

Maintaining wildlife habitat in the boreal forest of Alaska

A guide for land owners, developers, and timber harvesters



Alaska Department of Fish and Game
Division of Wildlife Conservation, 2020



Maintaining wildlife habitat in the boreal forest of Alaska

A guide for land owners, developers, and timber harvesters

Alaska Department of Fish and Game

Division of Wildlife Conservation, 2020

Authors: Thomas Paragi (ADF&G), Sue Rodman (ADF&G)

Editors: Doug Hanson (DOF), Julie Hagelin (ADF&G),
Will Putman (TCC), Mike Taras (ADF&G), Jen Curl (ADF&G)

Watercolor artwork: Erica Craig

The State of Alaska is an Affirmative Action/Equal Opportunity Employer. Contact the Division of Wildlife Conservation at (907) 465-4190 for alternative formats of this publication.

Hunters are important founders of the modern wildlife conservation movement. They, along with trappers and sport shooters, provided funding for this publication through payment of federal taxes on firearms, ammunition, and archery equipment, and through state hunting license and tag fees.

List of Figures

Figure 1. Aspen felling, Nenana Ridge

Source: Dale Haggstrom, Alaska Department of Fish & Game

Figure 2. Angled shear blade, Delta Junction Bison Range

Source: Tom Paragi, Alaska Department of Fish & Game

Figure 3. Roller chopper, Tok

Source: Tom Paragi, Alaska Department of Fish & Game

Figure 4. Red stem willow and white spruce regeneration, Tok River

Source: Tom Paragi, Alaska Department of Fish & Game

Figure 5. Blade scarification of duff layer, Standard Creek State Forest

Source: Tom Paragi, Alaska Department of Fish & Game

Figure 6. Log skidder and disk trencher, Nenana Ridge

Source: Tom Paragi, Alaska Department of Fish & Game

Figure 7. Great gray owl feeding vole to chicks, Nome Creek

Source and copyright: © Ted Swem

Figure 8. Northern flicker and snag cavity, Delta Junction Bison Range

Source: John Wright, Alaska Department of Fish & Game

