Fisher Ecology in the Kiskatinaw Plateau Ecosection

Year-end Report

March 2009

A 10-week old fisher kit peers out of natal den

Photo by Carl Gitscheff

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Executive Summary

Fishers (*Martes pennanti*) are medium-sized members of the Mustelid (weasel) family that occur in the lowland forested areas of central and northeastern British Columbia. Research in other areas of BC has shown that forest harvesting focused on late-successional forests may have detrimental effects on fisher populations. However, knowledge gaps of habitat needs in the Peace region hamper the ability of forest licensees to adequately manage for fisher habitat. Through research of a population of fishers in the Kiskatinaw Plateau ecosection, this project addresses several primary objectives to support sustainable fisher populations in the Peace River Region.

We monitored radio-tagged fishers to examine habitat relationships within the Kiskatinaw Plateau ecosection. We collected 432 radiolocations of 15 radio-tagged fishers between 1 April 2008 and 15 March 2009. We have identified 161 rest sites and 27 reproductive dens since the inception of the study. Eleven reproductive dens were in declining balsam poplars and 16 were in declining trembling aspens. The mean dbh of natal and maternal den trees was 59.1 cm (SD = 9.2, n = 11) for balsam poplar and 51.7 cm (SD = 10.5, n = 16) for trembling aspen. All of the den trees had some level of decay that produced cavities that could be used as dens. This is typical of dens reported for fishers elsewhere in British Columbia. We tallied the number of kits in 7 of the 8 litters that were produced by females during 2008; 4 litters were comprised of 3 kits and the remaining 3 litters had 2 kits each.

We documented fishers resting in or under accumulations of woody debris, subnivean cavities under shrubs, in burrows dug by woodchucks and bears, in cavities in balsam poplar or aspen trees, under single pieces of coarse woody debris, or on platforms in black or white spruce trees or lodgepole pine. We also radiolocated fishers resting in abandoned buildings, underground burrows, abandoned beaver (*Castor canadensis*) lodges, magpie (*Pica pica*) nests in willow, on the snow surface and in snow burrows not associated with any habitat element. The home ranges of 17 fishers for which we collected sufficient data averaged 32 km² (SD = 15, n = 13) for females and 199 km² (SD = 51, n = 4) for males.

We identified 3 new potential Wildlife Habitat Area and amended 1 previously identified Wildlife Habitat Area for fishers within the study area during 2008. The WHAs were laid out to include reproductive den structures and sufficient foraging and security habitat to maintain the integrity and effectiveness of the area for rearing.

We conducted several presentations and outreach activities targeted at a variety of audiences throughout 2008-09. We continued outreach to landowners that had fishers using their property. We had considerable involvement from local trappers in the project, through outreach activities and presentations, field tours, and consistent liaison with trappers with lines in our study area. We have consistently ensured the results of work to date have been effectively extended to industry and government, by including several key industry partners in our project activities.

Work planned for 2009-10 includes habitat evaluations, identifying additional candidate Wildlife Habitat Areas, completion of a final project report, publishing peer-reviewed scientific reports, and extension of the results of this work to forest licensees, trappers, and the oil and gas industry.

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1.0 Introduction

The fisher (*Martes pennanti*) is a medium-sized member of the Mustelid (weasel) family that inhabits many of the lowland forested areas that dominate the plateaus and plains of central and northeastern British Columbia. Fishers are considered to be habitat specialists, fulfilling most of their life requirements in forested habitats (Powell 1993, Weir and Harestad 2003). Evidence from studies of fishers in western coniferous forests indicates that fishers require late-successional seral stages or associated habitat elements for foraging, resting, and whelping (Jones 1991, Weir and Harestad 2003). Because of this strong association, forest-harvesting activities that focus on late-successional forests may have detrimental effects on fisher populations by altering and degrading the abundance and distribution of resources they require.

Fishers are currently on the provincial Blue list (special concern) and habitat requirements for this species are needed for sustainable forest management plans. Large cottonwood trees with heart-rot are characteristic of reproductive denning habitat of fishers in central British Columbia (Weir 2003, Weir and Harestad 2003). Fishers in central BC also appear to rely on large woody debris as thermal cover during periods of extreme cold (Weir et al. 2004). However, in the Peace region of northeastern British Columbia, fishers appear to be abundant in spite of the relative rarity of these habitat features. Thus, current habitat management guidelines under the Forest and Range Practices Act (FRPA) may not be relevant or effective for fishers in the Peace region.

These gaps in knowledge of the habitat relationships of fishers in this region hamper the ability of forest licensees to adequately manage for fisher habitat as part of their sustainable forest management plans. Detailed habitat ecology information is required to ensure that habitat protection and management for fishers in these areas is appropriate and effective. Forest managers need to determine if current stand-level management practices in the Peace region are sufficient to supply natal and maternal denning sites and cold weather refuges for fishers. Knowledge of habitat requirements for this region will support revisions to the Identified Wildlife Management Strategy (IWMS) account for this species that better reflect these needs.

Fishers in British Columbia are currently managed as a furbearer that can be legally harvested by trappers on registered traplines between 1 November and 15 February. Harvests of fishers have declined in British Columbia over the past 30 years, which has contributed to its current status as "vulnerable" in the province (Weir 2003). The density of fishers in the Williston region of northcentral British Columbia was estimated to be between 8.8 and 11.2 fishers/1000 km² (Weir and Corbould 2006). However, due to the lack of relevant density estimates for northeastern British Columbia, harvest management may be incorrectly based on estimates from other jurisdictions.

