Extension Note

BC Journal of Ecosystems and Management

British Columbia's Interior

Fisher Wildlife Habitat Decision Aid

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Introduction

Fishers (*Martes pennanti*) are forest-dependent carnivores of the weasel family that are considered a ***Species at Risk*** under the Identified Wildlife Management Strategy and ***Species of Special Concern*** (blue-listed) by British Columbia Conservation Data Centre. Under the *Forest and Range Practices Act*, forest and range licensees in British Columbia are required to develop Forest Stewardship Plans and manage their operations to maintain limiting habitats of ***Identified Wildlife*** within their tenures accordingly. Several aspects of the ecology of fishers make them susceptible to forest-harvest activities, including their use of structural elements found primarily in late-successional forests. This Wildlife Habitat Decision Aid (WHDA) summarizes the latest scientific and experiential information that forestry practitioners, including silviculture planners and operational foresters, need to consider when managing for fisher habitat requirements. This information was obtained through an extensive literature analysis and discussions with experts in fisher ecology in British Columbia. Most information on fisher ecology in this extension note was derived from studies conducted in the Cariboo, Williston, Chilcotin, and South Peace regions.

The WHDA format has been used to convey information on factors requiring consideration when managing forests and range in British Columbia for specific wildlife species. This WHDA provides information on habitats used by fishers for birthing and rearing young, resting, and foraging; a provincial fisher distribution map and a list of biogeoclimatic zones where fishers most commonly occur; and forest management considerations when harvesting and conducting silviculture activities within fisher range. Also included is a resource and reference list that contains more detailed information. Most reference material that is not available online can be ordered through libraries.

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KEYWORDS: *denning, fisher, foraging, forest planning, furbearer, harvesting, home range,* Martes pennanti *(fisher), mustelid, reproduction, resting, silviculture, wildlife habitat.*

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Larry Davis

Description

Fishers have long, thin bodies, pointed faces, rounded ears, and short legs. Fishers have dense coats and well-furred tails that make up about one-third of their total body length. The fur of fishers is long, luxurious, and chocolate-brown in colour, with considerable grizzling patterns around the shoulders and back. Male and female fishers differ in size, both in body mass and length. Average body mass ranges from 2.6 kg for females to 4.8 kg for males. The average body length, excluding the tail, is 51 cm for females and 60 cm for males. Fishers can be differentiated from American martens by their larger body mass (approximately 2–3 times larger), darker coloration, and shorter, more rounded ears.

Diet

Fishers are generalist predators and typically eat any animal that can be caught and killed. Important prey items for fishers include, in descending order of importance in diet:

- Snowshoe hares
- Red squirrels and northern flying squirrels
- Red-backed voles and mice
- Porcupines
- Grouse
- Ungulate carrion

Distribution

Fishers occupy low- and mid-elevation forested habitats throughout their range in British Columbia (see adjacent map).

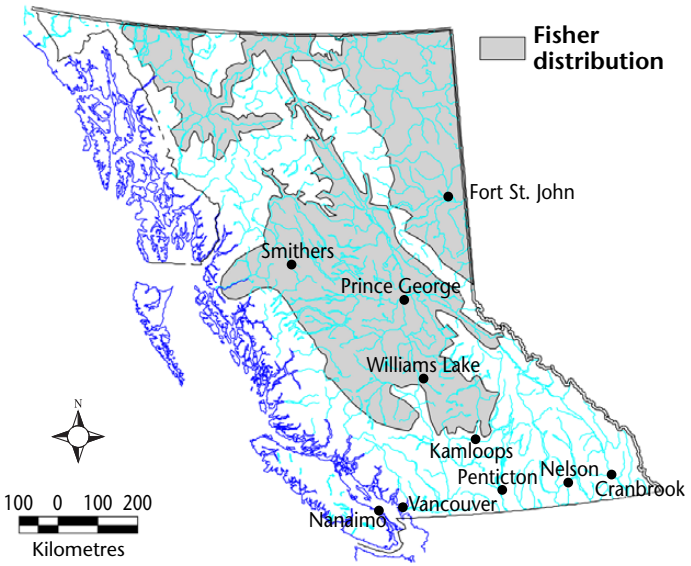
Biogeoclimatic subzones[a, b] where fishers are most commonly found

BWBSdk	SBPSmk
BWBSmw	**SBPSxc**
BWBSwk	SBSdh
IDFdk3 &dk4	SBSdk
MSdc	**SBSdw**
MSdk	SBSmc
MSdm	SBSmh
MSdv	SBSmk
MSxk	SBSmm
MSxv	SBSmw
SBPSdc	SBSwk
SBPSmc	

[a] See Meidinger and Pojar (1991) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.