Figure 9. Paint marking snags and debris for retention, Tok River

Source: Tom Paragi, Alaska Department of Fish & Game

Figure 10. Spruce broom, Fairbanks area

Source: Tom Paragi, Alaska Department of Fish & Game

Figure 11. Advanced regeneration, Tok River

Source: Tom Paragi, Alaska Department of Fish & Game

Figure 12. *Upper.* Punk knots in white spruce, Nenana Ridge

Source: Bob Ott, Tanana Chiefs Conference

Lower. Weeping punk knot exposed with hatchet, Tok River

Source: Tom Paragi, Alaska Department of Fish & Game

Figure 13. Olive-sided flycatcher using snag, Fairbanks area

Source: Jim Davis, Alaska Department of Fish & Game

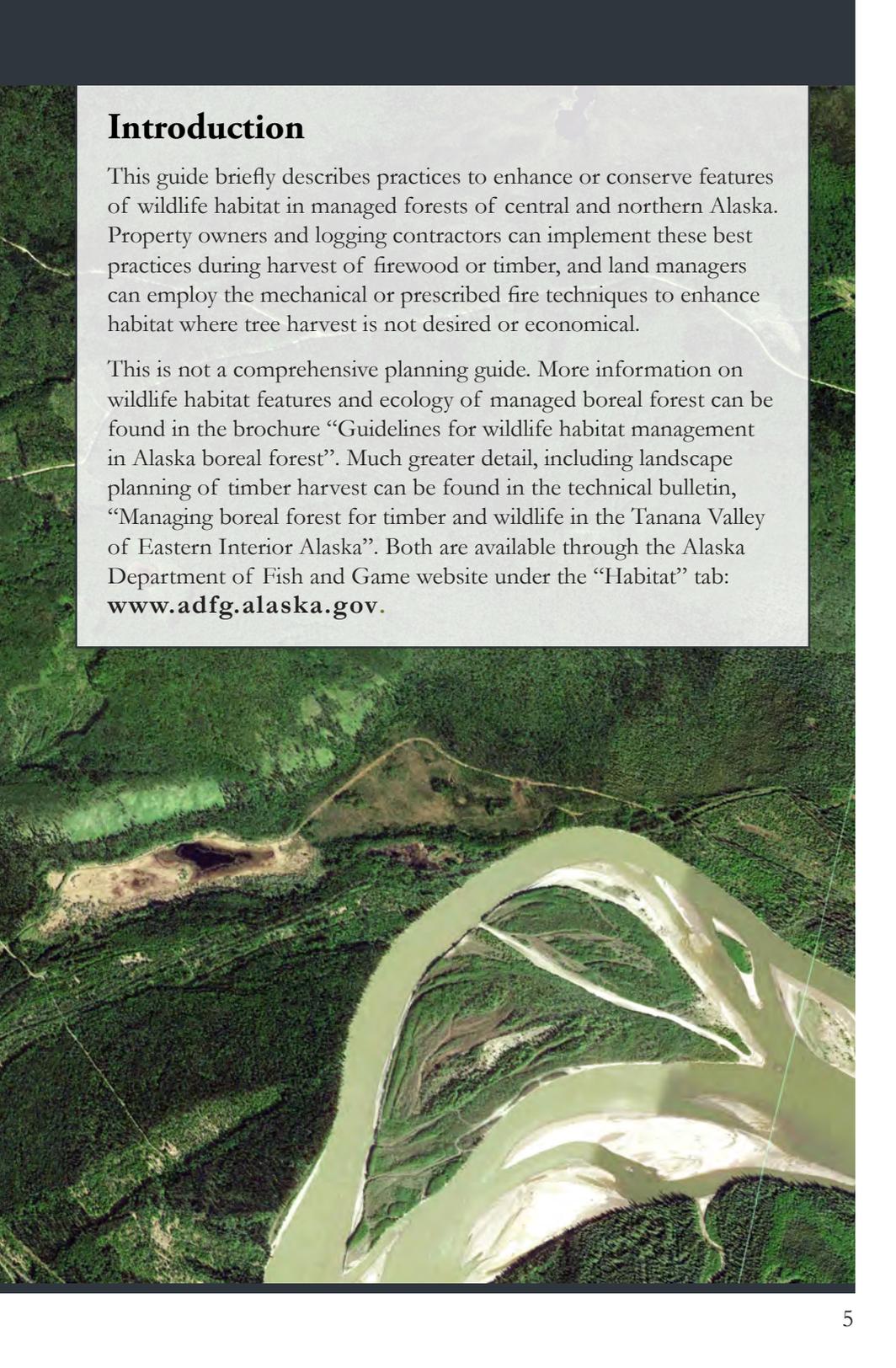


Image from Google Earth, Nenana Ridge, 2019. Upper half: aspen felling and prescribed burns for moose and grouse habitat along forest roads. Lower half: research sites for hazardous fuel breaks with prescribed burns and a lightning fire. Tanana River floodplain and islands are in lower right of image.

Introduction

This guide briefly describes practices to enhance or conserve features of wildlife habitat in managed forests of central and northern Alaska. Property owners and logging contractors can implement these best practices during harvest of firewood or timber, and land managers can employ the mechanical or prescribed fire techniques to enhance habitat where tree harvest is not desired or economical.

This is not a comprehensive planning guide. More information on wildlife habitat features and ecology of managed boreal forest can be found in the brochure “Guidelines for wildlife habitat management in Alaska boreal forest”. Much greater detail, including landscape planning of timber harvest can be found in the technical bulletin, “Managing boreal forest for timber and wildlife in the Tanana Valley of Eastern Interior Alaska”. Both are available through the Alaska Department of Fish and Game website under the “Habitat” tab: www.adfg.alaska.gov.