This project addresses several primary objectives to support sustainable fisher populations in the Peace River Region. First, we will identify the characteristics of natal and maternal denning habitat to provide increased and appropriate protection under the Forest and Range Practices Act. Second, we will describe and identify habitat relationships of fishers in this region to provide applicable and valuable information to land management planning processes and habitat supply analyses. Finally, we will provide extension reports and presentations to the forest, oil and gas, and trapping industries that will help these groups manage fishers and fisher habitat in a sustainable manner.

2.0 Project Area

Our project area was in the Kiskatinaw Plateau ecosection (Demarchi 1995) to the south and west of Dawson Creek, BC (55° 45' N, 120° 11' W). The Kiskatinaw Plateau is a relatively flat upland dissected by the Murray, Kiskatinaw and Wapiti rivers. It rises from the Peace Lowlands to the north and culminates in the Rocky Mountain Foothills to the south. Numerous wetlands occur on upland sites. Our research study area covered 950 km² of the moist-warm subzone of the Boreal White and Black Spruce biogeoclimatic zone (BWBS) and included both lowland and upland forested area to the east of the Kiskatinaw River and north of Tupper Creek (Fig. 1).

Forests in the project area are typical of boreal mixed-wood landscapes. Dominant tree species include white spruce (*Picea glauca*), trembling aspen (*Populus tremuloides*), lodgepole pine (*Pinus contorta*), and black spruce (*Picea mariana*), with other deciduous components of balsam poplar (*Populus balsamifera* spp. *balsamifera*) and paper birch (*Betula papyrifera*). Young forest stages were comprised primarily of trembling aspen or lodgepole pine, whereas later-successional stands were dominated by spruce or seral associations of trembling aspen. The natural disturbance regime of the project area was frequent, large-scale fires (up to 1,000 km²) occurring about every 100 years (British Columbia Ministry of Forests and British Columbia Ministry of Environment, Lands and Parks 1995).

3.0 Methods

All methods used and data collected for this inventory and research program followed applicable sections of Resource Information Standards Committee (RISC) species inventory (Resources Information Standards Committee 1998a) and inventory methods for medium-sized territorial carnivores (Resources Information Standards Committee 1999). All data were stored in a relational database, based on the Wildlife Species Inventory template (British Columbia Ministry of Sustainable Resource Management 2006).

3.1 Radio-monitoring

Radio-tagged fishers were monitored using standard telemetry procedures (RISC 1998a). We collected directional bearings from ground stations using a three-element, collapsible Yagi antenna. We estimated locations and 95% error polygons from ground telemetry using Locate III software (Nams 2005). We estimated the precision of each location using the 95% error polygons for ground locations. All ground telemetry work used Universal Transverse Mercator (UTM) coordinates from a handheld Global Positioning System. All locations were recorded using North American Datum 1983. Aerial telemetry methods followed those outlined in the Resources Inventory Standards Committee document "Wildlife Radiotelemetry" version 2.0 (1998b).

Ground-based radiotelemetry was used to identify reproductive (i.e., natal and maternal) dens of parturient females. Natal and maternal dens were identified by repeatedly radio-tracking adult female fishers during April and May (e.g., Weir 1995, Weir and Corbould 2008). Reproductive den sites and structures were marked and described during the period of occupancy. We also used ground telemetry to identify resting sites used by radio-tagged individuals. Den and rest sites were characterized on the basis of site type (ground, tree, cavity, coarse woody debris), species and diameter-at-breast height of element used (if a tree).

