Conservation and Logging on Private Land IN ALBERTA

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Conservation and Logging on Private Land in Alberta

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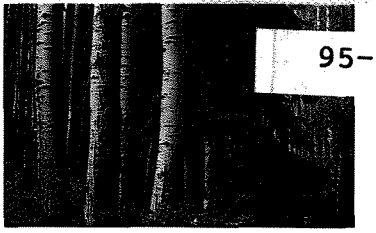

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INTRODUCTION

Many landowners in Alberta have the privilege of owning tracts of forested land. That forest most commonly includes stands of trembling aspen and black (balsam) poplar and to a lesser extent spruce, fir, pine or birch.

The Alberta forest products industry has recently expanded and diversified. Today it is willing to buy many of the tree species found on private land and to buy timber in small quantities. As a result, landowners are often able to find convenient buyers for timber from their land. But logging is a long-term decision. Actions taken now can have consequences for your land, your farming operation and the environment for many years to come.

The reasons for timber harvesting vary from landowner to landowner. Some farmers want to sell their timber and develop the land for agricultural production. Others need the income from timber harvesting and may be content to leave the cutover area unmanaged. Still others are interested in managing their forested land for long-term, supplemental income. Timber harvesting needs to be planned to fit in with your goals for your land and farming operation.

Whatever your interest in logging on private land, this book gives practical information about the effects of timber harvesting on soil, water, wildlife habitat and aesthetics. And it provides information to help you plan and conduct logging with the sustainable use of these resources in mind.

Impacts of Logging and Subsequent Land Use

Timber harvesting can have long-term effects on your farm and the surrounding landscape; the subsequent land use may have even greater impacts. These impacts relate to runoff, gully erosion, in-field erosion, streams, watertables, wildlife habitat, aesthetics and economics. The nature and extent of the impacts will depend on the logging practices, subsequent land use and landscape characteristics.

Runoff and Gully Erosion

Gully erosion and other *runoff** related problems such as flooding can occur when surface runoff from rainfall or snowmelt becomes extreme. By clearing forested land, you may increase the risk of runoff problems for you and your neighbours.

Clearing forested land increases the risk of gully erosion.

On forested land, the potential for such problems is low. The trees intercept rain and dissipate rainfall energy, reducing the volume and energy of rain reaching the forest floor. Water on the forest floor moves within the litter cover layer which slows water movement. This allows more water to *infiltrate* the soil, leaving less water to contribute to surface runoff.

On cleared land, however, *watersheds* of only a few hundred acres can generate sufficient runoff to wash out culverts or flood low lying land and to form gullies too large to repair with farm equipment.

*Words in italics are defined in the Glossary.

Farm watersheds, because of their small size, can respond more quickly to runoff events than large, regional watersheds. Even local showers can produce rapid runoff, so the risk of gully erosion and flooding can be high. In addition, as more small watersheds within a regional watershed are cleared, the whole regional watershed becomes more sensitive to runoff. This increases the potential for flooding, erosion, sedimentation and water quality degradation throughout the area.

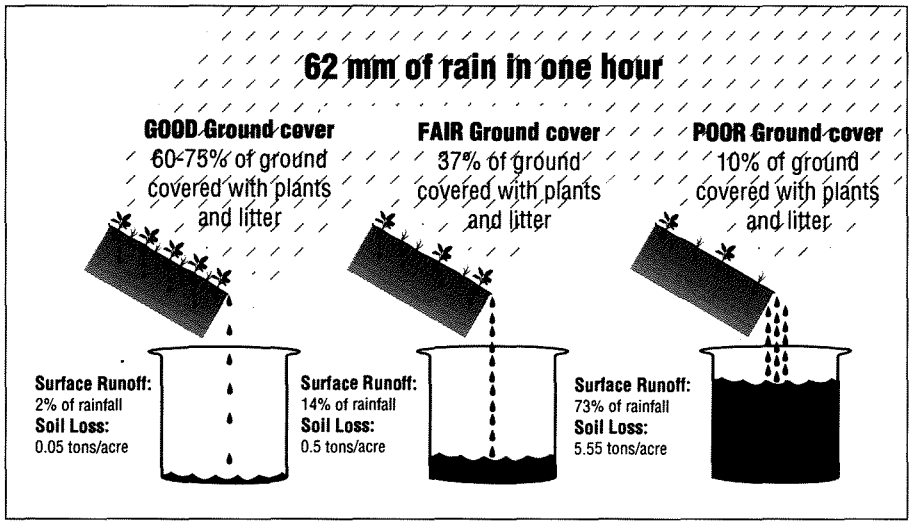
Logging on a farm watershed needs careful planning and management to reduce these negative effects. If a cleared forest is regenerated promptly, the impact on the watershed can be minimized.

In-field Water Erosion

In-field water erosion refers to soil removal by raindrops hitting the ground and runoff flowing as *sheet flow* or in small *rills.* Characteristics that increase the risk of in-field erosion include:

- steep slopes or long, uninterrupted slopes;
- sandy or silty soils;
- soils without a protective vegetative cover;
- reduced infiltration resulting from low permeability at or near the soil surface (due to soil crusting, frozen soil, fine textured soil, shallow soil or other characteristics); and
- soils low in organic matter.

