CHAPTER 4. Carnivores - Multi-species Baseline Initiative

Lucid, M.K., L. Robinson, and S.E. Ehlers. 2016. Multi-species Baseline Initiative project report. 2010-2014. Idaho Department of Fish and Game, Coeur d'Alene, Idaho, USA.

Introduction

Large mammals have relatively low reproductive rates, large home range requirements, and low natural population densities (Noss et al. 1996) making their populations more responsive to changing human land use practices and environmental conditions than many other species. This can lead to conservation challenges for some mammals (Noss et al. 1996) but also allows wildlife management programs to maintain stable to growing populations of species such as elk (*Cervus elaphus*), white-tailed deer (*Odocoileus virginianus*), and black bears (*Ursus americanus*) with harvestable surpluses (Ackerman 2013).

Such game species are typically allotted a relatively large portion of the conservation dollar and our knowledge base of their ecological requirements and status is subsequently greater than for non-game species. The term 'forest carnivore' generally refers to mammals with regulated fur trapping seasons but much inventory and research effort is spent on 'rare' forest carnivores such as wolverine (*Gulo gulo*), Canada lynx (*Lynx canadensis*), and fisher (*Pekania pennanti*) which are generally thought to not be abundant enough for populations to withstand regulated harvest in the western contiguous 48 U.S. Rare forest carnivores are charismatic and often receive disproportionately more conservation resources than other non-game taxa such as amphibians and gastropods. Regardless, forest carnivores have historically been targeted for human use and land management for their benefit remains contentious.

In the U.S. Rocky Mountains, forest carnivores have long been the subject of conservation efforts ranging from suggestions to make them a conservation 'umbrella' for other species (Noss et al. 1996) to using wolverine, lynx, fisher, and grizzly bears (*Ursus arctos*) as focal species for conservation planning (Carroll et al. 2001). Lynx (USFWS 2014b) and grizzly bears (USFWS 1999) are currently classified as 'threatened' under the U.S. Endangered Species Act and wolverine (USFWS 2014a) and fisher (USFWS 2011) have been considered for listing by the U.S. Fish and Wildlife Service (USFWS).

'Rare forest carnivores' is a catch-all term often applied to wolverine, fisher, and lynx in the northern Rocky Mountains. Despite broad interest in managing for these wide ranging species, inventory and conservation projects exist with little spatial or temporal continuity. For example, in the late 1980s and early 1990s, a fisher augmentation was implemented in the West Cabinet Mountains straddling the Idaho-Montana border. The project ended without a follow-up monitoring program (but see Vinkey 2003) leaving managers with no real information as to the success of the program or status of the fisher population. Since the 1990s a variety of forest carnivore inventories and other research efforts have occurred in the Idaho Panhandle and adjoining mountain ranges (Hayden et al. 2001, Bowers et al. 2002, Bowers et al. 2003, Vinkey 2003, McCall et al. 2006, Patton 2006, Wik 2006, Cushman et al. 2008, Knetter and Hayden 2008, Ulizio et al. 2007, Albrecht and Heusser 2009, Hausleitner and Kortello 2014). Lacking is synergy to coalesce such efforts to better understand species' status across space and time.

Multi-species Baseline Initiative (MBI) Forest Carnivores was funded primarily to develop a baseline occurrence and distribution dataset of wolverine, fisher, and lynx in the Idaho

Panhandle and adjoining mountain ranges. In 2010 we received funds to conduct a summer grizzly bear, lynx, and fisher survey in the Selkirk Mountains. After 2010 we shifted our focus to winter forest carnivore surveys for three reasons: 1) other research groups were already focused on grizzly bear monitoring, 2) no group in our study area was working to fill wolverine, lynx, or fisher information gaps identified in Idaho and Washington State Wildlife Action Plans (SWAP), and 3) because summer hair snaring seemed a less effective survey tool than emerging winter bait station techniques. To obtain the maximum data return for our survey effort, we tested existing techniques and refined emerging techniques to develop protocols that enabled detection of rare and common forest carnivores and other co-occurring species. We conducted field work from 2010-2014 with the objective of developing distribution maps and baseline datasets of target SGCN and co-occurring species to inform the 2015 Idaho and Washington SWAP revisions.

Methods

In summer 2010, we conducted bear, fisher, and lynx surveys at 172 sites in 172 survey cells in the Selkirk Mountains. In summer 2011, we conducted surveys in 175 cells for lynx in the Selkirk, Purcell, and West Cabinet Mountains. We used remote cameras to conduct lynx surveys during the summers of 2012 (4 sites) and 2014 (8 sites). From 2010-2014, we deployed 497 multi-species winter bait station surveys in 457 cells in the Selkirk, Purcell, West Cabinet, Coeur d'Alene, and Saint Joe Mountains (Map 4-1). During the winters of 2011, 2012, and 2014 we ran wolverine traps at 2, 3, and 15 sites in the Selkirk and Purcell Mountains.

Summer Fisher and Lynx Hair Snares

In 2010, we deployed fisher and lynx hair snares 300 m from bear hair snare corrals and approximately 100-150 m from a road or trail. In 2011, only lynx hair snares were deployed. Lynx hair snares were deployed in relation to the invertebrate survey location which was randomly placed within a 50-150 m buffer near a road or trail. Lynx hair snares were placed along the road or trail associated with the invertebrate survey.

To survey for fishers, we used the triangular style fisher hair snare box described in Schwartz et al. (2006). Two sides of the hair snare consisted of corrugated plastic sheeting. These two sides were nailed to a tree at a height of approximately 3 ft above the ground. Each side of plastic sheeting had one .30-caliber gun brush bolted to its walls; a third was nailed to the tree in between the first two to make a triangular shaped enclosure. Another triangular shaped piece of plastic sheeting forms the top of the snare. A piece of chicken was wired to the "roof" of the snare and a dab of Gusto (Caven's Lures, Minnesota, USA) call lure was applied to a branch above the snare. We deployed fisher hair snare boxes only in the winter of 2010 (n = 25) and in the summer of 2010 with one box per grid cell (n = 172).

To survey for lynx, we used the lynx rub pad style hair snare described in McKelvey et al. (1999). Rub pads consisted of a 3 in. x 3 in. square of carpet or sponge with four .30-caliber gun brushes arranged around the edges. Carpet squares were soaked in castor oil and liquid catnip and nailed to the base of trees at a height of 25 cm above the ground. As a visual attractant, we hung a pie plate on a wire leader attached to a swivel and bent to facilitate spinning in light breezes. We deployed one lynx hair snare per grid cell in 2010 (n = 172) and 2011 (n = 175). In 2010, snares were placed 100-150 m from a road or trail. In 2011, snares were place within view of a road or trail.

Fisher boxes and rub pads were visited three times in 2010. The first visit was to deploy the box or pad. On the second and third visits we collected any gun brushes with hair and stored them in coin envelopes. The fisher box, rub pad, and associated hardware were removed on the final visit. In 2011, lynx rub pads were visited only twice (once to deploy and once to retrieve) at approximately 14 day intervals.

Lynx rub pad (left) and fisher box (right).

Summer Remote Cameras

Remote cameras (Reconyx™ PC800 or PC900) were deployed specifically to detect lynx during the summer months of 2012 and 2014. Camera locations were chosen in the field in areas where lynx presence had previously been documented by project personnel.

Opportunistic Observations

We occasionally had the opportunity to collect samples from target species incidental to our regular field work. We collected scat, hair, and track observations of target species (lynx, wolverine, fisher, grizzly bear) while in the field conducting carnivore surveys. Scats and hair were submitted to Wildlife Genetics International (WGI; Nelson, BC) for DNA analysis. From 2010-2014, we collected hair or scat samples from grizzly bear (n = 2), lynx (n =3), and wolverine (n = 1). We report only observations which are verifiable by photograph or DNA.

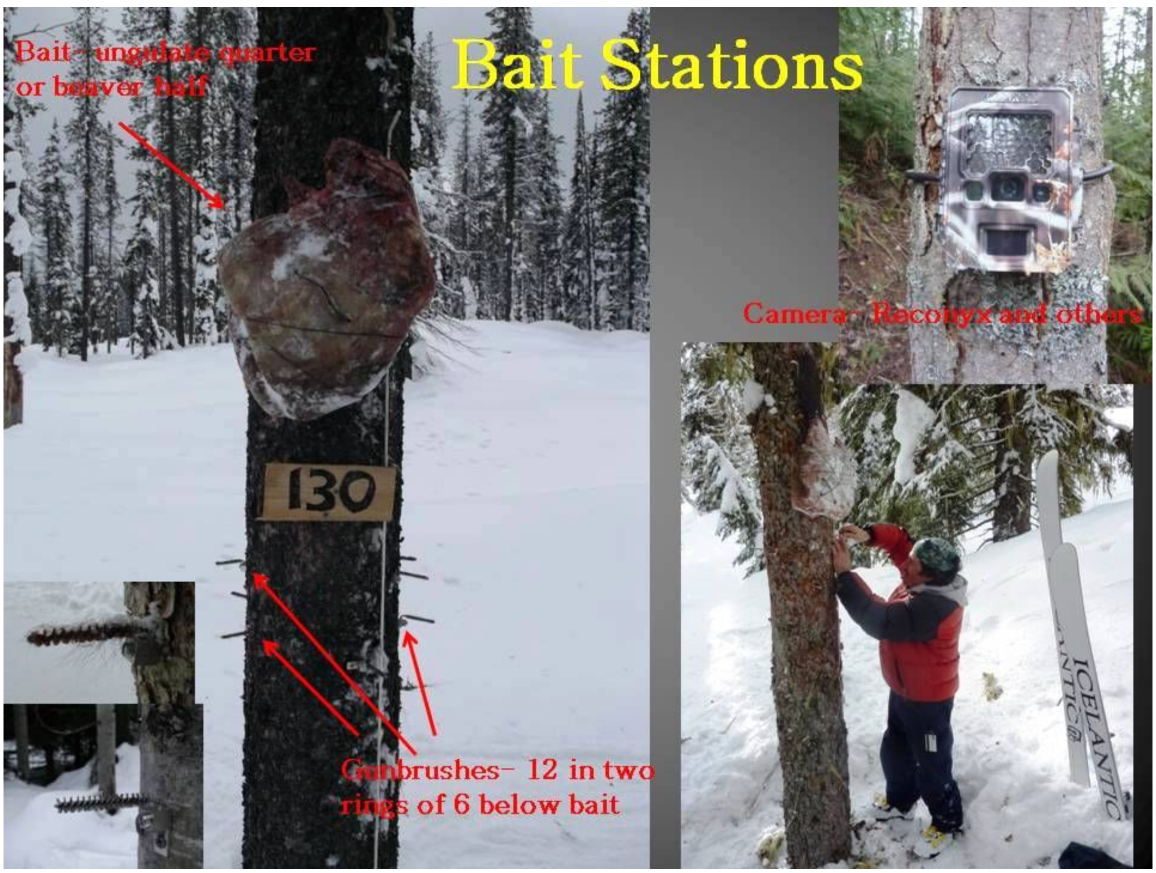
Winter Bait Stations

Winter bait station sites were selected prior to visiting the field with the use of topographic maps (Garmin BaseCamp and GoogleEarth) and field crews deployed stations within 200 m of the assigned location. Cells with a mean elevation of >1000 m were prioritized for survey (median elevation = 1310 m) and at least one bait station was deployed in each selected cell. Sites with high likelihood to be used by fisher, lynx, or wolverine were prioritized such as road intersections, saddles, ridges, and drainage intersections. We alternated site selection between ridges and drainage bottoms in adjacent cells.

Bait stations were established over five winters (2010-2014) with a January 25 median setup date (earliest was October 30) and a March 14 median takedown date (latest was June 30). Stations were deployed for a median of 39 days (range of 12-162 days). Surveys were conducted during the winter months to avoid destruction of stations and removal of bait by bears.

Most stations (n = 439) were visited once and 58 stations were revisited 1 to 3 times for a total of 567 sampling sessions (Table 4-3). Mean deployment length of revisited stations was 25 days for the first sampling period (n = 58), 36 days for the second sampling period (n = 58), and 29 days for the third sampling period (n = 12). When revisiting stations, field personnel collected hair samples, downloaded pictures, replaced camera batteries, and replaced bait if needed.

We selected live bait trees >30 cm in diameter which were isolated from other trees by at least 1.5 m (to prevent animals from jumping onto bait from neighboring trees and avoiding gun brushes). We used annealed wire to attach a skinned and frozen beaver carcass or skinned ungulate quarter to the bait tree approximately 6 ft above snow level. To ensure bait was firmly attached to the tree, we pre-wired the frozen bait by drilling holes on either side of the spinal column or leg bone (4 total holes). We then tightly wrapped annealed wire around the bone to ensure that even after the meat was removed, the bone would still be attached to the tree. As a scent attractant, we hung a sponge soaked in Gusto (Caven's lures, Minnesota, USA) within 20 m of the bait tree. For a size reference, we attached a rope with reflective tape every foot below the bait.



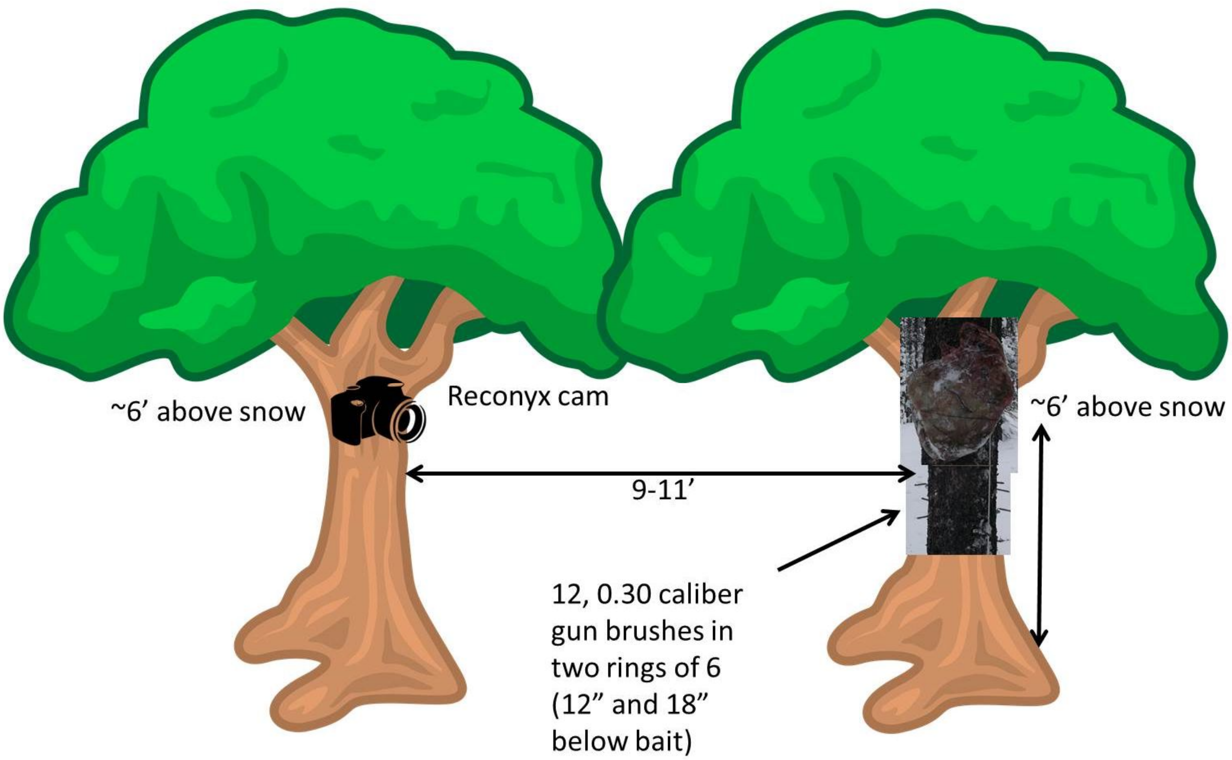
Bait station technique.

We used aluminum terminal lugs to affix 12, .30 caliber gun brushes below the bait in 2 concentric rings of 6 at 30 and 45 cm below the bottom of the bait. To reduce bait contamination of hair samples we avoided placing gun brushes directly below the bait. Hair samples were dried and stored in paper coin envelopes at room temperature.

We deployed one remote camera on a tree adjacent to the bait tree. We primarily used Reconyx™ cameras (Wisconsin, USA) but also cameras produced by other manufacturers (Table 4-2). We equipped all cameras with ≥ 4GB memory cards and rechargeable NiMH batteries.

Distance between bait and camera tree was dependent on camera model due to varying trigger sensitivities and fields of view. We placed Reconyx™ cameras 9-11 ft from the bait, but other models needed to be placed closer (approximately 8 ft from bait). Reconyx™ cameras were set on high sensitivity to take 3 rapidfire pictures with no delay between triggers; night mode was set to "balanced" (for complete protocol, see Appendix IV).

All images collected by remote cameras (*n* = 722,435) were reviewed independently by two wildlife biologists to identify species.



Wolverine Traps
We selected 15 sites in the Selkirk and Purcell Mountains where we had either documented wolverine activity or felt wolverine activity was likely given historical observations or predicted wolverine habitat (Map 4-9). We pre-selected specific trap sites using Garmin BaseCamp and GoogleEarth software.

We used stationary round log (*n* = 2) and portable wooden (*n* = 13) wolverine traps (Lofroth et al. 2008). The baited traps were monitored via satellite trap transmitter (Vectronic Aerospace, Germany). Daily satellite transmissions were received via email; additionally, we conducted an in-person check every third day. During the in-person checks, snow was removed from the trap and traps were re-baited if necessary.

Stationary log (left) and portable wooden (right) wolverine traps.

Incidental Trapping Captures

Licensed trappers are required by Idaho state law to turn in incidentally captured fisher carcasses to IDFG. We collected DNA samples from all fisher carcasses turned into IDFG personnel. We conducted a follow-up phone interview to determine the location of the trapped fisher.

Licensed trappers are also required to report lynx incidentally captured to legal trapping activity to IDFG personnel. All trappers (*n* = 3) reporting incidentally captured lynx during the course of the project participated in in-person interviews with IDFG staff.

Sample Storage

Hair and tissue samples were placed in coin envelopes and then dried and stored at room temperature. Scats were sampled by swiping both sides of a flat toothpick across the outside of the scat. Toothpicks were then placed in a coin envelope and dried and stored at room temperature.

Taxonomy

Image Review - Each remote camera image was reviewed independently by two different biologists with extensive experience identifying Northern Rockies mammals. Each biologist maintained a spreadsheet of identifications. Spreadsheets were compared after each review and, when necessary, images were reviewed a third time to resolve discrepancies.

Genetic Species Identification - Samples were analyzed for species and individual identification at WGI which extracted DNA from hair samples by clipping up to 10 guard hair roots, as available, or up to 30 underfur hairs if needed to supplement guard hairs. Samples were processed with QIAGEN DNeasy Blood and Tissue Kits, using QIAGEN's protocol for tissue. The species test was a partial sequence analysis of the mitochondrial 16S rRNA gene.

Individual ID

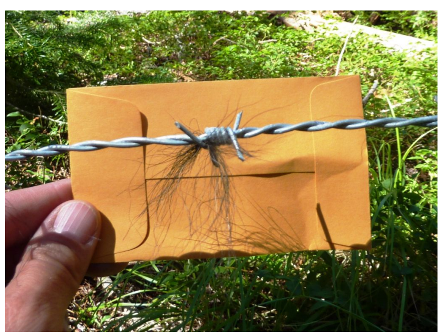
After successful species identification, samples of target species (lynx, wolverine, and fisher) were submitted for genotyping, which used a microsatellite array to distinguish individuals (Paetkau 2004). WGI used microsatellite markers to determine individual identification and gender of fisher (*n* = 12 markers), grizzly bear (*n* = 8 markers), lynx (*n* = 11 markers), and wolverine (*n* = 13 markers).

Fisher Haplotypes
We sent samples from each individual fisher detected from 2010-2012 from WGI to the USFS Rocky Mountain Research Station Genetics Laboratory in Missoula, MT. There samples were analyzed using a 300bp region of the control region previously used to evaluate fisher (Drew et al. 2003, Vinkey et al. 2006).

Bear Hair Corrals
Technicians were assigned grid cells and selected bear corral locations in the field. All sites were ≥100 m from a road or trail. Sites with high likelihood to be used by bears were prioritized including saddles, ridges, and drainage intersections.

Following Woods et al. (1999), we used Gaucho® style barbed wire to establish bear corrals. Wire was strung around 3-4 trees approximately 50 cm above the ground and pulled tight. A duff pile of bark, logs, and moss was built in the center of the corral and baited with a mixture of cow blood and ground fish.

Corrals were revisited twice at approximately 14 day intervals for a total of three visits. Corrals were re-baited on the second visit. On the second and third visits, each barb was examined for hair. Hair was removed from each barb with tweezers and placed in a coin envelope. Tweezers were exposed to flame for 5 seconds between each hair sample to destroy any DNA. The corral was dismantled on the third visit.



Bear hair collected on barbed wire.

Results and Discussion
We documented 28 species and genera during our bait station surveys (Table 4-1; Maps 4-3 through 4-28). We detected fisher at 59 bait stations in 47 different cells (Map 4-3). Eight incidental trapping mortalities were reported in our study area from 2010-2014. We detected 46 individual fishers in our study area (25 males, 19 females, 2 unknown gender; Table 4-4). We detected lynx at 16 sites (2 bait stations, 3 incidentally trapped, 7 remote cameras, and 4 opportunistic scats; Table 4-5; Map 4-5). DNA analysis identified 5 individuals (2 males and 3 females). We detected wolverines at 13 sites in 13 different cells (Table 4-6; Map 4-7). Genetic analysis identified a total of 3 individual males. We detected grizzly bears at 6 sites in 6 different cells in the Selkirk Mountains (Table 4-7; Map 4-11). Genetic analysis identified 4 individual grizzly bears (3 males, 1 female).

