National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science

Evaluation of Fisher (*Pekania pennanti*) Restoration in Olympic National Park and the Olympic Recovery Area

2015 Annual Progress Report

Natural Resource Report NPS/OLYM/NRR—2016/1274

ON THE COVER
Fisher (female OPF-0828) visiting remote camera station in Olympic National Park, National Park Service.
Photograph courtesy of the National Park Service.

Evaluation of Fisher (*Pekania pennanti*) Restoration in Olympic National Park and the Olympic Recovery Area

2015 Annual Progress Report

Natural Resource Report NPS/OLYM/NRR—2016/1274

Patricia J. Happe[1], Kurt J. Jenkins[2], Thomas J. Kay[1], Kristy Pilgrim[3], Michael K. Schwartz[3], Jeffrey C. Lewis[4], Keith B. Aubry[5]

[1]National Park Service
Olympic National Park
600 East Park Avenue
Port Angeles, WA 98362

[2] U.S. Geological Survey
Forest & Rangeland Ecosystem Science Center
600 East Park Avenue
Port Angeles, WA 98362

[3]U.S. Forest Service
Rocky Mountain Research Station
800 Block East Beckwith
Missoula, MT 59801

[4]Washington Department of Fish and Wildlife
600 Capital Way N.
Olympia, WA 98501

[5]U.S. Forest Service
Pacific Northwest Research Station
3625 93rd Ave. SW
Olympia, WA 98512

August 2016

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado, publishes a range of reports that address natural resource topics. These reports are of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

The Natural Resource Report Series is used to disseminate comprehensive information and analysis about natural resources and related topics concerning lands managed by the National Park Service. The series supports the advancement of science, informed decision-making, and the achievement of the National Park Service mission. The series also provides a forum for presenting more lengthy results that may not be accepted by publications with page limitations.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner. Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols. This report received formal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data, and whose background and expertise put them on par technically and scientifically with the authors of the information.

Views, statements, findings, conclusions, recommendations, and data in this report do not necessarily reflect views and policies of the National Park Service, U.S. Department of the Interior. This paper has been peer reviewed and approved for publication consistent with U.S. Geological Survey Fundamental Science practices (http://pubs.usgs.gov/circ/1367/).

This report is available in digital format from the Olympic National Park website (http://www.nps.gov/olym/index.htm) and the Natural Resource Publications Management website (http://www.nature.nps.gov/publications/nrpm/). To receive this report in a format optimized for screen readers, please email irma@nps.gov**.**

Please cite this publication as:

Happe, P. J., K. J. Jenkins, T. J. Kay, K. Pilgrim, M. K. Schwartz, J. C. Lewis, and K. B. Aubry. 2016. Evaluation of fisher (Pekania pennanti) restoration in Olympic National Park and the Olympic Recovery Area: 2015 annual progress report. Natural Resource Report NPS/OLYM/NRR—2016/1274. National Park Service, Fort Collins, Colorado.

NPS 149/133794, August 2016

Contents

Figures and Photographs

Page

Tables

Page

Conversion Factors

Inch/Pound to SI

Parameter	Multiply	By	To obtain
Length	foot (ft)	0.3048	meter (m)
	mile (mi)	1.609	kilometer (km)

SI to Inch/Pound

Parameter	Multiply	By	To obtain
Length	meter (m)	3.281	foot (ft)
	kilometer (km)	0.6214	mile (mi)
Area	square kilometer (km^2)	247.1	acre
	square kilometer (km^2)	0.3861	square mile (mi^2)
Mass	gram (g)	0.03527	ounce (oz)

Executive Summary

With the translocation and release of 90 fishers (*Pekania pennanti*) from British Columbia to Olympic National Park during 2008–2010, the National Park Service (NPS) and Washington Department of Fish and Wildlife (WDFW) accomplished the first phase of fisher restoration in Washington State. Beginning in 2013, we initiated a new research project to determine the current status of fishers on Washington's Olympic Peninsula 3–8 years after the releases and evaluate the short-term success of the restoration program. Objectives of the study are to determine the current distribution of fishers and proportion of the recovery area that is currently occupied by fishers, determine several genetic characteristics of the reintroduced population, and determine reproductive success of the founding animals through genetic studies.

During 2015, we continued working with a broad coalition of cooperating agencies, tribes, and non-governmental organizations (NGO) to collect data on fisher distribution and genetics using non-invasive sampling methods. The primary sampling frame consisted of 157 24-km^2 hexagons (hexes) distributed across all major land ownerships within the Olympic Peninsula target survey area. In 2014 we expanded the study by adding 58 more hexes to an expanded study area in response to incidental fisher observations outside of the target area obtained in 2013; 49 hexes were added south and 9 to the east of the target area. During 2015, Federal, State, Tribal and NGO biologists and volunteers established three Distributioned motion-sensing camera stations, paired with hair snaring devices, in 87 hexes; 75 in the targeted area and 12 in the expansion areas. Each paired camera/hair station was left in place for approximately 6 weeks, with three checks on 2-week intervals. We documented fisher presence in 7 of the 87 hexagons. Four fishers were identified through microsatellite DNA analyses. The 4 identified fishers included 1 of the original founding population of 90 and 3 new recruits to the population. Three additional fishers were detected with cameras but not DNA, consequently their identities were unknown. All fisher detections were in the target area. Additionally, we identified 46 other species of wildlife at the baited camera stations. We also obtained 4 additional confirmed records of fishers in the study area through photographs provided by the public and incidental live capture.

During 2016, we plan to resample 69 hexagons sampled in the target area in 2014 and 12 new hexes in the expansion area. In addition, we plan to sample non-selected hexes in-between hexes where we had a cluster of fishers in 2014, to provide better understanding of occupancy patterns and minimum number of individuals in an area where fishers appear to be concentrating.

Acknowledgments

This project was funded principally through grants from the National Park Service Natural Resource Preservation Program (NRPP) to Olympic National Park, the U.S. Fish and Wildlife Service (USFWS) Recovery Program to U.S. Geological Survey (Forest and Rangeland Ecosystem Science Center), and the USDA Forest Service-Olympic National Forest (ONF). Several agencies and Tribes, including the following, provided indispensable in-kind support for field work (biologist salaries, supplies, and vehicles): Lower Elwha Klallam Tribe, Makah Tribe, ONF, Olympic National Park, Point-no-Point Treaty Council, Quileute Tribe, Skokomish Tribe, Quinault Nation, Washington Department of Fish and Wildlife, Washington Department of Natural Resources (WDNR), U.S. Geological Survey, Jefferson Land Trust.

This project would not have been as successful in 2015, without the help of many people. About one-third of the sampling in 2015 was completed by project partners. We want to thank (in no particular order) S. Murphie from the Makah Tribe; B. Ackerman and S. Miller from the Skokomish Tribe; W. Michaelis, J. Skriletz, A. McMillan, B. Murphie, R. Nagel, and S. Ament from WDFW; T. Cullinan from Point-no-Point Treaty Council; S. Horton and J. Hanawalt from WDNR; B. Howell from ONF; G. Rasmussen from the Quileute Tribe; K. Sager-Fradkin, D. Manson, S. Cendejas-Zarelli, K. Kaufman, and K. Turrey from the Lower Elwha S'Klallam Tribe; C. Clendaniel, K. Cook, C. Battersby, D. Bahls, J. Joyce, D. Rugh, D. Stockment, and S. Pensler from the Jefferson Land Trust; T. Kay, L. Castillo, A. Hokit, M. Matsumoto-Hervol, G. Montgomery, M. Murphy-Williams, J. Oetting, L. Platt, T. Setubal, S. Yates from the NPS fisher crew, E. Burke, H. Hareza, E. Hennessey, E. Kohler, P. Loafman, S. Gremel, E. Teitelbaum, and S. Yuncevich, from other NPS crews that helped out when really needed, and our stellar NPS volunteers G. Hunter , and M. Danisiewitcz. We also thank E. Gordon from USGS.

In 2015 we had a lot of support from private and other landowners, who allowed us to set up cameras on their lands, or the lands they manage. This assistance greatly enhanced our research. We would like to thank Christina Vestal from the Rayonier Corporation, Eric Beach at Green Diamond Resource Company, Blake Murden at Port Blakely Tree Farms, Tom Swanson at Green Crow, Norm Schaaf at Merril & Ring and the staff city of Port Angeles for all their help.

Big thanks go out to Betsy Howell for providing up-to date maps for access on National Forest lands, and for arranging housing for the crew in the USFS Bunkhouse. We thank Jody Tucker, USFS Rocky Mountain Research Station (RMRS), for consulting on several aspects of this study. Lastly, we would also like to thank the communications, ranger, and trail crew (packer) staffs at Olympic National Park for providing so many necessary logistical and safety supports of our field operations.

Photo 1. 2016 NPS and USGS fisher team. From left to right, back row: E. Hennessy, E. Kohler, A. Hokit. K. Jenkins, T. Kay, S. Yuncevich, G. Montgomery. Front row: M. Matsomoto-Hertzol, E. Gordon, S. Yates, L. Castillo, J. Oteeing, and P. Happe. Missing are M. Murphy-Williams, L. Platt, T. Setubal, and S. Gremel.

Background and Study Objectives

The fisher, *Pekania pennanti*, once occupied coniferous forests at low to middle elevations throughout much of the Western United States, but was extirpated from Washington State during the last century. The fisher was listed as a State endangered species in October 1998. In 2006 Washington State developed a Fisher Recovery Plan, with a goal of establishing multiple self-sustaining fisher populations in Washington (Hayes and Lewis 2006). The West Coast Distinct Population Segment of fishers was proposed for listing as threatened by the U.S. Fish and Wildlife Service in 2014 (U.S. Fish and Wildlife Service 2014). In 2016, the USFWS ruled that listing was not warranted at this time, in part due to the ongoing reintroduction and conservation efforts in Washington State (U.S. Fish and Wildlife Service 2016).

In 2007, the NPS and WDFW completed a Fisher Reintroduction Plan and Environmental Assessment for Olympic National Park (National Park Service 2007). The goals of that effort were to restore fishers to Olympic National Park (ONP) and Washington State. The project was designed to take up to 10 years to complete, and to be conducted in two phases. During Phase 1, 90 fishers were translocated from central British Columbia to the Olympic Peninsula from 2008 to 2010, and the initial success of the reintroduction was monitored by radio-tracking translocated fishers (2008–2011). Data were collected on post-release survival, movements, home-range establishment, and reproduction. Initial findings indicate that survival was highly variable among release years (Lewis 2014). In addition, access constraints in a large wilderness area prevented the reliable determination of breeding success for most of the released females, creating additional uncertainties about the current status of reintroduced fishers on the Olympic Peninsula.

The need for a second monitoring phase, consisting of non-invasive surveys of fisher distribution, was identified in both the State and Federal fisher recovery planning efforts (Lewis 2006; National Park Service 2007). The goal of Phase 2 of the fisher monitoring in the Olympic Recovery Area is to evaluate the status of reintroduced fishers on the Olympic Peninsula from 2013–2016. Specific objectives are to:

1. Determine the proportion of potential habitat occupied by fishers on the Olympic Peninsula,
2. Determine the genetic diversity and effective population size of the reintroduced fisher population,
3. Determine the minimum number of fishers known to be alive on the Olympic Peninsula,
4. Estimate the reproductive success of the released fishers and their known progeny, and
5. Determine if the population has experienced a genetic bottleneck.

Results of the first year of the study, the 2013 field season, were summarized in Happe et al. (2014), and the second year in Happe et al. (2015).

Research Accomplishments, 2015

Sampling design and methods followed those contained in the protocol developed during Phase 1 and finalized in 2013 (Jenkins and Happe 2013), and used during the 2013 and 2014 field seasons (Happe et al. 2014, 2015). Prior to the start of the 2015 field season we polled wildlife biologists working for State, Federal and Tribal agencies on the Olympic Peninsula to determine who was still interested in participating in the project. Biologists from ONF, WDFW, WDNR, Makah Tribe, Quileute Tribe, Quinault Nation, Lower Elwha Klallam Tribe, Point no Point Treaty Council, Skokomish Tribe, and Jefferson Land Trust indicated that they would like to participate in the field sampling effort. We reported the results from the 2014 field season, reviewed and made minor modification to the protocol (on file at ONP), and made plans for 2015 during the annual meeting of Olympic Peninsula Wildlife Technical Group. Throughout the year the NPS and USGS continued to coordinate sampling efforts, provide most of the equipment (with the exception of bait and batteries), collate and process data, and process all samples.

Study Area

Our study area consisted of a target survey area and an expansion area, including all accessible lands less than 4,700 ft (1,435m) in elevation. In this study, “accessible” is defined as lands that can be safely accessed on foot, as well as private and tribal lands where access is permitted by the landowner. The target survey area consists of lands on Washington’s Olympic Peninsula, excluding the Quimper Peninsula and other lands in the northeast and areas south of the USFS boundary (Figure 1). The target area corresponds with the area where most of the translocated fishers established home ranges following their release. The expansion areas were defined as lands where the fisher population could have colonized if the population expanded, and included the Quimper Peninsula and other lands to the northeast and lands south of Olympic National Forest.