Ground cover can dramatically affect the amount of runoff and soil erosion, as shown in this drawing of the effects of a very heavy rainstorm in the Utah mountains.



(Adapted from Figure 2 in: E.L. Noble, "Sediment Reduction Through Watershed Rehabilitation" in *Proceedings: Federal Interagency Sedimentation Conference*, 1965, United States Department of Agriculture Miscellaneous Publication 970)

Forested areas in Alberta typically have Gray Luvisol (Gray Wooded) soils which have many of these characteristics. Most forested landscapes in the settled part of Alberta are gently to moderately sloping and have minimal risk of erosion unless converted to cultivated land.

The litter and tree residue remaining immediately after logging usually protect the soil from in-field erosion, unless logging practices result in excessive surface disturbance. Land developed to pasture is also reasonably well protected if the pasture is properly managed to maintain good ground cover. On cultivated land, however, slopes greater than 5 per cent are susceptible to in-field erosion. Long slopes (greater than 800 m (2,600 ft) in length) are susceptible to erosion at slopes as low as 2 per cent.

Wind Erosion

Depending on the subsequent land use, logging can also increase the risk of soil erosion by wind. Conditions promoting wind erosion include:

- sparse or absent vegetative cover,
- dry, loose and finely aggregated soil,
- smooth soil surface,
- large fields, and
- high velocity winds.

Vegetative cover, including crop residue, is particularly important in reducing wind erosion. It anchors the soil, increases surface roughness, reduces wind speed, conserves soil moisture and adds organic matter which helps bind the soil particles into aggregates. Clearing and cultivating land removes the vegetative cover for part or all of the year. Large, open fields are especially erosion prone because long, unobstructed distances allow the wind's velocity to increase.

Streams

Tree roots help stabilize stream banks, and tree shade helps reduce algae growth in streams in some cases. Streamside vegetation also traps sediments before they reach the stream and absorbs nitrates from groundwater. Clearing trees removes these benefits.

Stream banks can also be damaged by equipment or livestock trampling, resulting in reduced water quality and increased sedimentation. In extreme cases, stream banks may be destroyed, and the diverted stream flow can cause flooding and sedimentation in new locations.

Trees left standing after *selective harvesting* are susceptible to *windthrow*. Excessive windthrow next to streams can reduce bank stability and increase sedimentation.

WATERTABLES

Trees act as living pumps that draw moisture out of the soil and release it into the atmosphere. At the same time, tree shade and shelter may prevent excessive evaporation from dry sites. Depending on topography, soil and availability of water, clearing trees can have one or more of the following effects on watertables and associated site conditions:

- waterlogged soils that are difficult to reforest or crop,
- reduced soil moisture and drying of existing wetlands,
- fluctuating watertables causing increased soil salinity or changes in soil pH, or
- problems with water quantity or quality in existing dugouts, springs or wells.

WILDLIFE

Wildlife need food, water, shelter and cover to hide in. Adequate wildlife habitat must contain all these components. Although clearing may benefit some species, generally forested land provides habitat for more species than pasture land, and pasture land provides habitat for more species than cultivated land.

AESTHETICS

Removing forest cover changes the aesthetics of the local landscape. In some areas, public opinion may result in pressure to modify timber harvesting practices to reduce the visual effect.

ECONOMICS

Logging and any subsequent land development can have significant economic consequences. You will need to carefully estimate the costs and benefits to decide if timber harvesting is the best economic choice for you. For example:

- The *merchantable* value of timber varies greatly from site to site. What is the value of the timber at your site?
- Costs for slash disposal and reclamation or development of agricultural land can be large; they may be higher than the value of the harvested trees.
- Removing tree cover removes the environmental benefits associated with trees. This can have economic impacts. For instance, crop yields on open fields are typically less than those on sheltered fields. As well, unsheltered farmsteads have greater heating costs, and unsheltered livestock operations have greater feed and bedding costs.
- Clearing may affect the real estate value of your property. Are wooded areas worth more than cleared land? Are they likely to be worth more in the future?

Estimate the investment of time and capital for the various land use options you are considering. Weigh these against the returns to decide if the proposed activities will help meet your goals.

Much debris remains after logging, even with the good logging methods used here. Removing this debris can be costly.

SHOULD YOU HARVEST TIMBER?

Your decisions on whether or not to log, on timber harvesting methods and on subsequent land uses will have long-term implications. To make these decisions, ask yourself the following questions:

- What land use alternatives should I consider?
- What is my land's capability for timber production or for agricultural production? Do my trees have merchantable value?
- What are the conservation concerns if the trees are cleared?
- Which harvesting methods are best for possible future land use options?
- Which options best meet my goals for my farming operation and my land?

ALTERNATIVE LAND USES

Woodlot Management

Sustained yield timber management for your woodlot involves carefully planned, periodic timber harvesting and reforestation. It can provide long-term supplemental income. Woodlot management allows you to obtain economic benefits from your forested land without eliminating the forest's environmental benefits. A forester or forestry technician can provide technical assistance in planning this land use.

