of the translocation.

Translocation of Fishers (Year 1)

From December 2009 to February 2010, we translocated fishers from 4 different areas, and separated by >20 km, located in Northern California (Fig 1). We captured 20 fishers (12 females and 8 males) during our trapping efforts. We removed fewer than 5 animals from most locations, but we removed 5 animals from an area that had been extensively monitored for 3 years (Eastern Klamath Study Area; EKSA). We conducted physical examinations, age estimation, and health testing for all captured fisher prior to translocation. All animals were tested for exposure to canine distemper virus and parvovirus and also vaccinated for rabies and distemper virus prior to release. We returned 2 female and 2 males to their original trapping locations because they were in poor physical condition or too young. One female fisher died in captivity for unknown reasons.

We released 9 female and 6 male fishers. Analysis of cementum annuli from fisher teeth revealed the age structure of translocated fishers to consist primarily of animals that were over 24 months old (Fig 2). Average body weight of translocated females was 2.11 ± 0.27 kg (\pm SD) and males 4.08 ± 0.15 kg. Female fishers were surgically implanted with a Telonics 310L VHF transmitter (Telonics, Mesa, AZ) with an estimated battery life of 14 months. These transmitters weighed 40 g and were equipped with a mortality sensor. All surgeries were performed by a veterinarian employed by the California Department of Fish and Game. Male fishers were outfitted with Sirtrack KiwiSat 202 PTT (Argos) collars. These collars weighed 90 g and were on daily for 4 hours and have an estimated battery life of 390 days.

We released 7 females and 6 males along the Butte Creek river drainage, which roughly bisects the Stirling district, and an additional 2 females along the West Branch of the Feather River. We released 4 females in December of 2009, 3 females and 6 males in January 2010 and 2 females in February of 2010.

Translocation of Fishers (Year 2)

Trapping began in late 2010 with the objective of moving an additional 15 fishers onto the Stirling district. New sites were selected for trapping to lessen the impact of removing fishers at any one site and to increase the genetic diversity of animals moved to Stirling. In October, we trapped on lands owned by Green Diamond Resource Company north of Arcata, CA. Only 2 males were moved from this area with 4 females being rejected for translocation because of an un-described trematode (class Platyhelminthes) infection (Clifford, personal communication). Trapping also resumed on lands owned by SPI near Weaverville, and in the Eastern Klamath study area. Trapping continued into January of 2011 resulting in a total of 13 animals (6 males and 7 females) being translocated to the Stirling district. All females were outfitted with a Telonics MOD-105 (50 grams) VHF radio collar. All males were outfitted with a Sirtrack Kiwisat 303 PTT transmitter that has an activity and temperature sensor.

Movement, Survival and Reproduction

We have monitored fishers actively (telemetry) and passively (motion-sensitive cameras) since release. We try to locate females daily with ground telemetry, and use fixed-wing aircraft to locate females that are difficult to find from the ground. In general females were located less frequently than males (Table 1). We located each female an average of 53 times (SD = 42) during the period starting in late 2009 through 2010 whereas males were located on average of 132 times (SD = 98) during 2010. Additionally, females are located an average of only 23% of days their transmitters were known to be functional (Table 1). In comparison, males were located 97% of days their transmitters are known active (this includes all location classes available from the Argos system). We experienced problems with both VHF and Argos transmitters. Four of 9 (44%) of VHF implants appeared to fail months prior to the end of the predicted battery life (some fishers might have dispersed too far away to find them), and 4 of 6 (66%) of Argos transmitters did fail prior to the end of predicted battery life (Table 1). These failures reduced the number of total locations acquired for both females and males and, thus, affected our understanding of their movement patterns, home range development, and survival.

Fishers had varied movement patterns and distances following translocation with females showing smaller and less frequent long-distance (>10 km) movements than males. The furthest distance females have moved from their respective release points averaged 11 km (range = 4–26). Females have generally settled close (< 5 km) to their original release sites. The average furthest distance males traveled from their respective release sites was 32 km (range = 15–57). Generally, long-distance movements occurred within the first few weeks after release, though some males continued to make relatively large movements into July. The loss of contact that we attribute to telemetry failure confounds our ability to know where, or if, some males settled and created home ranges; however, evidence from the male that was tracked all year and from remote cameras suggest that individuals created home ranges in areas that we last knew they were alive.