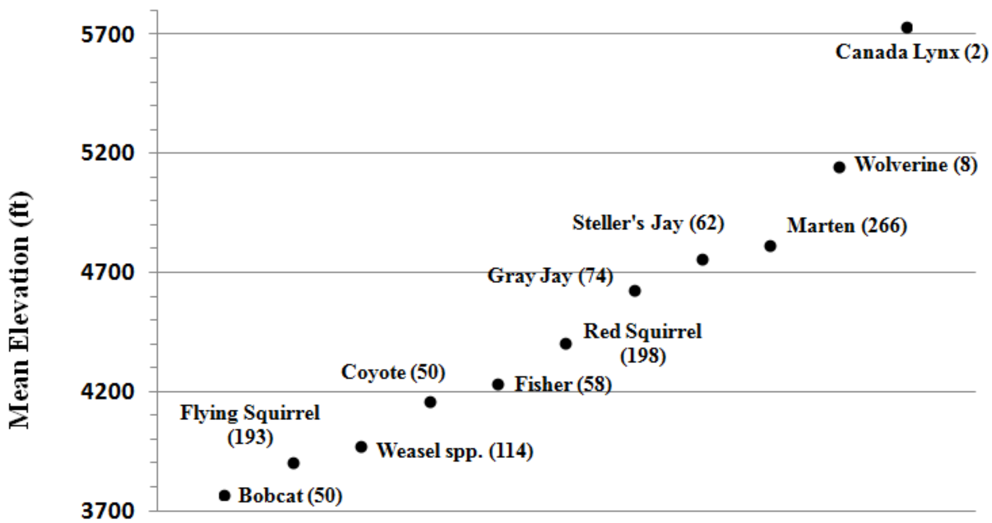


Figure 4-1. Mean elevation of stations detecting species visiting 497 forest carnivore bait stations in the Idaho Panhandle and adjoining mountain ranges during the winters of 2010-2014. Numbers in parentheses represent number of stations detecting species.

Species Richness

We detected 28 species and genera at all bait stations (Table 4-1). We detected an average of 2.8 species per bait station across the study area (range= 0-11 species; Map 4-2). We found relatively low species richness in the Coeur d'Alenes (1.9 species per station). Marten (*Martes americana*) and red squirrels (*Tamiasciurus hudsonicus*) in particular had lower detection rates in the Coeur d'Alenes when compared to the rest of the study area. Marten were detected at 54% of overall stations, 12% of Coeur d'Alene stations, and 63% of all stations outside the Coeur d'Alenes. Red squirrels were detected at 40% of overall stations, 21% of Coeur d'Alene stations, and 45% of all stations outside the Coeur d'Alenes.

Species richness is a fundamental measure of biological diversity and is often used to assess ecosystem health and develop conservation strategies (Gotelli and Colwell 2001). The Coeur d'Alenes have a long history of mining, timber harvest, and road development (IPNF 2012) and at first glance, the lower rates of marten and red squirrel detections and overall species richness may seem related to anthropogenic factors. However, other inherent variabilities need to be considered and, unlike the other mountain ranges, all of the Coeur d'Alene sites were surveyed during one field season (2014). This could have influenced results although we do not see similar species richness reductions in surveys conducted in other mountain ranges in 2014.

Few data are available to compare the species richness levels we found to historic levels and the disparity does not hold for all taxonomic groups. Terrestrial gastropods have higher species richness in the Coeur d'Alenes compared to other mountain ranges in our study area. With low mobility and permeable skin, it would seem reasonable that terrestrial gastropods would be more sensitive to anthropogenic influences than the highly mobile animals which visit bait stations. It is not possible to know whether gastropod disparity represents natural richness levels or is a remnant of historically higher levels of biodiversity. Regardless, priority should be given to investigating the low vertebrate richness levels in the Coeur d'Alenes.

Selkirk Mountain marten (*Martes americana*)
Photo credit: Lacy Robinson

Fisher Results
Fisher Summary (Table 4-4) - Forty-six individual fisher (25 males, 20 females, 1 unknown gender) were detected in our study area. We detected 1 individual female in the Coeur d'Alenes, 9 individuals in the Saint Joe (5 males, 4 females), 1 individual male in the Selkirks, and 35 individuals in the West Cabinets (19 male, 15 female, 1 unknown gender). Fisher not identifiable to individual were detected in the Coeur d'Alenes (*n* = 2 detections), Saint Joe (*n* = 4 detections), and West Cabinets (*n* = 10 detections). Fisher were not detected in the Purcells.

Summer Fisher Hair Snares - We detected 0 fisher using the summer hair snare method.

Incidental Fisher Trapping Captures - Eight fisher mortalities (3 males, 5 females) incidental to licensed public trapping were recorded within the study area from 2010-2014 (Table 4-4; Map 4-3). One male fisher was captured in a MBI wolverine live trap on March 29, 2011. This animal was released unharmed after a hair sample was collected.

Bait Stations (Fisher) - We detected fishers at 58 bait stations in 46 cells (Map 4-3). We detected a total of 39 individuals through DNA analysis (22 males, 16 females, 1 unknown gender). Fisher were detected in the Selkirks (*n* = 1), West Cabinets (*n* = 33), Coeur d'Alenes (*n* = 1), and Saint Joe. (*n* = 4) (Table 4-4; Map 4-3). Fisher were not detected in the Purcells. Over five survey seasons, we recaptured a total of 8 fisher from previous Years at bait stations, all in the West Cabinets.

Fisher Mitochondrial DNA Haplotypes - Control region mtDNA haplotypes were determined for 19 individual fishers. Mid-western origin haplotypes 5 (*n* = 9) and 10 (*n* = 6) and British Columbia origin haplotype 4 (*n* = 4) were found (Drew et al. 2003, Vinkey et al. 2006) (Table 4-4; Map 4-4).

Fisher (*Pekania pennanti*) at bait station in West Cabinet Mountains.

Fisher Status

Fisher were sparsely distributed across the southern portion of the study area and, consistent with other recent surveys (Knetter and Hayden 2008, Albrecht and Heusser 2009), less abundant in the Coeur d'Alenes than Saint Joe Mountains.

West Cabinet Fisher - The relatively high West Cabinet fisher concentration is likely the result of the augmentation effort that occurred in the late 1980s and early 1990s when 110 fisher were released in both the East and West Cabinet mountains (Vinkey et al. 2006). Subsequent West Cabinet surveys detected fisher (Knetter and Hayden 2008, Vinkey 2003) in portions of the range. MBI surveys were the first comprehensive fisher survey of the West Cabinets since the augmentation.

The majority of West Cabinet haplotypes were of mid-western origin (Haplotypes 5 and 10: Drew et al. 2003). This would be expected as that was the source population for the augmentation (Vinkey et al. 2006). However, fisher of British Columbia origin (Haplotype 4; Drew et al. 2003) were also detected. Although the occurrence of Haplotype 4 indicates at least some genetic in-flow to the West Cabinets, the paucity of fisher in adjoining mountain ranges suggests the West Cabinets have limited connectivity with adjoining mountain ranges. Our results suggest the augmentation was successful in establishing a West Cabinet fisher population but obstacles remain to connectivity with other mountain ranges.

Selkirk Fisher - Hair snare surveys reliably detected small numbers of fisher in the Selkirks in the first decade of the 2000's (Cushman et al. 2008, McCall et al. 2006, Knetter and Hayden 2008). The 1 Selkirk male we detected was first detected during a previous project (K. Pilgrim, U.S. Forest Service, personal communication) in 2005. The MBI project detected this male in 2010 approximately 2 km from the 2005 detection. In 2011 we captured this male in a wolverine trap 23 km north of the 2010 detection well outside of what would be the limits of the mean northern Rockies male fisher home range of 98.2km^2 (Sauder and Rachlow 2014).

We were surprised to detect only 1 fisher in the Selkirks for 3 reasons: 1) recent detections of multiple fisher individuals by other surveys, 2) abundant modeled suitable Selkirk habitat (Olson et al. 2014), and 3) the well forested MacArthur wildlife corridor is thought to provide a means of gene flow for wildlife between the Selkirk and West Cabinet Mountain Ranges (Davidson 2003, Cushman et al. 2006, Schwartz et al. 2009). Possible reasons for low Selkirk fisher numbers include: 1) an unidentified mortality source in the Selkirks, 2) modeled habitat is not actually suitable (Olson et al. 2014), 3) the West Cabinets fisher population is not at carrying capacity and surplus individuals are not available to disperse, and 4) the MacArthur corridor or other potential corridors are not permeable to fisher. Examining these scenarios would be the next logical step in Selkirk fisher conservation.

Lynx Results
Lynx Summary (Table 4-5) - Five individual lynx (2 males, 3 females) were detected in our study area. We detected 1 individual male in the Selkirks, 3 individuals (1 male, 2 females) in the Purcells, and 1 individual female in the West Cabinets. Lynx not identifiable to individual were detected in the Purcells (n = 18 detections) and West Cabinets (n = 1 detection). Lynx were not detected in the Coeur d'Alenes or Saint Joe.

Summer Lynx Hair Snares - We detected 0 lynx using the summer hair snare method.

Canada lynx (*Lynx canadensis*) at bait station in Purcell Mountains.

Incidental Lynx Trapping Captures - From 2010-2014, 3 lynx were incidentally captured by licensed trappers targeting other species. On December 12, 2012, a juvenile female was captured approximately 9 miles northeast of Bonners Ferry, ID. The trapper mistakenly identified the animal as a bobcat and shot her in the trap. One lynx was captured near Naples, ID in January 2014 and was released alive by the trapper. One adult female was captured near Naples on January 29, 2014. The trappers called IDFG and she (LF1) was fitted with an ARGOS satellite collar and released. In July, 2015, LF1's collar released as programmed, and we lost contact with her.

Opportunistic Lynx Observations - We collected 3 lynx scats opportunistically during field work. One scat was collected February 4, 2011 and DNA analysis matched this scat to a male detected in 2012 at a bait station in the Purcell Mts. The remaining two scats were collected in December, 2013 and were identified as a new female individual and as a female with DNA not of high enough quality to identify her to individual (Table 4-5).

Bait Stations (Lynx) - Lynx were detected at two different bait stations: one in the Selkirks in 2010 and the second in 2012 in the Purcells (Map 4-5). Both lynx were genetically identified as males and the male detected in 2012 was also detected from a scat sample collected in 2011.

Summer Lynx Remote Cameras - During the summer of 2012, we deployed 4 cameras from July 27-September 11 in the Purcells (180 trap nights). We detected lynx 7 times during 6 different 24 hour periods on 3 different cameras. In 2014, we deployed 4 cameras from June 19-September 22 and 4 additional cameras from July 26-September 22 in the West Cabinets (612 trap nights). We detected the radio-collared lynx, LF1, on August 10 and July 2, 2014 on two different cameras.

LF1 was travelling without kittens each time she was photographed (*n* = 2) by remote cameras in 2014. This lynx is identified as LF1 because it is wearing a radio-collar.

LF1 Reproductive Assessment - We used remote cameras to obtain images of LF1 during the summer of 2014 to determine if she was travelling with kittens. In 2014 and 2015, we mapped LF1's ARGOS locations to determine if location clustering indicative of denning activity (Olson et al. 2011) had occurred. We obtained 2 images (July 2 and August 10, 2014) of LF1, neither of which showed kittens travelling with her. LF1's collar released as scheduled in summer 2015 and no cameras were deployed in the area to determine if she was with kittens before she could have been photographed with the collar which would positively identify her. Clusters indicating denning were not observed in either 2014 or 2015 and we therefore did not initiate follow-up field efforts to confirm reproduction. The ARGOS collar LF1 was fitted with did not collect locations as often or of as high quality as the GPS collars used in Olson et al. (2011) and may not have indicated denning activity had it occurred. Regardless, we found no evidence that LF1 produced viable kittens in 2014 or 2015.

Lynx Parent-offspring Relationships - All 3 female lynx shared alleles at each of 10 micro-satellite markers. Although 10 loci do not give us enough power to definitively assess parentage, this would be consistent with a parent and offspring relationship. The 2 male lynx did not have genetic structure consistent with a parent offspring relationship with each other or the 3 females.

Lynx Status

We consistently detected lynx within designated critical habitat (USFWS 2014b) in the Purcell Mountains. The home range of radio-collared lynx, LF1, in the West Cabinets was entirely outside of designated critical habitat (Map 4-6). Occasionally, we detected lynx outside of critical habitat in the Purcells and Selkirks.

Our project is the first comprehensive lynx survey across the Idaho Panhandle, although more limited surveys have also detected lynx in the Coeur d'Alene and Saint Joe Mountains from 2006-2007 (Albrecht and Heusser 2009) or failed to detect lynx from 2004-2006 (Patton 2006).

Although bait stations have proven effective at detecting lynx (SCCM 2014) in areas of high lynx density, our bait stations only detected 2 of 5 MBI individuals. Bait stations and other methods appear less likely to detect lynx in areas of lower density and it was only through a combination of detection tools that we were able to identify 5 individuals. Consistent with other studies (Long et al. 2007), rub pads (McKelvey 1999) performed particularly poorly, detecting 0 lynx (and only 4 bobcats; Map 4-22) in areas of confirmed lynx occurrence. We did not detect lynx at bait stations in areas of confirmed lynx occurrence in the West Cabinets possibly due to fisher presence. Fisher are a primary lynx predator (Augusta et al. 2012) and we suspect lynx might avoid bait stations used by fisher. Un-baited remote cameras detect lynx consistently in areas of confirmed occurrence and we suggest bait station surveys which detect fisher, but not lynx, be followed up by un-baited trail camera surveys (Weingarth et al. 2015) to further evaluate lynx presence in an area.

Wolverine Results

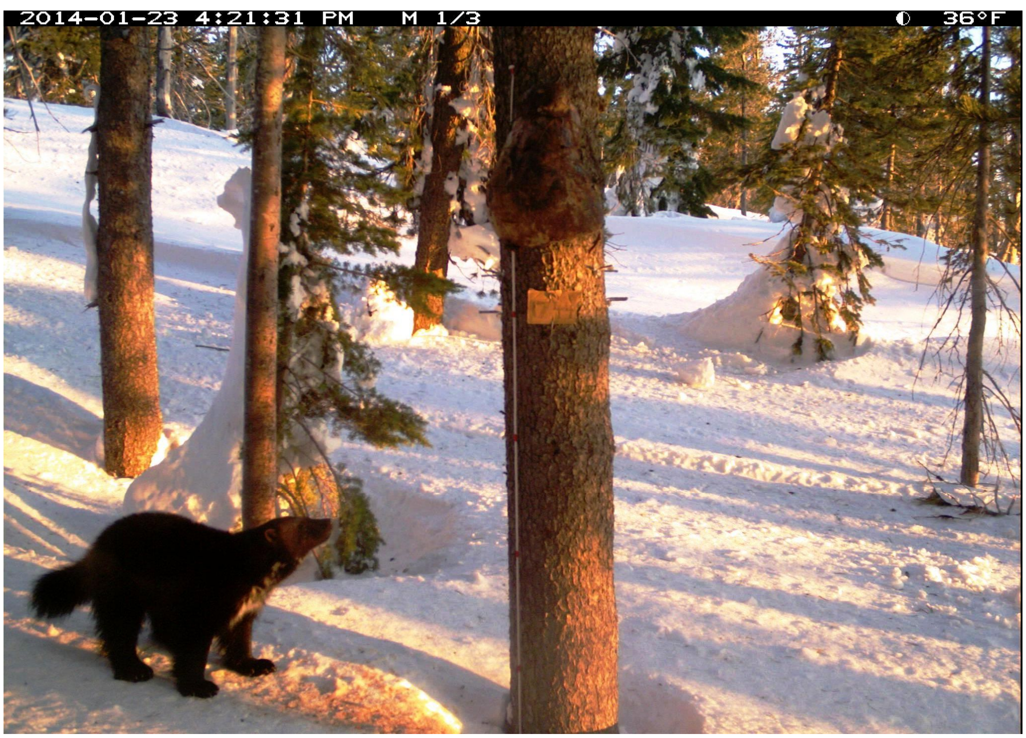
Wolverine Summary (Table 4-6) - Three individual male wolverine were detected in our study area. We detected 1 individual male in the Selkirks and 2 individual males in the Saint Joe. Wolverine not identifiable to individual were detected in the Selkirks (n = 1 detection), Saint Joe (n = 3 detections), and West Cabinets (n = 2 detections). Wolverine were not detected in the Coeur d'Alenes or Purcells.

Opportunistic Wolverine Observations - We collected one wolverine scat sample in 2011, which was identified to L11S1, the resident male detected at 3 bait stations. Five sets of wolverine tracks were observed during the 2010-2011 winter season: 2 sets in the Selkirks and 3 sets in the West Cabinets (Table 4-6).

Opportunistically detected wolverine (*Gulo gulo*). Selkirk Mountains.
Photo credit: Lydia Allen, IPNF

Wolverine Trapping Effort - Wolverine traps were deployed for a total of 1,058 trap nights over the three seasons of trapping: 2011 (2 traps, 82 trap nights), 2012 (3 traps, 142 trap nights), and 2014 (15 traps, 834 trap nights; Map 4-8). No wolverines were trapped over these 3 seasons. Incidental captures include 1 fisher (2014), 3 bobcats (*Lynx rufus*) (2014), and 3 martens (1 in 2011, 2 in 2014). We obtained a hair sample from all non-target animals using a gun brush taped to a stick. They were all released unharmed.

Bait Stations (Wolverine) - We detected wolverines at 8 bait stations in 8 survey cells (Map 4-7). The three most northern detections in the Selkirks were of the same male, L11S1 (Table 4-6). These detections occurred in 2010, 2012, and 2013 and we therefore conclude that this was a resident animal. The remaining 2 detections were both identified through DNA analysis as two different males and they occurred in 2014 in the Saint Joe. An additional 3 bait stations in the Saint Joe detected wolverine by camera but DNA samples failed to produce an individual genotype.



Wolverine (*Gulo gulo*) at bait station. Saint Joe Mountains.

Wolverine Parent-offspring Relationships - None of the 3 wolverine identified showed a genetic pattern of parent-offspring relation.

Wolverine Status

A substantial portion of our study area has been identified as wolverine habitat (Copeland et al. 2010, Inman et al. 2013; Map 4-9) and the USFWS considers all modeled wolverine habitat within the study area to be occupied (USFWS 2013). Our field surveys documented only 3 unrelated males and a handful of detections of unknown individuals scattered across the landscape (Table 4-6). These findings are consistent with more limited wolverine surveys on the Coeur d'Alene-Saint Joe divide (Hayden et al. 2001, Bowers et al. 2003, Bowers et al. 2003).

Despite the scarcity of actual wolverines on the landscape, a large portion of the study area has been identified as important for wolverine conservation. The MacArthur Corridor was identified as a wolverine dispersal pathway (Schwartz et al. 2009) and a majority of the IDFG Panhandle Administrative Region is designated as wolverine priority conservation areas (IDFG 2014). We conclude there are fewer wolverines within the study area than estimated carrying capacity (Inman et al. 2013) and we found no evidence of reproduction within the study area.

Grizzly Bears

Grizzly Bear Summary (Table 4-7) - We conducted targeted grizzly bear surveys in the Selkirks only. Four individual grizzly bears (3 males, 1 female) were detected in the Selkirks. Grizzly bears not identifiable to individual were detected in the Selkirks (n = 1 detection) and Purcells (n = 1 detection).

Grizzly Bear Hair Snare Corrals - During the summer of 2010, we detected grizzly bears at 2 (1%) and black bears at 125 (73%) of 172 bear hair snare corrals (Map 4-10). Of 1,142 hair samples submitted from bear corrals, 766 (67%) successfully produced a species identification. Seven (1%) samples identified as grizzly bear, 718 black bear (94%), and 41 (5%) were from non-bear mammals. The 7 grizzly bear samples represent 2 individual males and a sample from an unknown individual from 2 different cells (Table 4-7; Map 4-11). We also collected hair from a grizzly bear in a third cell at a fisher hair snare box. The sample was high enough quality to identify the species but not the individual. Black bears were not genotyped to individual.

Black bears were consistently detected at hair corrals across the study area but grizzly bears were detected at only 2 corrals. A comparable US Selkirk study detected grizzly bears at < 1% of bear hair corrals in 2003 and 2004 (S. Cushman, US Forest Service, personal communication). Similarly, our 2010 survey detected grizzly bears at 1% of stations, indicating this species occurs in low numbers in the US Selkirks.

Grizzly bear (*Ursus arctos*) at Selkirk Mountain hair snare corral. Selkirk Mountains.

Opportunistic Grizzly Bear Observations - We collected two grizzly bear hair samples opportunistically (Table 4-7; Map 4-11). Both were genotyped and represented two male individuals, one of which was previously detected at a bait station. We also obtained one image of a grizzly bear on a trail camera.

Bait Stations (Grizzly Bears) - We detected grizzly bears at 2 bait stations. One was genotyped a female and DNA was not collected from the other (Table 4-7; Map 4-11).

Grizzly Bear Parent-offspring Relationships - Two of the 4 grizzly bears we detected were placed in a parent (father, C134B2V2) offspring (daughter, BronsonV2K) relationship.

Conclusions

Our bait station surveys represent the first comprehensive inventory of forest carnivores and their associates in the Idaho Panhandle and adjoining mountain ranges. This baseline inventory sets the stage for long term monitoring which we recommend be implemented to assess changes in species abundance and distribution over time.