Developing Agricultural Land

Some agricultural activities, such as carefully managed bush grazing, do not require total forest clearing. However, your goals may call for permanent clearing of forested land for agricultural production. The sale of timber removed during clearing can help to offset development costs. An agrologist can give technical assistance in determining the agricultural potential of your land and in addressing possible conservation concerns.

Timber Liquidation

In timber liquidation, timber is harvested for its cash value and the cutover land may remain undeveloped and unmanaged. Although you obtain economic benefits from the timber, problems such as soil and water degradation may also arise. Assess the costs and liabilities as well as the short-term benefits.

Forest Conservation

Your goals may be best served by not harvesting. Perhaps the forest is immature or the benefits it provides are worth more than the cash value of the timber. However, forests are not static, and forest management may be needed to keep your forest healthy.

Land Use Capability

The land's capability to produce timber, annual crops or forages will depend on the soil, climate and topography. Collect and assess soil information for the land. Assess the quality, quantity and age of the existing timber resource as well as any limitations to current or future timber production.

Is the area of adequate or marginal quality for timber production? for agricultural production? for wildlife habitat? You may want to consult a forester, forestry technician, agrologist and/or wildlife biologist to assess the land's capability for the various land use options you are considering.

Not all soils are suitable for clearing and agricultural development.

Conservation Considerations

Soil

Review your soil information. Are certain areas of the property prone to erosion due to steep slopes, sandy soils or other factors? Can you control erosion by conservation farming practices or should you not clear these areas? Consider legislation such as the Soil Conservation Act which holds you responsible for soil erosion on your land. Repairing erosion damage often costs more than avoiding it.

Bare soils are prone to water erosion, even on very low slopes.

Water

Cleared land (cultivated or pasture) generates more runoff than forested land. Consult with an expert to identify the *runoff sensitive areas* of your farm. These areas rapidly convey runoff to a surface channel or basin. Rapid runoff following rainstorms or snowmelt can cause flooding, erosion, sedimentation and water quality degradation. Consider keeping runoff sensitive areas under forest cover. If you do harvest timber from these areas, selective harvesting or small *cutblocks* will minimize the effect on the watershed.

Watercourses require particular attention even on less sensitive areas. Be aware that a defined drainage pattern may not develop until trees and litter cover are removed. Changes in land use may also affect the watertable. Vegetated watercourses, stream bank protection and assessment of potential watertable effects should form part of your conservation planning.

Wildlife Habitat

For some landowners, wildlife is an important consideration. To maintain habitat for a variety of wildlife species, you can take a number of measures.

- Maximize *edge* (the transition between forest and cleared areas) to provide better habitat for many species.
- Limit *line-of-sight* along clearings and trail systems to improve protection from predators.
- Leave some dead or dying trees (*snags*) to provide important roosting, nesting and denning habitat for birds and small mammals.
- Leave dead and downed logs and brush piles to provide habitat for birds and small mammals.

- Leave *travel corridors* between small parcels of habitat to improve habitat value.
- Use selective harvesting or small *clearcuts* to conserve important components of wildlife habitat.

In some cases, forest conservation may be the only option that allows you to protect all the components necessary for adequate habitat. Consult a wildlife biologist or habitat technician for additional advice on managing habitat.

Aesthetics

Although aesthetics is a subjective matter, failure to recognize the concerns of your neighbours can result in hard feelings. Consider the surrounding landscape. Would clearing your forest have a significant visual impact? Smaller clearings, *visual buffers*, selective harvesting and prompt clean-up after logging are some ways to minimize the impact on aesthetics.

Timber Harvest Methods

Several methods can be used to harvest timber. Each method has advantages and disadvantages. Your objectives for the present and future use of your forested land will influence the harvest method that you choose. The harvest method will, in turn, affect other decisions such as cutblock size, layout and road location.

Clearcut Harvest

Clearcutting removes all merchantable trees from the cutblock at the same time. This method is the most economical way to harvest. It is appropriate for most species but is especially suited to even-aged stands of sun loving (*shade intolerant*) species such as lodgepole pine or aspen. For land use options that require removal of the forest, clearcutting is probably the only realistic option.

One common misconception about clearcutting is that you must remove all the forest at once. Although you harvest all the merchantable trees in a certain area, the size of that area can be large or small depending on your objectives. A series of small clearcuts, promptly regenerated, can provide periodic, sustainable income while maintaining a healthy forest with diverse age classes.

Partial Cut Harvest

In partial cut harvest systems, the initial harvest does not remove all the merchantable trees from any unit of land. Partial cut methods are intended to encourage natural regeneration. The three partial cut systems are:

- *Selection method* - harvesting selected trees in an uneven-aged stand either individually or in small groups at periodic intervals throughout a harvesting rotation. Harvested trees may be the most valuable trees, the poorest quality trees, the oldest trees or trees of a certain species.
- *Shelterwood method* - harvesting mature trees in two or more cuttings to allow establishment and early growth of seedlings under partial shade and shelter of older trees.
- *Seed tree method* - leaving individual trees or groups of trees uncut to provide seed to regenerate the cutover area.

The amount of tree cover initially removed increases from selection to shelterwood to seed tree method.

Only some of the mature trees are logged in partial cut harvesting.