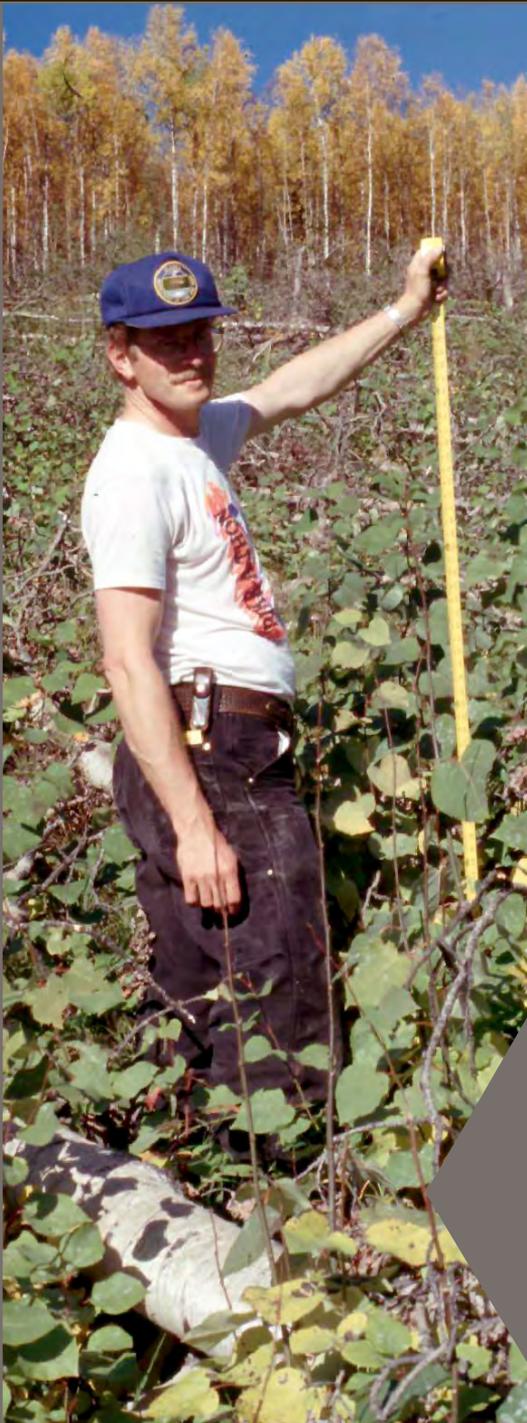
Young forest habitat characteristics

When a disturbance such as fire or logging kills mature trees and exposes soil in patches, vegetation on the forest floor goes through a series of growth or structural stages over time called succession. Early-successional habitat is primarily young vegetation growing in direct sunlight that provides wildlife with important food resources (e.g. twigs and leaves for moose and hares, leaves for insects, insects for birds) and security cover for prey to hide from predators. Planning for early-successional habitat often focuses on how to stimulate new plant growth. Deciduous shrubs (alder, willow) and deciduous trees (aspen, birch, poplar) can regenerate by seed or by sprouting from roots and stumps, whereas conifers (larch, spruce) grow primarily from seed.

Managing young forest habitat for wildlife

Sprouting from existing roots to maintain similar vegetation type

Crushing old willows with a dozer or logging machinery will stimulate willow sprouting from the roots. The best response occurs if crushing is done during the winter dormant season when leaves are off (September to April) and nutrient reserves are in the roots. Temperatures $<20^{\circ}\text{F}$ allow brittle live stems to snap more easily, and frozen ground minimizes uprooting. Keep the dozer or skidder blade 6 – 12 inches off the ground while in motion.



Abundant root sprouting by aspen trees is stimulated by tree harvest, through cutting or removing trees, or by simply felling them, ideally during the dormant season (**Fig. 1**).

Rather than piling debris to burn it, a prescribed “broadcast burn” of debris across the entire logged site can stimulate new growth in existing willows, especially in wet areas, where the roots are unlikely to burn. In drier areas, where some of the organic duff can be burned off to expose mineral soil, burning also provides a germination bed during peak seed dispersal of willows in early summer. Exposing soil also benefits germination of tree seeds for reforestation. In some instances, contractors may be required to burn piles of logging debris, but for safety the Alaska Department of Natural Resources, Division of Forestry will conduct or oversee broadcast burns in timber sales.