[b] **Bold typeface** indicates subzones in which fishers are most abundant.

Fisher distribution in British Columbia



Map adapted from Weir (2003).

Habitat

General considerations

- Fishers rely on many aspects of forested ecosystems to fulfil their life requirements and almost all activities of fishers occur in forested environments.
- Loss of forested habitat from resource extraction and other human developments is believed to be the main long-term threat to fisher populations throughout their range.
- Fisher home ranges are large (typically ≥ 25 km² for females and ≥ 100 km² for males) and include a mosaic of habitat types.
- Fishers avoid areas with little overhead cover, including wetlands, cleared areas, and recent cutblocks, presumably to avoid being killed by other predators such as large raptors. Fishers can only establish home ranges where sufficient overhead cover exists.
- Fishers can use a wide variety of forest stands for resting, birthing and rearing, and foraging, often making use of patches of good habitat in otherwise generally unsuitable stands.
- For rearing young and resting, fishers depend on a range of structures that provide protection from weather and predators. These structures, such as trees with large cavities, are usually rare across the landscape and are typically the result of the natural processes of disease, death, and decay of trees found in late-successional forests.
- Fishers tend to forage in a variety of forested habitats that provide catchable prey, ranging from dense, regenerating forests for snowshoe hares to late-successional, structurally diverse forests that support squirrels and voles.

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Habitat (continued)

- In the SBS and BWBS biogeoclimatic zones, moist-rich site series (e.g., riparian forests) are often a key component of fisher home ranges, as many reproductive denning and rest-site structures are most common in these ecosystems. Fishers generally avoid submesic or dryer stands in these zones. In the SBPS and IDF zones, riparian forests are important to fishers, but mesic and submesic site series can also be used for reproduction because dry microsites in these zones can have a lower incidence of fire leading to the preservation of older trees, which have important characteristics of reproductive dens.

Reproductive denning habitat

- Female fishers need cavities in large-diameter trees for giving birth and rearing young.
- Trees used as reproductive dens are generally large for the stand and, in some zones, often survivors of previous disturbances (i.e., veterans). Species and sizes of trees that fisher have been documented using for reproductive dens vary by biogeoclimatic zone.

SBS and MS:	Black cottonwood ≥ 90 cm dbh
BWBS:	Trembling aspen ≥ 40 cm dbh Balsam poplar ≥ 50 cm dbh
SBPS:	Trembling aspen ≥ 40 cm dbh Lodgepole pine ≥ 35 cm dbh
IDF:	Douglas-fir ≥ 60 cm dbh

- Fishers have very specific requirements for reproductive dens that appear to be met by only a few different sizes and types of trees. Ecological processes are important for creating reproductive dens and the formation of den trees appears to be a rare occurrence.
- Most dens are in live (but declining) trees. Den trees always have some form of heart rot that allows for the formation of a large cavity. Decay agents typically include hardwood trunk rot (*Phellinus igniarius*) in black cottonwood and balsam poplar, aspen trunk rot (*P. tremulae*) in trembling aspen, and possibly brown crumbly rot (*Fomitopsis pinicola*) in Douglas-fir and lodgepole pine.

Richard Klafki

Fisher accessing denning cavity.

- For fishers to access internal cavities, some form of damage to the tree bole is needed, typically from frost cracks, low-intensity fires causing scars, or large anchored branches pulling out from the bole. Most branch-hole entrances (black cottonwood, balsam poplar, Douglas-fir, lodgepole pine, trembling aspen) are more than 6 m above ground, but entrances may be lower in trees with fire-scars or frost-cracks (trembling aspen, black cottonwood, lodgepole pine). Entrances are typically 5–10 cm wide and 7–15 cm tall, which is thought to exclude potential predators. Fishers occasionally widen cavities excavated by woodpeckers, but most woodpecker cavities are not large enough for use by fishers.
- For use as a den, boles need to provide a cavity that is usually more than 30 cm in diameter. This limits dens to trees that have an accessible cavity where the tree bole is generally greater than 40 cm in diameter.
- Individual den trees are very important, as females may re-use the same den from year to year. Females with kits will use den trees continuously for periods of up to 3 months after giving birth and will occasionally use up to three different den trees during the rearing period (April to June).