The selection method is best adapted to uneven-aged stands of *shade tolerant* species such as spruce or fir. It can also be used to convert even-aged stands to uneven-aged stands if the species being managed is capable of regenerating in a partially shaded stand. Selection cuts are often considered to be less visually offensive than clearcuts. As such, they are frequently favoured in areas where recreation or scenic values are important. Selection cuts may also be used to harvest timber from sensitive areas such as steep slopes or *buffer strips* where it is desirable to maintain permanent tree cover.

Unlike the selection method, the shelterwood and seed tree methods will not provide a continuous cover of mature trees. Once young trees are well established on the cutover, the remaining larger trees are removed, leaving only the even-aged regeneration.

Windthrow is a serious concern in all partial cut systems. If *residual trees* blow down, uprooted stems can displace significant amounts of soil and can be unsightly. The impact on soils, watersheds and aesthetics may be worse than if the trees had been harvested. As well, salvage harvests usually cost more than clearcutting.

Planning a partial harvest to minimize windthrow requires considerable expertise. The risk of windthrow is related to soil texture, soil moisture, wind speed and the species, age, *rooting habit*, size and crown development of the residual trees. In general, selection cutting that removes very little of the mature stand in the initial harvest is the least likely to result in windthrow problems. Consult a professional forester for advice on the shelterwood and seed tree methods.

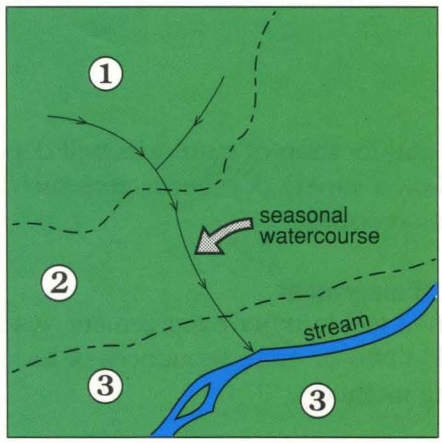
No Harvest

You may decide not to harvest if the benefits of the forest are worth more to you than the cash value of the timber. However, not harvesting can have long-term impacts. If the forest is overmature or if it consists of an even-aged stand with just one or two tree species, it may be more susceptible to damage from insects, disease or fire. Management activities, including timber harvesting, may be desirable to maintain a healthy, diverse forest.

Planning Land Use Activities

Planning will help you to select land use choices compatible with your long-term goals. The preceding sections identify some impacts associated with logging and provide suggestions for dealing with these concerns. If you have not yet decided whether logging helps you meet your goals, please review the previous sections again. If you have decided that logging fits with your goals and you plan to proceed, the next chapter provides tips for logging in a cost-effective, environmentally responsible way.

Before



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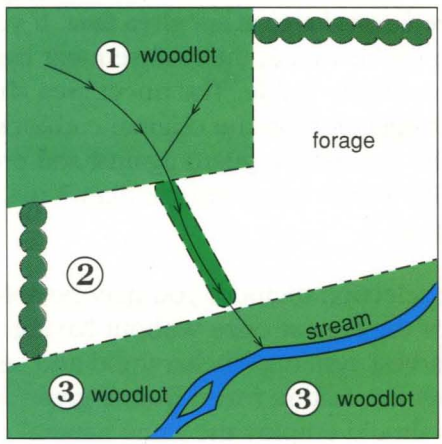


① **Steep rolling, pine/aspen**
- terrain constraints, erosion potential
- manage for timber production using small clearcuts (because shade intolerant species)

② **Gently sloping, aspen/spruce**
- log and develop for forage production
- note native shelterbelts on north and west, and treed buffer along seasonal watercourse

③ **Lowland, spruce/black poplar**
- flood plain, high watertable making land unsuitable for crop production
- buffer on permanent stream
- very productive for timber; use partial cut method to maintain tree cover

CONSIDERATIONS FOR TIMBER HARVESTING ACTIVITIES

CUTBLOCKS

The size and location of cutblocks will depend on your goal for the land and on a variety of other factors such as harvesting method and conservation issues.

Woodlot Management

In sustained yield timber management, mature timber is usually removed in two or more sequences of harvesting depending on the harvesting method.

For clearcutting, as a general rule, **you should not clear more than half of the mature forested area at any given time**. If you remove all the best timber in the first pass, then subsequent harvest sequences will be less economically viable. The uncut area should not be harvested until the vegetation on the original cutblocks has grown sufficiently to protect the watershed, guard against soil erosion and provide cover for wildlife. Forest cover greater than 3 m (10 ft) in height will achieve this.

With the selection method, you may be able to harvest a larger portion of the area at once without having as much impact. The other partial harvest systems (shelterwood and seed tree cuts) ultimately remove all the mature forest from a given area; therefore, these methods should employ the same general rule as clearcuts.

To minimize the effect of harvesting, keep cutblocks as small as possible. Bear in mind, however, that there are trade-offs between the size of individual cutblocks and the road or trail system required to access them. Roads significantly affect soil and water resources because they expose bare soil and may alter surface drainage patterns. Larger cutblocks may have less impact than smaller ones if you require less road to access them.