Figure 1. Felling of aspen by chainsaw produced this dense root sprouting after two growing seasons. Dense young aspen forest after felling or timber harvest will provide 1-2 decades of abundant winter browse for hares and moose and brood security cover for ruffed grouse. If you look carefully in the foreground, you can see stems stripped by moose at the time this image was taken in early fall.



Felling or burning aspen allows sunlight into the stand, warming the soil and resulting in better densities of root sprouting in aspen and stump sprouting in birch, with younger birch trees producing more sprouts than older trees. Aspens trees are connected by the roots in genetically identical groups (clones). The greatest sprouting of aspen occurs when all the trees in the clone larger 1" in diameter are killed, but some trees may be left during harvest operations for visual aesthetics. Observations of vegetation response after wildland fires show that sites with a few old aspen or birch trees may be rejuvenated to a limited degree by broadcast burning of the remaining trees. This "top kill" should be completed in spring as soon as ground fuels are dry, but can also be applied to healthy mature trees as it does not affect their roots. Burning off any logging slash reduces shading of the soil.

Where wildland fires create large aspen stands near the road system, a shear blade (**Fig. 2**) or roller chopper (**Fig. 3**) can be used every few years to maintain younger forest patches for stand age diversity as the burned area regrows into aspen forest. Shearing on frozen ground with a sharp blade is feasible for trees up to a 12-inch base diameter.





Figure 2. An angled shear blade on a dozer has a sharpened ground blade for cutting trees during forward motion and a stinger tip (in image foreground) for first splitting larger trees that could impede motion.

Stump sprouting is best for balsam poplar or paper birch when they are cut or sheared during the dormant season. Sprouting is greatest from trees that are healthy, not too old (under 60 years), and on warm open sites. Stumps should be left about 6 inches above ground surface to avoid damaging growth buds located near the root collar. Roller chopping works for up to about a 6-inch base diameter. It is important to fill the roller drum with glycol for maximum weight.

Enhancing natural seed germination and planting sites

Where risk of soil erosion is low, scarification by machinery can expose mineral soil for germination of naturally-dispersed seeds, potentially increasing species diversity of plants, which also supports a diversity of wildlife. Exposed soil also creates planting sites for seedlings to alter species composition for specific benefits over a few decades, such as planting conifers on a deciduous site to create future timber, or allowing seed from deciduous trees and shrubs to germinate on a conifer dominated site to lower fire risk.



Figure 3. A roller chopper drum is filled with glycol anti-freeze for maximum weight to aid crushing and chopping force. The device stimulates the sprouting of willows and young aspen while breaking smaller debris and forcing contact with the ground to aid decomposition. Operators have mixed opinions about whether sharpening the cutter blades to increase cutting performance is worth the effort.



Natural scarification occurs in small patches where windblown trees tip up root wads (**Fig. 4**) or severe wildland fire consumes organic duff above mineral soil on the forest floor. Humans expose mineral soil for seed beds by using a dozer or log skidder for blade scarification (**Fig. 5**) or disk trenching (**Fig. 6**).

Natural or human scarification of frozen ground immediately following winter harvest operations will avoid soil compaction in wet areas and produce germination sites for willow seeds dispersing in late spring and early summer before a solid grass mat can form in the fresh clearing. Whole-tree skidding in winter, especially of conifers, tends to leave branches more widely scattered, which provides important dispersed cover for small mammals. Whole tree skidding during summer can result in adequate scarification on some sites, but also results in limb piles at sites where logs are ultimately piled (decking sites), and thereby reduces cover for wildlife.





Figure 4. Red-stem willow and white spruce regeneration on exposed soil where a spruce root was tipped; this is a natural form of scarification.