Fishers that were released in the second year have often made larger movements after release than did animals from first year. Preliminary analyses suggests that animals that both males and females that were released in or near existing home ranges moved away from these areas very quickly, but slowed down their rates of travel after entering areas that we have never documented other fishers. Additionally, both male and females from the second year release have begun to settle into areas of frequent use (incipient home ranges), and none of overlap with areas of use from animals released in the first year. Thus, fishers are now present throughout a larger proportion of the Stirling district at the beginning of 2011 compared to any of 2010 (Fig 3).

Survival

All females survived until early June but 3 females died between mid-June and August 2010. Bobcat (*Lynx rufus*) DNA was found on the remains of 2 fishers (Wengert, UC Davis, unpublished data), but the quality and quantity of the remains were insufficient to determine if a bobcat was the cause of mortality. One female was found dead in a water tank and subsequent necropsy by a veterinary pathologist demonstrated the animal died from drowning (Clifford, unpublished data). One male lost his collar in early February but has subsequently been photographed and trapped confirming he

survived. We have not yet documented a male mortality, but we can confirm that at least 3 males survived until late fall of 2010.

Since mid-summer we have passively monitored for both fishers. We have used both remote cameras as well as hair-snare/track plate boxes to identify areas that fishers use. In that time we have identified fishers in a minimum of 4 areas where we have no actively transmitting fishers (Fig 4). Locations where fishers have been detected at camera stations appear to correspond to areas that individuals used prior to being lost from contact (represented by minimum convex polygons). Though these comparisons are not definitive we feel optimistic that these camera detections provide evidence that 5 of 6 remaining female and 3 of 6 male fishers were alive into the fall of 2010.

Fishers that were released in the second year (2010-2011) have survived at a high rate through April 2011. We have documented that all females (7) have survived through April. One male was found dead on highway 32 in March of 2011 (Table 1). At least 3 Argos transmitters from the second year's releases have also apparently malfunctioned as of April 2011.

Reproduction

During March and April of 2010 we identified 5 female fishers using dens in both standing dead and live trees with cavities. Subsequently, we placed motion-sensitive cameras near these dens and photographed 4 females with a single kit each (Fig 5). The remaining females either showed no denning behavior or were located too infrequently to determine if denning had occurred. Additionally, we photographed or personally observed males at the den locations of all 5 denning females. We have also documented at least 1 female that appeared to have bred with a male (matted, wet hair at the neck). The proximity and timing of male fishers to females in den trees is consistent with breeding behavior (Powell 1993).

Female fishers have selected numerous structures and species of trees to use as both natal and maternal dens. Fishers primarily used live trees or snags for denning sites (~90%) but we also documented females in downed logs, stumps, and under tangles of woody debris. Fishers used Douglas-fir (*Pseudotsuga menziesii*) 35% of the time, but other conifers such as Ponderosa pine (*Pinus ponderosa*), and Incense cedar (*Libocedrus decurrens*) have also been used. Black oak (*Quercus kelloggii*) has been used as den tree in 22% of instances.

We have documented at least one juvenile fisher that was presumably born in Stirling in 2010 that survived until November. We determined that a fisher that had visited a baited camera station was a male by measuring identifiable characteristics of a tree that we observed in the photographs of the animals. Further, we documented that this male had no noticeable chest patches (white marking on the pelage) whereas all males had such marking that we released earlier in the year. In subsequent trapping we have not been able to capture this or any juvenile fishers.

Data collected during early 2011 indicates that females from the first and second year releases have reproduced. At least 2 females that were released during the first year have successfully reproduced. We have documented a minimum of 4 (3 kits in 1 litter and 1 kit in another) produced by these females indicating that they were able to find appropriate mates and resources during their first year on Stirling to allow them to successfully breed. Additionally, we have documented a minimum of 5 of the 7 females

released in year two have apparently denned. We have documented a litter of 2 kits from one of these females and are currently attempting to estimate litter sizes of other females. Male fishers have again been documented at multiple female' den trees.