Some other considerations for designing cutblocks are as follows:

- Cutblock boundaries should follow natural terrain features, contours and timber types (similar species and age).
- *Windfirm* cutblock boundaries will reduce the effects of cutblocks on aesthetics, soil erosion and sediment loads in the watershed.
- Spruce blocks for natural regeneration by seedfall from adjacent stands should be laid out in narrow strips perpendicular to the prevailing winds. No part of the block should be more than 150 m (490 ft) from the seed source.

- Irregular boundaries will provide better wildlife habitat than straight boundaries (more edge and reduced line-of-sight).
- Leaving a few standing trees and old fallen logs will improve wildlife habitat. In particular, trees with existing nests should be identified and protected.
- Young, healthy trees should be protected from damage during harvesting. These trees can form the next crop, saving time and costs for reforestation.

Conversion to Agricultural Production

The size and shape of cutblock created when agricultural land is developed are determined by the pattern of arable soil, desirable size for each operating unit (field or pasture) and topographic constraints such as wetlands, watershed boundaries, watercourses or steep slopes. Where topography is not a limiting factor and the soils are arable, you may want to remove most of the forest cover in one harvest. **This will increase the risks of soil erosion and flooding.** Well-planned buffer strips and/or natural (native) shelterbelts can help reduce these risks.

Native Shelterbelts and Buffer Strips

Shelterbelts improve crop yields by reducing wind erosion and soil moisture loss, and by trapping snow for increased spring soil moisture. They also provide habitat and travel corridors for wildlife.

Native shelterbelts must be wide enough to provide reasonably continuous tree cover. A width of at least 5 to 10 m (15 to 30 ft) is usually required. Consider leaving an untilled area of equivalent width beside the shelterbelt. By encouraging natural regeneration in this area, you can ensure continued shelter when the trees in the original strip become overmature.

The area where crop yields benefit from a shelterbelt is a function of shelterbelt height. At a distance of about 20 times the height of the shelterbelt, conditions are similar to an unsheltered field. If trees in the shelterbelt are about 15 m (50 ft) in height, one shelterbelt every 300 m (1,000 ft) will ensure that all the cleared area receives some benefit.

Treed buffer strips along watercourses or other *riparian areas* create a barrier to equipment traffic, preventing soil disturbance. A cover of *duff* and vegetation protects against erosion and helps filter runoff before it enters the watercourse.

Buffers on riparian areas also provide important habitat and travel corridors for wildlife and enhance fish habitat by shading the watercourse. Wider buffer strips are recommended for larger water bodies because more wildlife is concentrated there.

Large *permanent streams* (streams with an unvegetated channel width greater than 5 m (15 ft)) should have undisturbed buffers at least 60 m (200 ft) wide on both sides of the streams. Smaller permanent streams should have 30 m (100 ft) buffers.

Ephemeral streams are vegetated channels or swales where water flows only during and immediately after rainfall and snowmelt. They can provide significant amounts of water (and sediment) to larger streams. Treed buffers are not required for ephemeral streams but the understorey vegetation should be left as undisturbed as possible.

Intermittent streams have well-defined channels that flow during wet periods but may dry up during drought. Intermittent streams should be treated as ephemeral streams or as small permanent streams depending on the slope and stability of their banks and adjacent soil conditions.

Buffers at least 100 m (300 ft) wide should be left along the shores of lakes greater than 4 ha (10 ac) in size. *Seepage areas* do not require buffer strips but heavy equipment should stay out of these areas except during dry or frozen periods.

Some additional guidelines for buffer areas are:

- No heavy equipment should be permitted within the buffer.
- Adjacent trees should be felled away from the buffer.
- No slash or other debris should be allowed to enter the watercourse; if debris does enter the watercourse, it must be removed immediately without equipment entering the watercourse.
- Where possible, breaks in topography should be used to define the boundaries of the buffer.
- If trees are not windfirm, a wider buffer may be required.
- *Feathered edges* (selectively logged transitions between clearcut areas and undisturbed buffers) may help reduce windthrow.

Selective logging within shelterbelts and buffers may be appropriate under certain conditions. Careful removal of diseased trees, overmature trees or trees susceptible to windthrow is acceptable provided the integrity of the shelterbelt or buffer is maintained. Fell such trees away from the shelterbelt or buffer. Winch or pull from the edge so heavy equipment does not enter the protected area. Take care that neither felling nor skidding damages other trees within the area.