A disk trencher pulled behind a dozer provides continuous uniform scarification unless logging slash or debris is large or dense enough to hinder effective penetration by the disks. Blade scarification can be done on sites where logging debris or blowdown would hinder disk trenching, and it also allows patches rather than continuous rows of exposed soil.

Unlike scarification by disk trencher, blade scarification requires operator experience to avoid scalping away too much of the organic layer (which retains moisture on dry sites and provides nutrients for seedlings over time). Moss or turf divots on cool or wet sites ideally should be pushed to the north side of scarified patches to reduce shading, whereas divots on drier, well-drained sites should be pushed to the south side to provide shade and reduce the drying effect of summer sun.



Figure 5. Blade scarification of the duff layer to expose mineral soil, reduce competing plants, and allow seed germination or planting sites.

Hazardous fuel treatments to reduce fire risk

Thinning or removing conifers on strategic sites near communities can reduce the danger of a crown fire spreading. On a mixed species forest site, thinning can be done by cutting spruce while leaving hardwoods and regenerating deciduous shrubs. Fuel breaks dominated by herbaceous ground cover and deciduous woody species pose less risk for crown fire, and are generally less flammable. Thus, these types of fuel breaks can safely retain some late-succession habitat features that are important to wildlife, such as individual snags or widely-spaced live conifers. Retaining these features preserves denning trees for marten, nesting sites for owls and other birds, as well as feeding sites for insectivores like woodpeckers (see “Mature Forest” pg. 14).

A Hydro Ax grinds wood into chips that can insulate the soil against solar radiation, reducing new plant growth. A site where the chips are also masticated (tilled into the soil) further reduces surface fire risk, but also reduces growth of non-flammable plants (e.g. willows) that provide wildlife habitat and visual aesthetics. Reduced growth results from bacteria, fungi, and insects that pull nitrogen from the soil to decompose the wood chips, which reduces site productivity for re-growing willows or other non-flammable shrubs that provide wildlife habitat and visual aesthetics. Where chipping and mastication are a priority for fire safety, consult with a forester about fertilizing to speed decomposition, or using smaller equipment to scarify strips or patches to enhance deciduous shrub growth.

Debris spread across the landscape provides habitat for smaller mammals. However, removal (e.g. firewood salvage) or burning of conifer slash with less than a 5-inch base diameter is recommended to reduce the potential for outbreaks of spruce engraver beetles. Such infestations could ultimately create dead trees nearby, thus potentially reducing the benefits of the fuel break or reducing aesthetic or timber values.

Dense dead shrubs might be shear bladed, roller chopped, or crushed by machinery in fuel treatment areas to fragment debris and increase ground contact so decay can be aided by soil moisture. Roller chopping when the ground is thawed can expose soil, so consider local seed sources, timing of seed release and treatment objectives such as avoiding an increase in conifers.





Figure 6. Twin furrows to expose mineral soil created by pulling a disk trencher behind a log skidder or dozer. The depth of scarification can be adjusted; this was deep because of dense grass cover on a winter logging site for birch.

Early summer chopping benefits aspen and willows, while fall chopping benefits paper birch and white spruce. Leaving some dead trees or snags in an area may pose little fire risk and serve important habitat needs (see “Managing for old forest habitat” in next section).

Scarification might be applied to fragmented areas of grass that (when cured) can be ground fuel. The resulting soil exposure can create germination sites for deciduous trees and shrubs. Scarification might also fragment continuous areas of live flammable shrubs such as dwarf birch and Labrador tea to aid in suppression of ground fires. Live deciduous trees and willows are compatible with the objective of fuel reduction and will provide vegetation diversity that benefits wildlife species, particularly near streams and ponds.



Mature forest habitat characteristics

Late-successional habitat is a mixture of live trees, dead trees (snags), and dead wood on the ground (debris) that provide wildlife with important vertical structure for denning and nesting sites, and cover from environmental extremes. In late-successional habitat, shrubs and other ground plants that serve as cover grow in partial shade or in canopy gaps where sunlight reaches the ground. Older stands of trees in boreal forest are believed to contain substantial species diversity or high biomass of invertebrates and non-vascular plants, which in turn provide forage for vertebrates such as songbirds. Planning for late-successional habitat often focuses on what features need to remain on the site after logging and reforestation.