Food Habits

We have documented that fishers are consuming a wide variety of prey items on Stirling. The remains of alligator lizards (*Elgaria coerulea*) have been found in the feces of fishers, and are locally abundant in some land cover types. Several sciurids, including gray squirrels (*Sciurus griseus*) and California ground squirrels (*Spermophilus beecheyi*) have been documented as fisher's prey items (Fig 6). Many squirrel species are abundant throughout land cover types that fishers are using. At one den tree we found the partially consumed remains of an unknown raptor chick (e.g., owl or hawk; identification pending). Thus, fishers seem to use multiple types of prey, but we cannot currently suggest what food are preferred or used most often. We have started analyzing fecal material and prey remains that have been collected from fishers in the field (many den trees have abundant fecal samples). Our goal is to document types of prey that have been consumed, the relative proportions of those foods, and to evaluate differences in type proportion of prey types based on sex, age, and the individual.

Trapping on Stirling

In late 2010 we began trapping on the Stirling district to recapture animals that were still alive but without functioning transmitters, to replace still working transmitters, and to capture any juveniles that were born in 2010. In December we captured male 18308 near the 160C road. This male had increased his mass from 4.2 kg (at time of release) to 4.8 kg. His transmitter was replaced with a Lotek Minitrack GPS collar; however, this collar failed within one month after deployment. This same male was later captured in February of 2011 and a new KiwiSat 303 (Argos transmitter) was deployed. Additionally, we have captured 2 other animals that were lost from telemetry contact. Female 17ECC was captured near the A-line and male 181F9 was captured off of the R-line (both in February of 2011). All animals that have been recaptured have either increased or been stable in weight gain and their overall condition was classified as good to excellent. These captures confirm that some fishers survived though their transmitters had failed.

Acknowledgements

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Table 1. Number of locations (Loc), the date released (Released), the last date that a fisher was last known alive (Last Contact), the number of known active telemetry days (Active), and the percent of days that telemetry locations were obtained (Percent Loc) for each of 15 translocated fishers from 2009 and 2010 on Stirling district in the Northern Sierra Nevada, CA. The estimated number locations have not been filtered or edited and may change upon closer assessment.

| Study Year | Animal ID | Sex | Loc | Released | Last Contact | Active | Percent Loc |
|--------------------|--------------------|------------|------------|-----------------|---------------------|---------------|--------------------|
| 1 | 17582 | F | 154 | 14-Jan-10 | 01-May-11 | 472 | 0.33 |
| | 19316 ^a | F | 3 | 14-Jan-10 | 07-Apr-10 | 83 | 0.04 |
| | 168F2 ^a | F | 14 | 02-Feb-10 | 02-May-10 | 89 | 0.16 |
| | 17ECC ^c | F | 59 | 21-Dec-09 | 15-Mar-11 | 202 | 0.34 |
| | 199B9 | F | 221 | 09-Dec-09 | 01-May-11 | 508 | 0.44 |
| | D00B0 ^b | F | 71 | 21-Dec-09 | 15-Jul-10 | 206 | 0.34 |
| | F6280 ^b | F | 53 | 09-Dec-09 | 22-Jun-10 | 195 | 0.27 |
| | F65B6 ^b | F | 21 | 03-Feb-10 | 25-Jun-10 | 142 | 0.15 |
| | F8B8D ^a | F | 32 | 14-Jan-10 | 09-Jul-10 | 176 | 0.18 |
| | 181F9 ^c | M | 262 | 14-Jan-10 | 01-May-11 | 105 | 2.50 |
| | 16848 | M | 104 | 14-Jan-10 | 10-Jun-10 | 147 | 0.71 |
| | 596E2 ^a | M | 166 | 14-Jan-10 | 27-Jul-10 | 194 | 0.86 |
| | FB7DA ^a | M | 39 | 14-Jan-10 | 25-Feb-10 | 42 | 0.93 |
| | F0858 ^a | M | 135 | 14-Jan-10 | 26-Jun-10 | 163 | 0.83 |
| | 18308 | M | 622 | 14-Jan-10 | 01-May-11 | 472 | 1.32 |
| 2 | 93B5A | F | 64 | 06-Nov-10 | 01-May-11 | 176 | 0.36 |
| | 18FFF | F | 35 | 15-Nov-10 | 01-May-11 | 167 | 0.21 |
| | 18871 | F | 41 | 13-Dec-10 | 01-May-11 | 139 | 0.29 |
| | 182F4 | F | 27 | 14-Jan-11 | 01-May-11 | 107 | 0.25 |
| | 17FD8 | F | 45 | 14-Jan-11 | 01-May-11 | 107 | 0.42 |
| | 1E003 | F | 37 | 25-Jan-11 | 01-May-11 | 96 | 0.39 |
| | 21FB6 | F | 23 | 25-Jan-11 | 01-May-11 | 96 | 0.24 |
| | F605B ^a | M | 293 | 02-Nov-10 | 29-Mar-11 | 147 | 1.99 |
| | 58985 ^a | M | 195 | 08-Nov-10 | 01-Feb-11 | 85 | 2.29 |
| | 18CC8 | M | 441 | 15-Nov-10 | 01-May-11 | 167 | 2.64 |
| 18C3E ^b | M | 121 | 13-Dec-10 | 12-Mar-11 | 89 | 1.36 | |
| 18AA5 | M | 258 | 14-Jan-11 | 01-May-11 | 107 | 2.41 | |
| 22526 ^a | M | 128 | 25-Jan-11 | 20-Mar-11 | 54 | 2.37 | |