Resting habitat

- Fishers use several types of resting sites throughout the year. The type used depends to a large extent on ambient temperature and the structures available in the different biogeoclimatic zones.
- When temperatures are above –10°C, fishers tend to rest in trees, either on rust brooms, in cavities, or on exposed branches.
- When temperatures fall below –10°C, fishers need to find rest sites that provide thermal cover. These sites include spaces under large logs, in log piles or, in some cases, in burrows dug by other animals. Cold-weather rest sites associated with logs rely on an insulating layer of snow (> 25–30 cm deep) to provide suitable thermal protection. When snow is not sufficiently deep, fishers may use debris piles or burrows dug by other animals. These sites may be critical for the survival of fishers during periods of extreme cold (e.g., below –25°C).
- Typical sites used for resting vary by biogeoclimatic zone, as follows.

SBS AND MS:

- Large (≥ 40 cm diameter) rust brooms (*Chrysomyxa arctostaphyli*) on hybrid spruce, which are generally ≥ 40 cm dbh.
- Cavities (created by aspen trunk rot) and large branches in large-diameter (≥ 50 cm dbh) trembling aspen.
- Large-diameter declining black cottonwood (≥ 75 cm dbh) with internal decay (hardwood trunk rot).
- Trees with rust brooms are two to five times more likely to be used as rest sites than large-diameter aspen or cottonwood when warmer temperatures occur.
- Pieces of large woody debris (≥ 35 cm diameter, decay class 2–3, ≥ 10 m long) that are elevated (25–50 cm) off the ground are used as cold-weather sites when snow is present.

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Habitat (continued)

SBPS AND IDF:

- –Hybrid spruce with rust brooms, typically on trees ≥ 30 cm dbh are used most frequently.
- –Natural or artificial piles of woody debris, particularly during cold weather.
- –Squirrel middens and other below-ground animal burrows.
- –Large branches, brooms, and squirrel dreys (nests) on Douglas-fir (≥ 50 cm dbh) and lodgepole pine (≥ 20 cm dbh).

BWBS:

- –White spruce (≥ 30 cm dbh) and black spruce (≥ 20 cm dbh) with rust brooms.
- –Large-diameter trembling aspen (≥ 40 cm dbh) or balsam poplar (≥ 45 cm dbh) with internal decay (aspen trunk rot or hardwood trunk rot), cavities accessed either through branch holes or fire scars.
- –Piles of culled logging debris or piled slash (generally > 20 m^3), and abandoned woodchuck burrows when temperatures are below –20°C.

Current habitat protection measures

- On Crown land, Wildlife Habitat Areas (WHAs) can be identified to protect important fisher habitat (2–60 ha), such as reproductive dens and concentrations of rest sites and foraging areas.
- Objectives of WHAs are to maintain:
  - –mature and old reproductive denning sites and large-diameter trees along riparian and riparian-associated habitats;
  - –connectivity between riparian and upland habitats; and
  - –important structural attributes for fishers and their prey species.

Forest management considerations

Habitat considerations to benefit fishers can be included in decisions made in all phases of forest management. This can be achieved by considering the distribution, abundance, and connectivity of habitats required by fishers throughout the landscape, within areas comparable in size to a fisher home range, and in residual and managed stands.

- Because of the high specificity fishers have for many rare habitat components, reliance on habitat conservation measures in the *Forest and Range Practices Act* may not support an adequate distribution and abundance of important habitats for fishers. An ample supply of foraging, reproductive, and resting habitat needs to be maintained and promoted, both over space and time, in managed forests.
- Forest harvesting typically removes many of the features of late-successional forests that fishers rely on (e.g., large declining trees) and replaces them with stands that have fewer preferred structural components and are of lower suitability. Harvesting will affect the distribution of habitats for fishers and may force fishers to search more widely to obtain sufficient resources or abandon an area until the impacted habitats regenerate sufficiently.
- To ensure habitat is maintained for fishers in the short and long term, harvesting prescriptions should provide sufficient retention and recruitment of structural attributes from all stages of forest development, including a range of stem sizes, decay classes, and the ecological processes that create these structures.
- Management practices that suppress disease, death, and decay of trees or remove older-aged forests will have a detrimental effect on the supply of vital forest components needed for reproduction, security, and thermal cover.
- Increased access that accompanies forest harvesting in previously inaccessible areas may increase trapping mortality, possibly diminishing "source" populations.
- The direct impacts of the mountain pine beetle outbreak on fisher habitat are unclear.
  - –In the SBPS zone, fishers often use large, declining lodgepole pine trees for reproductive dens. After an initial peak in pine snags, the large-scale die-off of lodgepole pines may reduce the availability of trees that can support den cavities, which may make other species of den tree more valuable (e.g., trembling aspen, Douglas-fir).
  - –In the SBS zone, where fishers largely avoid lodgepole pine forests, the increased coarse woody debris (CWD) from dead pines in non-salvaged areas and the resulting release of subcanopy trees may enhance the quality of many pine-dominated stands for fishers, both as resting and foraging habitat.
- Large-scale intensive salvage logging of beetle-affected stands can substantially hamper the ability of the landscape to support fishers (see below).