Managing mature forest habitat for wildlife

Cavity trees, dead or alive, should be retained wherever possible for the benefit of wildlife. Trees with broken tops often develop heartwood rot while still alive and become hollow shelters for many species (**Fig. 7**).

Figure 7. A Great Gray Owl feeding a yellow-cheeked vole to its chicks in the broken top of a burned spruce. These owls feed on small mammals that can girdle young trees on reforestation sites.





Figure 8. Northern Flicker at a cavity entrance in aspen snag. Flickers are a primary excavator of cavities in boreal forest, producing nest or den habitat for many other birds and mammals.



Other live trees with sound tops may develop heartwood rot, and species like the Northern Flicker (**Fig. 8**) can chisel cavity openings used by many birds and mammals, even after the tree becomes a snag. Cavity trees have marginal economic value as fuel wood and should be left standing if they do not pose a safety risk during operations. If choices are necessary, larger cavity trees are relatively more valuable to retain on a site for wildlife than smaller cavity trees, because large cavities can be used by a greater number of larger birds or mammals. *However, operator safety (particularly for hand felling) takes priority over habitat objectives whenever working around snags or cavity trees.*

It is easy to retain specific habitat features important to wildlife – called retention patches – by marking them with paint (**Fig. 9**) or flagging above typical winter snow depth to avoid removal until fellers become trained on which features to leave.



Figure 9. Red paint marking snags and debris recommended for retention as late-successional features for wildlife where logging occurs.

MATURE FOREST

Other features to mark include seed trees that aid natural reforestation or trees with large witch's brooms (*Chrysoomyxa arctostaphyli*, **Fig. 10**) used as raptor nests, marten resting sites, or flying squirrel winter shelters. Ground dens with openings greater than a 12-inch diameter are used by foxes, coyotes, wolves, and bears. Avoid driving over these holes with machinery on thawed ground to reduce the potential for collapse.

Operating machinery around young trees requires caution to avoid damage of future timber crops. Leaving "retention patches" - or an area undisturbed by machinery or harvest activity - that include healthy young trees (**Fig. 11**) during logging or scarification helps advance regeneration of disturbed sites. Young trees serve as forage and cover for wildlife, and patches may be set aside by foresters if few marketable trees are present. Retention patches with live trees can provide wind shelter to protect snags against blow down, and also reduce operator time and risk in trying to avoid individual features with machinery.

Punk knots at lower branch exits of white spruce trees (**Fig. 12**) reliably indicate presence of the heartwood defect red ring rot (also called white pocket rot, *Phellinus pini*) for most of the bole (trunk) on both dead and live white spruce. Infected boles have low value as lumber. Unless infected trees pose a safety risk, white spruce with visible punk knots should be left standing to provide habitat as snags and cavities for wildlife, and eventually as debris.