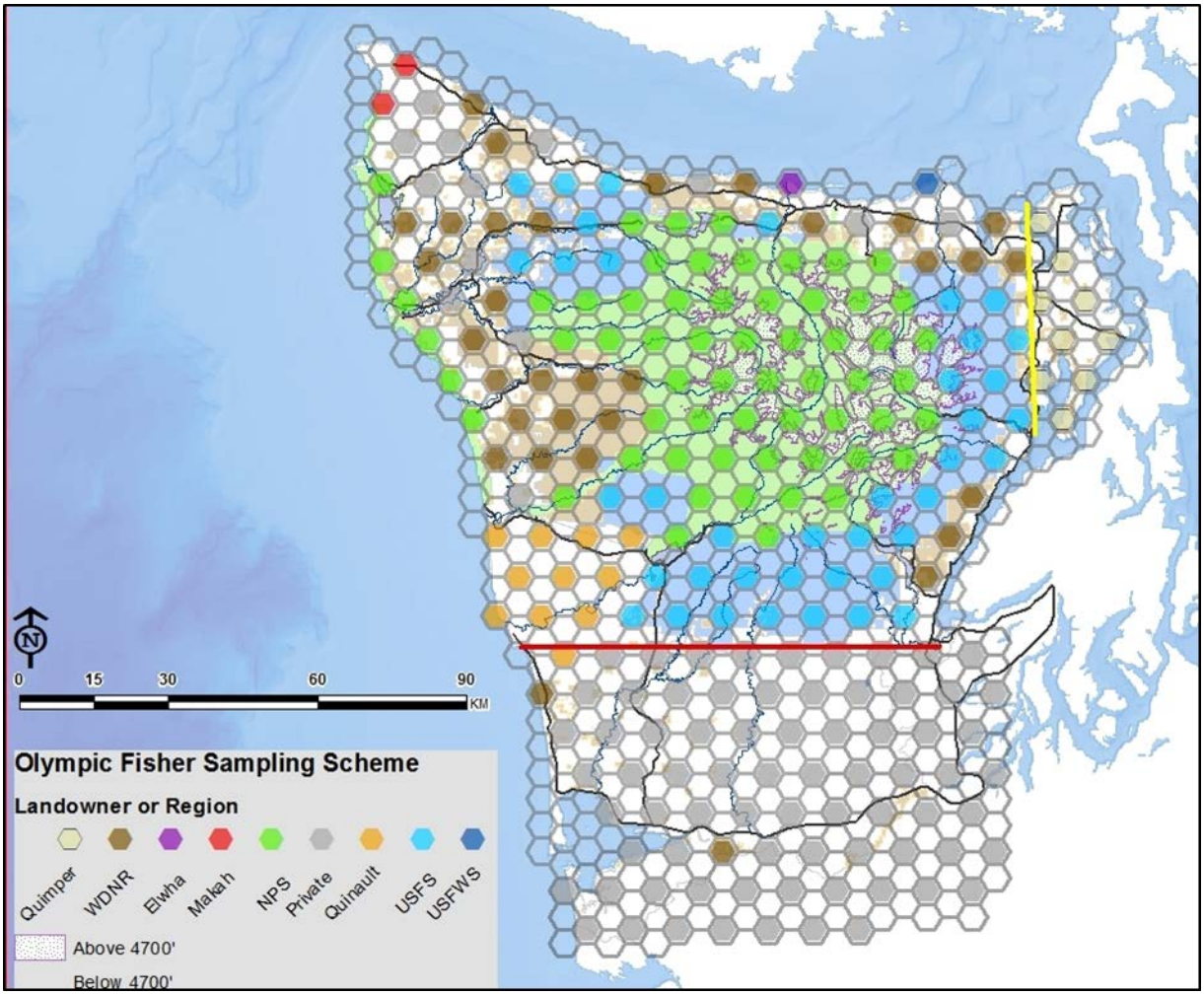

Figure 1. Sampling frame depicting 24-km^2 hexagons where fisher occupancy and genetic characteristics are being sampled on the Olympic Peninsula. The target survey area includes the Olympic Peninsula (lands north of the horizontal red line) and excludes the Quimper Peninsula and other lands on the northeast (lands east of the vertical yellow line). The expanded survey area, designed to detect population expansion outside the target area, includes lands south of the horizontal red line and east of the vertical yellow line. Landowners are Washington Department of Natural Resources (WDNR), Lower Elwha Klallam Tribe (Elwha), Makah Tribe (Makah), National Park Service (NPS), Private, Quinault Nation (Quinault), U.S. Forest Service (USFS), and U.S. Fish and Wildlife Service (USFWS).

The primary sampling units are 24-km^2 hexagonal cells (hexes) [approximately the size of a core area used by female fishers in the study area (Lewis 2014)]. Using a randomly selected starting point, we selected every other hex, resulting in 241 hexes out of 775 selected for sampling; 157 selected hexes are in the target area, and 84 are in the expanded survey areas (75 south of the target area, and 9 on east (Figure 1). Within the target area, hexes occur entirely or predominantly on lands managed by ONP (n=60), ONF (n=39), Washington State (n=30), Native American Tribes (n=14), private landowners (n=13), and the U.S. Fish and Wildlife Service (n=1). In the expansion area lands are primarily private.

We used a Generalized Random Tesselation Stratified (GRTS) sampling scheme to assign a random sampling order for each hex (U.S. Environmental Protection Agency 2011). Each partner selected the grouping of hexes in their area that they would try to sample from 2013-2016. Following that selection, each partner was given the firing order for their hexes, based on the random sampling order assigned to that hex by GRTS.

Methods

Within each hex we established three sampling stations in suitable fisher habitat (Jenkins and Happe 2013), with each station preferably at least 1 km apart (Figure 2). Suitable fisher habitat was defined as mid- to late-seral forests, or forested stands that most closely matched those conditions within each hex. Each station contained a motion-sensing camera and a hair-snaring device for collecting DNA. Our primary camera was the Bushnell® Trophy Cam HD, with a black LED flash. The hair snaring device was a triangular cubby box baited with a chicken drumstick and equipped with six gun-brushes attached to the inside walls, three near each entrance. The camera was focused on both the chicken bait affixed to a tree and the triangular cubby box (Figure 3). On the front of the bait tree we placed approximately 1 teaspoon of Caven's Gusto long-distance call lure (Minnesota Trapline Products, Inc., Pennock MN) to attract fishers. In 2015 we applied Gusto to a clump of moss that was protected under a small rain shield placed above the bait and placard. Following set up, each station was visited three times, with 14-day intervals between visits, resulting in 6 weeks of sampling within each hex. This design resulted in a hex being sampled for a total of nine station-visit events (that is, each of three sampling stations sampled for three 14-day intervals [visits]. The study design allowed for three 6-week sampling sessions (spring, summer, and fall) between May 26 and November 4, 2015. Hexes assigned to the 2015 sampling year were allocated to one of the 3 sampling sessions, based on seasonal accessibility constraints and logistical efficiencies (Jenkins and Happe 2013).

Figure 2. Example of locations of stations in a hex. Fishers were detected in this hex in 2015. Station 1 had to be moved due to interference by black bears.

Figure 3. Member of a field crew setting up a station within Olympic National Forest (Hex 234 Station 1). Note camera (circled in red) on left of frame is pointing to tree bait (yellow circle) and baited cubby box (blue circle) on the right of the frame. Above the tree bait is a placard indicating the Hex and station (white rectangle), with the Gusto call lure attached to the tree above the placard (green circle) (NPS Photo).

Sampling Effort

Fourteen of the 157 hexes within the target area were removed from the sampling frame in 2014 and 2015. Ten hexes were removed from consideration on the Quinault reservation, as we do not have permission to work in that area. Four hexes were removed due to access and habitat limitations (2 that include portions of Mt Olympus and have very little forested habitat below 4,700 feet that is safely accessible, 2 on private lands near Sequim which do not contain enough fisher habitat to put in 3 stations).

In 2015 we sampled 75 hexes in the target area. We sampled all remaining hexes that had not been sampled in 2013 or 2014 (26) and re-sampled 49 out of the 52 hexes that were sampled in 2013. The 3 hexes from 2013 that were not resampled in 2015 were omitted because they did not have enough secure (cameras would not be interfered with or stolen) and accessible fisher habitat (n=1), or they were previously resampled in 2014 (n=2) due to incomplete sampling effort in 2013 (Figure 4).

In the expansion areas added in 2014 (Happe et al. 2015), State and Tribal partners sampled 10 hexes in the south and 2 in the east (Figure 4). Two hexes were dropped from the southern and one from the eastern expansion area during 2015 due to habitat suitability or access constraints.

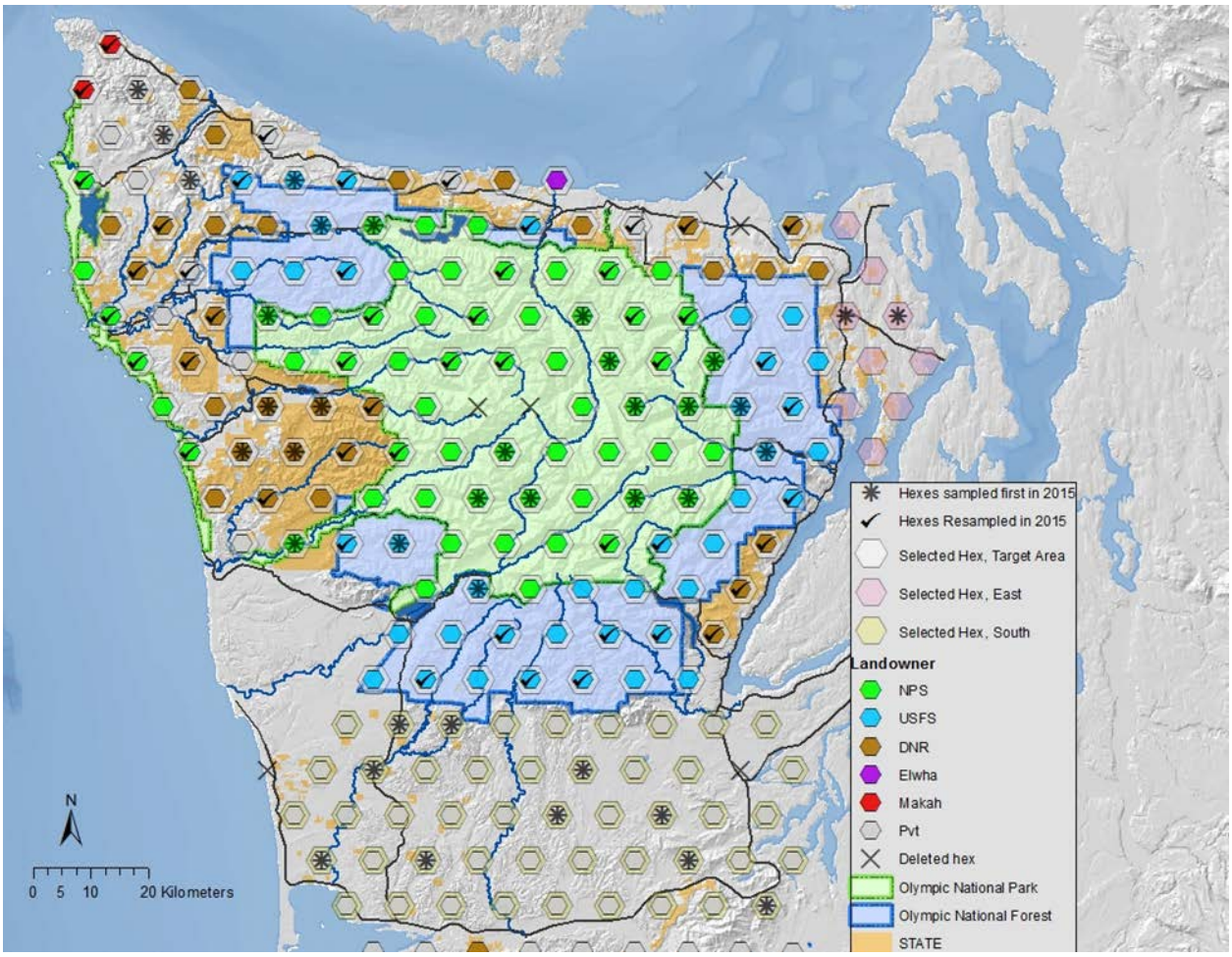

Figure 4. The sample frame, landownership, and location of hexes selected for sampling (all years combined) in the target sample area (white-shaded hex outer edge), expansion area south of the target area (tan/gray hex edge) and expansion area east of the target area (pink outer hex edge). Landownership is characterized by the interior color of the hex. Hexes sampled in 2015 are indicated with an asterisk if they were sampled in 2015 for the first time, and with a checkmark if they were sampled first in 2013 and resampled in 2015.