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Table 4-1. Species and genera detected by remote camera and DNA analysis at forest carnivore bait stations in the Idaho Panhandle and surrounding drainages during the winters of 2010-2014.

Species	Latin Name	Camera Only	DNA Only	Camera+DNA	DNA Total	Camera Total	Total # of Stations detecting species by either camera or DNA (% of total stations surveyed))	median days to first detection*	Mean elevation of species detected (m)**
Marten	*Martes americana*	49	10	207	217	256	266 (54)	7.0	1467
Red squirrel	*Tamiasciurus hudsonicus*	193	1	4	5	197	198 (40)	19.0	1342
Flying squirrel	*Glaucomys sabrinus*	183	1	9	10	192	193 (39)	13.0	1189
Weasel	*Mustela spp.*	108	2	4	6	112	114 (23)	10.5	1209
Gray jay*	*Perisoreus canadensis*	74	0	0	0	74	74 (15)	12.5	1410
Snowshoe hare*	*Lepus americanus*	70	0	0	0	70	70 (14)		
Steller's jay*	*Cyanocitta stelleri*	62	0	0	0	62	62 (12)	15.5	1450
Fisher	*Pekania pennanti*	9	1	48	49	57	58 (12)	12.0	1289
Moose*	*Alces alces shirasi*	55	0	0	0	55	55 (11)		
Coyote*	*Canis latrans*	50	0	0	0	50	50 (10)	27.0	1267
Bobcat	*Lynx rufus*	21	2	27	29	48	50 (10)	19.0	1148
White-tailed deer*	*Odocoileus virginianus*	37	0	0	0	37	37 (7)		
Elk*	*Cervus elaphus*	33	0	0	0	33	33 (7)		
Raven*	*Corvus corax*	23	0	0	0	23	23 (5)		
Human*	*Homo sapiens*	22	0	0	0	22	22 (4)		
Wolf*	*Canis lupus*	16	0	0	0	16	16 (3)		
Black bear	*Ursus americanus*	14	1	1	2	15	16 (3)		
Clark's nutcracker*	*Nucifraga columbiana*	13	0	0	0	13	13 (3)		
Mouse	*Peromyscus spp.*	10	0	0	0	10	10 (2)		
Mink	*Mustela vison*	2	0	7	7	9	9 (2)		
Raptor*	*Accipitridrae*	9	0	0	0	9	9 (2)		
Wolverine	*Gulo gulo*	2	0	6	6	8	8 (2)	29.0	1567
Red Fox	*Vulpes vulpes*	4	0	2	2	6	6 (1)		
Mule deer*	*Odocoileus hemionus*	5	0	0	0	5	5 (1)		
Raccoon	*Procyon lotor*	2	0	1	1	3	3 (1)		
Cougar	*Puma concolor*	3	0	0	0	3	3 (1)		
Canada lynx	*Lynx canadensis*	0	0	2	2	2	2 (0)	43.0	1747
Grizzly bear	*Ursus arctos*	1	0	1	1	2	2 (0)		
Striped skunk	*Mephitis mephitis*	0	0	1	1	1	1 (0)		
Total		1070	21	321	342	1391	1412		

Table 4-2. Camera failures experienced at forest carnivore bait stations in North Idaho and surrounding drainages, winters 2010-2014.

Camera Model	# of Stations Deployed	Camera not triggering for all detections	Technical failure of camera	IR failed	Possible battery failure (pics end for no reason)	Pics start late or very few pics for no reason	Total Camera-related failures (% of total deployed)
Reconyx PC800	156	2			5	2	9 (6)
Reconyx PC900	141	5	2	2	7	1	17 (12)
Reconyx RC55	90		1		2	3	6 (7)
Reconyx RM45	30			1	1		2 (7)
Reconyx HC600	7					1	1 (14)
All Reconxy models	424	7	3	3	15	7	35 (8)
Moultrie M-80xt	63	24			4	1	29 (46)
Trailwatcher	3			1		1	2 (67)
Bushnell Trophy Cam	2	1					1 (50)
Total- All Models	497	32	3	4	19	9	67 (13)

Table 4-3. Success of DNA analysis for samples collected at forest carnivore bait stations in North Idaho and surrounding drainages, winters 2010-2014.

year	# of stations surveyed	mean # days deployed	# of stations revisited	mean # days between revisits	Total # sampling sessions	total # samples collected	total # samples submitted for species ID	total # samples producing species ID	% of successful species ID brushes	total # samples submitted for genotype	total # samples producing genotype	% of successfully genotyped brushes
2010	16	89	16	44	32	124	124	104	84	21	10	48
2011	17	34	12	18	29	337	184	161	88	132	86	65
2012	86	54	24	29	122	1037	216	201	93	80	61	76
2013	97	45	6	27	99	703	139	125	90	13	7	54
2014	281	46	0	-	281	1744	348	310	89	56	37	66
Total	497				563	3945	1011	901		302	201	

Table 4-4. Individual fishers detected at forest carnivore bait stations and opportunistically in the Idaho Panhandle and adjacent mountain ranges during 2010-2014 field surveys. Reported coordinates are accurate to within 500 meters of actual location.

Individual	Gender	Mt. Range	Date	ID Method	Latitude	Longitude	Haplotype
R11H1	M	Selkirks	1/21/10	Bait Station (Photo+DNA)	48.72342	-116.74145	5
R11H1	M	Selkirks	3/29/11	Incidental Research Capture (Live Animal)	48.92077	-116.76647	5
SparV1K	M	W. Cabinets	1/22/11	Bait Station (Photo+DNA)	48.27466	-115.96271	4
BlueV1G	M	W. Cabinets	1/23/11	Bait Station (Photo+DNA)	48.11129	-116.01456	5
AuxorV1E	M	W. Cabinets	1/25/11	Bait Station (Photo+DNA)	48.27590	-116.25230	5
RossV1A	F	W. Cabinets	1/30/11	Bait Station (Photo+DNA)	48.19604	-115.95999	10
RossV1A	F	W. Cabinets	1/14/12	Bait Station (Photo+DNA)	48.19406	-115.96034	10
RossV2A	F	W. Cabinets	1/30/11	Bait Station (Photo+DNA)	48.19604	-115.95999	10
RossV2A	F	W. Cabinets	1/23/12	Bait Station (Photo+DNA)	48.27494	-115.96325	10
RossV2J	F	W. Cabinets	1/30/11	Bait Station (Photo+DNA)	48.19604	-115.95999	10
RossV2J	F	W. Cabinets	1/17/12	Bait Station (Photo+DNA)	48.20489	-115.95380	10
KeelerV2A	F	W. Cabinets	2/2/11	Bait Station (Photo+DNA)	48.31671	-116.08524	Unknown
KeelerV2A	F	W. Cabinets	12/26/11	Bait Station (Photo+DNA)	48.26618	-116.07237	Unknown
RattleV1E	F	W. Cabinets	2/3/11	Bait Station (Photo+DNA)	48.33088	-116.17650	5
RattleV2D	M	W. Cabinets	2/3/11	Bait Station (Photo+DNA)	48.33088	-116.17650	10
SmithV1F	F	W. Cabinets	2/3/11	Bait Station (Photo+DNA)	48.47427	-116.14400	5
SmithV1F	F	W. Cabinets	2/3/12	Bait Station (Photo+DNA)	48.47532	-116.14540	5
SmithV1F	F	W. Cabinets	1/22/13	Bait Station (Photo+DNA)	48.46008	-116.11545	5
SmithV2D	F	W. Cabinets	2/3/11	Bait Station (Photo+DNA)	48.47427	-116.14400	5
W3IV2	M	W. Cabinets	2/3/11	Bait Station (Photo+DNA)	48.47427	-116.14400	Unknown
W3IV2	M	W. Cabinets	11/11/11	Bait Station (Photo+DNA)	48.54221	-116.22678	Unknown
W3IV2	M	W. Cabinets	11/15/11	Bait Station (Photo+DNA)	48.50131	-116.30313	Unknown
EastforkV1A	M	W. Cabinets	2/3/11	Bait Station (Photo+DNA)	48.24739	-116.11533	4
EastforkV1A	M	W. Cabinets	12/26/11	Bait Station (Photo+DNA)	48.24763	-116.11041	Unknown
EastforkV1C	M	W. Cabinets	2/3/11	Bait Station (Photo+DNA)	48.24739	-116.11533	5
EastforkV2E	M	W. Cabinets	2/3/11	Bait Station (Photo+DNA)	48.24739	-116.11533	Unknown
IT20142	M	Saint Joe	11/7/11	Incidental Trapping (Carcass)	47.40821	-116.31457	Unknown
W1DV2	F	W. Cabinets	11/11/11	Bait Station (Photo+DNA)	48.48549	-116.24255	5
W3LV2	F	W. Cabinets	11/11/11	Bait Station (Photo+DNA)	48.54221	-116.22678	10

Individual	Gender	Mt. Range	Date	ID Method	Latitude	Longitude	Haplotype
W3LV2	F	W. Cabinets	11/16/11	Bait Station (Photo+DNA)	48.51083	-116.19703	10
W2DV2	M	W. Cabinets	11/14/11	Bait Station (Photo+DNA)	48.49114	-116.36652	5
W70MV2	M	W. Cabinets	12/29/11	Bait Station (Photo+DNA)	48.29664	-116.17377	4
W74IV3	F	W. Cabinets	12/29/11	Bait Station (Photo+DNA)	48.27121	-116.12864	Unknown
W66AV2	F	W. Cabinets	1/7/12	Bait Station (Photo+DNA)	48.28778	-116.25527	Unknown
W66AV2	F	W. Cabinets	1/7/12	Bait Station (Photo+DNA)	48.31066	-116.26239	Unknown
W67EV3	M	W. Cabinets	1/7/12	Bait Station (Photo+DNA)	48.31066	-116.26239	5
W72KV2	F	W. Cabinets	1/28/12	Bait Station (Photo+DNA)	48.19401	-116.10147	Unknown
W33GV2	M	W. Cabinets	2/3/12	Bait Station (Photo+DNA)	48.39905	-116.09369	5
W31LV2	M	W. Cabinets	2/3/12	Bait Station (Photo+DNA)	48.53761	-116.05778	10
W50CV2	U	Saint Joe	2/8/12	Bait Station (Photo+DNA)	47.04797	-115.35403	4
W83AV2	M	W. Cabinets	2/11/12	Bait Station (Photo+DNA)	48.30344	-115.98667	Unknown
W90DV2	M	W. Cabinets	2/13/12	Bait Station (Photo+DNA)	48.07405	-115.86283	Unknown
W85FV2	M	W. Cabinets	2/24/12	Bait Station (Photo+DNA)	48.13863	-115.88323	Unknown
FC1092CV2	F	W. Cabinets	1/18/13	Bait Station (Photo+DNA)	48.33277	-116.27469	Unknown
FC1142AV2	M	W. Cabinets	1/27/13	Bait Station (Photo+DNA)	48.40229	-116.22906	Unknown
C097875(A)	M	Saint Joe	2/4/13	Incidental Trapping (Carcass)	47.41841	-116.27443	Unknown
87-87208(A)	M	Saint Joe	10/31/13	Bait Station (Photo+DNA)	47.01850	-115.36867	Unknown
87-87208(A)	M	Saint Joe	12/26/13	Incidental Trapping (Carcass)	47.02351	115.45968	Unknown
C112713(A)	F	Saint Joe	12/9/13	Incidental Trapping (Carcass)	47.40821	-116.31457	Unknown
FC1097_2014BIV2	M	W. Cabinets	12/20/13	Bait Station (Photo+DNA)	48.58676	-116.15149	Unknown
FC1097_2014BIV2	M	W. Cabinets	2/15/14	Bait Station (Photo+DNA)	48.55119	-116.27912	Unknown
87-87208(C)	F	Saint Joe	12/26/13	Incidental Trapping (Carcass)	47.03988	-115.92804	Unknown
FC1236IV2	F	W. Cabinets	12/29/13	Bait Station (Photo+DNA)	48.52174	-116.12420	Unknown
IT20141(A)	M	Saint Joe	1/3/14	Incidental Trapping (Carcass)	47.39755	-116.34831	Unknown
FC1390DV2	F	Saint Joe	1/16/14	Bait Station (Photo+DNA)	47.15188	-115.78327	Unknown
C112795(A)	F	W. Cabinets	1/19/14	Incidental Trapping (Carcass)	48.55607	-116.23504	Unknown
FC990BV2	F	Coeur d'Alenes	1/24/14	Bait Station (Photo+DNA)	47.78701	-116.38300	Unknown
FC1071BV2	M	Saint Joe	2/1/14	Bait Station (Photo+DNA)	47.39184	-116.08433	Unknown
FC1071BV2	M	Saint Joe	2/25/14	Bait Station (Photo+DNA)	47.37755	-116.28125	Unknown
87-87811	F	W. Cabinets	2/4/14	Incidental Trapping (Carcass)	48.33003	-116.30069	Unknown

Individual	Gender	Mt. Range	Date	ID Method	Latitude	Longitude	Haplotype
FC1097_2014ADV2	M	W. Cabinets	2/17/14	Bait Station (Photo+DNA)	48.53858	-116.28409	Unknown
Unknown	U	W. Cabinets	12/9/11	Bait Station (Photo)	48.21837	-116.02788	Unknown
Unknown	U	W. Cabinets	12/29/11	Bait Station (Photo)	48.29664	-116.17377	Unknown
Unknown	U	W. Cabinets	1/16/12	Bait Station (Photo)	48.24708	-115.96315	Unknown
Unknown	U	W. Cabinets	2/3/12	Bait Station (Photo)	48.39905	-116.09369	Unknown
Unknown	U	W. Cabinets	1/19/13	Bait Station (Photo)	48.46054	-116.30167	Unknown
Unknown	U	W. Cabinets	1/21/13	Bait Station (Photo)	48.27810	-116.07384	Unknown
Unknown	U	W. Cabinets	1/30/13	Bait Station (Photo)	47.13044	-115.79146	Unknown
Unknown	U	Saint Joe	1/30/13	Bait Station (Photo)	47.13071	-115.72313	Unknown
Unknown	U	Saint Joe	2/6/13	Bait Station (Photo)	47.13246	-115.98778	Unknown
Unknown	U	W. Cabinets	12/29/13	Bait Station (Photo)	48.63536	-116.17251	Unknown
Unknown	U	Saint Joe	1/12/14	Bait Station (Photo)	47.38331	-115.98754	Unknown
Unknown	U	Saint Joe	1/14/14	Bait Station (Photo)	47.13013	-115.83683	Unknown
Unknown	U	W. Cabinets	2/2/14	Bait Station (Photo)	48.24970	-116.19186	Unknown
Unknown	U	Coeur d'Alenes	3/1/14	Bait Station (Photo)	47.60283	-115.86463	Unknown
Unknown	U	Coeur d'Alenes	3/6/14	Bait Station (Photo)	47.60510	-116.13650	Unknown
Unknown	U	W. Cabinets	3/7/14	Bait Station (Photo)	48.56473	-116.17202	Unknown

Table 4-5. Individual lynx detected at forest carnivore bait stations and opportunistically in the Idaho Panhandle and adjacent mountain ranges during 2010-2014 field surveys. Reported coordinates are accurate to within 500 meters of actual location.

Individual	Gender	Mt. Range	Date	ID Method	Latitude	Longitude	Elevation (m)
Shorty2C	M	Selkirks	2/21/2010	Bait Station (DNA + Photo)	48.96050	-116.67960	1751
W12AV2	M	Purcells	2/6/2012	Bait Station (DNA + Photo)	48.99714	-116.03759	1650
W12AV3	M	Purcells	2/6/2011	Scat (DNA)	48.94313	-116.09629	1686
LF2	F	Purcells	12/29/2012	Incidental Trapping (Carcass)	48.81653	-116.27998	1011
OMG20141B	F	Purcells	12/18/2013	Scat (DNA)	48.98565	-116.06906	1321
OMG20141B	F	Purcells	3/21/2014	Scat (DNA)	48.97482	-116.07157	1365
LF1	F	W. Cabinets	1/29/2014	Incidental Trapping (Live Animal)	48.54283	-116.32148	1118
LF1	F	W. Cabinets	8/10/2014	Trail Camera	48.59039	-116.26870	1666
LF1	F	W. Cabinets	7/2/2014	Trail Camera	48.59040	-116.29497	1313
Unknown	U	Purcells	8/13/2012	Trail Camera	48.99570	-116.06813	1284
Unknown	U	Purcells	8/14/2012	Trail Camera	48.93629	-116.05739	1573
Unknown	U	Purcells	8/15/2012	Trail Camera	48.90287	-116.05258	1835
Unknown	U	Purcells	8/15/2012	Trail Camera	48.99570	-116.06813	1284
Unknown	U	Purcells	8/22/2012	Trail Camera	48.90287	-116.05258	1835
Unknown	U	Purcells	9/6/2012	Trail Camera	48.93629	-116.05739	1573
Unknown	U	Purcells	9/11/2012	Trail Camera	48.93629	-116.05739	1573
Unknown	U	W. Cabinets	Jan. 2014	Incidental Trapping (Photo)	48.57275	-116.35091	835
Unknown	U	Purcells	1/14/2014	Trail Camera	48.98565	-116.06906	1318
Likely OMG20141B	U	Purcells	1/19/2014	Scat (DNA)	48.95089	-116.06996	1414
Unknown	U	Purcells	1/23/2014	Video at Wolverine Trap	48.98565	-116.06906	1318
Unknown	U	Purcells	1/26/2014	Video at Wolverine Trap	48.98565	-116.06906	1318
Unknown	U	Purcells	1/27/2014	Video at Wolverine Trap	48.98565	-116.06906	1318
Unknown	U	Purcells	2/5/2014	Trail Camera	48.98565	-116.06906	1318
Unknown	U	Purcells	2/10/2014	Video at Wolverine Trap	48.98565	-116.06906	1318
Unknown	U	Purcells	2/14/2014	Trail Camera	48.98565	-116.06906	1318
Unknown	U	Purcells	2/17/2014	Trail Camera	48.98565	-116.06906	1318
Unknown	U	Purcells	3/21/2014	Trail Camera	48.98565	-116.06906	1318
Unknown	U	Purcells	7/31/2014	Photo, USFWS Bear Survey	48.96891	-116.09999	1854

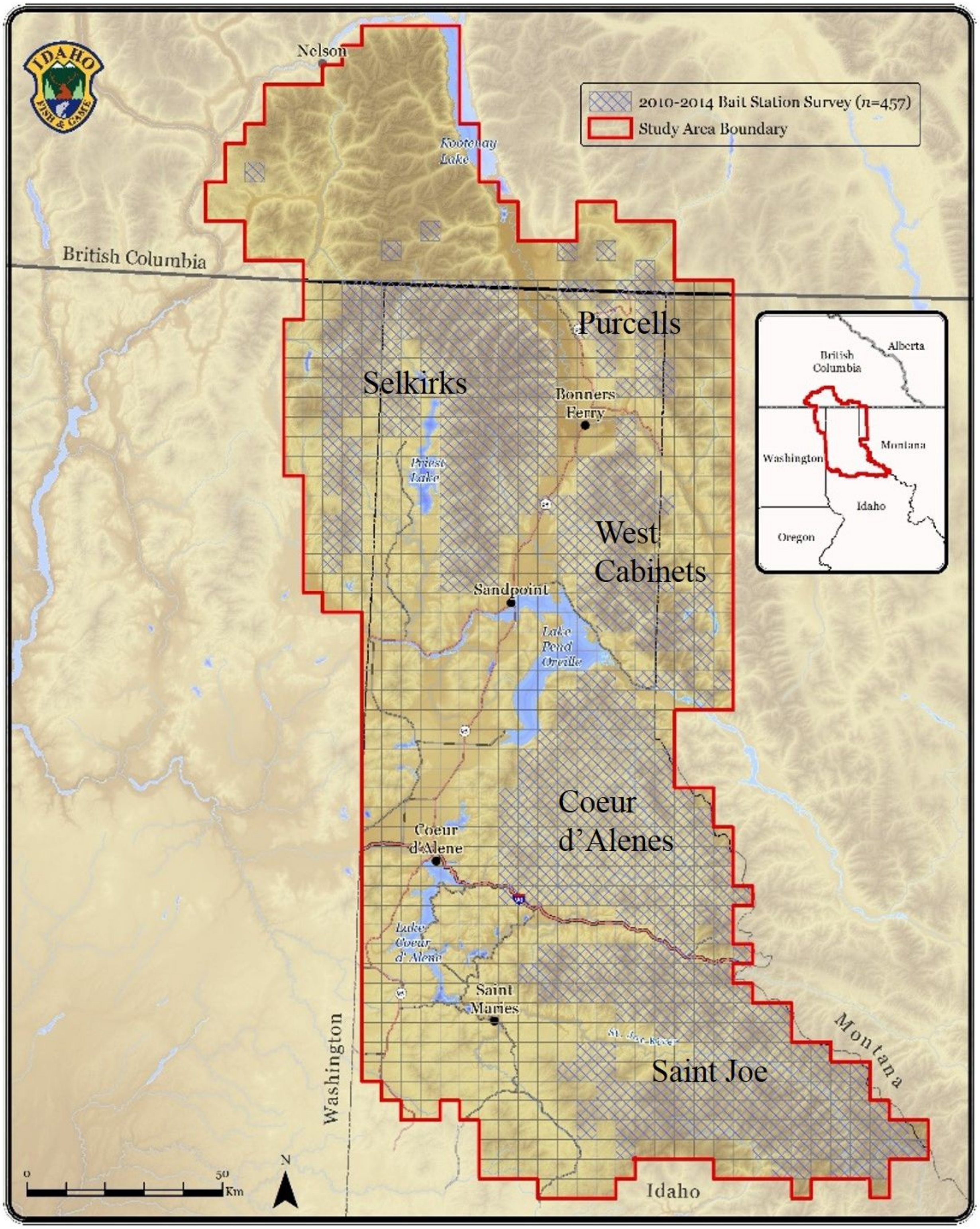
Table 4-6. Individual wolverines detected at forest carnivore bait stations and opportunistically in the Idaho Panhandle and adjacent mountain ranges during 2010-2014 field surveys. Reported coordinates are accurate to within 500 meters of actual location.