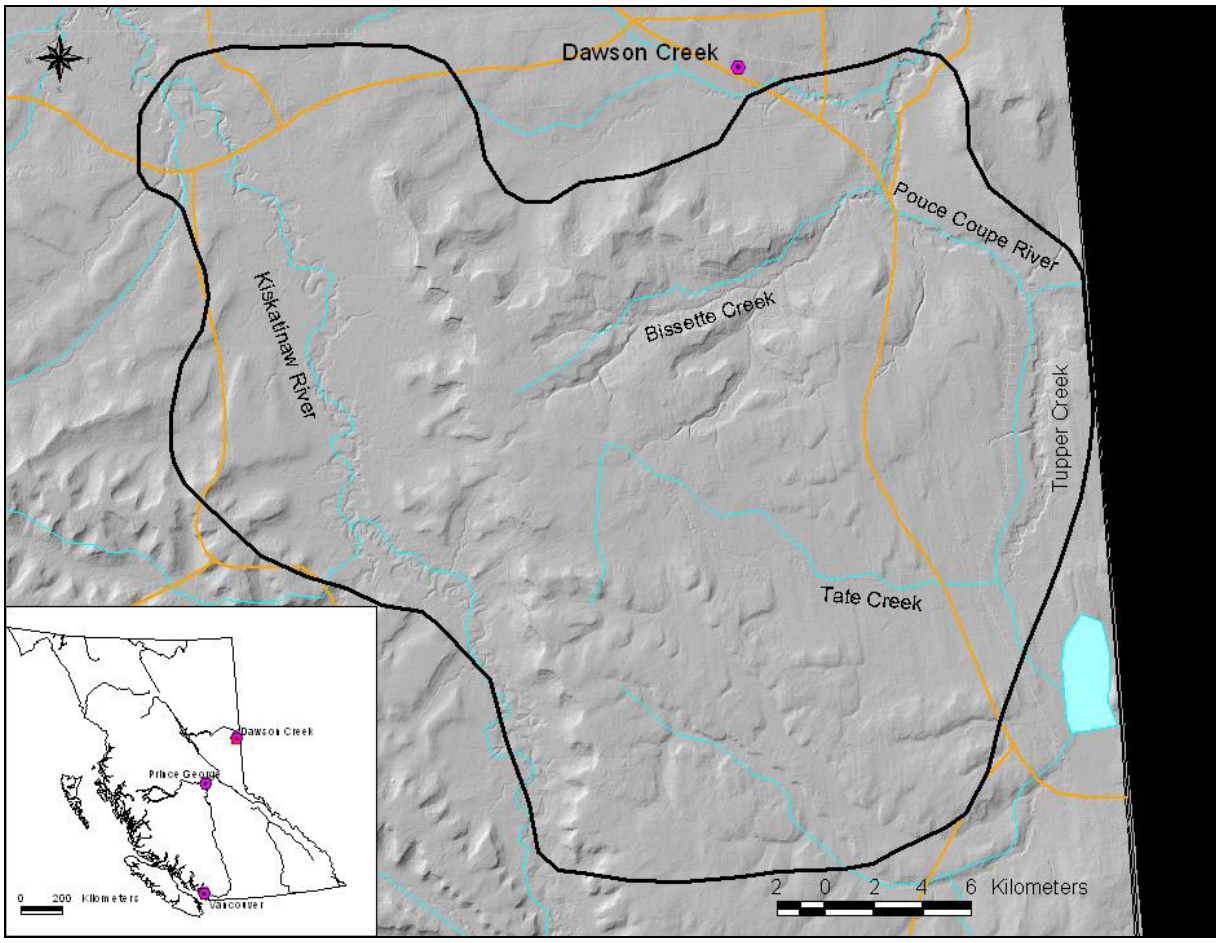

Figure 1. Location of the research study area southwest of Dawson Creek, British Columbia.

3.2 Home range

We estimated size and location of the home range of each resident fisher using two estimators. For fishers with 30 or more locations, we estimated home ranges using the 95% isopleth of the utilisation distribution (UD) generated from the fixed kernel method with the smoothing parameter selected by least-squares cross-validation (Worton 1989, Seaman et al. 1999). For fishers with repeated observations at one location (e.g., reproductive den, rest site), we initially estimated the smoothing parameter for the fixed kernel for a dataset without repeated observations. Using the smoothing parameter value generated from this technique, we re-ran the fixed kernel on the complete dataset. For fishers with <30 radiolocations, we only calculated home ranges using the minimum convex polygon (MCP) created from 100% of their radiolocations. We used the Animal Movement extension to ArcView (Hooge and Eichenlaub 1999) for all home range calculations.

3.3 Habitat assessment

We conducted habitat evaluations in 400-m² plots at reproductive dens and rest sites. We used methods outlined in Describing Terrestrial Ecosystems in the Field (British Columbia Ministry of Environment, Lands and Parks and British Columbia Ministry of Forests 1998) to quantify vegetation and structural characteristics of the plot. We used ground inspection methods for site description, mineral soil characteristics, humus form, coarse fragment content, and ecosystem description. We estimated ocular percent cover for the A (tree), B1

(high shrub; 2-10 m), B2 (low shrub; 0.15-2 m), B (all shrub), C (herbaceous), and D (moss) vegetation layers. We estimated percent cover for each tree species in the A layer. We assessed all trees ≥15 cm dbh within the plot using Mensuration and Tree Attributes for Wildlife techniques (British Columbia Ministry of Environment, Lands and Parks and British Columbia Ministry of Forests 1998: sections 4 and 6). We measured coarse woody debris (British Columbia Ministry of Environment, Lands and Parks and British Columbia Ministry of Forests 1998: section 7) on two 24-m linear transects emanating from plot centre.

3.4 Prey track surveys

We assessed density of prey activity during winter by conducting prey-track encounter transects in various habitats throughout the study area. We surveyed track transects after >1 cm of fresh snow had fallen, at least 24 hours had passed since this snowfall, the temperature was >-20°C, and <5 days had passed since the last snowfall. Track transects were conducted by surveying tracks along lines up to 1250 m in length. We truncated transects if terrain or snow conditions became unstable or unsafe.

Once a start point was identified [usually from Vegetation Resource Inventory (VRI) maps], we followed a bearing that was more-or-less perpendicular to the trail/road for the first 500 m of the transect. The second (traverse) transect segment was 250 m long and at right angles to the first. The third transect segment was 500 m long and at the reverse direction (-180°) of the start bearing.

As we moved along the transect, we documented the biogeoclimatic site series and structural stage of each stand that we entered. At each set of tracks encountered, we recorded the species, distance along transect, stand in which the observation occurred, and reliability of species identification.

4.0 Results[1]

4.1 Radio-monitoring

We collected 432 radiolocations of 15 radio-tagged fishers between 1 April 2008 and 15 March 2009, of which 418 were suitably precise for inclusion in habitat or home range analyses (i.e., ≤0.75 km²). We identified the element used for resting or denning on 81 occasions, the patch used for resting, denning, or while active at 119 sites, and the stand used for 259 radiolocations. We have identified 150 rest sites, 15 natal dens, and 12 maternal dens since the inception of the research study.

Of 150 rest sites that we identified, most were on rust brooms or branches in white spruce trees (33), in piles of woody debris (29), or in cavities in aspen or balsam poplar trees (30). Other sites used for resting by tagged fishers included: subnivean sites that lead to burrows previously excavated by woodchucks or bears (17), in the crown of black spruce trees (12), under single pieces of coarse woody debris (7), at the base of willow clumps or other shrubs (12), under abandoned buildings (3), in abandoned beaver lodges (2), in rock crevices (2), and single observations in a magpie nest, a lodgepole pine tree, and on the snow surface.