Roads, Landings and Skid Trails

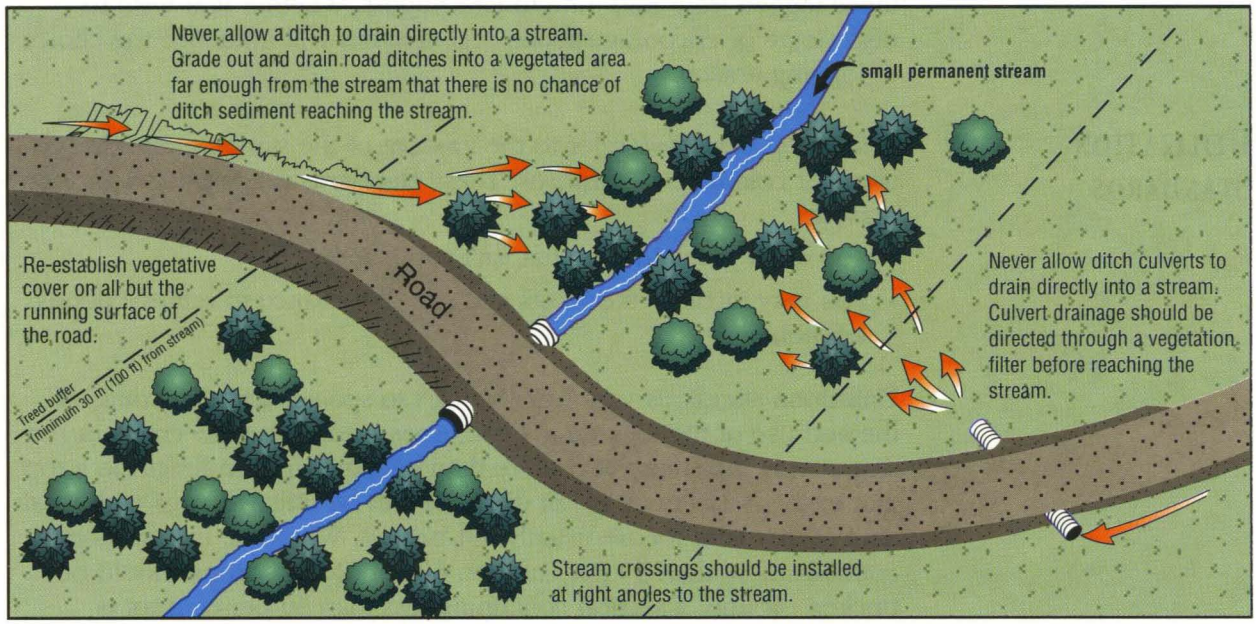
Wherever possible, roads, landings and skid trails should be located on level, well-drained areas within the cutblock. Avoid unstable areas, *water source areas*, springs and seepages. Minimize cuts and fills by following natural benches, moderate slopes and ridges.

Roads, landings and other bared areas should not be permitted within 100 m (300 ft) of the high water mark of lakes or permanent streams, within 30 m (100 ft) of intermittent streams, or within ephemeral streams or water source areas. Exposed soil surfaces should be revegetated as soon as possible. Do not allow runoff from bare areas to flow directly into watercourses. Carefully planned *water bars* (cross ditches) can be used to disperse runoff from skid trails and roads into undisturbed, vegetated areas.

Avoid stream crossings where possible. If a crossing is necessary, it should:

- be located on stable soils;
- allow for direct, gentle approaches;
- be at right angles to the watercourse;
- be located where the channel is well-defined, unobstructed and straight; and
- be at a narrow point along the watercourse.

Stream crossings require special attention to prevent erosion, sedimentation and flooding.



(Adapted from a figure on pages 30-31 in: B. Logan and B. Clinch, 1991, *Montana Forestry Best Management Practices*, Montana State University Extension Service Publication EB0096.)

At approaches to stream crossings, remove ground vegetation and duff only from areas requiring earthwork. Revegetate bared areas as soon as possible. Avoid disrupting the stream banks or channel, and keep debris out of the stream.

Surface Disturbance and Season of Logging

Logging should be conducted in a way that minimizes soil disturbance and water flow over exposed soil. Minimizing disturbance helps maintain a high infiltration rate and reduces the risk of erosion. However, if logging objectives include creating a seedbed for natural regeneration or broadcast seeding of forages, a controlled amount of surface disturbance may be desired.

Winter logging usually results in less disturbance of surface vegetation and the duff layer. To reduce surface disturbance during summer logging, choose low impact equipment and avoid travel on erodible soils or steep areas. Slopes over 45 per cent are usually considered too steep to harvest with conventional equipment; slopes over 30 per cent may require specially planned skid trails.

Soil *compaction* can reduce site productivity for many years after logging, particularly on clay or silt soils. Moist soils are more prone to compaction than dry soils. Logging when soil is frozen will minimize the risk of compaction. Summer logging is acceptable on well-drained soils but it may need to be temporarily halted during wet weather. Avoid or halt activities that cause ruts.

Aspen stands logged during winter will sucker more aggressively than those logged from mid-June to late August. Whether you wish to discourage or encourage aspen regeneration will influence the choice of logging season.

Utilization Standards

Utilization standards refer to the amount of the standing tree that is used for commercial purposes. These standards are important for two reasons:

- you don't get paid for what isn't used, and
- you may incur greater costs and site disturbance to remove debris left behind.

Utilization standards vary from species to species and according to the end use of the logs. In general, trees greater than 15 cm (6 in.) in diameter at the stump and more than 4.88 m (16 ft) in length to a top that exceeds 11 cm (4 in.) in diameter can be utilized. Logs with more than 50 per cent rot are usually left behind. When the butt section contains more than 50 per cent rot, 60 cm (2 ft) sections should be bucked off until a section containing less than 50 per cent rot is found. *Long butting* (cutting sections longer than 60 cm) can result in usable pieces being wasted.

The poor utilization standards used here produced little timber revenue for the landowner and left the land in poor condition for either woodlot production or agricultural development.