Individual	Gender	Mt. Range	Date	ID Method	Latitude	Longitude	Elevation (m)
LS11	M	Selkirks	1/27/11	Anal Secretion (DNA)	48.93619	-116.66917	1467
LS11	M	Selkirks	2/28/10	Bait Station (Photo)	48.88303	-116.80922	1447
LS11	M	Selkirks	3/14/11	Photo at Wolverine Trap	48.94954	-116.65305	1607
LS11	M	Selkirks	3/20/11	Photo at Wolverine Trap	48.94954	-116.65305	1607
LS11	M	Selkirks	12/13/11	Bait Station (Photo+DNA)	48.94582	-116.74344	1555
LS11	M	Selkirks	3/6/13	Bait Station (Photo+DNA)	49.09972	-117.02512	1588
FC1744AV2	M	Saint Joe	1/23/14	Bait Station (Photo+DNA)	47.22868	-115.30809	1764
FC1444CV2	M	Saint Joe	4/8/14	Bait Station (Photo+DNA)	47.36151	-115.70045	969
Unknown	U	W. Cabinets	1/15/11	Track (Photo)	48.23926	-116.11302	828
Unknown	U	W. Cabinets	3/24/11	Photo at Carcass	48.49971	-116.39590	882
Unknown	U	Selkirks	9/28/11	Photo at IPNF Bear Survey	48.78878	-116.60885	1848
Unknown	U	Saint Joe	11/20/13	Bait Station (Photo+DNA)	47.00672	-115.21117	1888
Unknown	U	Saint Joe	11/27/13	Bait Station (Photo)	47.07653	-115.16167	1595
Unknown	U	Saint Joe	4/10/14	Bait Station (Photo+DNA)	47.30472	-115.65991	1732

Table 4-7. Individual grizzly bears detected at forest carnivore bait stations and opportunistically in the Idaho Panhandle and adjacent mountain ranges during 2010-2014 field surveys. Reported coordinates are accurate to within 500 meters of actual location.

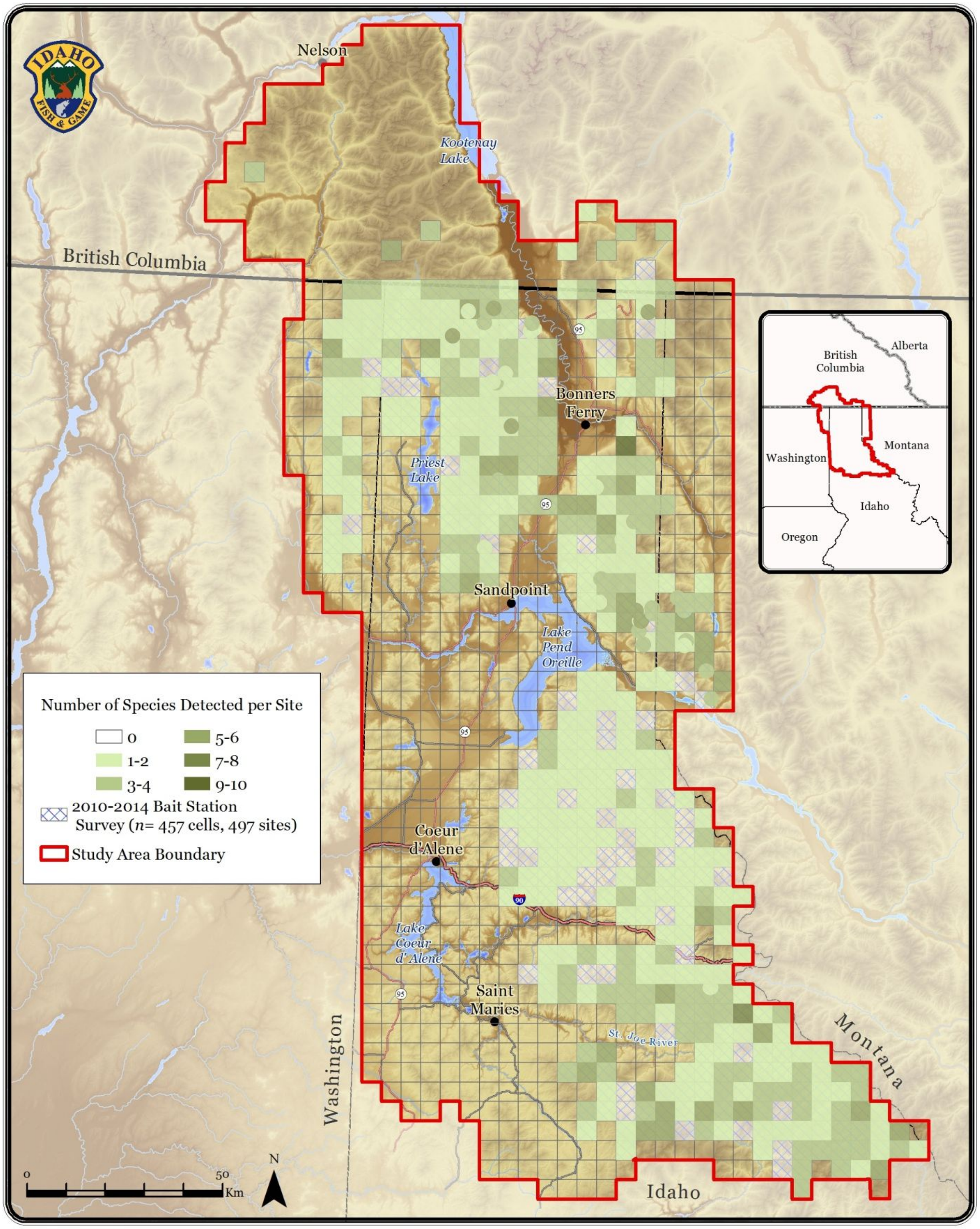
Individual	Gender	Mt. Range	Date	ID Method	Latitude	Longitude	Elevation (m)
C134B2V2	M	Selkirks	7/4/10	Bear Corral (DNA)	48.64205	-116.62307	1375
C134B2V2	M	Selkirks	4/12/12	Opportunistic Hair (DNA)	48.67865	-116.57740	1350
C81B10V1	M	Selkirks	7/16/10	Bear Corral (DNA)	48.82047	-116.94496	766
BronsonV2K	F	Selkirks	4/12/11	Bait Station (DNA+Photo)	48.92823	-116.51243	702
OMGR112	M	Selkirks	4/7/12	Opportunistic Hair (DNA)	48.95316	-116.55853	608
Unknown	U	Selkirks	8/1/10	Fisher Box (DNA)	48.81108	-117.24235	1240
Unknown	U	Purcells	9/10/12	Trail Camera	48.93629	-116.05739	1573
Unknown	U	Selkirks	5/22/14	Bait Station (Photo)	48.98668	-116.94183	976

Multi-species Baseline Initiative: Cells Surveyed With Winter Bait Stations



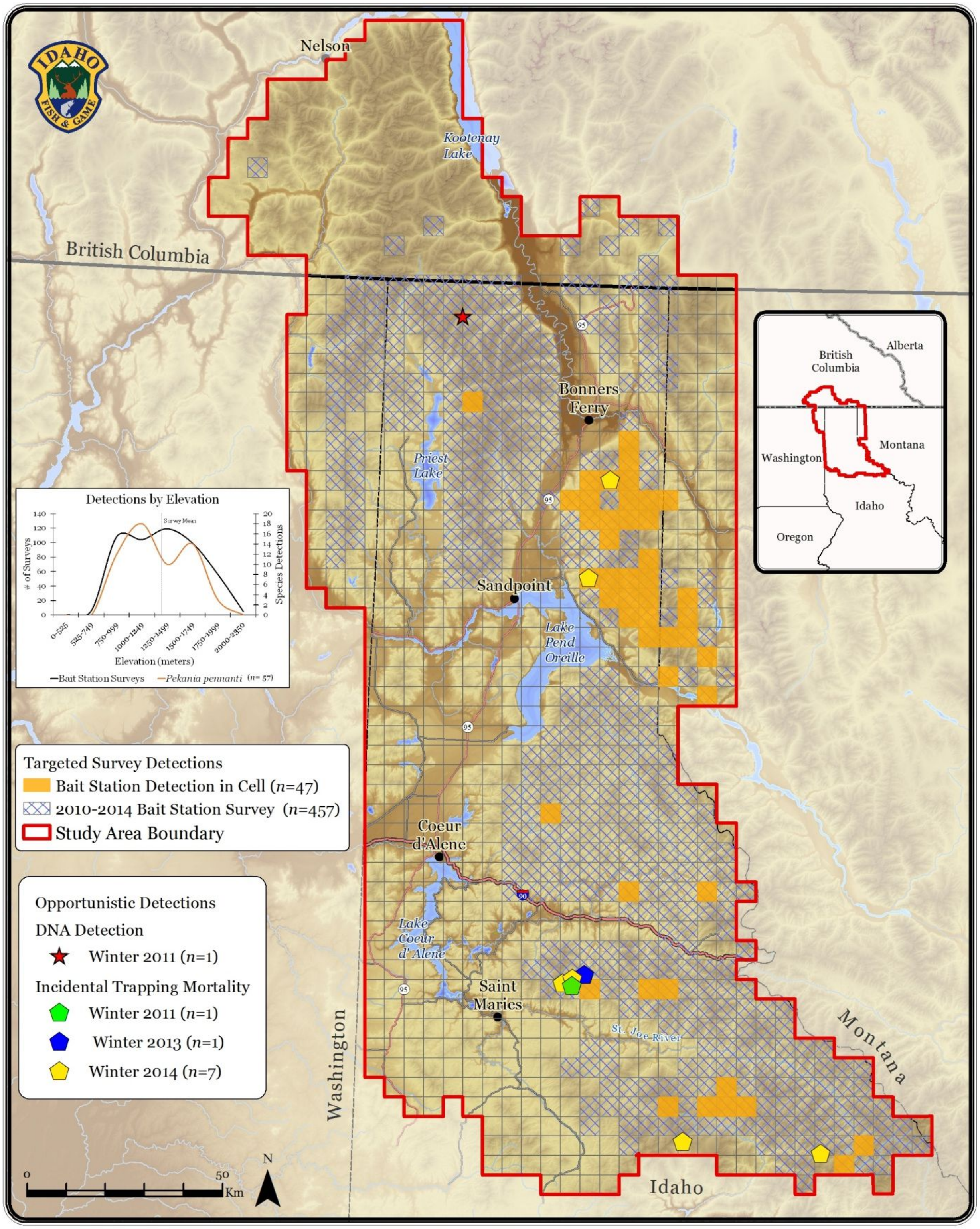
Map 4-1. 457 5x5 km cells surveyed using the winter bait station method 2010-2014.

Multi-species Baseline Initiative: Bait Station Species Richness



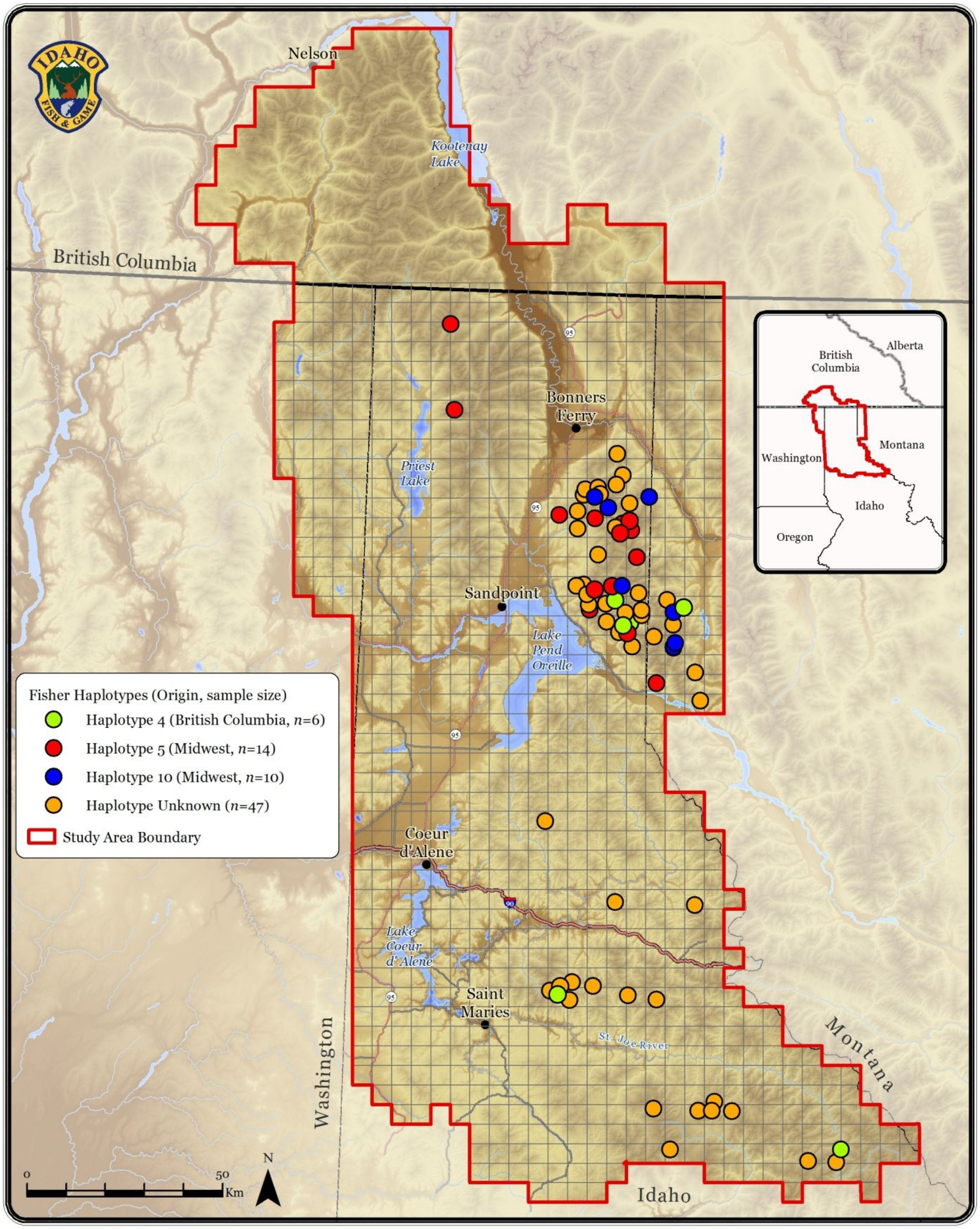
Map 4-2. Number of species detected during bait station surveys conducted from 2010-2014.

Multi-species Baseline Initiative: Fisher (*Pekania pennanti*) Detections



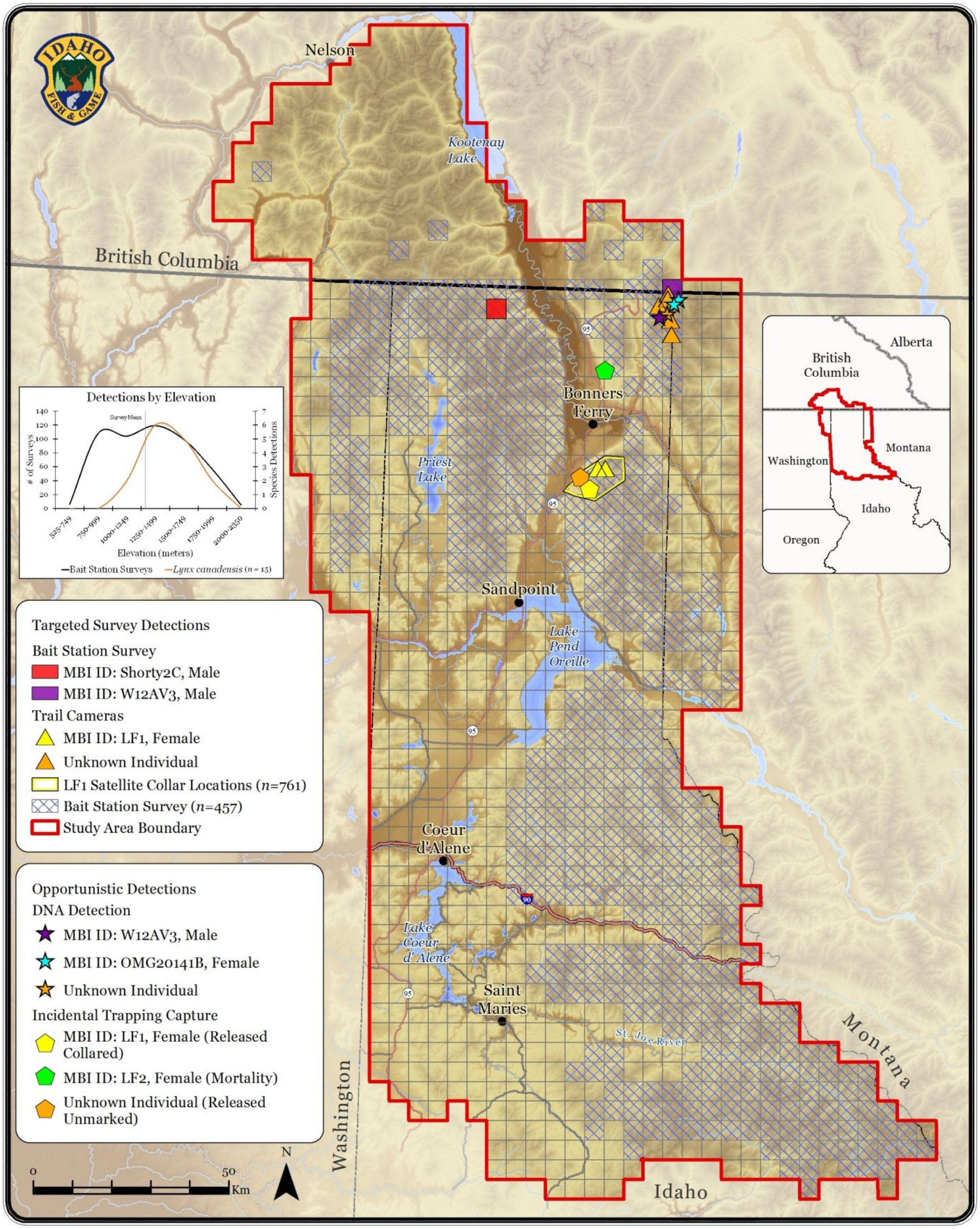
Map 4-3.

Multi-species Baseline Initiative: Fisher (*Pekania pennanti*) Control Region mtDNA Haplotypes



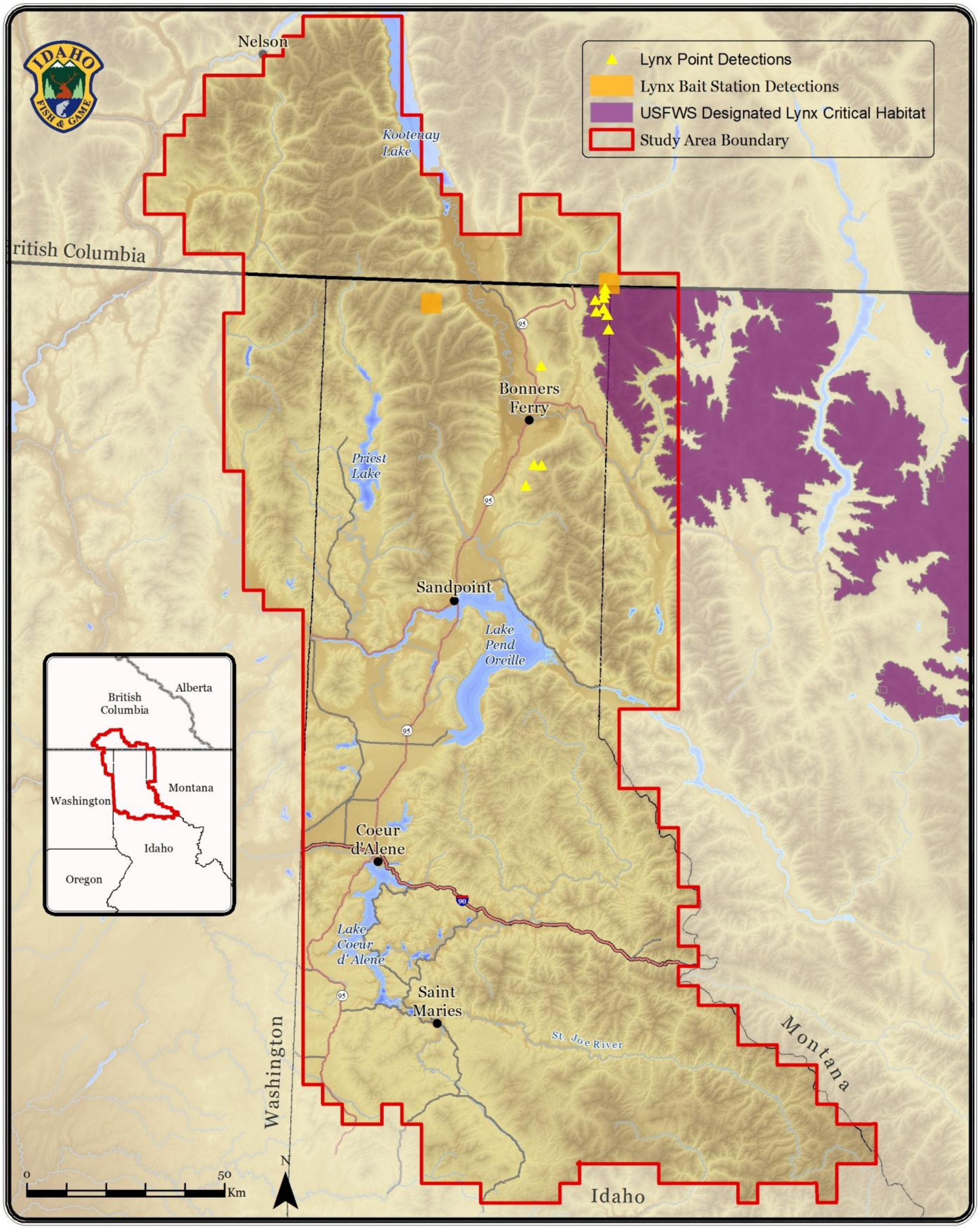
Map 4-4.