Ten of 12 radio-tagged females showed whelping behaviour during 2008 and began using natal dens between 22 March and 4 April ($\bar{x}$ = 29 March, SD = 5 d). Two of these females (F12, F13) were only documented repeatedly at the same site for <1 week, thus likely did not successfully rear kits. We used a video camera to view the interior of the cavity of one of the

[1] For data collected to 15 March 2009.

sites that F13 used and could not see any evidence of kits, despite her using the cavity repeatedly during the previous week.

We observed female fishers using two species of tree for rearing offspring (Table 1). We identified 15 natal (i.e., where kits were born) and 12 maternal (i.e., subsequent to natal) dens used by 12 females since April 2005: 11 in balsam poplars and 16 in trembling aspens, all with some amount of internal decay. The mean dbh of the natal and maternal den trees was 59.1 cm (SD = 9.2, n = 11) for balsam poplar trees and 51.7 cm (SD = 10.5, n = 16) for trembling aspen trees. Maternal dens occurred in similarly size trees as natal dens ($\bar{x}_{natal}$ = 55.5 cm, SD = 9.3, n = 15; $\bar{x}_{maternal}$ = 54.0 cm, SD = 12.4, n = 12). All of the den trees had some level of decay to produce cavities large enough to be used as dens. Entrances to cavities were either through fire-scars or branch-holes.

Table 1. Natal and maternal dens used by 12 radiotagged female fishers for rearing kits between 2005 and 2008.

Type of den	Species[a]	mean	SD	n
Natal den	Acb	56.8	9.1	7
	At	54.3	9.8	8
Natal den mean		55.5	9.3	15
Maternal den	Acb	63.1	9.2	4
	At	48.8	11.3	8
Maternal den mean		54.0	12.4	12

[a] Acb: balsam poplar (*Populus balsamifera* spp. *balsamifera*); At: trembling aspen (*Populus tremuloides*)

Between 29 April and 9 June, we visited dens to tally the number of kits in 7 of the 8 litters that were produced by radio-tagged females during 2008. With the assistance of Carl Gitscheff, who scaled the den trees, we viewed the den cavities with a remote lens and video camera while the female was away from the den tree. Four litters were comprised of 3 kits and the remaining 3 litters were of 2 kits each ($\bar{x}$ = 2.6, SD = 0.5, n = 7). We repeated surveys at 3 of the dens between late April and early June; the number of kits remained unchanged during the survey period for these litters. One adult female fisher (F22) died in early July, so it is unlikely that her kits survived.

Home ranges of radio-tagged fishers were well distributed across the study area (Figs. 2 & 3). The 95% UD home ranges of 17 resident fishers averaged 32.1 km² (SD = 15.0, n = 13) for females and 198.8 km² (SD = 51.1, n = 4) for males (Table 2).

Table 2. Monitoring history and estimated home ranges of radio-tagged fishers in the Kiskatinaw Plateau ecosection, British Columbia, 2005 - 2009.

Fisher ID	Sex	First capture	Last radiolocation	Monitoring duration (d)	Status	Number of radiolocations	Home range	
							95% FK[a]	MCP[b]
Females								
F02	F	08-Mar-05	27-Feb-09	1452	alive	85	26.8	39.6
F04	F	12-Mar-05	12-Mar-05	0	unknown	0	--	--
F07	F	04-Mar-06	18-Aug-07	532	dead	56	10.0	21.1
F08	F	10-Mar-06	27-Feb-09	1085	alive	103	39.2	67.9
F09	F	18-Mar-06	13-Dec-07	635	dead?	67	21.5	19.8
F11	F	18-Jan-07	27-Feb-09	771	alive	94	59.9	72.8
F12	F	23-Jan-07	25-Feb-09	764	alive	88	21.7	35.9
F13	F	24-Jan-07	25-Feb-09	763	alive	104	11.5	37.8

F14	F	26-Jan-07	03-Jul-08	524	unknown	60	50.1	53.6
F16	F	02-Mar-07	26-Feb-09	727	alive	89	34.7	42.2
F17	F	02-Mar-07	28-Feb-09	729	alive	83	42.1	61.3
F18	F	03-Mar-07	20-Jan-08	323	dead	26	--	73.4
F19	F	14-Mar-07	24-Feb-09	713	unknown	67	46.4	47.8
F22	F	18-Feb-08	03-Jul-08	136	dead	26	--	35.0
F23	F	20-Feb-08	25-Feb-09	371	alive	55	22.7	27.2
F26	F	12-Mar-08	25-Jan-09	319	dead	32	30.6	34.6
						mean	32.1	44.7
						SD	15.0	17.6
Males								
F01	M	05-Mar-05	11-May-05	67	unknown	8	--	--
F03	M	12-Mar-05	12-May-05	61	unknown	8	--	--
F05	M	15-Mar-05	19-Oct-08	1314	unknown	62	219.8	213.2
F06	M	18-Mar-05	13-May-05	56	unknown	7	--	--
F10	M	21-Mar-06	17-Nov-07	606	dead	52	249.5	194.5
F15	M	27-Jan-07	11-Jul-08	531	dead	47	129.5	88.0
F20	M	20-Mar-07	03-Nov-07	228	dead	16	--	111.3
F21	M	05-Feb-08	28-Feb-09	389	alive	37	196.5	199.0
F25	M	08-Mar-08	11-Mar-08	3	unknown	2	--	--
						mean	198.8	161.2
						SD	51.1	57.2

[a] isopleth of the 95% utilization distribution estimated using fixed kernel method
[b] minimum convex polygon of all radiolocations

We documented 4 mortalities of radio-tagged fishers during 2008-09. F15 (adult male) died from undetermined causes to the southwest of his normal home range between April and July 2008. F22 died in early July, but due to advanced decay, we were unable to determine cause of death. The position of the body suggested predation. Domestic dogs found the body of F10 (adult male with a defunct transmitter) along a rural road in early July. Puncture wounds suggested predation by a canid. Finally, F26 (2 year-old female) died in January 2009 as result of an unanchored, illegal foot-hold trap that was attached to her hind foot and which appeared to have resulted in her starvation.