Harvesting considerations (landscape level)

Landscapes that support fishers are made up of a mosaic of different ecosystems and structural stages. Landscapes that are primarily dominated by early- or late-successional forests will be less likely to support fishers than those that contain a mix of successional stages. As such, balanced forest management planning plays a key role in the ability of the landscape to support fishers.

- Although moderate levels of forest harvesting can increase the capacity of some landscapes, the intensity of forest harvesting can have profound implications on the ability of the landscape to support fishers. Forest harvesting that occurs too quickly and covers too large of an area will greatly reduce the ability of fishers to occupy an area. Recent research from north-central British Columbia estimated that harvesting 250 ha of forest in a 50-km^2 area (i.e., a female home range) within a 12-year span reduces the relative likelihood of the area supporting a resident fisher by 50%. This has substantial implications for fisher populations in areas undergoing intensive salvage harvest for trees affected by the mountain pine beetle. Because of this relationship between home-range occupancy and forest harvest, forest managers should consider the rate and extent of harvesting on the ability of the landscape to support fishers when developing forest management plans.
- Most habitat features used for reproduction and resting are difficult to conserve in areas harvested using conventional clear-cut methods, so landscape planning should conserve stands as ***Old Growth Management Areas***, ***Wildlife Tree Patches***, and ***Riparian Reserves*** where these features are common. See details regarding Wildlife Tree Patches, below, for characteristics of stands that should be conserved within reserves or in the rotation.
- Habitat value of stands changes over time. Early structural stages and pole–sapling forests are generally unsuitable for fishers, whereas mature and old forest stages are of highest value. These changes in habitat value as forest succession proceeds should be considered in landscape management scenarios.
- Utilize riparian forests to maintain connectivity between areas with forests capable of supporting fishers.

Forest management considerations *(continued)*

Harvesting considerations (stand level)

The quality of harvested areas is substantially diminished for fishers under typical clearcut and intensive forest management practices.

- Several prescriptions can be applied when harvesting to alleviate some of its effects on the quality of the habitat for fishers.
  - Retain 25 m^3/ha or more of elevated (50–100 cm above the ground) CWD (pieces > 20 cm diameter) dispersed throughout the cutblock to maintain foraging areas and cold-weather rest sites in the regenerating stand. This will increase the utility of the cutblock for fishers by about 35% compared with a block having no elevated large CWD.
  - Leave advanced regeneration and shrub-layer cover where feasible, which will provide foraging areas for fishers when the stand reaches the free-growing stage. Retaining 25% shrub cover in the cutblock will increase the likelihood of fishers using the regenerating stand by about 20% compared with a block having no shrub cover.
  - Avoid salvage logging of mountain pine beetle-infected forests that have good quality secondary structure.
  - Encourage retention of secondary structure along with 20–30% overstorey retention.
  - In mixed-species stands, protect secondary structure with retention of live overstorey trees. This type of harvesting may be determined at the strategic level with the aid of a field assessment.

Harvesting considerations (patch level)

Many of the structural components that fishers use can be retained or conserved by incorporating fisher habitat needs during the layout and harvest of proposed cutblocks. These retention strategies use decisions made by block-layout crews and machine operators when determining where and what to harvest.

BLOCK LAYOUT

- Wildlife Tree Patches can play an important role in the conservation of habitat within the cutblock and should provide for both current and future rest and reproductive den needs. This can be achieved by maximizing inclusion of required tree species and stems with important structural features.
- Within the stand to be harvested, Wildlife Tree Patches should be at least 2 ha, located within 200 m of the cutblock edge, linked to surrounding unlogged forest by residual or advanced regenerating cover, and contain as many of the following features as possible.