Landownership of sampled hexes varied: 36 (41 %) were on Federal lands, 5 (6%) on State lands, 7 (8%) on a mosaic of Federal and State lands, 8 (9%) on private or Tribal lands, and the remainder on lands with mixed ownership, including private, Tribal, Federal, land trust, and other State lands (Table 1).

Table 1. Landownership of hexes sampled in 2015.

Hex primary landownership	Number of hexes sampled
National Park Service (NPS)	18
NPS and Olympic National Forest (ONF)	8
NPS and Washington Department of Natural Resources (WDNR)	3
NPS and private	2
NPS and tribal	1
NPS, WDNR, and private	2
ONF	10
ONF and WDNR	4
ONF and private	2
ONF, WDNR, and private or tribal	4
WDNR	5
WDNR and private or land trust	19
WDNR, private, and tribal	1
Private	7
Tribal	1

In 2015 28 (32%) of the hexes were sampled by project partners; the remaining hexes were sampled by the NPS crew (Table 2).

Table 2. Lead agencies and number of hexes they sampled, 2015.

Hex lead	Number of hexes sampled
Jefferson Land Trust	2
Lower Elwha Klallam Tribe	3
Makah Tribe	5
National Park Service[1]	59
Quileute Tribe	3
Quinault Nation	1
Skokomish Tribe	3
Washington Department of Fish and Wildlife	6
Washington Department of Fish and Wildlife and Point no Point Treaty Tribes	2
Washington Department of Natural Resources	3

[1]Including USGS Field Crew member.

Our sampling protocol specified a 14-day interval between sampling visits. Thus, with 87 hexes sampled, the total sampling effort should have been 783 station/visit events (87 hexes * 3

stations/hex * 3 visits/station). In 2015 we ended up with 788 sampling events (Table 3); the extra sampling events were due to some stations being sampled for a 4th time to compensate for camera malfunction, camera destruction, or theft. In addition two stations were sampled for an additional sampling interval in order to get additional hair samples for DNA analysis.

Table 3. Station sampling intervals (days) for the 87 hexes sampled in 2015. n=788.

Value	Visit	Camera	Bait	Snare
Mean	14.3	13.7	12.4	12.7
Max	27	21	21	21
Min	0	0	0	0
Between 13 and 16 days	96%	93%	74%	79%

[Intervals reported for visits indicate the number of days between station checks. Intervals for camera, bait, and hair snare represent the number of days each device (or bait) was functional, if known, based on date stamps on camera images. The minimum of 0 days was due to camera theft.]

We averaged 14.3 days between station visits (Table 3). Although 96 percent of the sampling intervals were in our target range of 13–16 days, we did have some outliers. The minimum of 0 days was due to theft. Intervals greater than16 days were due to challenges with crew scheduling.

The average sampling interval for remote cameras was 13.7 working days per station/visit; 93 percent of the cameras were functional within our target range of 13–16 days. Twenty-four cameras were functional for no days due to either theft (1), camera destruction by a bear (1), or malfunctioning for the entire interval (22). The causes of malfunctioning cameras included not being turned on (4), batteries died (1), no card (1), pictures too dark (1) and unexplained malfunctions where bait was taken but no pictures taken (14). As the cameras have aged the amount of unexplained malfunctions has increased.

Baits placed on the tree or in the cubby box (Figure 3) were defined as functional if any chicken (including bones) remained at the end of the sample interval. Tree bait remained functional for an average of 12.4 days; 74 percent were functional for 13–16 days. At 26 percent of the sites, bait functionality was shortened due to consumption by black bears (*Ursus americanus*), spotted skunks (*Spilogale gracilis*), ravens (*Corvus corax),* opossums (*Didelphis virginiana*), domestic dogs (*Canis lupus familiaris*), or fishers before the sampling interval was complete. In some cases, where a station had repeated visits by bears, spotted skunks or ravens, we moved the station between sampling intervals; in some situations, however, it was not possible to move a station.

Hair snares were functional for an average of 12.7 days; 73 percent were functional for 13–16 days. During 65 intervals, however, snare functionality was unknown due to either camera malfunction or unclear pictures. Snare functionality was shortened due to either destruction of the cubby box by bears or consumption of the bait in cubbies by bears, spotted skunks, opossums, or fishers before the sampling interval was complete.

In the majority of hexes, cameras, tree baits, and cubbies were functional for greater than 75 percent of the sampling interval. In 12 hexes, however, cameras and/or tree baits were functional for less than 66 percent of the time, either due to technical problems or bait consumption. In the final analysis, planned at the end of the FY2016 field season, we will examine the effects of sampling effort on the probabilities of detection and estimates of site occupancy by fishers.

Fisher Detections

Remote Cameras

We detected fishers with cameras in seven hexes (Table 4, Figure 5). No fishers with radio-collars (founders released between 2008 and 2010) were observed in any pictures; however one founder who had shed a collar was detected through genetic analysis in hex 455. In four hexes we detected fishers at two stations: 309, 354, 363, and 600. In hexes 309 and 354 we were able to get DNA that was of sufficient quality to determine individual ID, and it was the same fisher at both stations. In hex 363 no hair was left at either station, so we don't know if it was one or two fishers. In hex 600 DNA was sufficient for identification at only one station. Fishers in two hexes were detected by camera only (363 and 645) and a fisher at a station in Hex 600 was detected by hair snare only (the camera was functioning poorly at that station during the interval when the fisher was detected). Three fishers were detected only once.

Table 4. Fishers detected by cameras and DNA analysis, 2015.

Hex Number	Fisher on Camera	Hair Collected	DNA Amplified	Fisher ID	Gender	Founder	Collar Visible	Number Stations[1]	Number Station-Visits[2]	First Visit[3]
309	yes	yes	Yes	OPF-0494	Female	No	No	2	4	1
354	yes	yes	Yes	OPF-0517	Male	No	No	2	3	1
355	yes	yes	No*	Unknown	Unknown	Unknown	No	1	1	2
363	yes	no	n/a	Unknown	Unknown	Unknown	No	2	2	1
455	yes	yes	Yes	M099	Male	Yes	No	1	1	1
600	yes	yes	Yes**	OPF-0828	Female	No	No	2	3	2
645	yes	no	n/a	Unknown	Unknown	Unknown	No	1	1	3

1: Number of stations a fisher was detected (maximum=3).

2: Number of station (3) and visit (3) combinations a fisher was detected (maximum=9).

3: Visit number a fisher was first detected.

* DNA was sufficient to determine it was a fisher, but not good enough for individual ID.

**: Fishers were detected at two stations. DNA from fisher at one station, where fisher was only detected by hair sample, and only detected once, was not of sufficient quality to get individual ID.

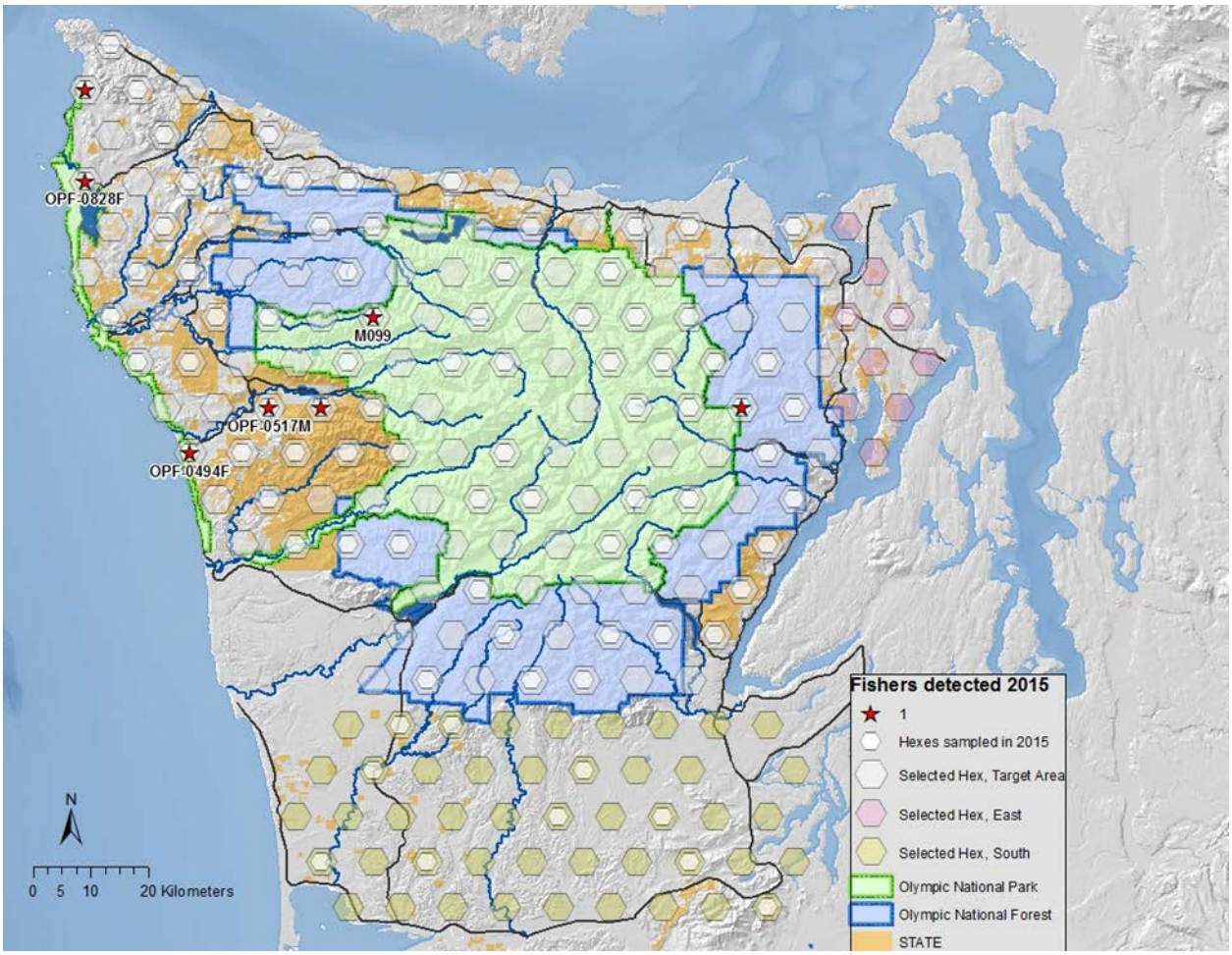

Figure 5. Location of fisher detections (stars) by cameras in hexes sampled in 2015 (white hexagons). Labels below fisher detections are the fishers identified through DNA analysis. Labels starting with OPF are new recruits, with gender indicated at the end of the string (F for females and M for males). ID numbers that start with a letter are founders. Fishers in 3 hexes do not have a genetic ID.

DNA Analysis

Ninety-nine hair samples were collected and sent to the laboratory for DNA analysis. The samples came from 34 station-visit events (1–6 samples per cubby) distributed among 24 different hexes. Twenty events were from intervals in which the camera was not fully functional and no fisher pictures were taken; the samples were sent in for analysis in the event that a fisher was present but was undetected by the camera. Twelve events were from stations and intervals in the hexes where we did detect fishers with the cameras and also collected hair. One event was from an interval where we detected marten (*Martes caurina*), and another from an event where the picture was not diagnostic (could have been either a marten or a mink (*Mustela vison*)).

We attempted to identify individual fishers using microsatellite DNA analysis. Samples that did not contain DNA for this analysis ("no amplification") were either hair from another species, or an inadequate sample from a fisher. In some samples we were able to identify that the hair was fisher, but too poor a quality to determine individual fisher ID. In a subset of the samples where cameras

were not working properly, species ID was determined on non-fisher samples. Other species identified through DNA included black bear (4 events), chipmunk (*Tamias* spp.) (1), domestic dog (1), long-tailed weasel (*Mustela frenata*) (1), Virginia opossum (2), short-tailed weasel (*Mustela erminea*) (1), and spotted skunk (11).

Four individual fishers from four hexes were identified through DNA analysis (Figure 5). One fisher was detected at a station that had a malfunctioning camera for part of the sampling interval (Table 4). We detected one founder, M099, who was 8 years old at the time of detection (Appendix A). We detected three new fishers (recruits to the population). Two were first generation recruits (offspring of fishers released in 2008, 2009 and 2010) and one was a second generation recruit (born to a fisher born on the Olympic Peninsula) (Table 5) (Appendix B).

Table 5. Maternal and paternal assignments for the new recruits detected during the occupancy study through DNA analysis, 2015.