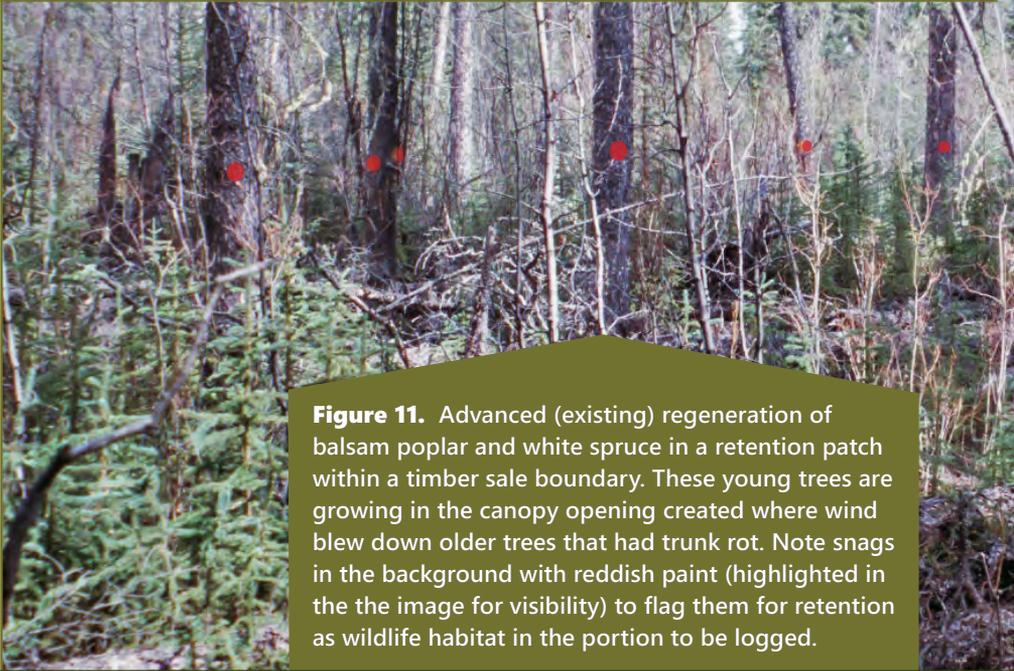


Figure 11. Advanced (existing) regeneration of balsam poplar and white spruce in a retention patch within a timber sale boundary. These young trees are growing in the canopy opening created where wind blew down older trees that had trunk rot. Note snags in the background with reddish paint (highlighted in the the image for visibility) to flag them for retention as wildlife habitat in the portion to be logged.



Figure 10. A live spruce broom rust (witch's broom) on a young white spruce. Dead brooms can persist for decades on live trees, and larger ones provide habitat for several birds and mammals.



Fig. 12. Punk knots on white spruce (*upper*: exposed with a hatchet, *lower*: weeping punk knot). Weeping punk knots indicate substantial defect (white pocket rot) that results in poor lumber quality. Harvesting infected trees in timber sales represents wasted logging effort and lost potential for future cavity trees that are important to wildlife.



Hard snags (those with solid sapwood) are often wind firm, may have value as lumber or fuel wood, and provide wildlife (songbirds, hawks, owls) with hunting perches (**Fig. 13**). Even in sale units where fuel wood salvage is the main objective as in burn areas, leaving some snags – especially larger ones or those with visible cavity openings – across the stand of trees can provide well-distributed habitat as the new crop of trees regenerates. Some live non-marketable species such as balsam poplar can remain in spruce cuts because they provide large snags or cavity trees for wildlife, and do not greatly hinder conifer regeneration.

Woody debris such as stumps, root wads, blowdown and larger debris should be left in place unless piling or salvage is approved by the forester to enhance operational efficiency during harvest or site preparation. If debris must be moved, scattered large piles provide maternal den potential for lynx, marten, and other predators of hares (which girdle young trees). Scattered small debris provides security cover in order for the most common small mammal (red-backed vole) to move across harvested sites and drop feces. These feces re-inoculate soils with spores of mycorrhizal fungi that interact with fine roots and ultimately enhance tree seedling health and growth.

Figure 13. Olive-sided flycatcher using the top of a spruce snag as a perch for hunting insects.





For more information or any questions, contact us:

Alaska Department of Fish and Game (ADF&G)

Division of Habitat (DOH) or Division of Wildlife Conservation (DWC)

Fairbanks office:

1300 College Rd.

Fairbanks, AK 99701

(907) 459-7200

www.adfg.alaska.gov under the “Habitat” tab

Alaska Department of Natural Resources (DNR)

Division of Forestry (DOF)

Fairbanks office:

3700 Airport Way, Fairbanks, AK 99709

(907) 451-2705

www.forestry.alaska.gov

Tanana Chiefs Conference (TCC)

Forestry Program

Fairbanks office:

122 First Ave., Suite 600, Fairbanks, AK 99701

(907) 452-8251

www.tananachiefs.org/sustainability/forestry