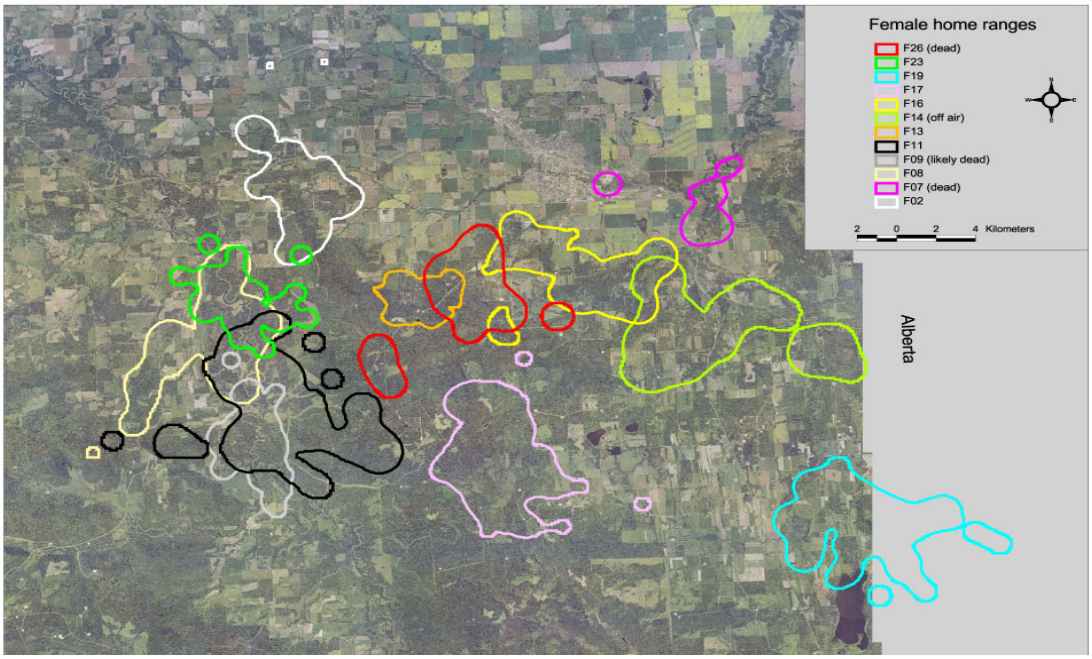

Figure 2. Home ranges of radio-tagged female fishers in the Kiskatinaw Plateau ecosection, 2005-09 (F12 not shown; 20 km north of other study individuals). Home ranges (95% UD) were estimated for fishers with >30 radiolocations.