		Maternal			Paternal			Distance to maternal home range	Earliest possible birth year
Individual	Gender	Match	Release year	Release age	Match	Release year	Release age		
OPF-0494	Female	F048	2009	1	M097	2010	4	47 km	2011
OPF-0828	Female	OPF-0494	n/a	n/a	M082	2010	0	51 km	2013
OPF-0517	Male	F006	2008	1	M035	2009	0	47 km	2011

Revisits

Of the seven fishers detected in 2015, three were detected in hexes sampled for the first time in 2015 (Figure 6, Table 6). One fisher was detected in a hex that did not have a fisher detection in 2013 (hex 600). This fisher is part of the second generation of fishers born on the peninsula (Appendix B) and the earliest she could have been born is 2013. Three fishers were detected in hexes where fishers were detected in 2013 (309, 455, and 645). In Hex 455 we detected a different fisher each year: M035 in 2013 and M099 in 2015. Both were founders, and the station was near, but not in their former home ranges (Happe et al 2013, Appendix A), and they each were detected only once at one station. In two hexes we do not know if we detected the same fisher both years. In Hex 309 in 2013 we detected two fishers, M079 and a smaller fisher whose DNA did not amplify; it is unknown if OPF-0494F was the small fisher we captured only on camera in 2013. We did not obtain a hair sample on the fisher detected in Hex 645 in 2015, so we are unable to determine if this is OPF-0077F that was detected there in 2013. There were four hexes where we detected fishers in 2013 where we did not detect them in 2015 (172, 410, 560, and 563).

Table 6. Comparison of hexes that were sampled in both 2013 and 2015, and in which fishers were detected in at least one of those years.

Hex Number	Sampled 2013	Fisher 2013	Fisher IDs 2013	Founder 2013	Sampled 2015	Fisher 2015	Fisher IDs 2015	Founder 2015
172	Yes	Yes	OPF-0005M	no	Yes	--	--	--
309	Yes	Yes -2	M079, unk	Yes, unk	Yes	Yes	OPF-0494F	no
354	no	--	--	--	Yes	Yes	OPF-0517M	no
355	no	--	--	--	Yes	Yes	Did not amplify	--
363	no	--	--	--	Yes	Yes	Hair not collected	--
410	Yes	Yes	OPF-0678M	no	Yes	--	--	--
455	Yes	Yes	M035	Yes	Yes	Yes	M099	Yes
511	Yes	Yes	OPF-0728M	no	Yes	--	--	--
560	Yes	Yes	F006	Yes	Yes	--	--	--
563	Yes	Yes	OPF-0301M	--	Yes	--	--	--
600	Yes	no		--	Yes	Yes	OPF-0828F	no
645	yes	Yes	OPF-0077F	--	Yes	Yes	Hair not collected	--

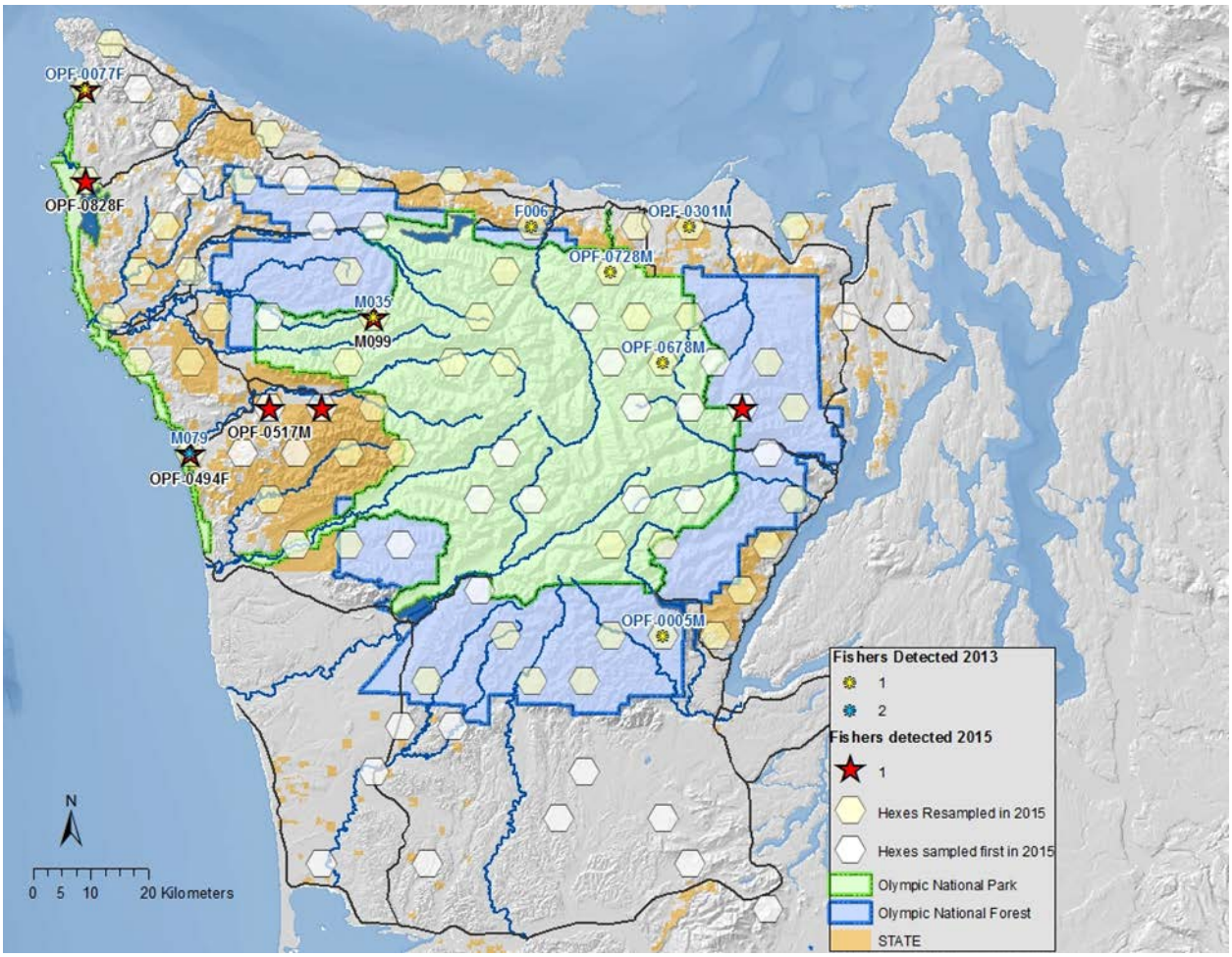

Figure 6. Location of fishers detected in 2015 (red stars) as compared to fishers detected in 2013 (yellow or blue asterisks). Hexes with fishers detected in both years have an asterisk superimposed on a red star. Shown are hexes that were sampled in 2013 and re-sampled in 2015 (yellow hexes) and hexes that were sampled for the first time in 2015 (white hexes). Labels by stars or asterisks are fisher ID as determined by DNA analysis, when available. Blue labels are for fishers identified in 2013, and black labels are for fishers identified in 2015.

Fishers were detected on multiple landownerships (Table 7). All were detected in hexes comprised of mixed landownerships, and most (n= 5) contained some NPS lands within the hex.

Table 7. Landownerships where fishers were detected in 2015.

Hex primary landownership	Number of hexes sampled	Number of fishers detected
National Park Service (NPS)	18	--
NPS and Olympic National Forest (ONF)	8	2
NPS and Washington Department of Natural Resources (WDNR)	3	--
NPS and private	2	1
NPS and tribal	1	1
NPS, WDNR, and private	2	1
ONF	10	--
ONF and WDNR	4	--
ONF and private	2	--
ONF, WDNR, and private or tribal	4	--
WDNR	5	--
WDNR and private or land trust	19	2
WDNR, private, and tribal	1	--
Private	7	--
Tribal	1	--

Other Species Detected

We collected more than 89,000 digital photographs and detected 46 wildlife species in 2015. Black bears were the most frequently detected species; they were detected in 62 (71 %) hexes and in 170 (22 %) station-visit events (Table 8). Bobcats (*Lynx rufus*), coyotes (*Canis latrans*) and spotted skunks were the next most frequently detected carnivores, detected in 42, 41 and 40 hexes respectively. However, spotted skunks were detected in more station-visit events (179) than any other species; when they occur in an area they revisit baits and are detected frequently.

We also obtained detections of potential fisher prey with remote cameras. In 2015, Douglas' squirrels (*Tamiasciurus douglasii*), mice (*Peromyscus* spp., *Microtis* spp., *and Zapus trinitatus*) and Northern flying squirrels (*Glaucomys sabrinus*) were detected in over 50% of the hexes, and snowshoe hares (*Lepus americanus*) and chipmunks in over 45% of the hexes (Table 8).

One new species of note was detected in 2015. We detected a Pacific marten at a high-elevation site in the Hoh Valley. This was the first marten detected on the Olympic Peninsula since 2008. Although we collected hair, the DNA did not amplify. We also continued to detect Virginia opossum, a species that appears to be invading the Olympic Peninsula from the south (Figure 7).

Table 8. Number of times a species or species group was detected with remote cameras in 2015, by hex and station-visit events. n=87 hexes and 788 station-visits.

Taxa group	Species	Hexes	Station / Visits
Carnivores	Black Bear	62	170
	Bobcat	42	59
	Coyote	41	76
	Spotted Skunk	40	179
	Weasel[1] (*Mustela* spp.)	30	54
	Cougar (*Puma concolor*)	23	29
	Raccoon (*Procyon lotor*)	11	15
	Domestic Dog	9	12
	Fisher	7	15
	Mink or Marten	2	2
	Pine Marten	1	1
Birds	Passerine[2]	126	240
	Jays and Crows [3]	45	76
	Raven	21	40
	Grouse[4]	18	22
	Turkey Vulture	13	20
	Owl[5]	10	11
	Woodpecker[6]	5	5
	Coopers Hawk (*Accipiter gentilis*)	1	1
Ungulate	Black-tailed Deer (*Odocoileus hemionus columbianus*)	52	101
	Elk (*Cervus elaphus*)	10	12
	Mountain Goat *(Oreamnos americanus*)	1	1

1: Short-tailed Weasel (21), Long-tailed Weasel (4), or unidentifiable weasel (5).

2: Dark-eyed Junco (*Junco hyemalis*) (5), Hermit Thrush (*Catharus guttatus*) (4), Varied Thrush (*Ixoreus naevius*) (43), American Robin (*Turdus migratorius*) (38), Pacific Wren (*Troglodytes pacificus*) (3), Swainsons Thrush (*Catharus ustulatus*) (2), Black-headed Grosbeak (*Pheucticus melanocephalus*) (1), Brown Creeper (*Sitta pusilla*) (1), Spotted Towhee (*Pipilo erythrophthalmus*) (1), or unidentifiable bird (28).

3: Gray Jay (*Perisoreus canadensis*) (17), Steller's Jay (*Cyanocitta stelleri*) (26) or American Crow (*Corvus brachyrhynchos*) (2).

4: Sooty Grouse (*Dendragapus fuliginosus*) (7), Ruffed Grouse (*Bonasa umbellus*) (7), or unidentifiable grouse (4).

5: Saw-whet Owl (*Aegolius acadicus*) (2), Northern Pygmy Owl (*Glaucidium gnoma*) (1), Western Screech Owl (*Otus kennicottii*) (1), Barred Owl (*Strix varia*) (1), unidentified *Strix* owl (3), unidentified owl (2).

6: Northern Flicker (*Colaptus auratus*) (4), Hairy Woodpecker (*Picoides villosus*) (1).

Table 8 (continued). Number of times a species or species group was detected with remote cameras in 2015, by hex and station-visit events. n=87 hexes and 788 station-visits.

Taxa group	Species	Hexes	Station / Visits
Small and medium mammals	Douglas' Squirrel	60	135
	Mice and Voles	51	137
	Flying Squirrel	45	96
	Snowshoe Hare	37	73
	Chip**m**unk	35	77
	Bushy-tailed Woodrat (*Neotoma cinerea*)	8	9
	Mountain Beaver (*Aplodontia rufa*)	6	8
	Bat	1	1
Miscellaneous	Human	16	21
	Virginia Opossum	11	59
Unidentified	Small mammal	54	86
	Medium mammal	12	15
	Large mammal	6	8
	Animal	29	47

1: Short-tailed Weasel (21), Long-tailed Weasel (4), or unidentifiable weasel (5).

2: Dark-eyed Junco (*Junco hyemalis*) (5), Hermit Thrush (*Catharus guttatus*) (4), Varied Thrush (*Ixoreus naevius*) (43), American Robin (*Turdus migratorius*) (38), Pacific Wren (*Troglodytes pacificus*) (3), Swainsons Thrush (*Catharus ustulatus*) (2), Black-headed Grosbeak (*Pheucticus melanocephalus*) (1), Brown Creeper (*Sitta pusilla*) (1), Spotted Towhee (*Pipilo erythrophthalmus*) (1), or unidentifiable bird (28).

3: Gray Jay (*Perisoreus canadensis*) (17), Steller's Jay (*Cyanocitta stelleri*) (26) or American Crow (*Corvus brachyrhynchos*) (2).

4: Sooty Grouse (*Dendragapus fuliginosus*) (7), Ruffed Grouse (*Bonasa umbellus*) (7), or unidentifiable grouse (4).

5: Saw-whet Owl (*Aegolius acadicus*) (2), Northern Pygmy Owl (*Glaucidium gnoma*) (1), Western Screech Owl (*Otus kennicottii*) (1), Barred Owl (*Strix varia*) (1), unidentified *Strix* owl (3), unidentified owl (2).

