2.4.2. Aging Mark Trails

Recently used mark trails may have disturbed soil and flattened vegetation in the pad marks. Sometimes wilting green vegetation may give a relatively accurate indication of the last use of the mark trail. Old and disused bear mark trails can be evident for many years after use by a more vigorous growth of vegetation, especially moss, in the foot depressions, compared with the rest of the trail. This is the result of water collecting in the depressions. Another technique for aging mark trails is to put twigs or grass stems across the pad marks and look for their absence or condition on the next visit to the area.

2.4.3. Bear Mark Trail Photos

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Mark trails are a made up of a series of staggered elliptical depressions, called mark pads, made when a bear deliberately twists it's feet in a regular stride sequence. Mark trails may lead to a mark tree (above) or an estuary wallow, just out the photo (right). Some mark trails are so distinctive that they can be spotted from the air (left) such as this one in *Stereocholon* lichen on a dry river channel.

2.5. Bear Mark Trees

Mark trees are trees (both coniferous and hardwood species) that bears create by rubbing, biting, scratching, and scent marking. Two types of mark trees have been identified: "scratch" trees with claw marks and/or tooth marks, and "rub" trees with little or no scratching of the bark (Hamilton and Archibald 1985). However, many mark trees may exhibit signs of scratching, biting as well as rubbing. Tree marking is practised by both black and grizzly bears and appears to serve several purposes. The main theories for marking include use as information signposts, small-scale territory definition, sexual advertisement, and comfort and grooming (LeFranc et al. 1987).

Marking is not only confined to trees, as boulders, shrubs, logs, large roots, trail signs, fence posts, cabin corners, and outhouses may also be used (Herrero 1985). Marking is more obvious on conifers than on hardwoods, due to the large amounts of pitch on some conifer species and the subsequent adherence of loose hairs to the exuded pitch. However, this does not mean that coniferous trees are more important than deciduous trees for marking; it just means that coniferous mark trees are more readily identified.

When marking trees, bears generally stand up to their full height and then bite, scratch, or rub against the trunk. Therefore, the height of marks above ground may give an indication of the size of the largest bears using the mark tree. Adult male bears sometimes straddle low shrubs or young conifers breaking their tops and urinating on them in the process. Look for bite marks and hair near the break.

Mark trees are generally found on bear trails or trail systems, often near the junction of two or more trails. They are most commonly located near creeks and streams, near important feeding and bedding habitats, or at topographic constrictions (e.g. a bottleneck in a narrow valley or in a mountain pass). Often, but not always, mark trees, mark trails and wallows are associated with one another (MacHutchon 2000).

The trunks of mark trees usually have a general polished appearance, lack lower branches, have smooth rounded branch stubs, broken or bent upper branches (up to a height of 3-4 m), a lack of moss and lichen growth, and may show signs of claw and/or bite marks. Claw slashes are usually diagonally, but sometimes vertically or horizontally, orientated. Bite marks are generally horizontal. Soil and vegetation at the base of a bear mark tree is often trampled and traces of mud or sand may be visible, on the tree and at its base from the fur of bears that have been rolling on the ground or wallowing. Mark trees and mark trails are indicative of bear travel routes or indicate that important feeding areas are nearby. Therefore, trails that are well rutted and have several mark trees and mark trails along them indicate well-used bear travel routes (MacHutchon 2000).

Male ungulates, such as moose, may also fray and tear bark with their antlers, generally on small diameter saplings ($\leq$17.5 cm) during the rutting season (Rezendes 1999). This behaviour is known as "antler rubbing". Moose antler rubs range in height from about 45 to 250 cm while deer rubs range from about 25 to 120 cm (Rezendes 1999). Large bears may mark trees to a height of 3.5 m. To distinguish claw marks from antler rubbing, look

for indications of 4-5 claws starting high on the trunk and being raked downwards. Claw marks tend to leave a relatively clean cut in the bark when compared to the frayed edges of antler rubs. Antler rubs also leave frayed bark at both ends of the rub, indicative of an up-and-down movement of the animal's head. Ungulates also scar trees by bark stripping upwards with the lower incisors to feed on the cambium underneath. The lower edge of the scar tends to be sharply cut and the upper edge more ragged (Halfpenny 1986). Incisors widths vary from about 12.5 mm for deer and 12.5-25.0 mm for moose (Stokes 1986). Bears may also feed on cambium (Herrero 1985). The width of adult black bear incisors range from 3-4 mm while adult grizzly bear incisors range from 5-10 mm.

Felines (cougar, lynx, bobcat) also claw-mark trees and stumps, but mostly hardwood species – they tend to avoid the pitch from conifers (McDougall 1997). Cougars generally claw a tree at a height of 1-1.5 m. Claw marks tend to be vertically oriented and are about 6 mm wide. Bear claw marks are much higher, deeper, and less vertical (McDougall 1997). Lynx and bobcats claw trees at a height of 60-100 cm but their claws often do not expose the inner bark, unlike the deeper marks left by bears (Smith 1982). All of these cats frequently spray very pungent urine at or near the "scratching post." When fresh, this cat smell is very noticeable, even to a human nose.

2.5.1. Bear Mark Tree Characteristics

- Bears use both coniferous and hardwood tree species as mark trees by rubbing, biting, scratching, and scent marking.
- Marking is more obvious on conifers than on hardwoods, due to the large amounts of pitch on some conifer species and the adherence of loose hairs to the exuded pitch.
- Marking is not only confined to trees; boulders, shrubs, logs, large roots, trail signs, fence posts, cabin corners, and outhouses may also be used.
- Young conifers with broken tops may be mark trees. Look for bite marks and hair near the break.
- Mark trees are generally found:
    - on bear trails or other trail systems;
    - near the junction of two or more trails;
    - near rivers creeks;
    - near important feeding and bedding habitats;
    - at topographic constrictions in a valley;
    - where trails cross the tree line.
- The trunks of mark trees usually:
    - have a general polished appearance;
    - lack lower branches;

- have smooth rounded branch stubs;
- broken or bent upper branches (up to a height of 3-4 m);
- lack moss and lichen growth;
- show signs of claw and/or bite marks (claw slashes are usually diagonal and bites horizontal);

- Soil and vegetation at the base of a mark tree is often trampled and traces of mud or sand may be visible, on the tree and at its base from the fur of bears that have been rolling on the ground or wallowing.
- Mark trees are often, but not always, associated with mark trails and wallows.
- Both black and grizzly bears make mark trees.

2.5.2. Aging Mark Tree Sign

When a bear claws deeply into the bark of a conifer such as a spruce, fir or pine, the sap begins to flow freely, pale and honey-like, down the trunk. On exposure to air, the pitch then slowly becomes darker and more viscous, eventually forming a hard crust. The cambium layer appears moist and pale when first exposed but dries and darkens with age. Broken twigs, white and sharp-edged when newly broken, become worn, blunted, and darker from continual rubbing by bears. The pale inner wood is visible on the trunks of freshly clawed aspens but heals over and turns black when the scar is old.

2.5.3. Bear Mark Tree Photos

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The tree species marked by bears is less important than the location of the tree. Conifer mark trees are more obvious than deciduous mark trees because of the large amounts of pitch exuded by species such as subalpine fir (right) and spruce. Note the large clumps of hair and smooth bark on this small mark tree. Cedars (above) also show marking clearly because of the frayed bark. However, be sure to distinguish these from antler rubs, which also have frayed bark, but are usually only found on small trees and also lack bear hair.