Multi-species Baseline Initiative: Canada Lynx (*Lynx canadensis*) Detections



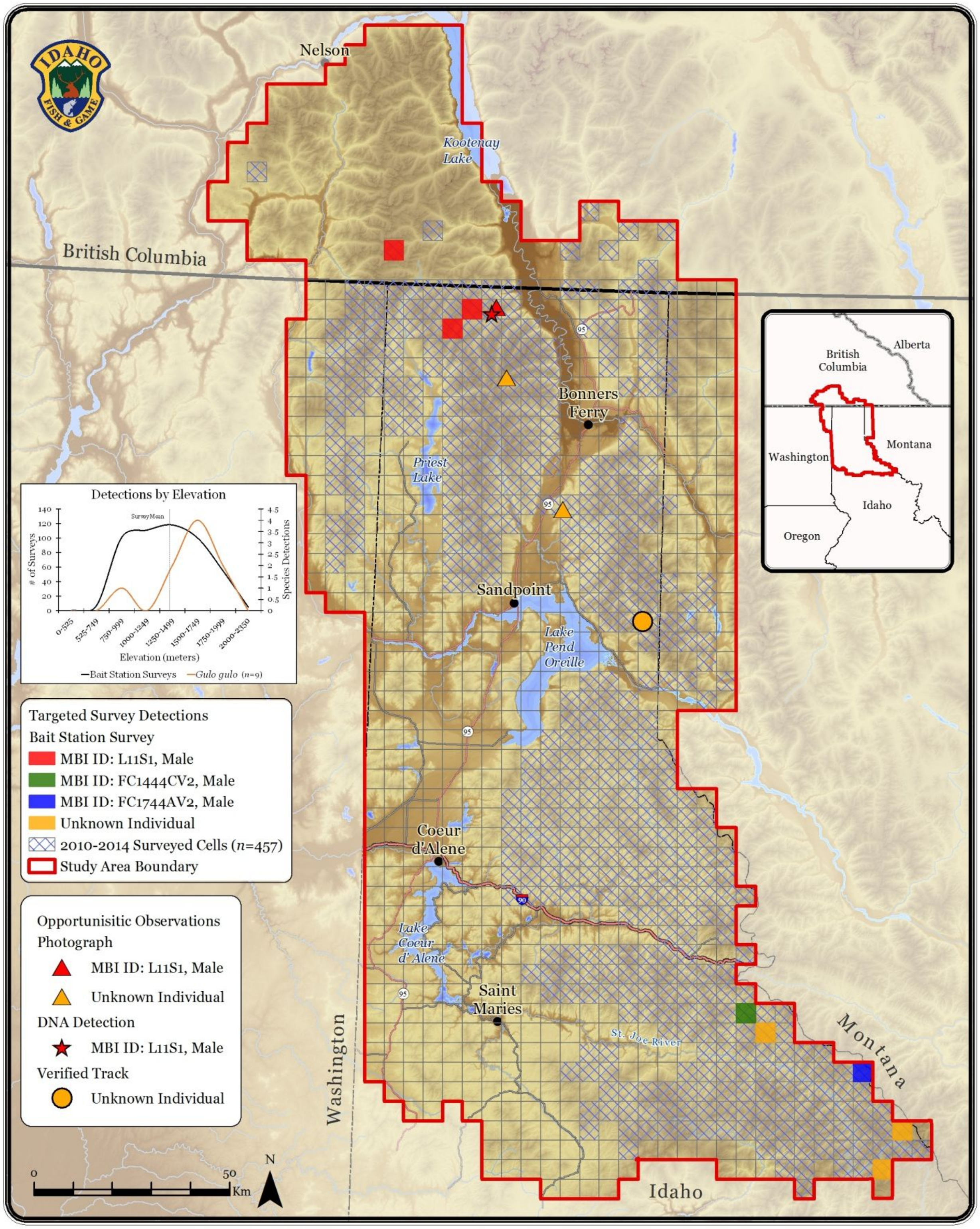
Map 4-5.

Multi-species Baseline Initiative: Lynx Detections and Critical Habitat



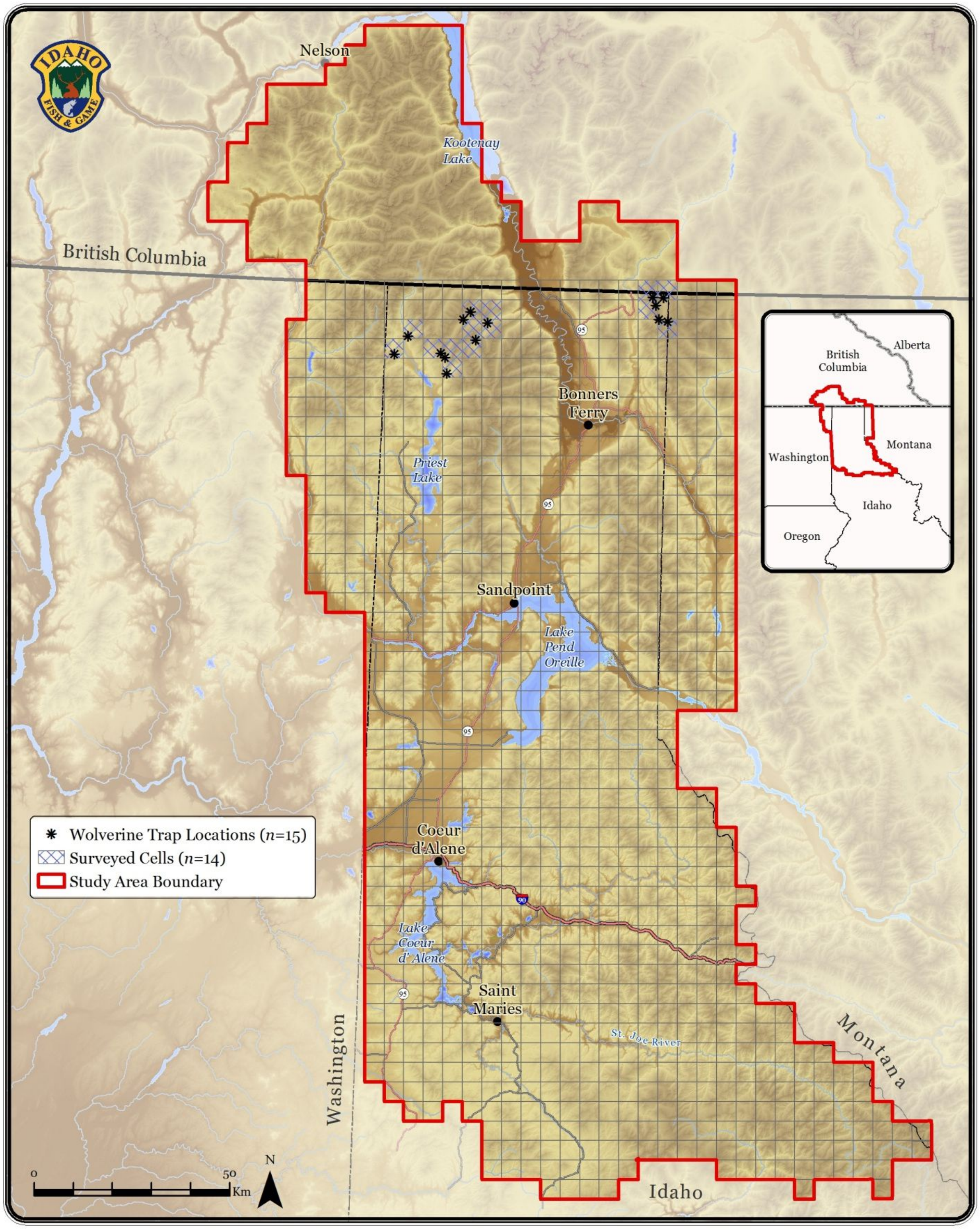
Map 4-6. USFWS designated critical lynx habitat and lynx detections in the Idaho Panhandle and adjacent mountain ranges from 2010-2014.

Multi-species Baseline Initiative: Wolverine (*Gulo gulo*) Detections



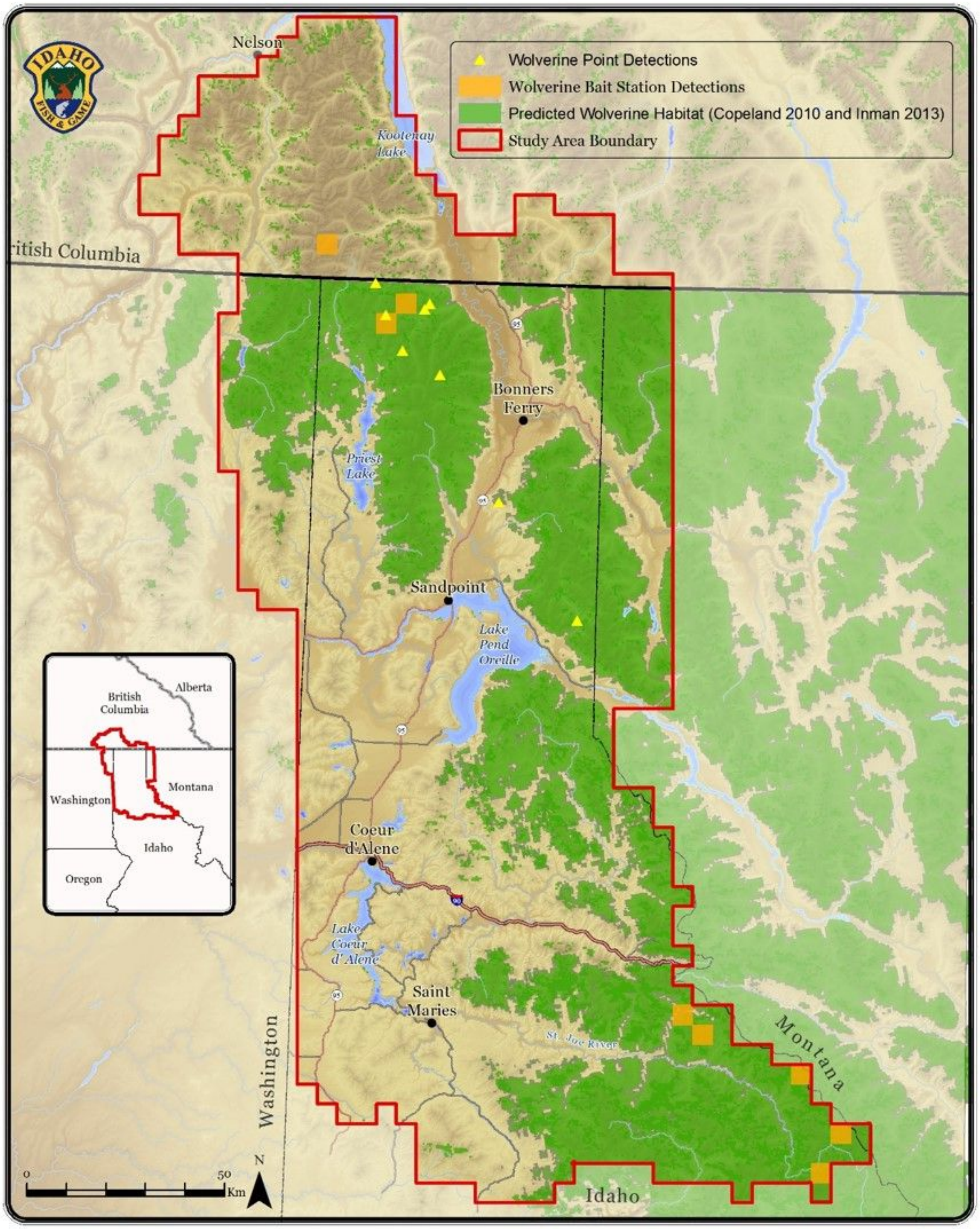
Map 4-7.

Multi-species Baseline Initiative: Wolverine (*Gulo gulo*) Trap Locations



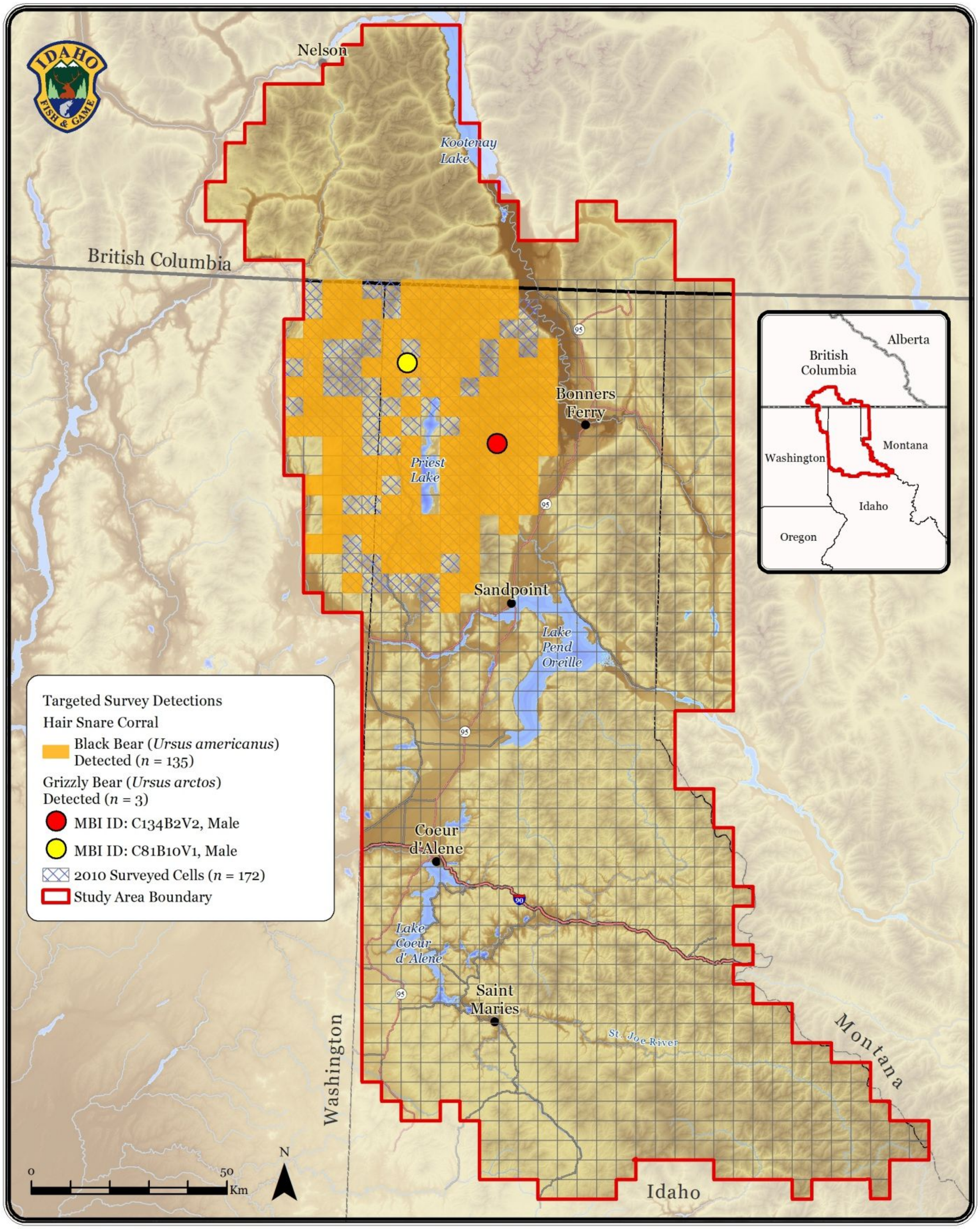
Map 4-8.

Multi-species Baseline Initiative: Wolverine Detections and Predicted Wolverine Habitat



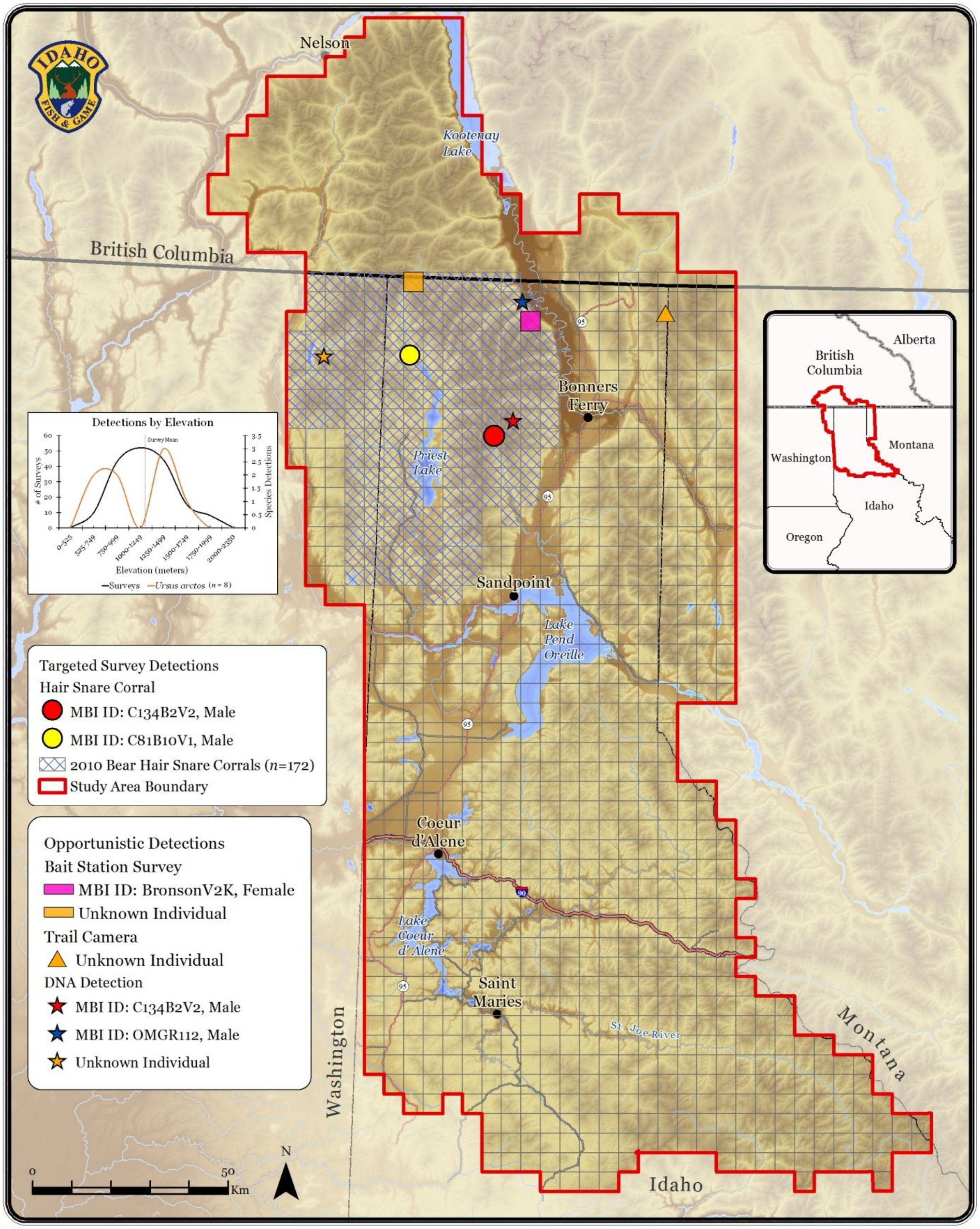
Map 4-9. Predicted wolverine habitat (Copeland 2010, Inman 2013), which is considered occupied by USFWS (USFWS 2013), and wolverine detections in the Idaho Panhandle and adjacent mountain ranges from 2010-2014.