6: Northern Flicker (*Colaptus auratus*) (4), Hairy Woodpecker (*Picoides villosus*) (1).

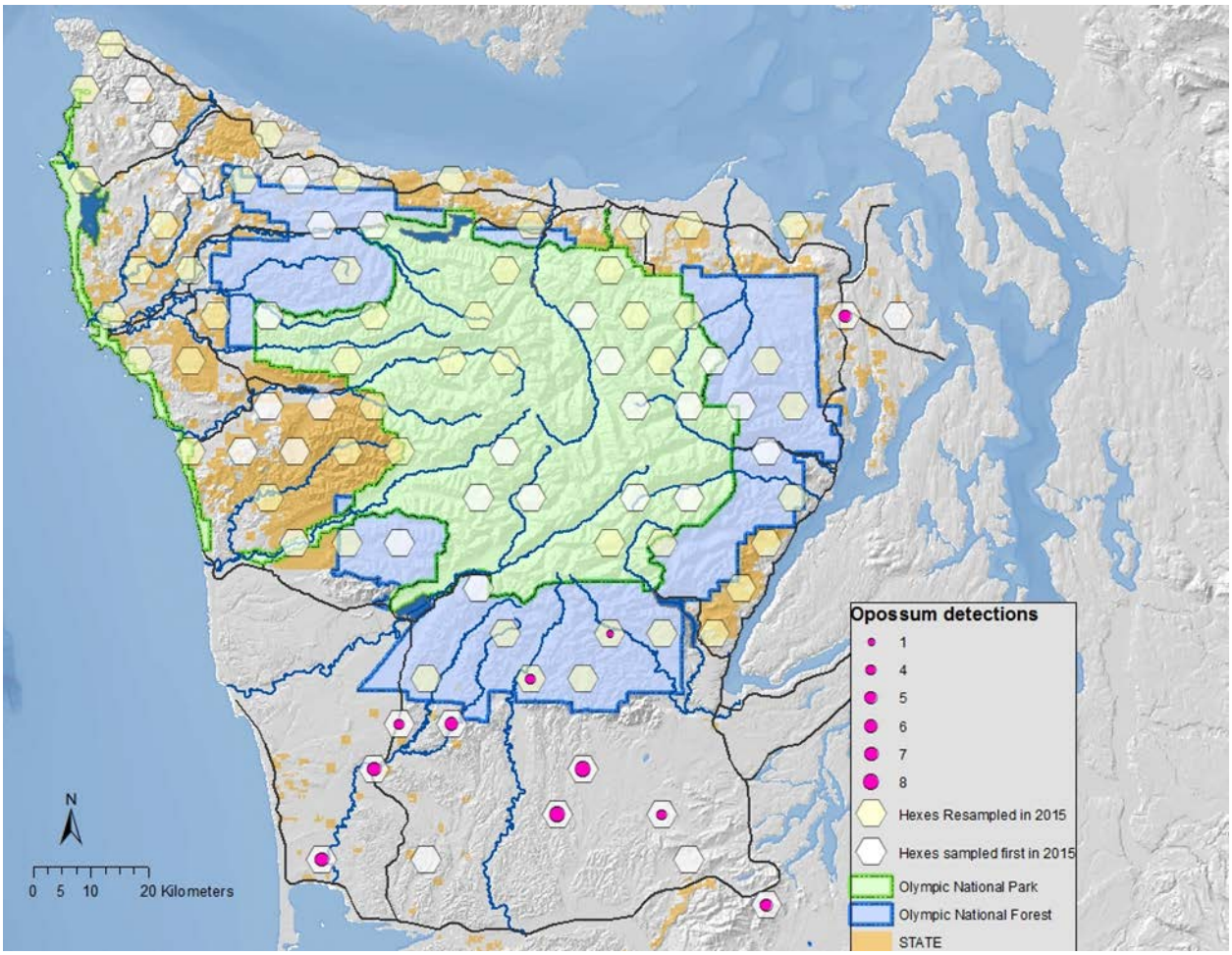

Figure 7. Location (pink dots) and number of station-visits events (scaled by dot size, max=9) of Virginia opossum detections collected in 2015. Shown are hexes sampled for the first time in 2015 (white shade) and sampled in 2013 and re-sampled in 2015 (yellow shade). Opossums were detected in 2 hexes in 2015 where they were not detected in 2013.

Other Fisher Detections

In addition to fishers detected through formal survey procedures, four other fishers were detected on the Olympic Peninsula from incidental detections or observations in 2015, all in the target area (Table 9, Figure 8).

Two fishers were reported to project personnel accompanied by verifiable photographs. Partners followed up with the deployment of cameras and hair snares at one site, and were able to determine the identity of that fisher (M064). The second photograph (F-113) is clearly a fisher, but we were not able to obtain information on the animal's ID. A third fisher was caught in a live trap and later released. Partners obtained hair samples from the trap, and we were able to determine that the animal was M011.

The fourth fisher was at the site where we obtained pictures in 2014 of F108, but were unable to obtain good DNA. We re-sampled the area in 2015, and detected a new fisher, male OPF-0489. It is unknown if this is the same individual that we detected on the cameras in 2014. When the incidental

observations are combined with the fisher detections from the study, our fisher detections in 2015 were primarily clustered on the northwestern and southwestern portions of the target area (Figure 10).

Table 9. Other fishers detected on the Olympic Peninsula, 2015.

Fisher number	Date collected	How detected	DNA amplified	Fisher ID	Gender	Founder	Collar visible	Comments
M064	2/16/2015	Camera	Yes	M064	Male	Yes	No	2010 release. Now 9 years old
F-113	3/16/2015	Camera	n/a	Unknown	Unknown	Unknown	No	--
M011	4/10/2015	Live Trap	Yes	M011	Male	Yes	No	2008 release. Now 9 years old.
OPF-0489	7/0/2015	Camera	Yes	OPF-0489	Male	No	No	--

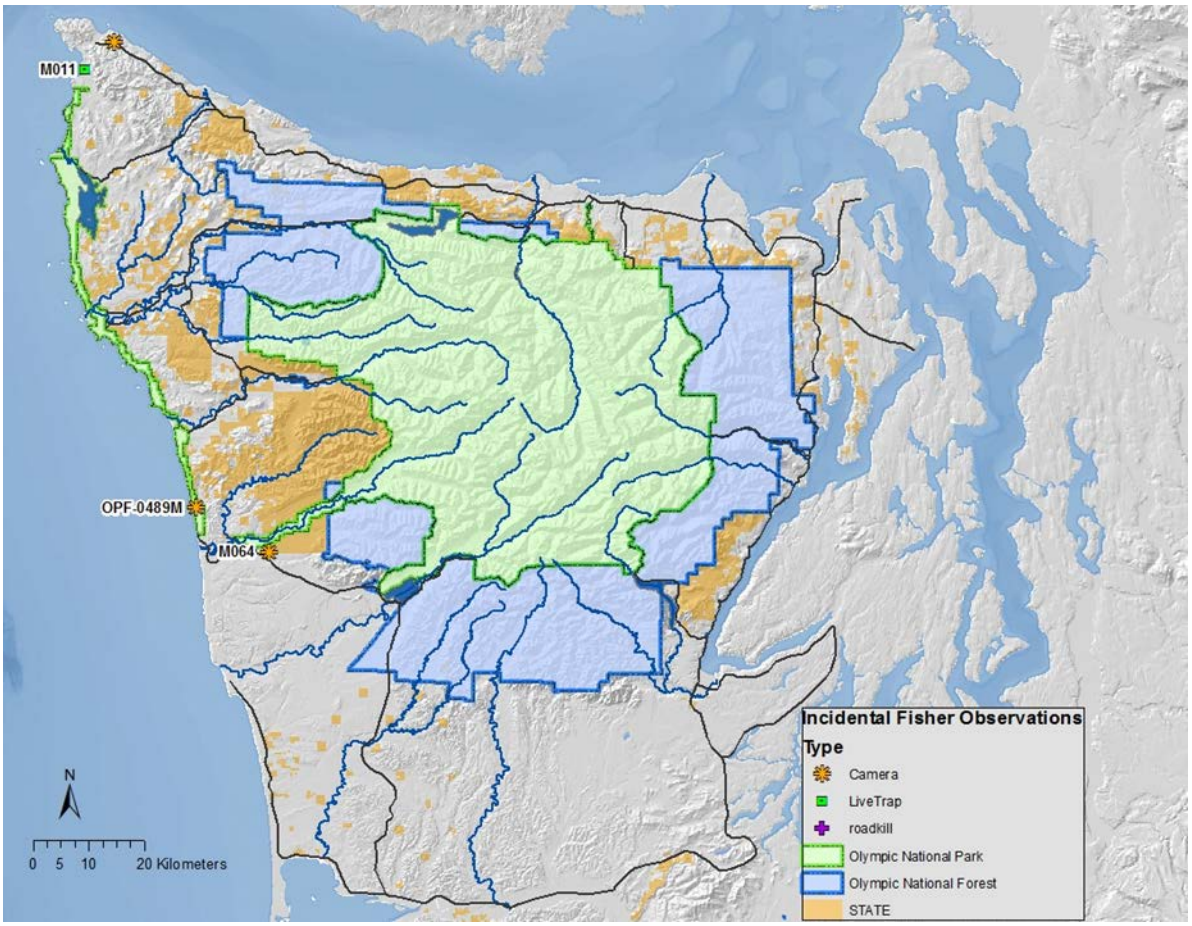

Figure 8. Location of incidental fisher detections on the Olympic Peninsula, 2015. Labels are for fishers with genetic ID.

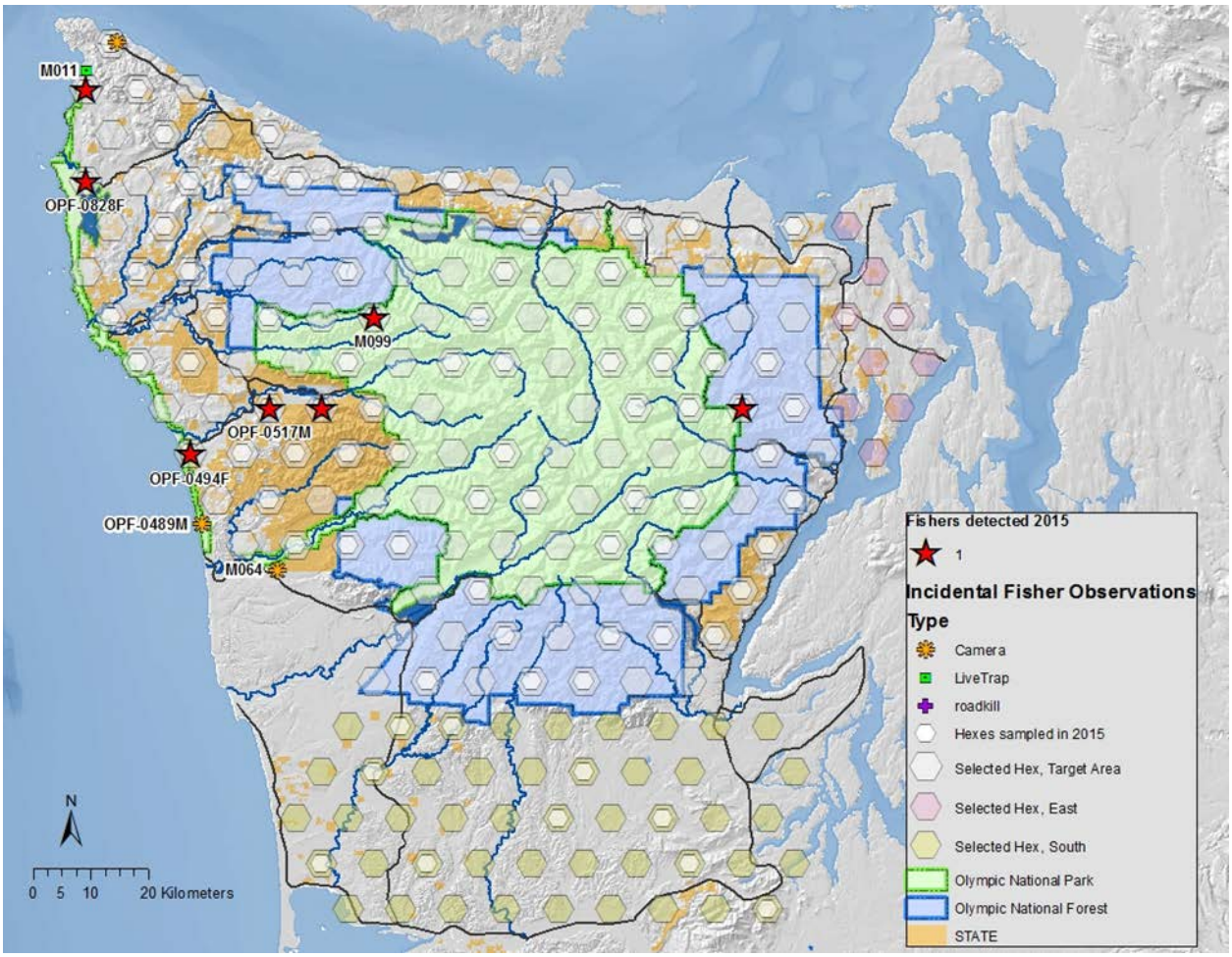

Figure 9. Location of all fisher detections on the Olympic Peninsula, 2015, including those detected as part of the formal survey and incidental observations. Labels for fishers with genetic ID's.