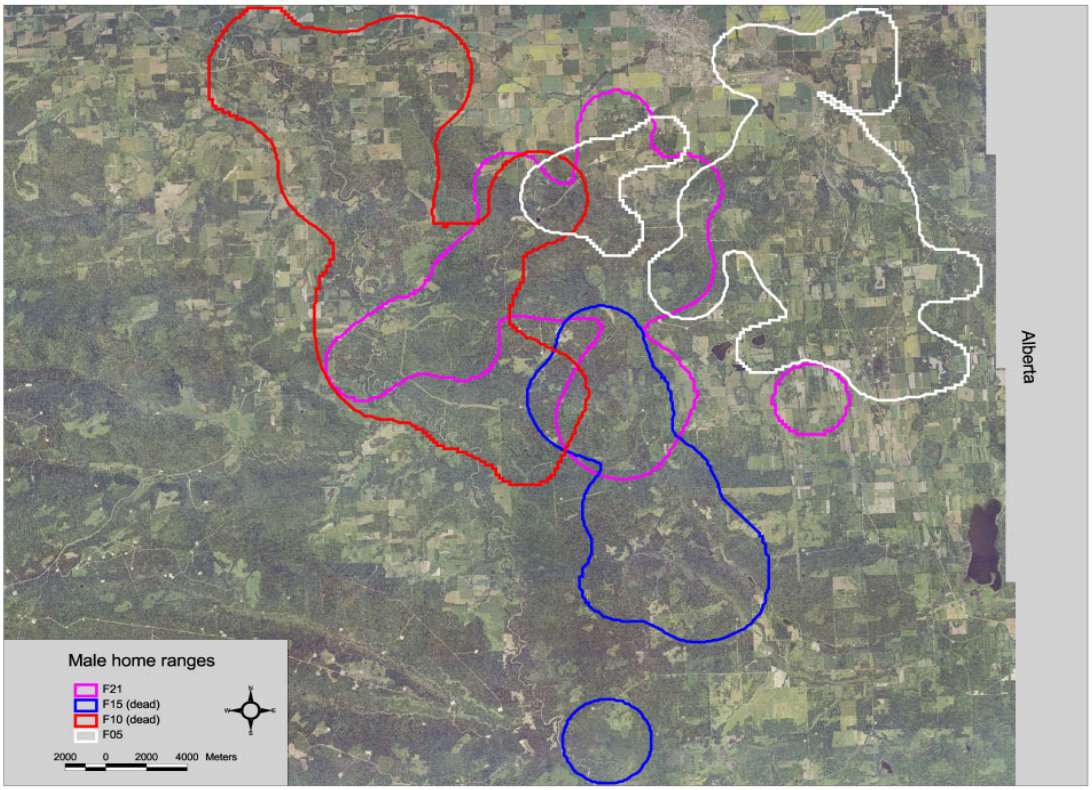

Figure 3. Home ranges of radio-tagged male fishers in the Kiskatinaw Plateau ecosection, 2005-09. Home ranges (95% UD) were estimated for fishers with >30 radiolocations.

4.3 Habitat evaluations

We have conducted 169 habitat evaluations at 88 used sites (15 natal and 11 maternal dens, 62 resting sites) and 81 comparison points throughout the study area.

4.4 Prey surveys

We continued conducting snow-track surveys for prey during 2008-09. Infrequent snowfall events during winter limited opportunities for conducting track transects. We completed 6400 m of track transects, encountering potential prey items (snowshoe hares, squirrels, grouse, and mice/voles) 306 times.

4.5 Wildlife Habitat Areas

During 2008, 3 new and 1 addendum Wildlife Habitat Area (WHA) proposals for fishers were submitted to the Ministry of Environment (Fig. 3).

The 3 new proposals were for areas on Crown land that supported reproductive dens of fishers and included foraging and resting habitats that surrounded these sites. The WHA identified for F17 (37.5 ha) included the natal den (large-diameter balsam poplar) that she used to successfully produce 2 offspring during 2008. The area surrounding the natal den was heavily used by the female for foraging during the rearing period. This natal den and foraging area was used from April – August 2008. The WHA on the Leach Gravel Reserve (28.6 ha) included 2 maternal dens of a radio-tagged adult female fisher (F02) that successfully produced offspring during 2005, 2006, and 2008. The area surrounding the maternal den was heavily used by the female for foraging and resting during each rearing period. The South Rim Creek WHA (22.7 ha) included both the natal and maternal dens (large-diameter aspen) of a radio-tagged adult female fisher (F23) that successfully produced 2 offspring during 2008. The area surrounding the dens was heavily used by the female for foraging during the rearing period. This natal den and foraging area was used from April – August 2008.

The one addendum WHA (25.6 ha) expanded a previously established WHA to include another maternal den and additional resting sites for F08 and F11. The additional area was identified because of 1) use of a maternal den (large-diameter trembling aspen) in the new area (May 2008), and 2) substantial, continued use of the area by both adult females during the rearing period (April – August 2008). The amalgamated area includes 4 significant wildlife habitat features: the natal den used successfully by different females in 2006 and 2008, 1 maternal den used in 2008, and important foraging areas used by both females during both rearing season of 2006 and 2008.

Two of the 8 female fishers that produced kits in 2008 used WHAs that were established in 2006. Four fishers selected natal and maternal dens in 2008 that were on private property or in Alberta so were not suitable for the delineation of candidate WHA proposals.