^a Telemetry device most likely failed prior to expected battery failure

^b Fisher was confirmed to have died

^c Telemetry collar was found with no evidence of fisher mortality

Fig 1. Source locations of fishers (black dots) translocated to the Northern Sierra Nevada, CA during late 2009 and early 2010. The yellow star shows the approximate location of release for fishers.

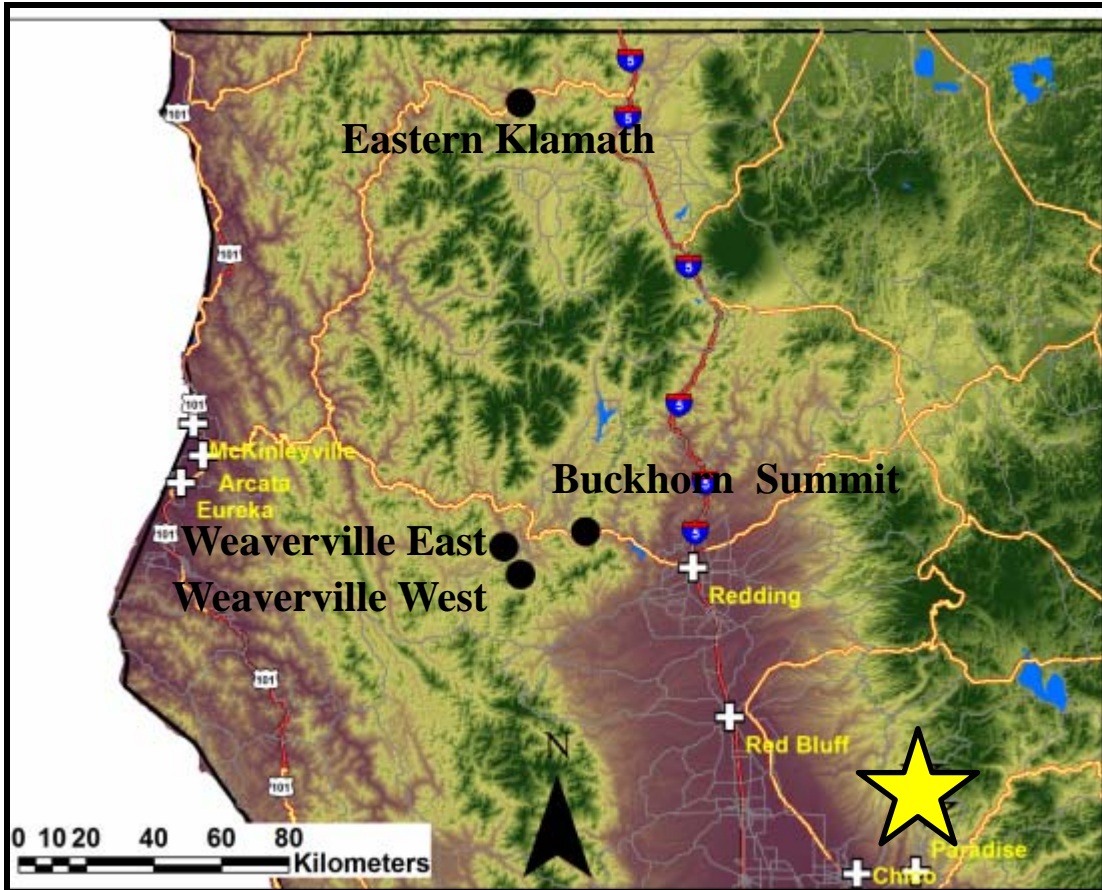


Fig 2. The estimated age structure of translocated fishers released on the Stirling district in late 2009 and early 2010 in the Northern Sierra Nevada, California. Black bars and white bars represent female and male fisher numbers respectively (per age