SBS AND MS

- Black cottonwood (≥ 90 cm dbh).
- Spruce (≥ 40 cm dbh) with rust brooms.
- Trembling aspen (≥ 50 cm dbh) with obvious signs of decay, including cavities, conks, and blind conks.
- Greater than 30% cover of tall shrubs (2–10 m stratum).
- Pieces of CWD (≥ 35 cm diameter) elevated off the ground.

SBPS AND IDF

- Trembling aspen (≥ 40 cm dbh) with obvious cavities, cracks, conks, or blind conks.
- Lodgepole pine (≥ 30 cm dbh) and Douglas-fir (≥ 50 cm dbh) with obvious signs of decay, including cavities, conks, and blind conks.
- Hybrid spruce with rust brooms (typically on trees ≥ 30 cm dbh).
- Accumulations of CWD (e.g., windthrow) of 5 m or more across and 2 m high.

BWBS

- Trembling aspen (≥ 40 cm dbh) with fire scars, cracks, or obvious internal decay (cavities, conks, or blink conks).
- Balsam poplar (≥ 50 cm dbh).
- White spruce (≥ 30 cm dbh) and black spruce (≥ 20 cm dbh) with rust brooms.
- Accumulations of woody debris of 5 m or more across and 2 m high.
- Patches of dense low-shrub cover (< 2 m stratum).

- As heart-rot cavities develop primarily in live trees, reserving some larger live trees (e.g., ≥ 30 cm dbh) within the Wildlife Tree Patch will ensure recruitment of important habitat components. These trees may not have obvious decay but are suspect because of injury or disease.

MACHINE OPERATORS

Harvesting within the remainder of the cutblock removes the majority of the trees, shrubs, and CWD that fishers need.

- Machine operators can retain or promote many structural legacies needed by fishers by following these guidelines.
  - Establish many small cull piles (e.g., 5 m or more across and 2 m high) of medium-sized woody debris (e.g., 10–20 cm diameter) within the cutblock, aiming for two piles per hectare, particularly near the cutblock edge. These sites provide shelter for many species of fisher prey.
  - Leave several larger cull piles (e.g., about 5 × 10 × 4 m) of medium-sized woody debris within the harvest unit, targeting for one pile per 10 hectares. These piles will provide important thermal cover during periods of cold weather and low snow cover.
  - Leave up to five single trees per hectare that have potential to form reproductive dens or rest sites in the future. See Wildlife Tree Patch prescription (above) for details on desired species and characteristics.
  - Avoid disturbing patches of structure, such as shrubby areas, accumulations of elevated CWD, and advanced regeneration during yarding or forwarding activities.

Silviculture considerations

The quality of regenerating cutblocks to fishers varies tremendously depending on the silvicultural systems that are implemented. Monotypic stands, which are low in structural and plant diversity, probably fulfil few life requisites for fishers because many of the habitat components fishers and their prey depend on are missing in these stands. Thus, maintaining structurally diverse and productive fisher habitat in logged areas is not only a function of the method and extent of timber harvesting, but also the type of site preparation and subsequent stand tending.

- Planting several different tree species in regenerating cutblocks will increase the structure and prey diversity in harvested areas.
- Thinning a regenerating stand reduces its productivity for snowshoe hares, which are an important prey item of fishers. Where thinning must be conducted to return a regenerating stand to the productive timber harvesting land base, leave 25% of the area unthinned and distributed in patches to provide refugia for hares.

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Forest management considerations *(continued)*

Silviculture considerations *(continued)*

- Habitat quality for fishers is closely tied to the supply of dead and dying trees. Silvicultural activities that strive to reduce the rates of important disease and decay processes will be detrimental to the development of rest sites and reproductive dens. Where appropriate, ensure that forest health prescriptions conserve broom rusts and heart-rot fungi within regenerating cutblocks.
- Mounded debris piles can greatly increase the suitability of a regenerating cutblock for fishers as these sites provide both foraging opportunities and rest sites. Where feasible, do not burn logging debris in recently harvested stands.
- Intensive site preparation activities generally reduce the structural complexity and overhead cover needed by fishers. To maintain and promote the utility of regenerating cutblocks for fishers, where feasible:
  - avoid prescribed burning, biomass salvage, or drag scarification of harvested cutblocks, as this will reduce the volume and structural complexity of residual CWD; and
  - avoid brushing or herbicide treatments that will reduce vegetation diversity in regenerating cutblocks, as a diversity of shrub and tree species result in better foraging habitat for fishers.