Multi-species Baseline Initiative: Bear Hair Snare Corral Detections



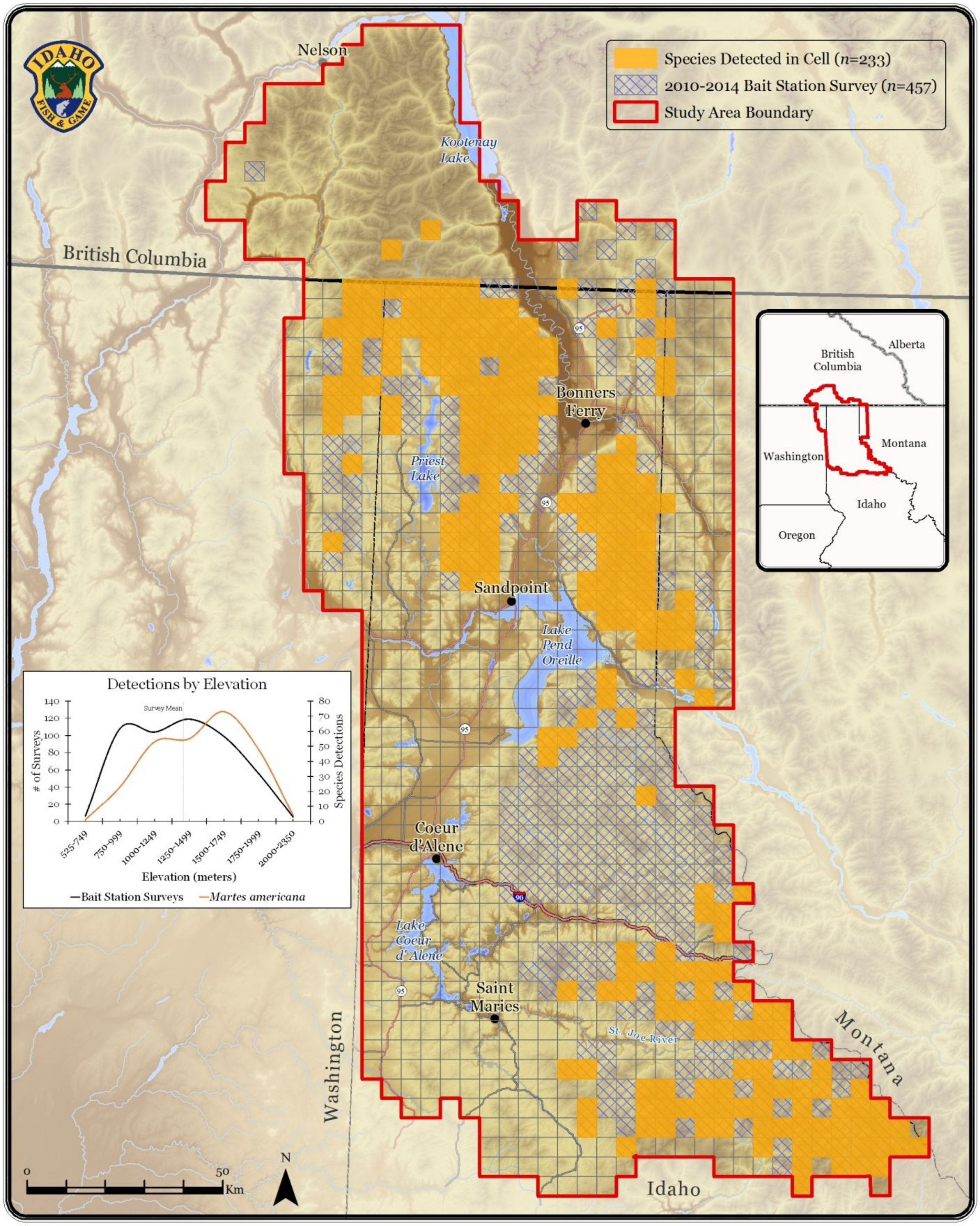
Map 4-10.

Multi-species Baseline Initiative: Grizzly Bear (*Ursus arctos*) Detections



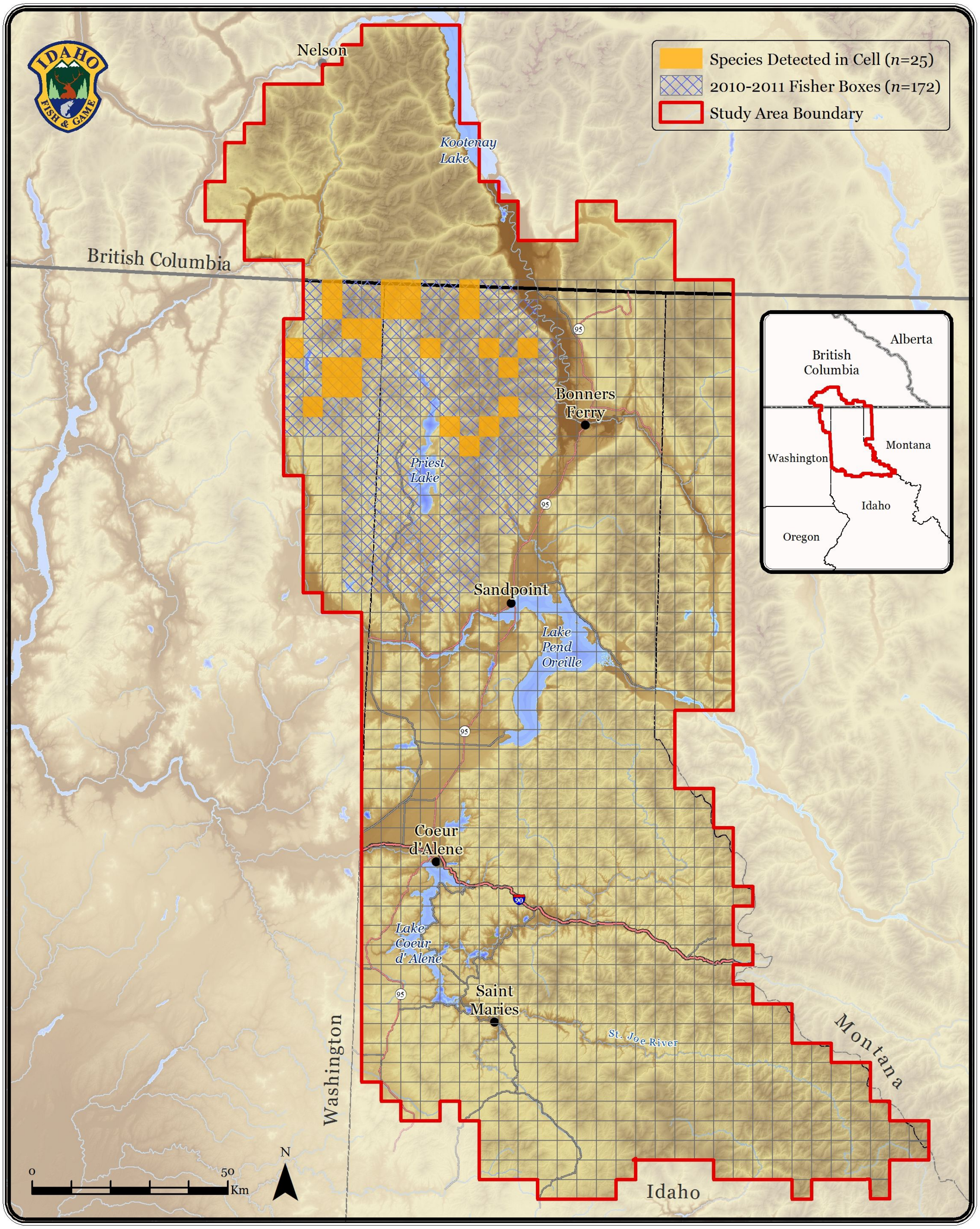
Map 4-11.

Multi-species Baseline Initiative: Marten (*Martes americana*) Detections



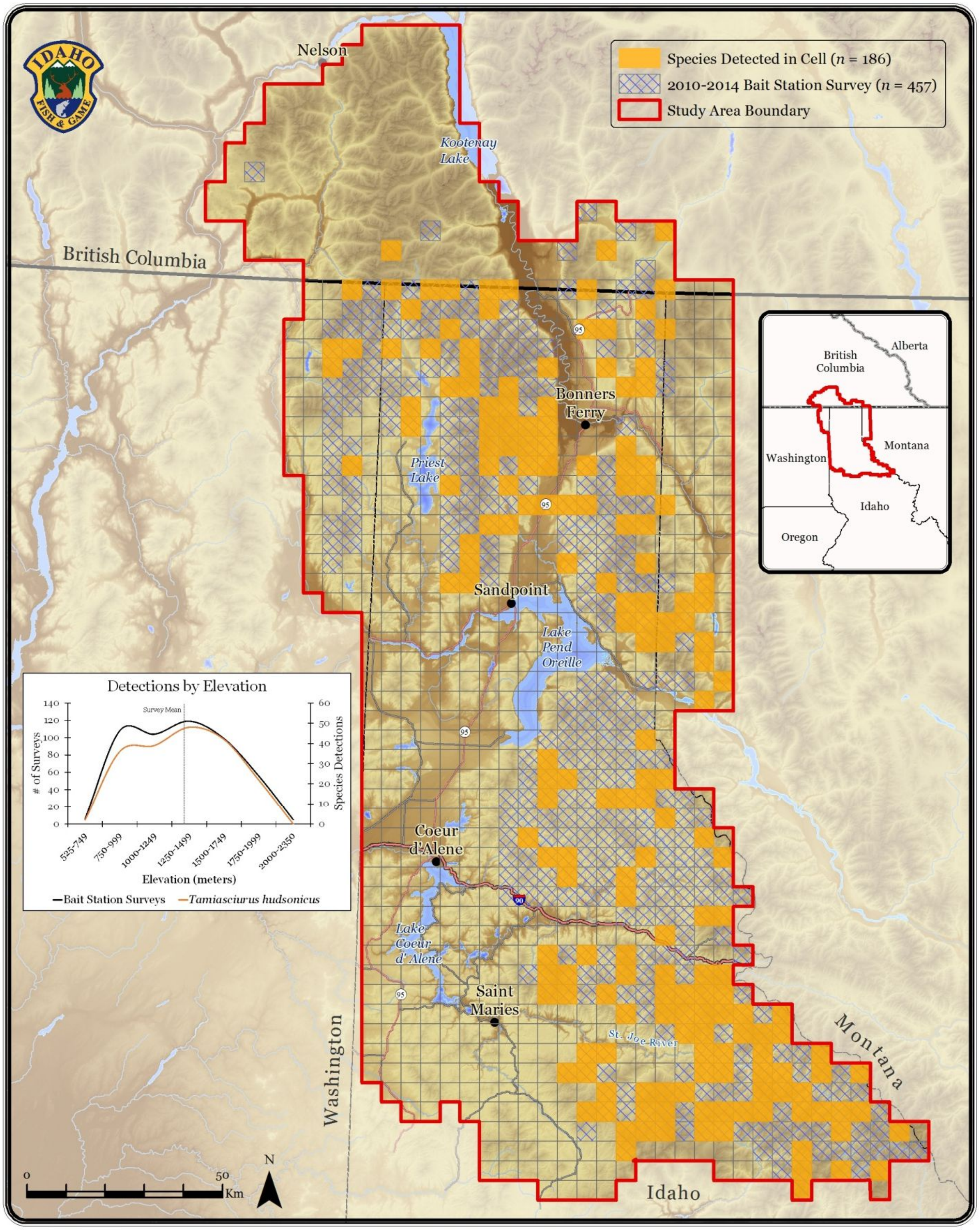
Map 4-12.

Multi-species Baseline Initiative: Marten (*Martes americana*) Detections in Summer Fisher Boxes



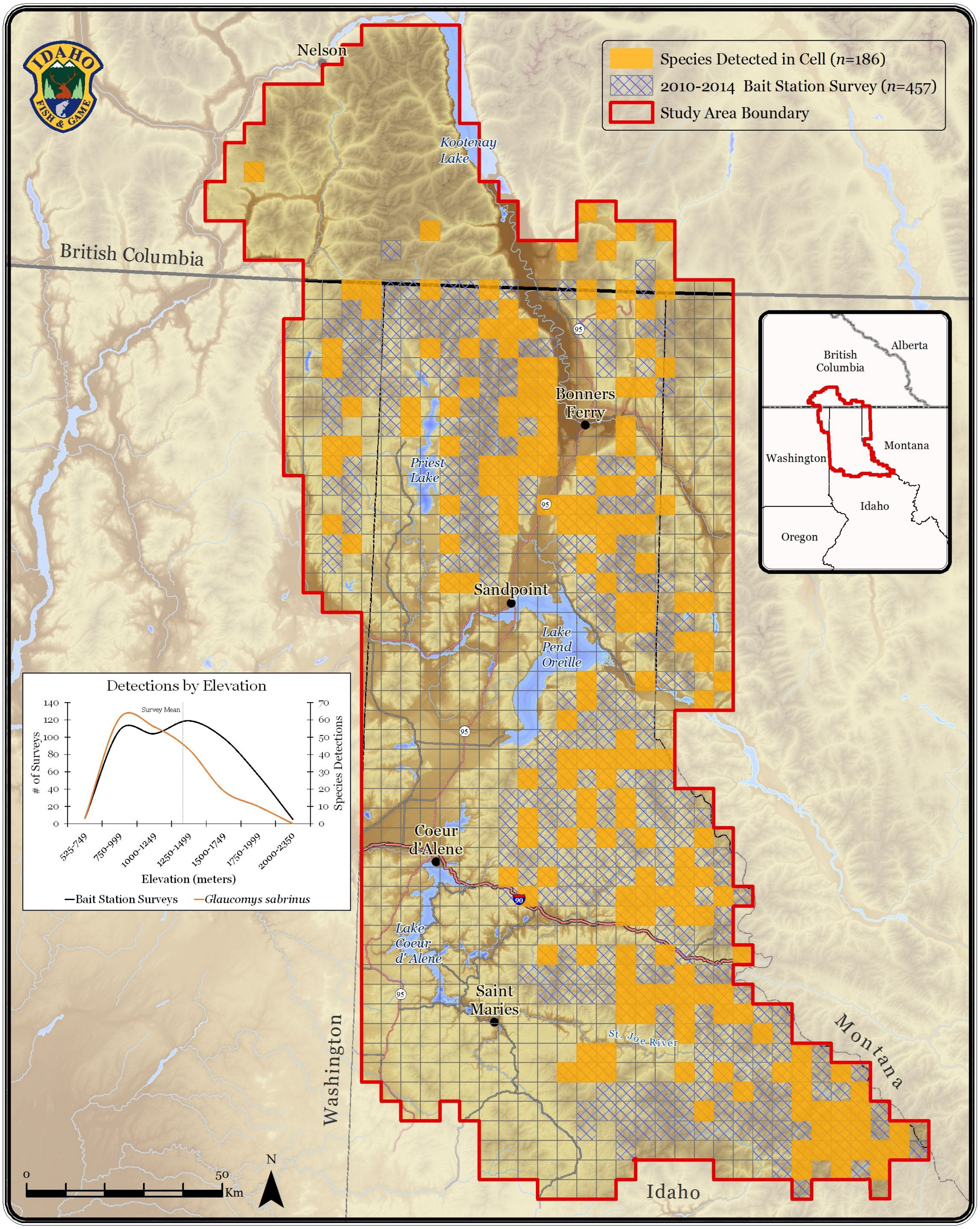
Map 4-13.

Multi-species Baseline Initiative: Red Squirrel (*Tamiasciurus hudsonicus*) Detections



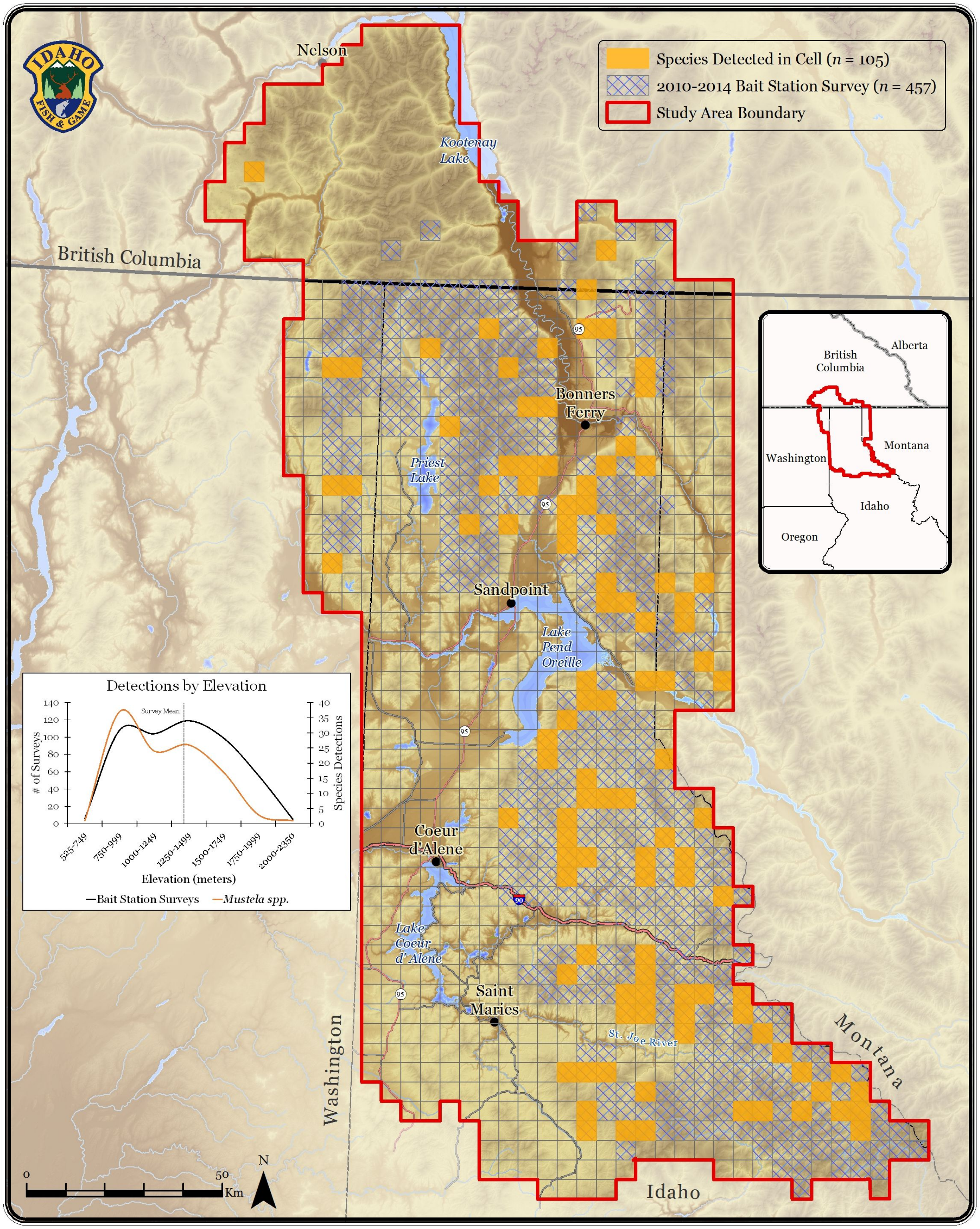
Map 4-14.

Multi-species Baseline Initiative: Northern Flying Squirrel (*Glaucomys sabrinus*) Detections



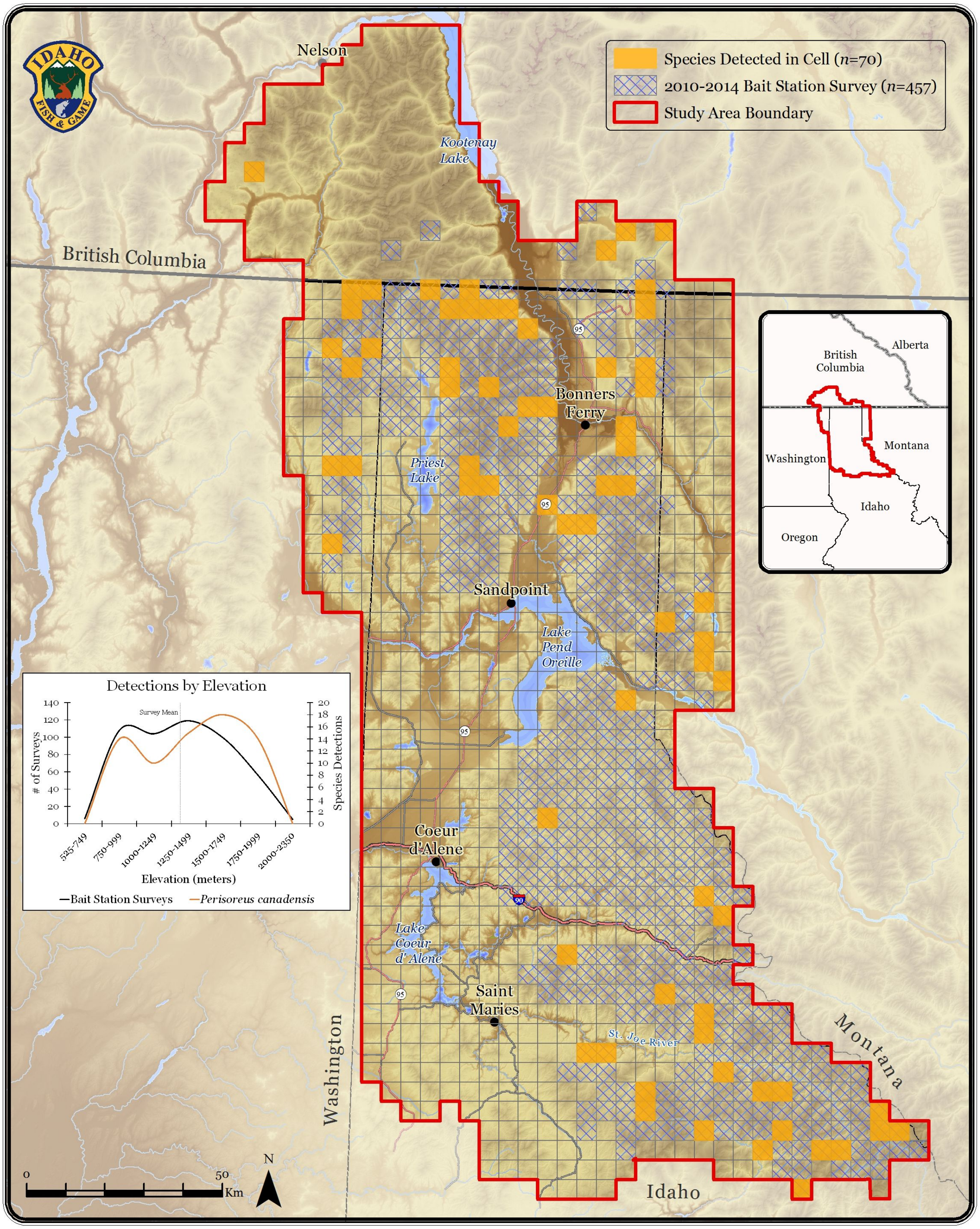
Map 4-15.