Aspen and most coniferous species (except tamarack) are widely used by the forest industry. Use of black poplar, white birch and tamarack is limited to specialty users. If you are removing all the trees but cannot find a market for some species, consider having the unmerchantable species *decked* for use as firewood. Otherwise they may contribute a significant volume to the debris that must be removed.

The use of all merchantable stems will minimize the amount of debris left after logging. A high price per unit of timber may appear attractive; however, this price may not yield the best return per unit of area if the logger takes only the best timber. You are paid for a lower volume of timber and are left with more debris to clean up.

A good logger can keep stump heights to 30 cm (12 in.), and is often able to keep them lower than this standard unless the trees are very large. However, the best stump height will depend on the subsequent land use. Low stumps enhance livestock and equipment access but are difficult to remove with conventional land clearing equipment. Higher stumps provide better leverage for uprooting with clearing equipment, but they will impede access for years after logging if they are not removed. **Uprooting stumps greatly increases site disturbance and is expensive.** Determine whether you require complete removal of all stumps and adjust the stump height accordingly.

Debris Management

Logging debris (branches, tree tops, stumps and unmerchantable stems) interferes with equipment access, impedes livestock movement and may constitute a fire hazard requiring control measures pursuant to the Forest and Prairie Protection Act. On the other hand, the same debris can provide some protection from wind and water erosion and may provide shelter for small seedlings.

Eliminating all logging debris from a cutblock can be expensive. Uprooting stumps and pushing slash into piles disturbs the soil which increases the risk of erosion. **Site disturbance and treatment costs increase with the area treated and the amount of debris handled.**

Unless debris is excessive, spreading it evenly across the cutblock and/or crushing it with machinery is usually adequate for forestry purposes. In fact, this may be more desirable than removing the debris because the decomposing debris slowly releases nutrients back into the soil. For most other purposes, the debris should be removed.

Depending on the logging method, debris may be dispersed throughout the block or concentrated at roads and landings. Hand felling followed by topping and limbing at the stump results in slash dispersed throughout the cutblock. This practice is common in partial cutting or pine clearcutting where logging slash contains seed necessary for natural regeneration. On other clearcuts, a more common practice is to skid whole trees to roadsides or landings where they are topped and delimbed. This results in more debris near roads and landings, and less spread around the cutblock.

Debris is pushed into piles for disposal by burning. Usually a *brush rake* is used to pile debris. It has a toothed blade which moves debris but leaves soil relatively undisturbed. A straight blade (no teeth) can also be used, but the piles usually have more dirt and are more difficult to burn. (A straight blade may be effective for bunching heavy accumulations of slash such as those near roadsides.) Piles for burning should be located on mineral soil, not organic soil.

Attempting to burn logging slash without piling it first is not recommended. A fire intense enough to completely burn large debris will also degrade the site by destroying soil organic matter. The risk of the fire escaping is also significant.

Burning of any kind may require a burning permit from the local authorities.

CONCLUSION

Logging your forested land can have many impacts on the soil, water, wildlife habitat and aesthetics of your property and the surrounding landscape. Logging practices can also affect your use of the land now and in the future, and the economics of your farming operation. By developing a sound understanding of the potential environmental, economic and social effects of the various logging alternatives, you can choose those practices which best meet your long-term goals.

GLOSSARY

Brush rake: a toothed blade designed to pile slash and brush with minimal soil disturbance.

Buffer strip: a protected strip of vegetated land beside roads, watercourses, mineral licks or other important features.

Clearcut: a logging method where all merchantable trees in a defined area are harvested; an area where this logging method has been used.

Compaction, soil: the process of decreasing soil volume such that soil density increases.

Cutblock: an area from which timber is harvested.

Decked: piled in an orderly fashion for loading.

Duff: the layer of partially and fully decomposed organic materials lying below the forest litter and immediately above the mineral soil.

Edge: the boundary between two ecological communities such as open land and forested land.

Ephemeral stream: a channel (usually vegetated) where water flows only during and immediately after rainfall or snowmelt.

Feathered edge: a transitional area between an undisturbed forest and a clearcut where trees are selectively logged to reduce the impact of windthrow on the forest edge.

Impermeable: a condition describing a surface or subsurface soil layer which will not readily allow water to pass through it.

Infiltration: the downward movement of water into the soil.

Intermittent stream: a stream (usually unvegetated) with distinct channel development where water flows during storms or the wet season but dries up during the dry season or drought.

Line-of-sight: the distance at which an object can be identified.

Long butting: a bucking practice in which merchantable pieces from the lower portion of the tree are wasted because long sections of the log are cut off in search of a portion with less rot.

Merchantable timber: the portion of a tree or trees that has attained sufficient size, quality and/or volume to make it suitable for harvesting.

Permanent stream: a well-defined channel where water usually flows all year.

Residual trees: trees remaining uncut following any cutting operation (harvesting or stand tending).

Rill erosion: a process in which many small channels a few centimetres deep are eroded.

Riparian area: the area adjacent to a water body, identified by vegetation, wildlife and other qualities unique to these locations.

Rooting habit: the characteristic rooting pattern of a species (for example, lodgepole pine has a deep tap root).