Growth and yield implications

- Maintaining densely stocked regenerating cutblocks as foraging areas may reduce the growth rates of replanted areas.
- Residual CWD may make planting and other silvicultural treatments more difficult.
- Allowing competing vegetation to remain within regenerating cutblocks may hamper growth of planted seedlings and lengthen the time to free-growing status.
- Protecting secondary structure in harvesting units will assist in addressing the mid-term timber supply and will provide fisher habitat.
- Providing movement corridors across the landscape will assist in addressing riparian management strategies and an array of other wildlife objectives.

QUICK LOOK-UP: Important features to retain as fisher reproductive dens and rest sites

Biogeoclimatic zones	Fisher use	Tree species	Size and characteristics
SBS and MS	Reproductive den	black cottonwood	≥ 90 cm dbh
	Resting site	hybrid spruce	≥ 40 cm with rust brooms
		black cottonwood	≥ 90 cm dbh
		trembling aspen	≥ 50 cm dbh
			Coarse woody debris pieces: ≥ 35 cm diameter, decay class 2–3, elevated 25–50 cm above ground
SBPS and IDF	Reproductive den	trembling aspen	≥ 40 cm dbh
		lodgepole pine	≥ 35 cm dbh
		Douglas-fir	≥ 60 cm dbh
	Resting site	hybrid spruce	≥ 30 cm with rust brooms
		Douglas-fir	≥ 50 cm dbh
		lodgepole pine	≥ 20 cm dbh
			Woody debris piles: various-sized pieces with some ≥ 25 cm diameter, piles ≥ 5 m diameter and ≥ 2 m tall
BWBS	Reproductive den	trembling aspen	≥ 40 cm dbh
		balsam poplar	≥ 50 cm dbh
	Resting site	white spruce	≥ 30 cm with rust brooms
		black spruce	≥ 20 cm with rust brooms
		trembling aspen	≥ 40 cm dbh
		balsam poplar	≥ 45 cm dbh
			Woody debris pile: various-sized pieces, piles ≥ 4 m × 3 m × 2 m

Monitoring recommendations

1. Evaluate use of retained trees as reproductive dens

This can be achieved through visual assessment of the tree bole. When fishers climb trees, they tend to flake bark off the tree and leave fine scrape marks (1–2 mm wide), approximately 1 cm apart, from their claws. As female fishers will use a reproductive den for periods of over 3 weeks, they will climb the den tree several times per day, which will leave conspicuous evidence of use.

2. Evaluate use of regenerating cutblocks and surrounding stands by fishers and their prey

This can be achieved through stratified snow-track surveys during winter for fishers and their prey and will help monitor the effectiveness of various management prescriptions.

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Test Your Knowledge . . .

British Columbia's Interior: Fisher Wildlife Habitat Decision Aid

How well can you recall some of the main messages in the preceding Extension Note? Test your knowledge by answering the following questions. Answers are at the bottom of the page.

1. What is the average home range for fishers?
   A) ≥ 10 km² for females and ≥ 50 km² for males
   B) ≥ 15 km² for females and ≥ 75 km² for males
   C) ≥ 25 km² for females and ≥ 100 km² for males

2. Fishers prefer den trees that:
   A) Have a cavity located typically below 6 m above ground, in black cottonwood and balsam poplar
   B) Have a cavity with entrance dimensions typically 5–10 cm wide and 7–15 cm tall, in a variety of tree species
   C) Have boles with cavities < 30 cm in diameter, in any tree species

3. Suggested harvesting prescriptions that can be applied to alleviate some impacts of harvesting on the quality of the habitat for fishers include:
   A) Retain ≥ 25 m³/ha of elevated coarse woody debris > 20 cm diameter, dispersed throughout the cutblock
   B) Reduce advanced regeneration and shrub cover where feasible
   C) Where possible, disturb patches of structure, such as shrubby areas, accumulations of elevated CWD, and advanced regeneration during yarding or forwarding activities

Answers

1. C Fisher home ranges are large and include a mosaic of habitat types.

2. B Fishers have very specific requirements for reproductive dens that appear to be met by only a few different sizes and types of trees.

3. A This will increase the utility of the cutblock for fishers by about 35% compared with a block having no elevated large CWD.