class). Estimates are based on cementum annuli analysis of upper pre-molars that were extracted during handling of each fisher.

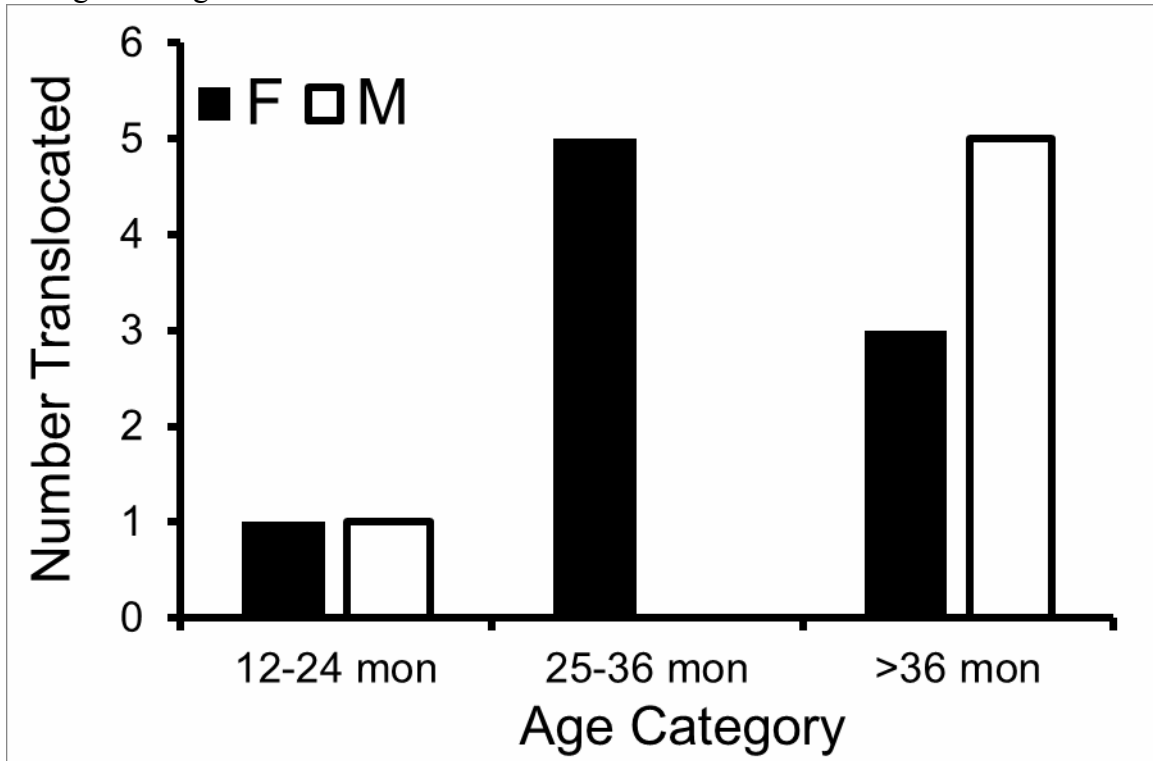


Fig 3. Estimated locations of female (red dots) and male (blue dots) fishers released in late 2009 and early 2010 (Year1), and female (yellow dots) and male (purple dots) females released in late 2010 (Year2) on the Stirling District in the Northern Sierra Nevada, CA. Light green shading represents lands managed by the Lassen National Forest (LPF) and darker green shading are lands managed by the Plumas National Forest (PNF). The colored stars show where fishers were released in the over the last two years.