Multi-species Baseline Initiative: Weasel (*Mustela* spp.) Detections



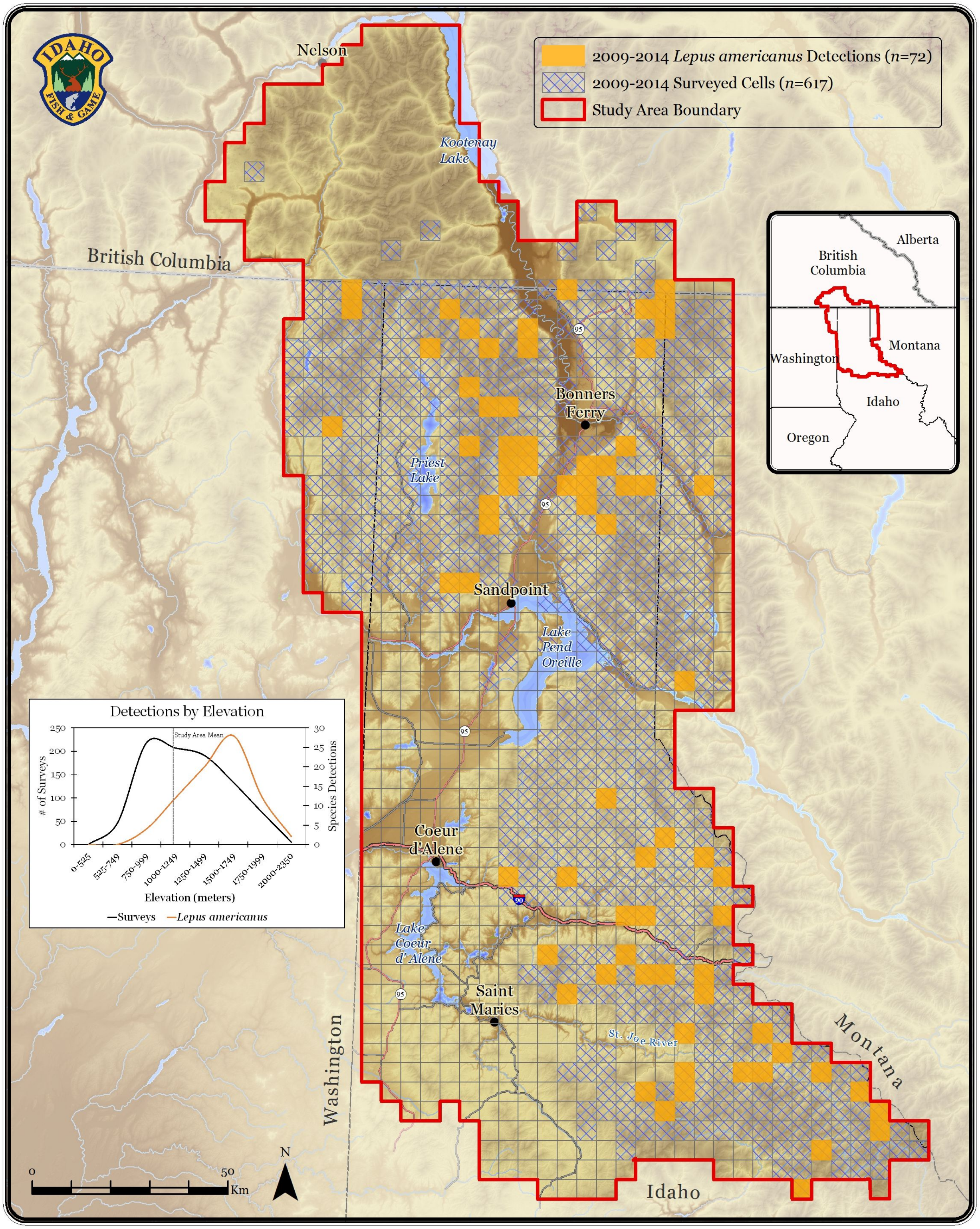
Map 4-16.

Multi-species Baseline Initiative: Gray Jay (*Perisoreus canadensis*) Detections



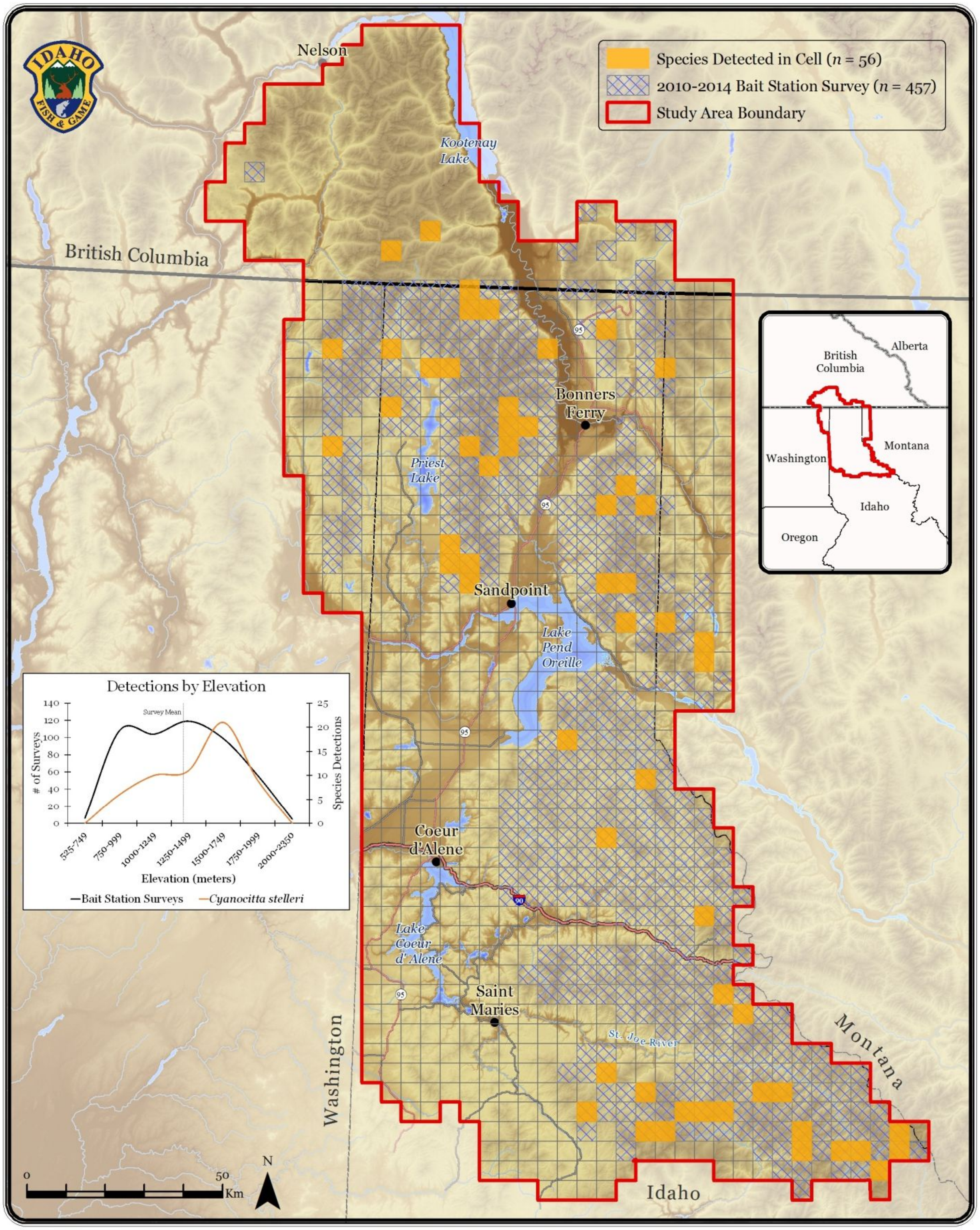
Map 4-17.

Multi-species Baseline Initiative: Snowshoe Hare (*Lepus americanus*) Detections



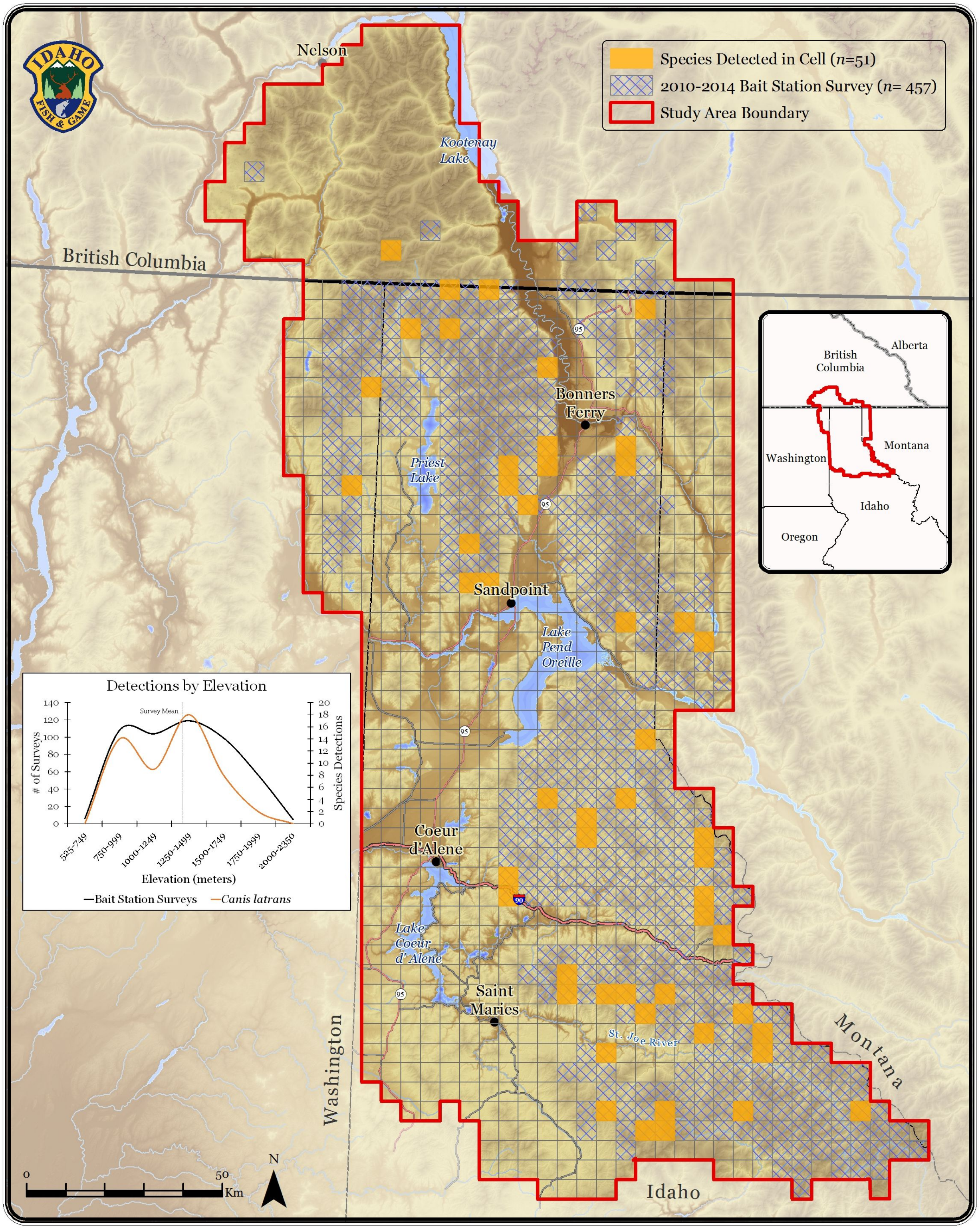
Map 4-18.

Multi-species Baseline Initiative: Steller's Jay (*Cyanocitta stelleri*) Detections



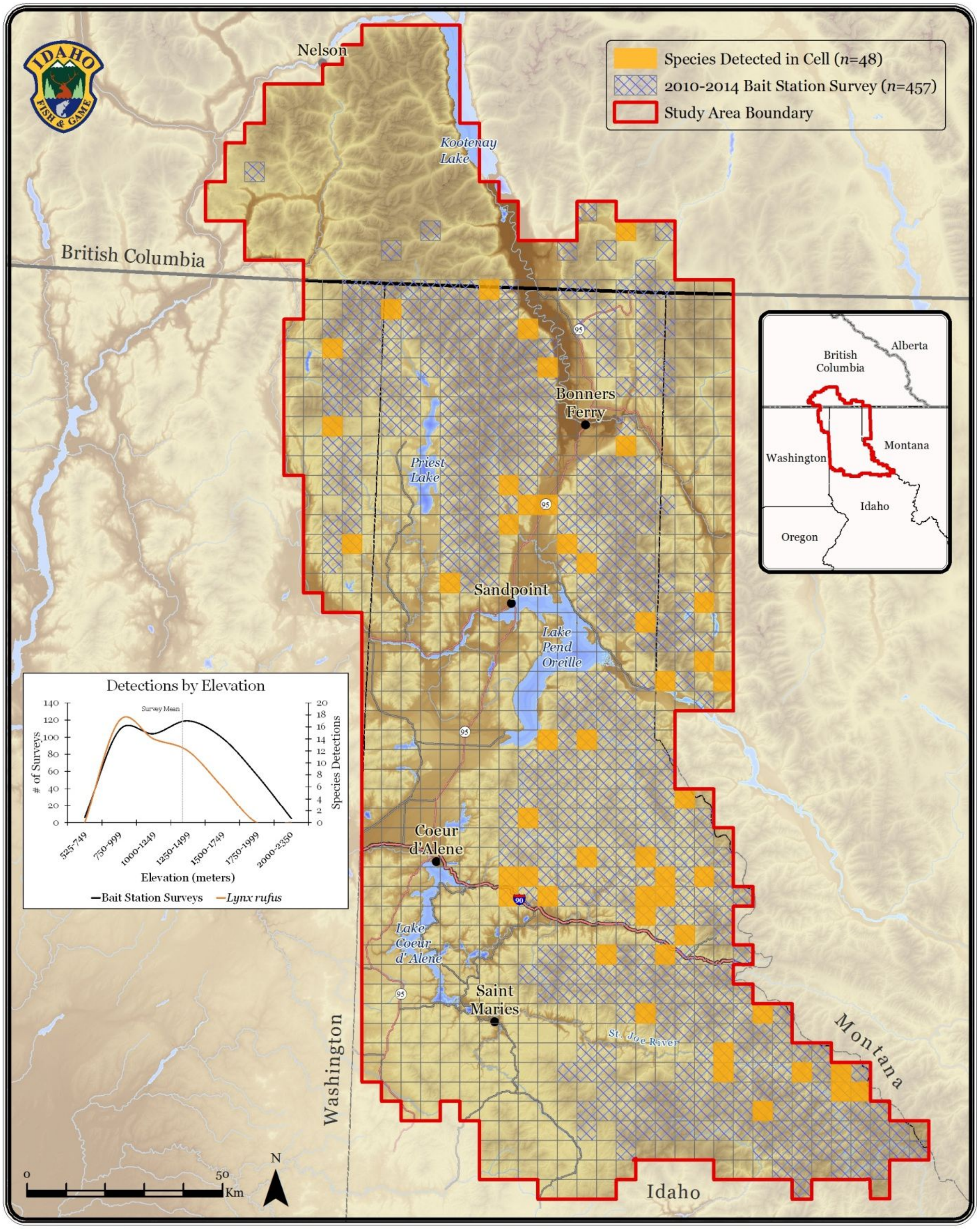
Map 4-19.

Multi-species Baseline Initiative: Coyote (*Canis latrans*) Detections



Map 4-20.

Multi-species Baseline Initiative: Bobcat (*Lynx rufus*) Detections



Map 4-21.

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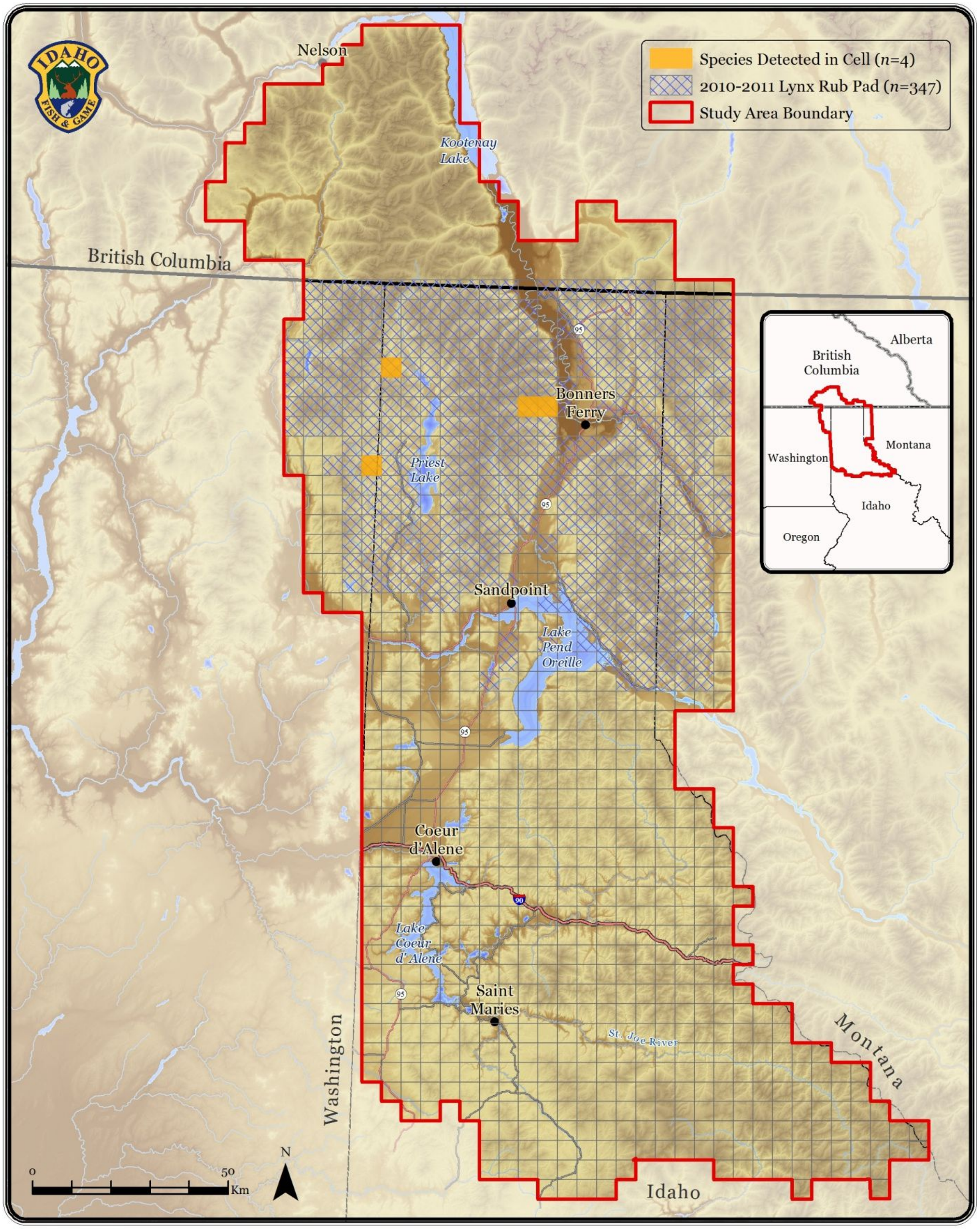
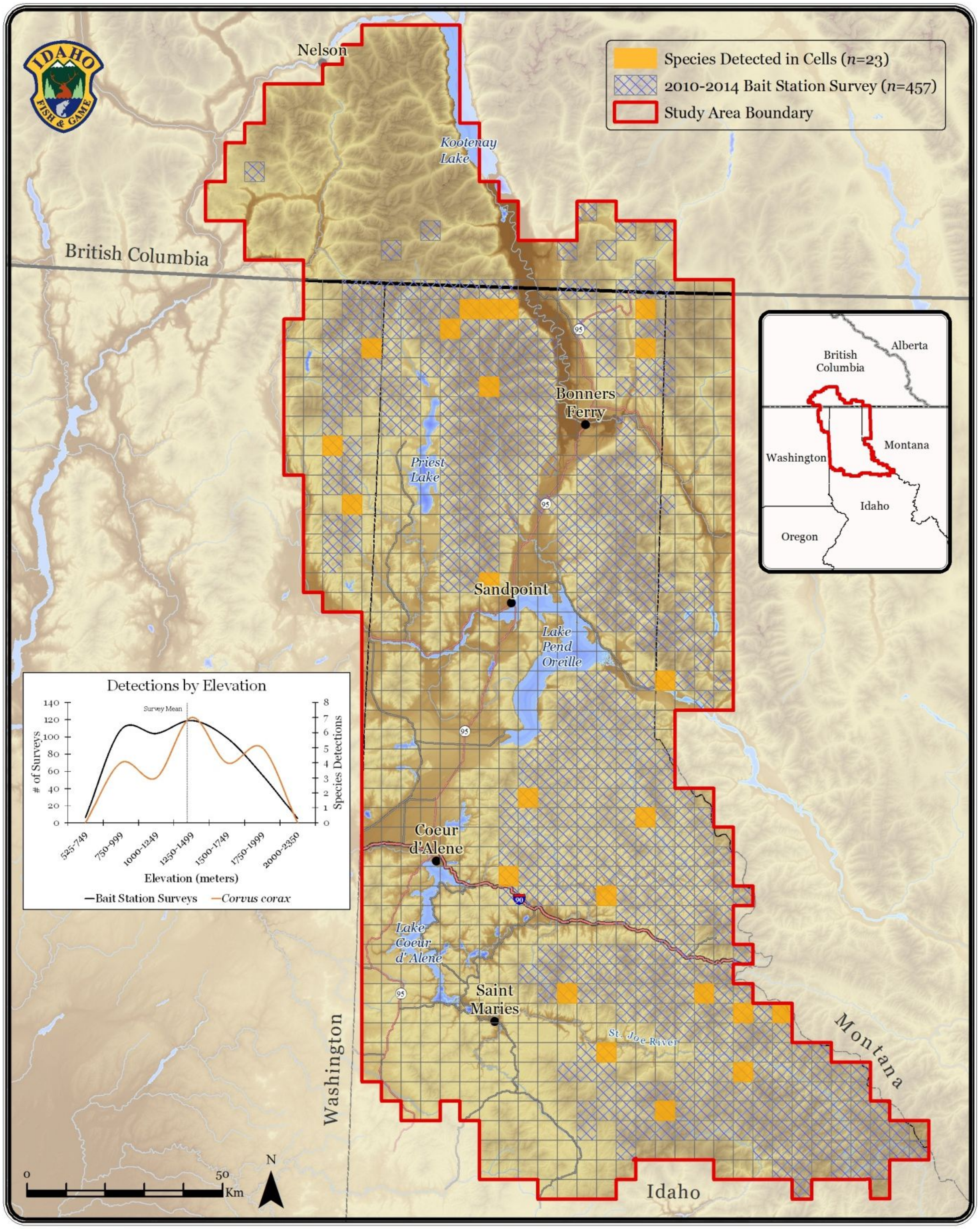
Multi-species Baseline Initiative: Bobcat (*Lynx rufus*) Detections at Summer Lynx Rub Pads