Runoff: the portion of total precipitation that flows away in streams.

Runoff sensitive area: a well drained area that rapidly conveys water to a stream or basin. It is characterized by moderate to steep slopes, low infiltration rates and limited surface storage.

Seed tree method: an even-aged silvicultural system in which individual trees or groups of trees are left uncut to provide seed to regenerate the cutover area. Seed trees are typically removed once regeneration succeeds.

Seepage area: a surface area that frequently emits groundwater. It is usually found at the upper contact between a lower impermeable layer and an upper permeable layer.

Selection method: an uneven-aged silvicultural system in which selected trees are harvested individually or in small groups at periodic intervals throughout a rotation.

Selective harvesting: a timber harvesting method that removes only some of the mature trees. In contrast to partial cut systems like the selection method, selective harvesting is not necessarily designed to encourage regeneration.

Shade intolerant: the inability of a plant to be competitive in the shade of other plants.

Shade tolerant: the ability of a plant to be competitive in the shade of other plants.

Sheet flow: water flowing over a surface as a sheet, rather than in a channel.

Shelterwood method: an even-aged silvicultural system in which mature trees are removed in two or more cuttings to allow for the establishment and early growth of new seedlings under partial shade and shelter of older trees.

Snag: a dead standing tree that may provide roosting or cavity nesting/denning opportunities for wildlife.

Sustained yield timber management: management of a forest property for continuous production of timber with the aim of achieving an approximate balance between net growth and harvest.

Travel corridor: an area with vegetated cover that reduces wildlife exposure to predators and weather, and is used by wildlife to travel from one habitat area to another.

Utilization standard: the size, species or quality characteristics that determine whether a tree or portion of a tree is merchantable.

Visual buffer: a vegetated buffer that is used primarily to alter aesthetic impact.

Water bar: an obstruction to divert water from the surface of a road or trail onto an adjacent (vegetated) area.

Water source area: that portion of a watershed where soils are saturated and/or surface flow occurs and contributes directly to stream flow.

Watershed: an area of land that collects and discharges water into a single creek or river through a series of smaller tributaries.

Windfirm: the ability to withstand moderate to heavy winds without toppling.

Windthrow: a tree or trees uprooted or broken off by wind.

ADDITIONAL INFORMATION SOURCES

The following publications provide more information on timber harvest planning and subsequent land use:

Successful Forestry: A Guide to Private Forest Management
Canadian Forestry Service
Catalog No. Fo29-17/1988E

Woodlot Management Guide for the Prairie Provinces
Farm Woodlot Association of Saskatchewan

Alberta Timber Harvest Planning and Operating Ground Rules
Alberta Environmental Protection
Publ. No. Ref. 71

Forest Landscape Management Strategies for Alberta
Alberta Forestry, Lands and Wildlife
Publ. No. T/228

Predisturbance Watershed Assessment Manual
Alberta Energy and Natural Resources
ENR Technical Report No. T/100

Resource Road Planning Guidelines
Alberta Energy and Natural Resources
ENR Technical Report No. T/25

Stream Crossing Guidelines: Operational Guidelines for Industry
Alberta Energy and Natural Resources
ENR Technical Report No. T/80

Span Designs for Constructing Temporary Log-Stringer Bridges in Alberta
Forest Engineering Research Institute of Canada

Culvert Sizing for Stream Crossings: A Handbook of Three Common Methods
Alberta Forestry, Lands and Wildlife, Alberta Forest Service
Publ. No. T135

Marketing Timber: From Private Land in Alberta
Canada-Alberta Partnership Agreement in Forestry
Alberta Environmental Protection
Publ. No. I/510

Aspen Woodlot Feasibility Study
Canada-Alberta Partnership Agreement in Forestry
Alberta Environmental Protection
Publ. No. I/529

Land Development: A Guide to Clearing, Piling, Breaking and Working Down Land in Northwestern Alberta
Alberta Forestry, Lands and Wildlife, Public Lands Division
Publ. No. I/27

Water Erosion
Alberta Agriculture, Food and Rural Development, Conservation and Development Branch
Conservation Manual Series

Watercourse Improvement and Gully Restoration
Alberta Agriculture, Food and Rural Development
Agdex 573-5

Grassed Waterway Construction
Alberta Agriculture, Food and Rural Development
Agdex 573-6

Farm Conservation Planning Manual
Alberta Agriculture, Food and Rural Development, Conservation and Development Branch
Conservation Manual Series

Copies of these publications can be borrowed from:

Canadian Forest Service
Woodlot Extension Library
5320 - 122 Street
Edmonton, Alberta T6H 3S5
Phone: 435-7264

For more information on timber harvesting and conservation, contact:

Alberta Land and Forest Services
Forest Management Division
9920 - 108 Street
Edmonton, Alberta T5K 2M4
Phone: 427-8474

Canadian Forest Service
5320 - 122 Street
Edmonton, Alberta T6H 3S5
Phone: 435-7210

Alberta Agriculture, Food and Rural Development
Conservation and Development Branch
7000 - 113 Street
Edmonton, Alberta T6H 5T6
Phone: 422-4385

OR

your local Alberta Agriculture, Food and Rural Development office or Alberta Land and Forest Services office