Follow-up on 2014 results that were not resolved in the 2014 annual report:

The DNA for F109, who was detected in 2014 in the eastern expansion area, did not amplify. We plan to re-sample that area in 2016.

Plans for 2016

2016 will be the year 4th and final year of this study. With support already in place from the NPS, USFS and the USFWS Recovery Program, assistance from our partners, and support for an intern received from SCA NPS Academy, we will be able to fully implement our monitoring protocol in 2016. We plan to have a crew leader and 6–8 crew members who will sample 55-60 hexes on ONP and ONF and lend support to partners on non-Federal lands.

All project partners are participating again in 2016. Through our joint efforts in the target area we plan to re-sample all hexes sampled in 2014 (69 hexes). In 2014, we detected three different fishers in adjacent sampled hexagons on the southern boundary of ONP and ONF. In 2016, we plan to intensify sampling in this region to obtain a better understanding of occupancy dynamics, to determine minimum number of animals in this area, and to determine sampling requirements for population density estimation. Through this effort we will be able to examine fisher occupancy patterns across the Olympic Peninsula and examine changes in occupancy over the two-year interval from 2014-2016. In the expansion areas south and east of the target study area we plan to sample 11-14 hexes, to further evaluate fisher colonization outside the primary (target) study area. In addition, we will continue to solicit incidental fisher observations and follow up on them when we are able. The incidental data provides valuable insights about fisher distribution and genetics.

We also will continue to develop models of detection probability and occupancy patterns of fishers and other carnivores on the Olympic Peninsula. Final occupancy estimates will not be available until sampling in all target hexes has been completed.

Lastly, ONF and the USFS Pacific NW Research Station, in partnership with ONP, started a coastal marten project in the winter of 2015, surveying for marten at 85 stations along over 70 km the coastal portion of the park. Cameras were deployed from 16 November 2015 to 16 February 2016. Camera functionality was tested at 14 sites in December 2015, and fishers were detected at 3 of those sites. Results of the complete effort will be presented in the 2016 annual report.

Publications and Public Outreach Activities (2014)

Reports:

Happe, P. J., K. J. Jenkins, T.J. Kay, K. Pilgrim, M. K. Schwartz, J. C. Lewis, and K. B. Aubry. 2015. Evaluation of fisher (*Pekania pennanti*) restoration in the Olympic National Park and the Olympic recovery area: 2014 annual progress report. Natural Resource Data Series NPS/OLYM/NRDS—2015/804. National Park Service, Fort Collins, Colorado.

Presentations:

February 2015: Seattle Mountaineers. Reintroducing the Fisher to Washington: the Olympic fisher Project. Seattle, WA.

March 2015: Science for Parks, Parks for Science: The Next Century. Olympic Fisher Restoration: A cross-boundary collaboration. Berkeley, CA.

April 2015: The Wildlife Society, Washington Chapter and Northwest Section Annual Meeting. Olympic Fisher Restoration: A cross-boundary collaboration. Grand Mound, WA.

Funding (2015)

This project received $115,000 in funding from NPS-NRPP, $20,000 from Olympic National Forest, and $24,000 from USGS (through a grant provided by U.S. Fish and Wildlife Service Recovery Program). In addition, USFWS Recovery Program funding to USGS supported the DNA analysis, and will continue to support DNA analyses, equipment and supplies, and vehicle costs in FY2016.

References Cited

Happe, P. J., K. J. Jenkins, T.J. Kay, K. Pilgrim, M. K. Schwartz, J. C. Lewis, and K. B. Aubry. 2015. Evaluation of fisher (*Pekania pennanti*) restoration in the Olympic National Park and the Olympic recovery area: 2014 annual progress report. Natural Resource Data Series NPS/OLYM/NRDS—2015/804. National Park Service, Fort Collins, Colorado.

Happe, P. J., K. J. Jenkins, M. K. Schwartz, J. C. Lewis, and K. B. Aubry. 2014. Evaluation of fisher restoration in the Olympic National Park and the Olympic recovery area: 2013 annual progress report. U.G. Geological Survey Administrative Report. U.G. Geological Survey, Reston, Virginia.

Hayes, G. E., and J. C. Lewis. 2006. Washington state recovery plan for the fisher. Washington Department of Fish and Wildlife, Olympia, Washington. Available online at: http://wdfw.wa.gov/wlm/diversty/soc/fisher/reintro.htm.

Jenkins, K. J., and P. J. Happe. 2013. Sampling design and field protocols for non-invasive fisher surveys on the Olympic Peninsula, Washington (Version 2013—1.0): Administrative Report to Olympic National Park, May 2013. Olympic National Park, Port Angeles, Washington.

Lewis, J. C. 2014. Post-release movements, survival, and resource selection of fishers (*Pekania pennanti*) translocated to the Olympic Peninsula of Washington. University of Washington Dissertation, University of Washington, Seattle, Washington.

Lewis, J. C., 2006, Implementation plan for reintroducing fishers to Olympic National Park. Washington Department of Fish and Wildlife, Olympia, Washington. Available online at: http://wdfw.wa.gov/wlm/diversty/soc/fisher/reintro.htm.

Lewis, J. C., P. J. Happe, K. J. Jenkins, and D. M. Manson. 2011. Olympic fisher reintroduction project—2010 progress report. Washington Department of Fish and Wildlife, Olympia, Washington.

National Park Service. 2007. Olympic National Park fisher reintroduction plan/environmental assessment. Olympic National Park, Port Angeles, Washington. Available online at: http://wdfw.wa.gov/wlm/diversty/soc/fisher/reintro.htm.

Sato, J. J., M. Wolsan, F. J. Prevosti, G. D'Elía, C. Begg, K. Begg, T. Hosoda, K. L. Campbell, and H. Suzuki. 2012. Evolutionary and biogeographic history of weasel-like carnivores (Musteloidea). Molecular Phylogenetics and Evolution 63(3):745–757.

U.S. Environmental Protection Agency. 2011. Aquatic resources monitoring—Specific design information—Illustrative examples. Available online at: http://www.epa.gov/nheerl/arm/designing/design_intro.htm (accessed 19 March 2014).

U.S. Fish and Wildlife Service. 2004. 12-month finding for a petition to list the west coast distinct population segment of the fisher (*Martes pennanti*). Federal Register 69(68):18770–18792.

U.S. Fish and Wildlife Service. 2014. Threatened species status for west coast distinct population segment of fisher, proposed rule. Federal Register 79(194):60419-60443.

U.S. Fish and Wildlife Service. 2016. Withdrawal of the proposed rule to list the west coast distinct population Segment of Fisher. Federal Register 81(74):22710-22808.

Appendix A. Founders detected in 2015

Animal ID	How Detected	Method	Hex	Release date	Age at Release	Age in 2015	Gender
M064	Incidental	Camera and DNA	220	24 Dec 2009	3	9	Male
M011	Incidental	Live Trap and DNA	653	27 Jan 2008	1	9	Male
M099	Study	Incidental	455	20 Feb 2010	0	6	Male

M064 was captured in British Columbia on 9 December 2009 and released in the Elwha on 24 December 2009. Due to a weak or failed radio signal we had a hard time radio tracking him, and obtained only 9 telemetry locations. Due to insufficient data, he was censored from all analysis of movements and survival. His last two locations were south of the Queets River in July 2010. He was observed on a camera set for a cougar study by project partners on 2/16/2015. They deployed a hair snare near the site and obtained DNA in mid-March 2015. He was 9 years old at the time of the detection. The location of this observation is approximate.

M011 was captured in British Columbia on 6 January 2008 and released in the Elwha on 27 January 2008. Soon after release he headed northwest, and by June 2008 had established a home range in the northwest corner of the Olympic Peninsula, near Neah Bay. We were able to get extensive information on this animal, as his radio was replaced in October 2008 when the first one failed. He was tracked principally by the staff from Makah tribal forestry, and we obtained 88 locations on him until his collar failed in late August 2010. He was observed to make two large-scale movements back to the core of the study area in both 2009 and 2010 during the breeding season, returning to his home range near Neah Bay following both excursions. He was trapped and released by a bobcat trapper on 10 April 2015. At the time of capture he was 9 years old, in the home range he used from 2008-2010, and had shed his radio-collar.

M099 was the last fisher captured in British Columbia and translocated to the Olympic Peninsula. He was caught in British Columbia on 12 February 2010 and released in the Quinault on 20 February 2010. We obtained 15 locations on him, and were able to determine that he established a home range on the ridge between the Hoh and the Bogachiel Rivers. We lost contact with him in October 2010. He was detected on Hex 455, at only one time at one station, 9 km from his 2010 home range area.

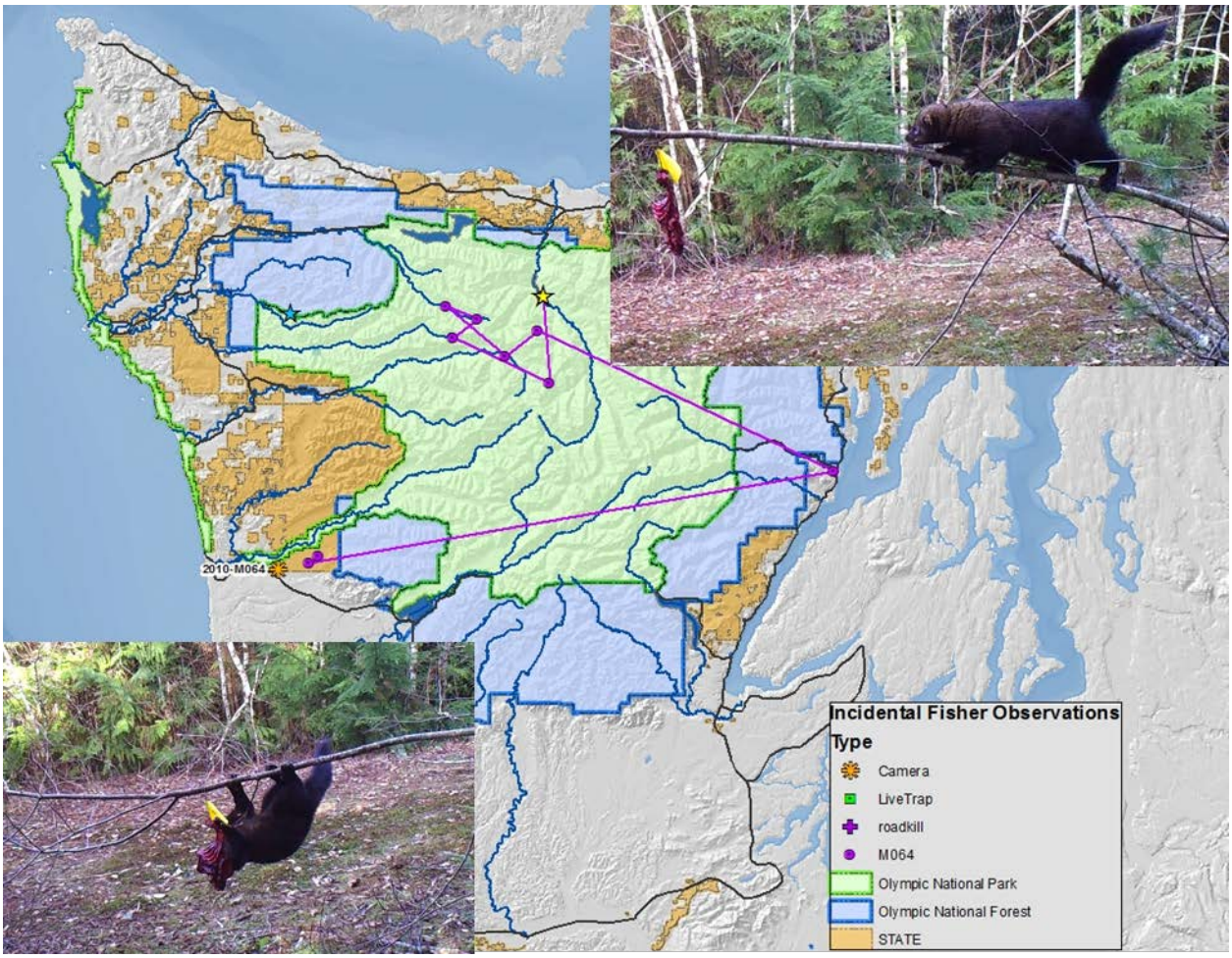

Figure A1. Release location (yellow star) and movements of M064 from his release through July 2010. Orange asterisk is approximate location of where he was detected in 2015. Insets are photos of M064 from 2015 (NPS Photos).