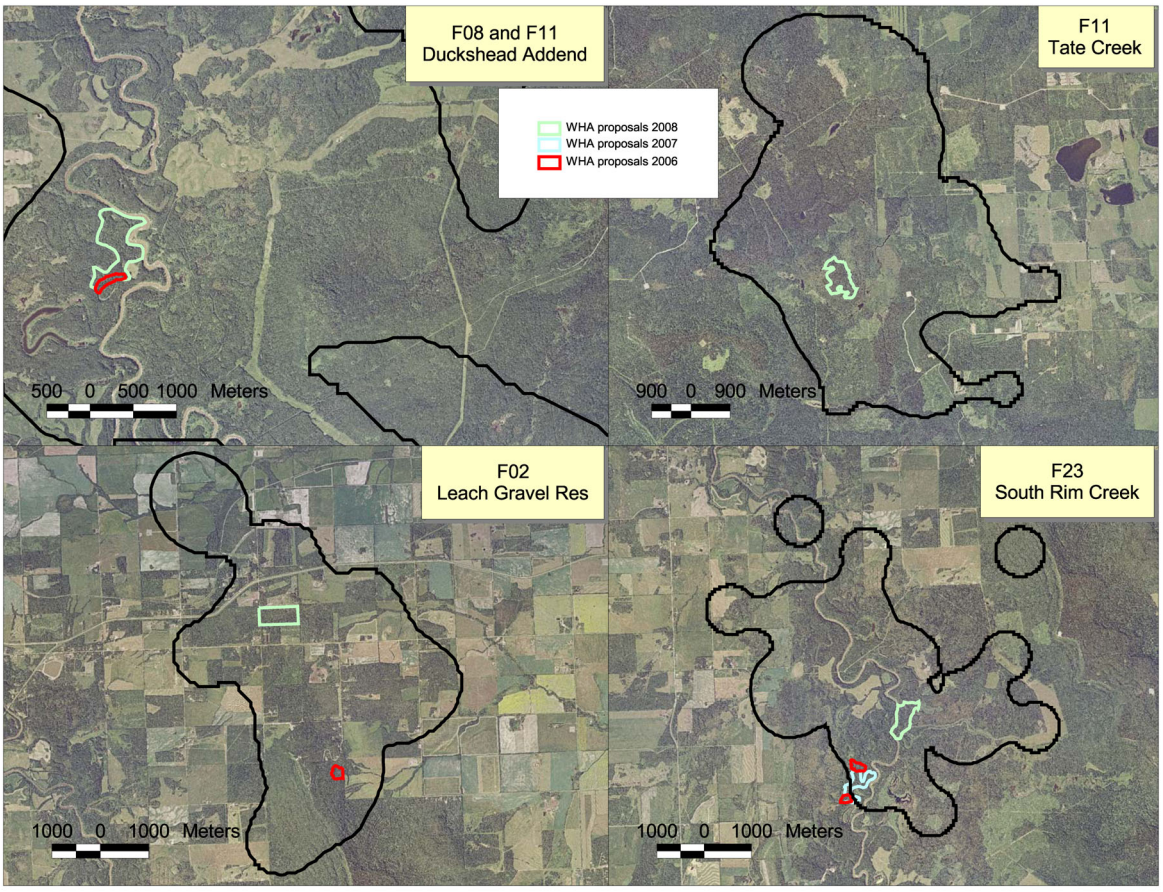

Figure 3. Location of 3 new and 1 addendum Wildlife Habitat Areas proposed in 2008 for 4 radiotagged fishers relative to their respective home ranges (solid black lines).

4.6 Presentations and outreach

We conducted several outreach activities targeted at various audiences throughout 2008-09.

We continued outreach to landowners who had radio-tagged fishers using their property. We distributed a project-information brochure to interested landowners as an introduction to the project and so that they could learn more about fishers and fisher habitat. The intent of the brochure was to provide basic information about fishers, highlight the objectives and methods of the project, and identify the funding agencies and partners involved. We also identified key project personnel and their contact information so that landowners could get more information or discuss the project in more detail. At least 58 landowners have granted project staff access to their land. We have distributed pamphlets to landowners, the regional district office, for distribution at the Ministry of Environment office, local trappers, and included them in local trapper education courses.

During 2008-09, we had considerable involvement from local trappers in the project. In addition to informal updates, we provided several updates and presentations about the project to the Dawson Creek Trappers Local. We contacted trappers with traplines in the study area several times throughout the year to discuss the project and keep them informed of progress and findings. We have developed good working relationships with all trappers in our study area and they have willingly cooperated with the project by curtailing trapping

activities in areas with tagged fishers. Copies of the 2007-08 year-end report were distributed to all of the local trappers and other members of the British Columbia Trappers Association. We have also liaised with the president of the Dawson Creek trappers local (Carl Gitscheff) on many occasions and he has accompanied us in the field with us several times.

We consistently ensured that results of work to date have been effectively extended to industry and government. Mark Phinney (District Biologist, Louisiana-Pacific Canada) has been a key partner in the project, receiving numerous project updates, and he has helped throughout the year with the collection of field data. His involvement in the project has helped ensure that input from forest licensees is at the forefront of the research considerations. We have had many Ministry of Environment biologists in the field with us to show them the proposed Wildlife Habitat Areas and to identify other key findings from the project that will help with their management of fisher habitat. During 2008-09, EnCana, the primary Oil and Gas tenure-holder in the area, became involved in the research project. Their involvement will facilitate effective conservation of fisher habitat within their operations and help increase the efficacy of our outreach activities to this sector.

5.0 Discussion

The natal and maternal dens of 12 female fishers we have identified to date were similar to dens reported for fishers elsewhere in British Columbia. Both Weir and Harestad (2003) and Weir and Corbould (2008) identified females whelping and rearing offspring in cavities in relatively large-diameter, declining deciduous tree species (black cottonwood). Seven of 15 natal dens we identified were in balsam poplars (*Populus balsamifera* spp. *balsamifera*), which is the same species as black cottonwoods (*P. b.* spp. *trichocarpa*).

The characteristics of natal and maternal dens were also similar, although the diameters of the trees were smaller than natal dens from elsewhere (mean 54.8 cm dbh, compared to about 100 cm dbh for black cottonwood dens; Weir 2003). The trees used by fishers as reproductive dens had considerable heart-rot (decay), which is similar to the characteristics of cottonwood trees used by fishers for natal dens in the Williston region. Den cavities were from 2 m to 15 m above ground level, which is somewhat lower than that found elsewhere ($\bar{x}_{\text{entrance height}}$ = 15 m; Weir and Corbould 2008).

The mechanisms by which den trees developed cavities appeared to be different than elsewhere in BC for several dens. Although several dens in balsam poplar were accessed through branch-holes, it appears that fire-scars on the bole of both aspen and poplar trees often resulted in heart-rot that continued up the bole of the tree. This is quite different than what has been observed in black cottonwoods, in which fisher den cavities are produced as the result of natural pathogens and branch development (Weir and Corbould 2008). The fire-scars we observed are believed to have occurred during low-intensity surface fires that killed some of the cambium layer on young aspens and balsam poplars, allowing introduction of heart-rot fungus through the lower portion of the bole.

Many structures that radio-tagged fishers used for resting were similar to those used elsewhere in British Columbia (Weir and Harestad 2003, Weir and Corbould 2008). We documented fishers resting in cavities in declining deciduous trees (balsam poplars and aspens). We found fishers resting on rust brooms and on branches in spruce trees when ambient temperatures were >–10°C, and using woody debris piles and subnivean sites (woodchuck burrows) when temperatures were below –10°C. These observations suggest that selection of rest sites by fishers in the Kiskatinaw Plateau ecosection is mediated by temperature, consistent with Weir et al. (2004).