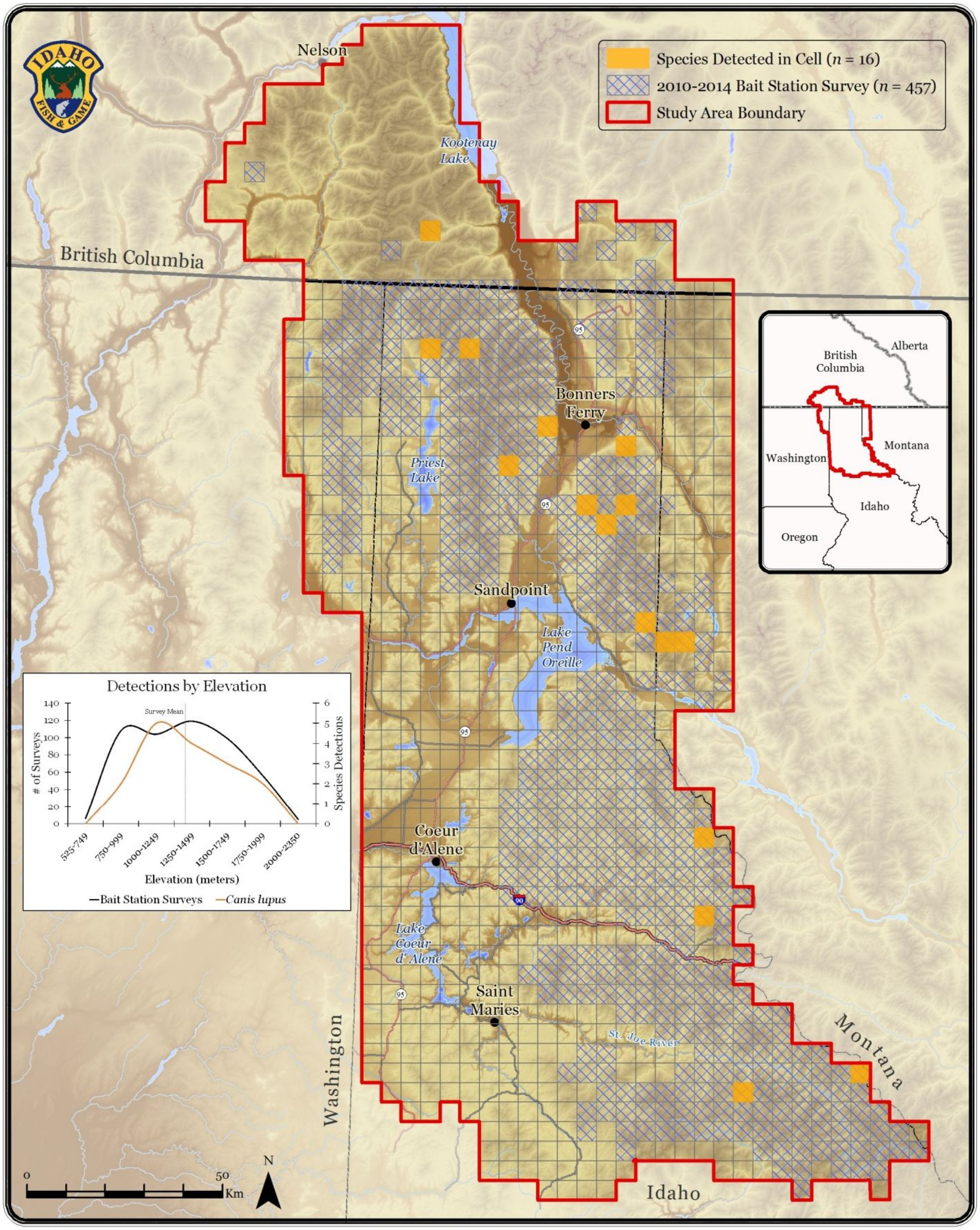
Map 4-22.

Multi-species Baseline Initiative: Common Raven (*Corvus corax*) Detections



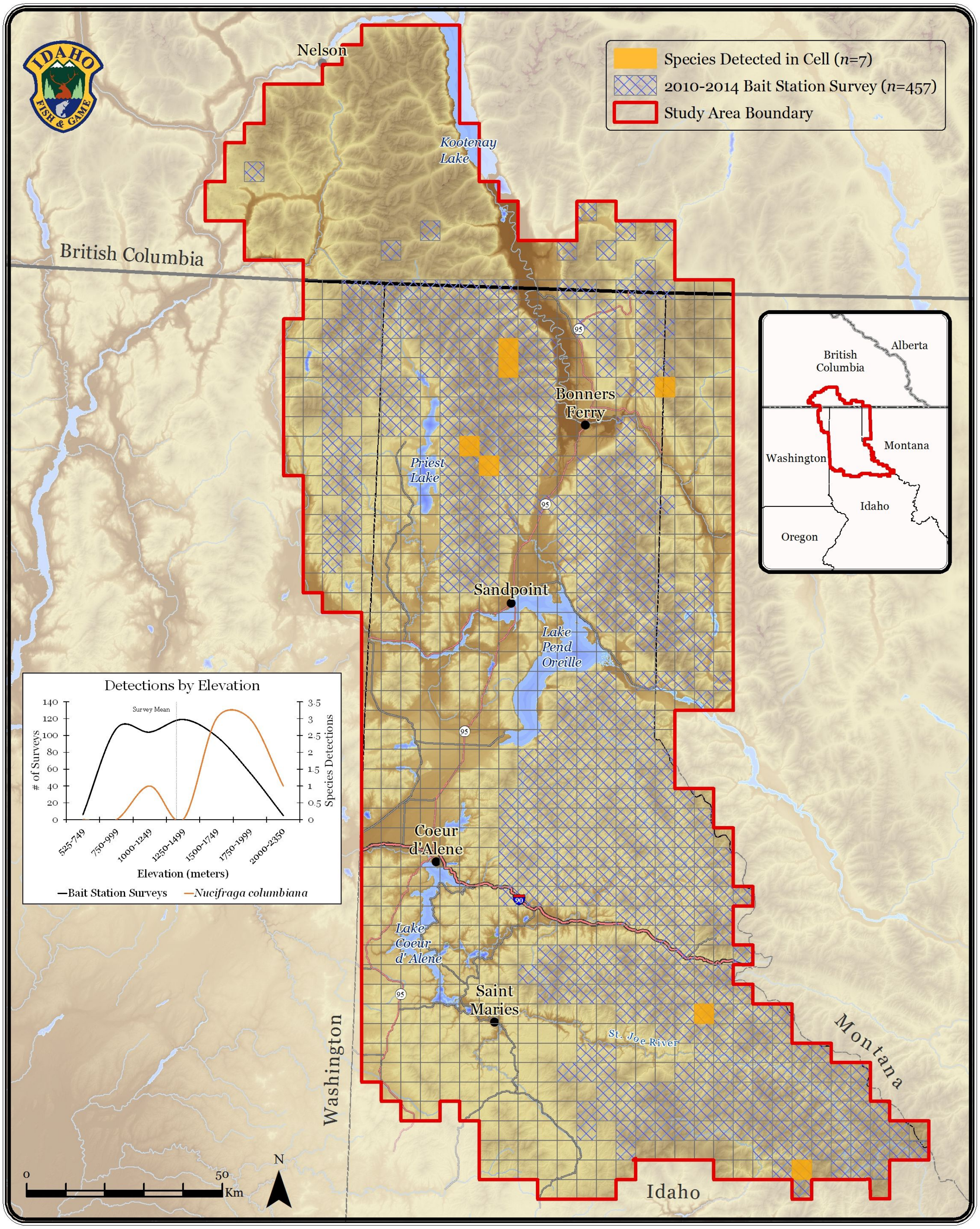
Map 4-23.

Multi-species Baseline Initiative: Wolf (*Canis lupus*) Detections



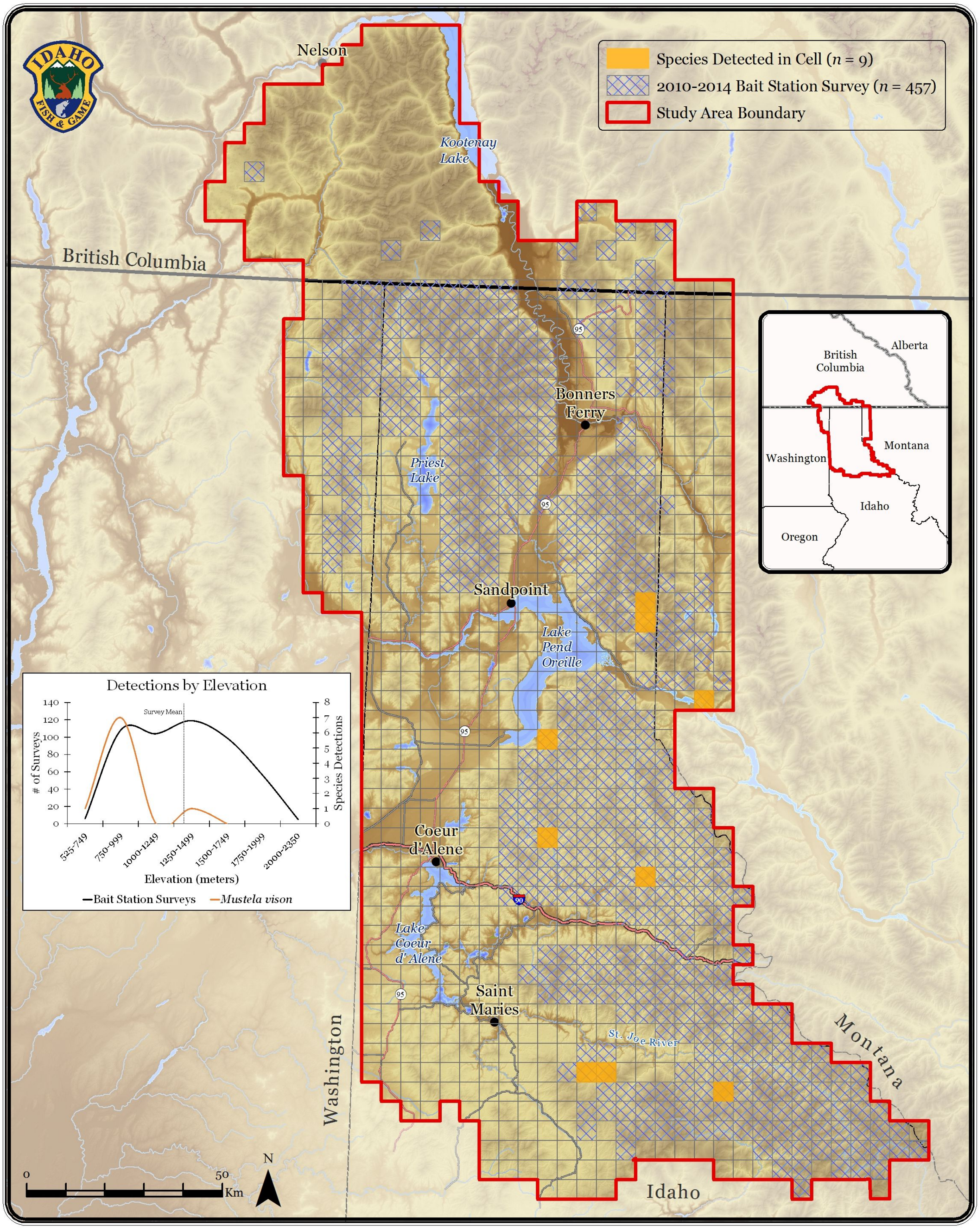
Map 4-24.

Multi-species Baseline Initiative: Clark's Nutcracker (*Nucifraga columbiana*) Detections



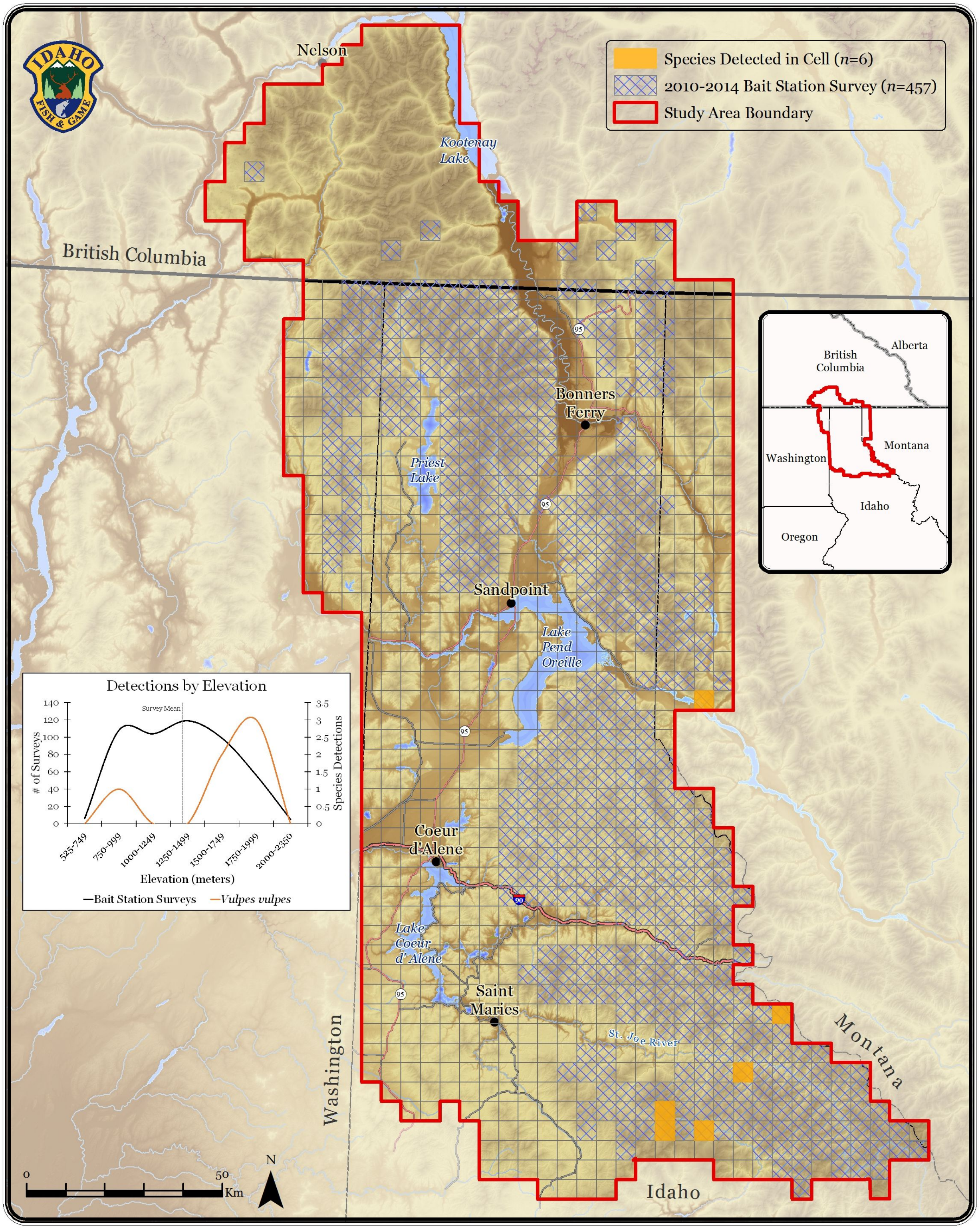
Map 4-25.

Multi-species Baseline Initiative: Mink (*Mustela vison*) Detections



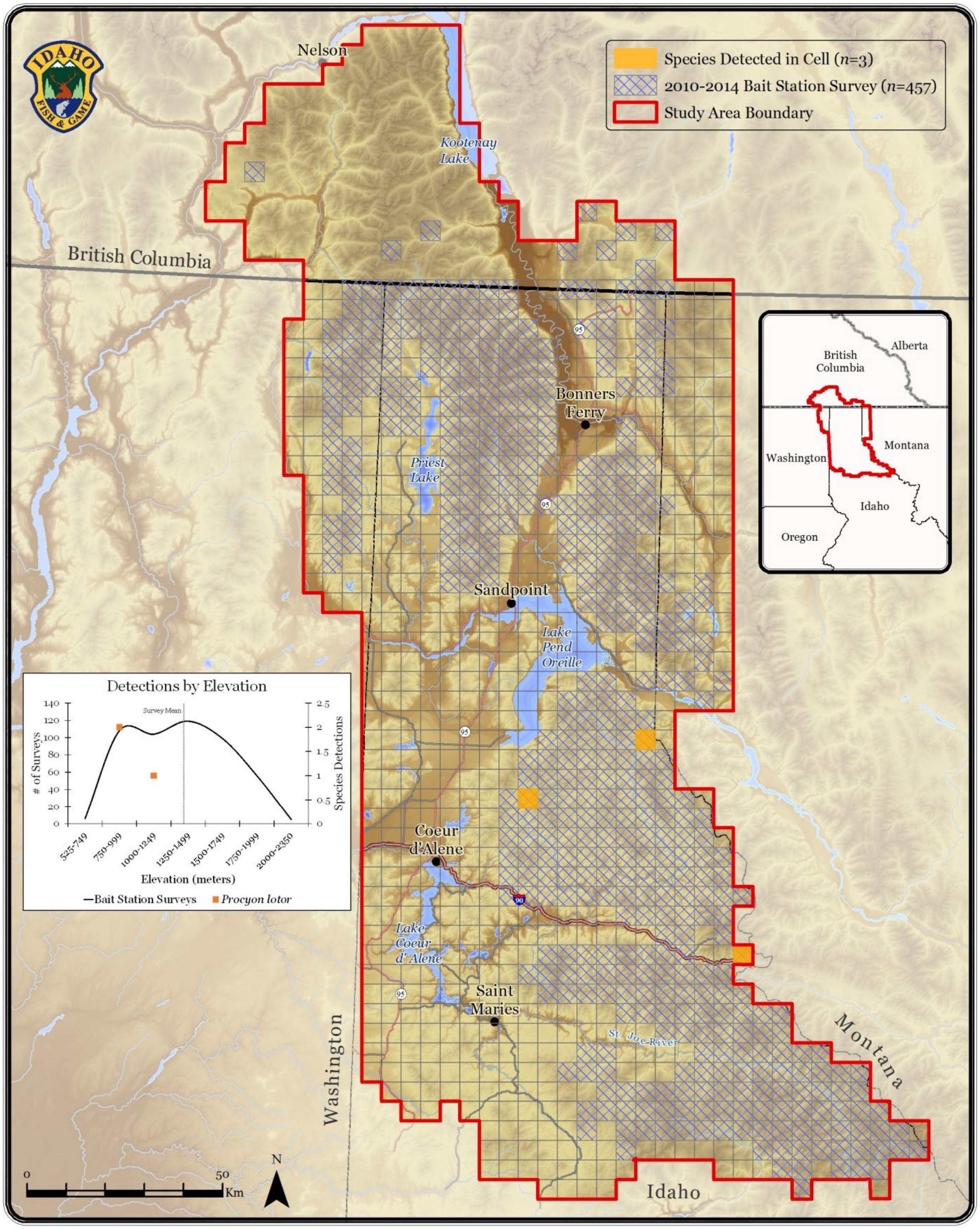
Map 4-26.

Multi-species Baseline Initiative: Red Fox (*Vulpes vulpes*) Detections



Map 4-27.

Multi-species Baseline Initiative: Raccoon (*Procyon lotor*) Detections



Map 4-28.