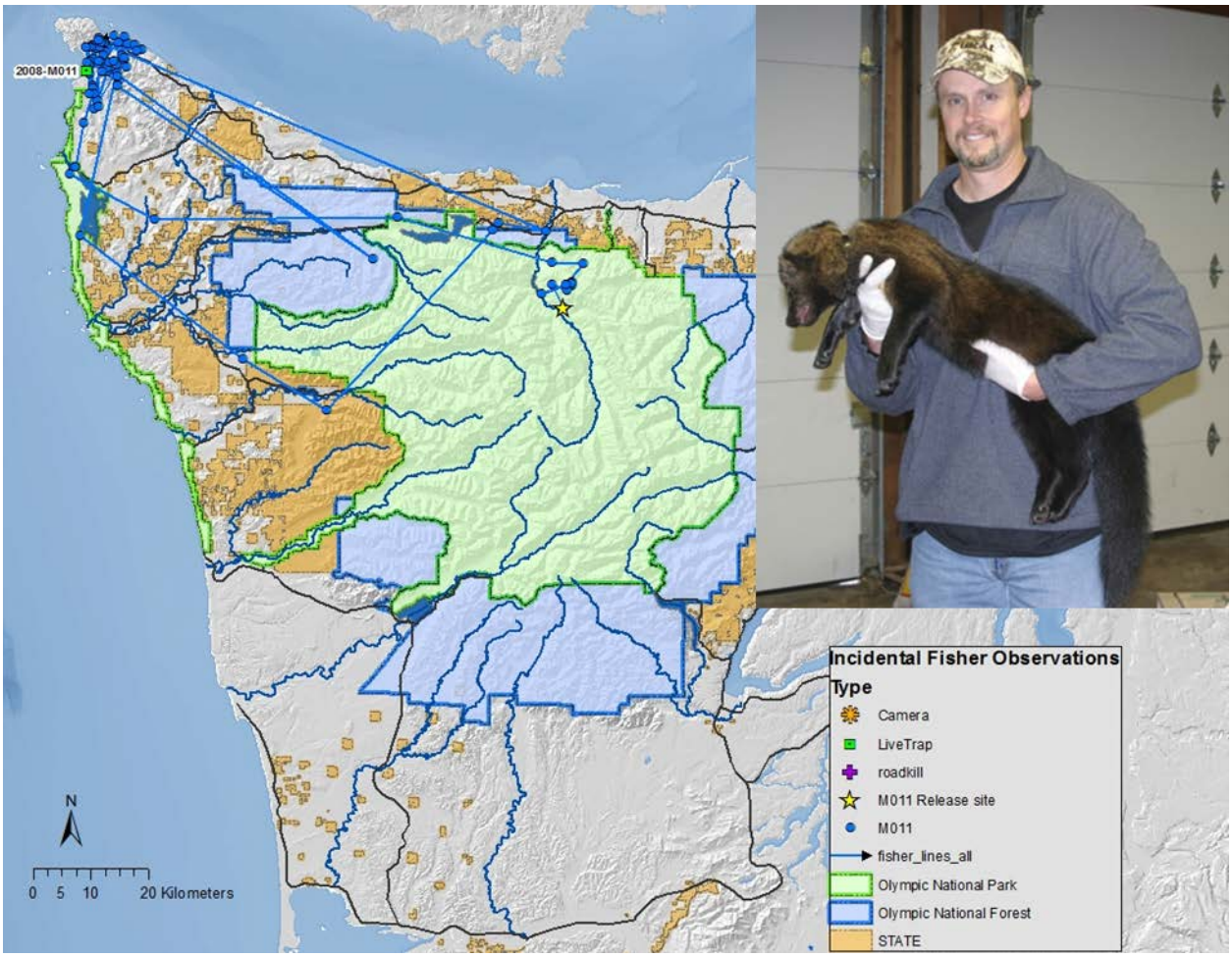

Figure A2. Release location (yellow star) and movements of M011 from his release in 2008 through August 2010. Green square indicates where he was trapped in 2015. Inset is picture of M011 with tribal biologist Rob McCoy, who re-captured him in 2008 when his first radio started failing.

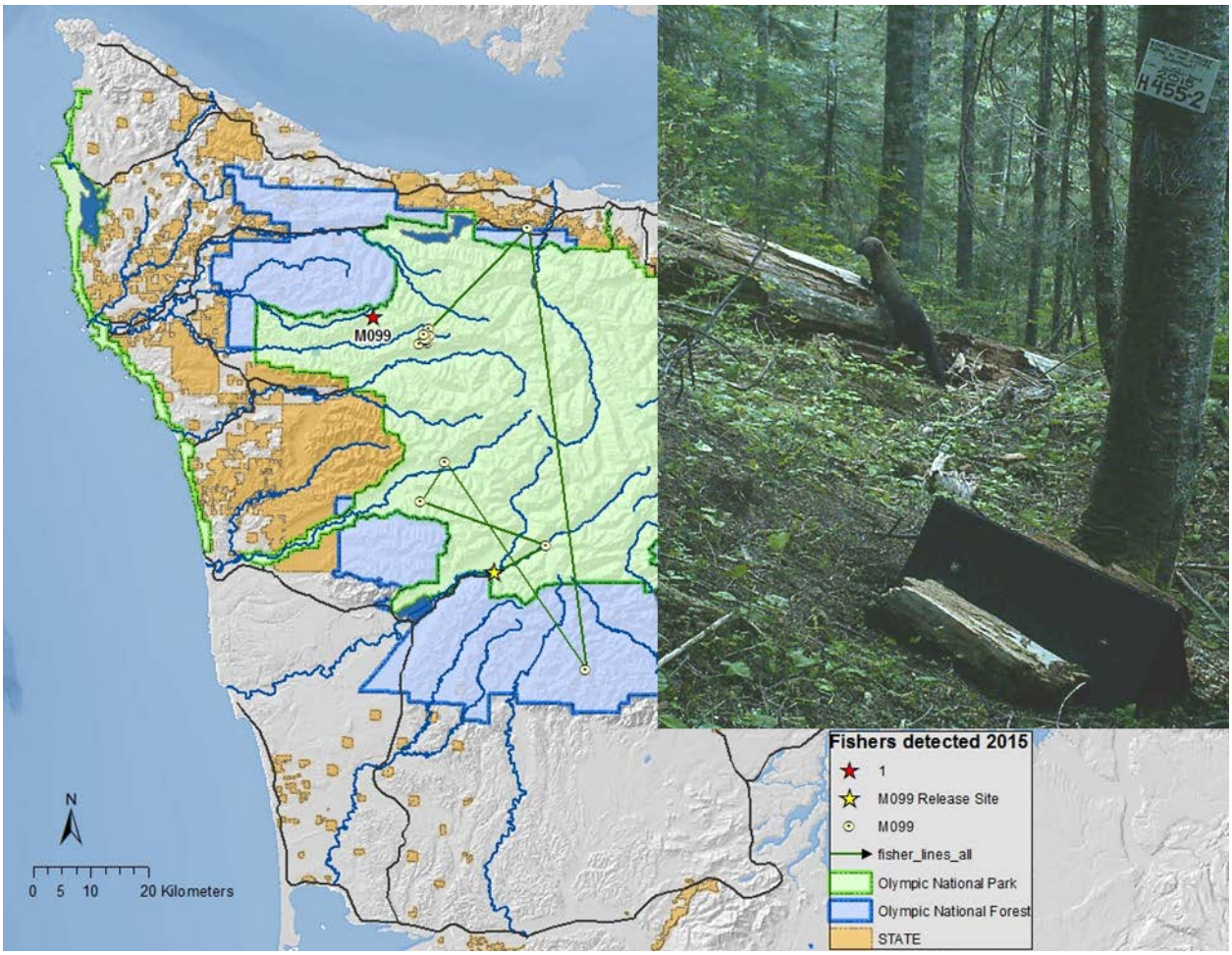

Figure A3. Release location location (yellow star) and movements of M099 from his release until October 2010. The red star indicates where he was detected in 2015. Inset is a photo of him at the camera station.

Appendix B. Parentage of recruits identified by DNA in 2015 in the occupancy study and incidental detections.

Table B1. Parentage of fisher recruits identified by DNA in 2015, Olympic Peninsula, WA.

Animal ID	How Detected	Method	Recapture	Where	Mother	Father	Gender
OPF-0489	Incidental	Camera and DNA	No	Hex 255	F004	M009	Male
OPF-0494	Study	Camera and DNA	No	Hex 309	F048	M097	Female
OPF-0828	Study	Camera and DNA	No	Hex 600	OPF-0494	M082	Female
OPF-0517	Study	Camera and DNA	No	Hex 354	F006	M035	Male

Table B2. Summary of information known about parents of four new recruits identified by DNA in 2015, Olympic Peninsula, WA.

1) OPF-0489 male		
Parental identification	Maternal: F004	Paternal: M009
Release year	2008	2008
Release age	2	0
Release site	Elwha	Elwha
Last heard	05/28/2010 (seen in July 2010)	9/17/2008
Fate	Unknown (collar dead)	Unknown (implant failure)
Home range determined	Yes	Yes
Home range area	NE: Morse Creek	NE: Upper Morse Creek Drainage

F004 was released in the Elwha in 2008 at age two, and radio-tracked for 2.5 years. Following release she did a lot of exploration, but finally settled down in August 2008 in a rural residential area just east of the Port Angeles city limits, in the lower Morse Creek drainage (Figure B1). She resided in that restricted area until her radio-collar failed in May 2010. In 2010, when she was 5 years of age, she was detected denning within her home range, and having a litter size of four (Lewis et al. 2011).

M009 was released in the Elwha at age 8 months, and soon after his release he settled down in the upper Morse Creek drainage (Figure B1). His implant failed in the fall of 2008, so our last location of him was in September 2008.

This is the fourth offspring of F004 and M009 detected (Happe et al. 2013, 2014). They are known to have had at least three litters.

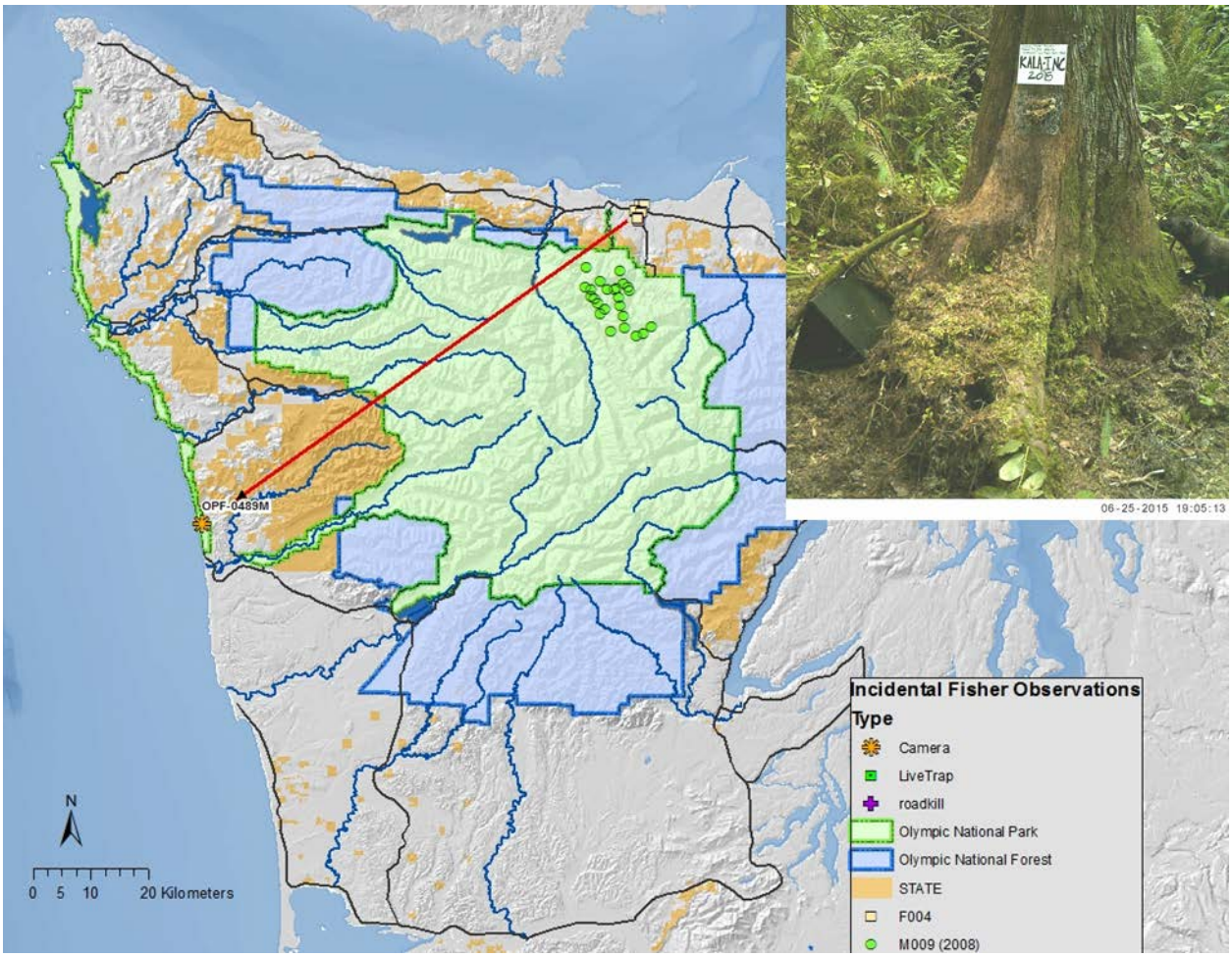

Figure B1. Home range locations of F004 (2008-2010) and M009 (2008). Also shown is detection location (orange asterisk) of their offspring OPF-0489. The red line represents the minimum dispersal distance between the home range of his mother and where he was detected. Inset is OPF-0489 at the station.