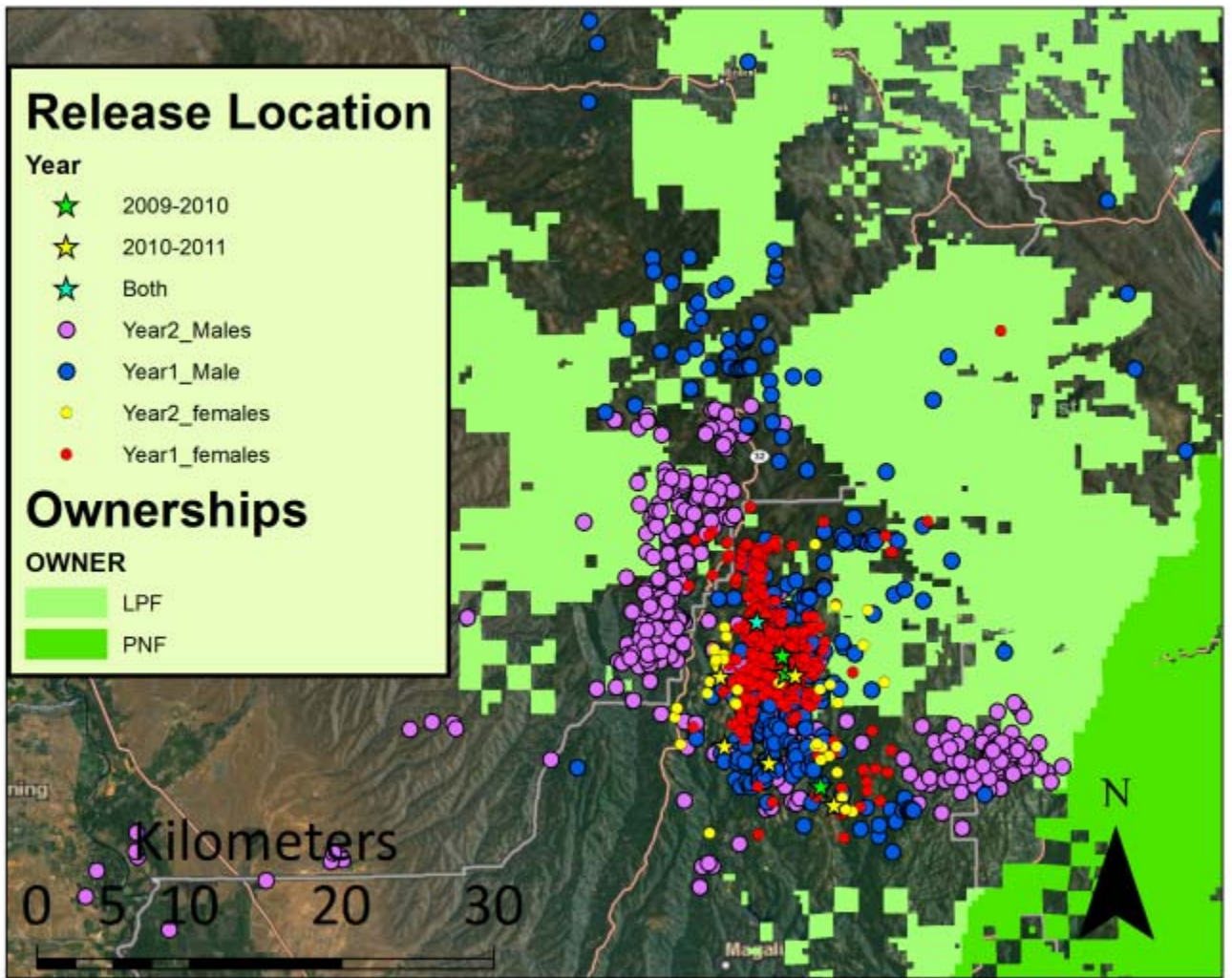


Fig 4. Minimum convex polygons of all translocated female fishers generated from estimated locations from winter 2009 through 2010 on Stirling district, Northern Sierra Nevada, CA. Polygons represented by black broken lines are females that died during summer of 2010 and colored or shaded polygons those females known or suspected to be alive during late fall of 2010. Colored crosses show locations where fishers were detected via remote camera in fall of 2010 (the green cross is the location of a male fisher from a camera).