5.1 Graduate Student

During 2008, Inge-Jean Mattson continued collecting field data for her M.Sc. thesis on the research project, under the supervision of Dr. Chris Johnson at the University of Northern British Columbia. Her thesis topics include: determining the intra-year and intra-specific variation in the diet of fishers in the Peace region, investigating whether fishers avoid anthropogenic disturbance and if so, quantifying potential habitat loss associated with anthropogenic disturbance, and developing a predictive model of potential fisher meta-population dynamics in BC.

6.0 Future Work

Works scheduled for 2009-10 include:

6.1 Continued radio-telemetry monitoring and habitat evaluations

Fisher radiolocations will be ground-inspected and detailed habitat descriptions will be conducted at all sites with suitable levels of precision. Den and rest sites will be revisited during summer to conduct full habitat descriptions using standard habitat measurement techniques. Habitat factors that affect selection will be described by analyzing the data gathered using resource selection analyses. These analyses will form the basis of models that predict fisher habitat value within this region.

6.2 Develop habitat conservation guidelines

Using outcomes from the habitat evaluations, we will work with forest licensees, government planners, trappers, and other habitat managers to develop effective conservation guidelines that will maintain critical habitat for fishers across the landscapes of the BWBS zone. By using identified key habitat components, we will work with industry to develop effective conservation methods to retain these structures, within their operational constraints. This approach will enhance the likelihood of successful adoption of fisher habitat prescriptions across the landscape. We will use information from habitat evaluations to update general wildlife measures for Wildlife Habitat Areas (WHAs) and other management areas (http://www.env.gov.bc.ca/wld/frpa/iwms/documents/Mammals/m_fisher.pdf). We will, if necessary, update the furbearer management guidelines for fishers (http://www.env.gov.bc.ca/fw/documents/fisher.pdf).

6.3 Identify candidate Wildlife Habitat Areas

We will use identified natal and maternal dens to delineate candidate WHAs within the project area. We will also use the habitat information collected at these sites to develop a predictive mechanism through which other potential WHAs can be identified outside of the project area.

6.4 Publish peer-reviewed scientific reports

Results of this work will be prepared as manuscripts for publication in peer-reviewed scientific journals. Publications in journals will facilitate adoption and widespread application of the habitat conservation guidelines and are the cornerstone of science-based management of this species and its habitats.

6.5 Extension programs for forest licensees, trappers, and oil and gas industry

Information from this research project is an integral part of the province-wide extension program that is currently underway to help conserve fisher habitat throughout BC. The long-term objective of the extension program is to help ensure that sufficient habitat is conserved,

recruited and enhanced at all scales to sustain populations of fishers in British Columbia. This long-term objective will be met by protecting and enhancing existing habitat and recruiting new habitat to meet the habitat needs of fishers for rearing, resting, foraging, and travelling. These medium-term objectives will be met by increasing the adoption of best-management practices among resource users in the forestry sector.

Result of our habitat analyses for resting sites, reproductive dens, and stand scale selection will feed into the primary extension products and activities of the extension program:

1) Fisher Habitat Workshop: a forum to summarize fisher habitat needs, enable round table discussions on fisher habitat and forestry, and discuss means to incorporate fisher habitat into sustainable forestry.
2) Fisher Wildlife Habitat Decision Aid (WHDA): a tool (published in Journal of Ecosystem Management) to succinctly present fisher habitat requirements and how they can be maintained at the stand level.
3) An article published in LINK (extension publication produced by FORREX) to increase awareness of the fisher WHDA.
4) An updated IWMS Fisher Species Account for FRPA.
5) Fisher habitat field guide: a guide book that integrates information on fisher habitat at stand and landscape scales. It will use illustrative means (e.g., simple graphics, tables and photos) to more easily communicate information. It will also facilitate the identification of fisher habitat at operational levels, and be a training tool and reference material for practitioners.
6) Fisher habitat presentation: PowerPoint training tool presented and/or distributed to forestry practitioners. It will incorporate material from the field guide and WHDA to provide examples of how to practically apply information on fisher habitat.
7) Web-based delivery: we will develop and implement a dynamic web-based system so practitioners have access to current information and extension materials related to fisher habitat management in British Columbia.

The extension program will use a collaborative approach that will engage researchers, regulatory agencies, forest licencees, logging and silvicultural contractors, and the British Columbia Trappers Association with specific extension products being developed for each practitioner audience. This extension program will be results-based and focus on outcomes which will facilitate easy evaluation of program successes. We will identify desirable changes in action, practice, decision, and policy for each target audience that will achieve long-term supply of fisher habitat.

Our presentations and publications targeted at trappers will promote habitat conservation and the sustainable harvest of fishers throughout the region. We expect to present the results of our work at meetings of local trapping organizations and at the annual general meeting of the British Columbia Trappers Association. Extension of the habitat information to trappers will be critical as trappers can be an important voice for fisher habitat conservation if armed with good information. We will also submit periodic and final summaries to the BC Trapper magazine. As trappers are keenly interested in the fur resources of the province, we will be liaising with them throughout the project to ensure their involvement and address any concerns or questions they may have about the work.

The third target audience of our extension program is the oil and gas sector. Activities of this industry may have a profound effect on the quality and distribution of habitat for fishers throughout the region. Throughout the course of this project, we will liaise with industry

representatives to develop a framework to facilitate habitat conservation for fishers. Specific extension materials will include presentations and hardcopy manuals on the effects of oil and gas activities on fishers and fisher habitat and techniques to mitigate these effects.

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