2) OPF-0494 female		
Parental identification	Maternal: F048	Paternal: M097
Release year	2009	2010
Release age	1	4
Release site	Queets	Quinault
Last heard	2/2/2011	9/29/2010
Fate	Unknown; shed collar	Unknown; collar failure
Home range determined	Yes	no
Home range area	SW; Quinault Reservation	
3) OPF-0828 female		
Parental identification	Maternal: OPF-0494	Paternal: M082
Release year	Born in Washington	2010
Release age	n/a	0
Release site	n/a	Bogachiel
Last heard	n/a	Sept 2011
Fate	n/a	Unknown; collar failure
Home range determined	n/a	Yes, from 2010-2011; but was detected in another area in 2014
Home range area	Detected in Hex 309; SW Coast, near Kalakoch	SW Coast; near Kalaloch (2010, 2011)

F048 was released in the Queets corridor on 17 January 2009 at age 1. She dispersed south to the Quinault reservation and established a home range in the northern portion of the reservation in 2009, and shifted to the south in 2010 (Figure B2). We lost contact with her in February 2011 when she shed her collar.

M097 was released in the Quinault on 20 February 2010 at age 4. He was equipped with a recycled satellite collar that did not function well, and we were not able to obtain much information on his movements. We lost contact with him in June 2010 with the last known locations being in the headwaters of the Dosewallips River. Because there was a tight cluster of points in that area, we suspect he either died or shed his collar.

M082 was released north of the Bogachiel drainage on 21 January 2010. He was 8 months old at the time of his release, and was radio-tracked for 21 months. He established a home range along the coast, near Kalaloch, and remained there at least until September 2011, when his collar failed. He was detected in 2014 at a camera station 62 km southeast of Kalaloch, at 5 years of age (Happe et al. 2015). He is the also the father of OPF-0678 that was detected in 2013 (Happe et al. 2014).

The earliest F048 and M097 could have bred is 2010, with OPF-0494 being born in 2011. OPF-0494 was detected 45 km north of F048's last known home range in 2015, north of Kalaloch. However a small fisher, whose DNA did not amplify, was detected in this hex in 2013; it is possible that OPF-0494 dispersed to this area as early as 2012.

The earliest OPF-0494 and M082 could have bred is 2012, with her earliest possible birth date for OPF-0828 being in April 2013. She was detected 50 km north of OPF-0494 near Lake Ozette, in a hex that was unoccupied in 2013. She is the second second generation fisher detected on this project.

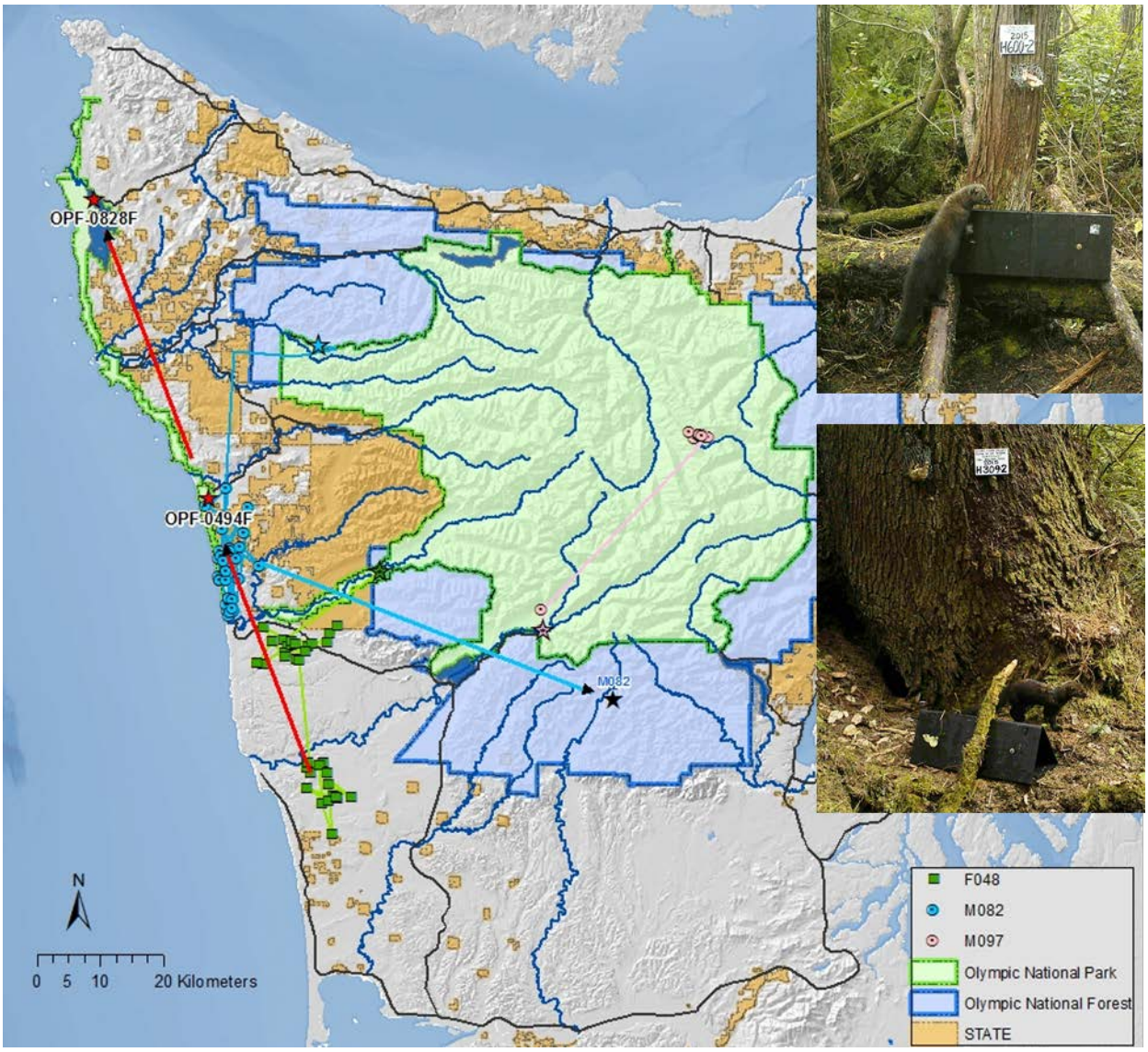

Figure B2. Release locations (stars) and movements (points connected with colored lines) of F048 (green), M082 (aqua) and M097 (pink) post release until contact was lost. Also shown are detection locations (red stars) of offspring of F048 and M097 (OPF-0494) and OPF-0494 and M082 (OPF-0828), and the location that M082 was detected (black star) in 2014. Red lines indicate dispersal distances from natal areas to detecton sites. The bold blue line indicates movement direction of M082 from his last location in 2011 to where he was detected on camera in 2014. Insets are photos of OPF-0828 (top) and OPF-0494 (bottom).

4) OPF-0517 male		
Parental identification	Maternal: F006	Paternal: M035
Release year	2008	2009
Release age	1	0
Release site	Elwha	Sol Duc
Last heard	6/14/2010	4/1/2010
Fate	Unknown; detected alive in 2013	Unknown; detected alive in 2013
Home range determined	Yes	Yes
Home range area	N; Elwha	N; Sold Duc

F006 was released in the lower Elwha in 2008 at age 1. We were able to monitor her movements for 2.25 years; details of her movement patterns are in Happe et al. 2013. Her final home range was in the Elwha Valley, near the northern park boundary. She was detected by a camera and hair snare in her previously documented home range in the summer of 2013, so it is likely that she remained in that area from 2009 to 2013.

M035 was released on December 21, 2008, in the Sol Duc Valley at the Aurora trailhead. He was 8 months old at the time of release. He did not move extensively following his release, and set up a home range in the Sol Duc area. We obtained 40 locations on him until he shed his radio collar. He was detected near his 2010 home range, in hex 455, in 2013 (Happe et al. 2013).

OPF-0517 is the second offspring detected for F006, the other being OPF-0005, who had M058 as a father (Happe et al. 2013). This is the first offspring detected for M035.

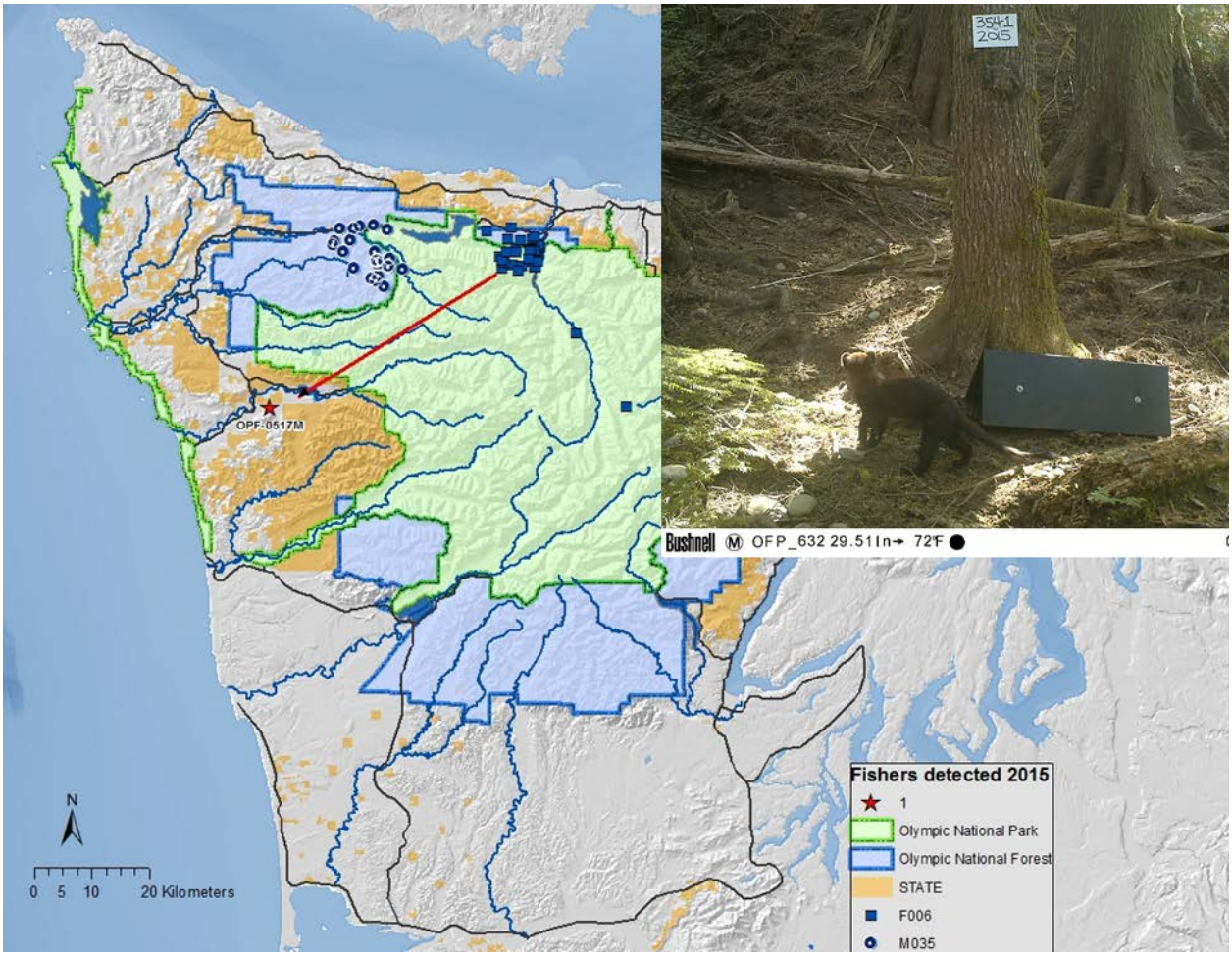

Figure B3. Home range locations of F006 and M035 and the detection location (red star) of their offspring OPF-0517 in 2015. Red line indicates minimum dispersal distance between natal area and detection location. Inset is photo of OPF-0517 at the camera station.

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 149/133794, August 2016

National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science
1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

www.nature.nps.gov

2016 National Park Service CENTENNIAL

EXPERIENCE YOUR AMERICA ™