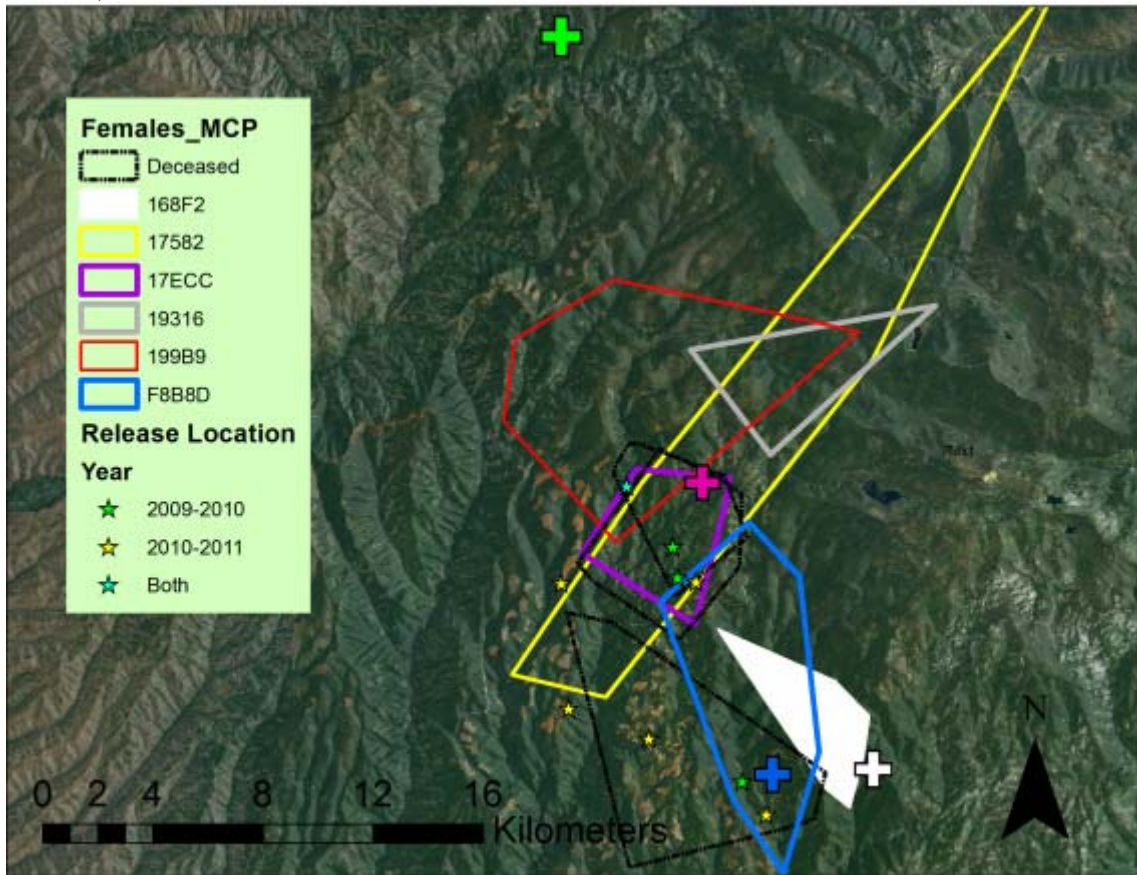


Fig 5. (Left) Female fisher D00B0 descending her maternal den tree with a kit during late June 2010 and (right) female fisher 199B9 descending her natal den tree with a kit during late May 2010 on Stirling district, Northern Sierra Nevada, CA.



Fig 6. (Top) A partially consumed California ground squirrel (*Spermophilus beecheyi*) at the base of a female fisher's den tree and (Bottom) a female fisher returns to her den tree with a gray squirrel (*Sciurus griseus*) during the first year after translocation onto the Stirling district, Northern Sierra Nevada, CA.

