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LEAVE STRIPS

GOOD or BAD ?

northern forest research centre
edmonton, alberta



LEAVE STRIPS: GOOD OR BAD?

BY

R.E. STEVENSON
Forestry Officer

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NORTHERN FOREST RESEARCH CENTRE
CANADIAN FORESTRY SERVICE
ENVIRONMENT CANADA
5320 - 122 STREET
EDMONTON, ALBERTA, CANADA
T6H 3S5

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INTRODUCTION

The policy of leaving strips of timber along streams, lakes, and roads has been a subject of debate and controversy for many years. Some forest managers believe the policy is sound; others ask why a strip should be left at all.

Acting on a request from the Saskatchewan Department of Natural Resources for a background statement on leave strips, the Northern Forest Research Centre has sampled the opinions of foresters in Ontario, British Columbia, and Alberta, reviewed legislation in the three provinces, and reviewed some of the literature on the subject in the United States. This report is based on current legislation, published reports, and personal statements, and is presented with the realization that it is less than an exhaustive review of the subject.



What is a Leave Strip?

A leave strip may be defined as a block or group of trees left uncut along a road, stream, or lakeshore.

What Good is a Leave Strip?

Leave strips screen recently logged areas from view. Along streams and waterways or near lakeshores, the leave strip prevents soil erosion, reduces influence of wind, provides shade, and enhances aesthetics. In Wyoming, it is felt that even if a leave strip dies the dead trees

serve the purpose of holding the scenery together. From the fishery and wildlife viewpoints a leave strip offers food, shelter, and safety along migration routes.



No leave-timber along major highway; this leads to unfavorable comments by the public.

LEAVE STRIP POLICIES

ONTARIO

There has always been a general policy of leaving reserves of timber along streams, watercourses, lakeshores, and roads in Ontario; most of them are 300-400 feet in width. Information on site protection is contained in a manual prepared by Hough, Stanbury & Associates Ltd. (1973) entitled Design Guidelines for Forest Management, and portions are paraphrased below.

Watercourses

Watercourses are generally defined as small streams* and larger rivers, including those having intermittent and constant flows.

* Streams that can be reasonably stepped or jumped over.

Clear-cutting may be permitted to the edges where ground vegetation exists on stream banks as surface protection, provided that the vegetation will not be disturbed by mechanical equipment. Where tree cover is dense and ground vegetation sparse or nonexistent, a reserve should be left adjacent to the stream to protect ground surfaces. While blowdown may well occur, the vegetation itself will provide the necessary protection against erosion.

All cutting operations near larger streams should be examined by the fish and wildlife manager prior to making a decision to cut to the edges.

All slash must be kept clear of the stream. Also, mechanical equipment should not encroach on bank and stream beds. Where bank slope is 25% or more, trees should not be cut, regardless of age. Since newly formed edges are subject to blowdown, a minimum distance from stream edges is necessary to provide protection and prevent obstruction of stream flow by fallen trees. The width of the protective buffer will be a function of specific site conditions, tree species, soils, and wind firmness.

Since stream-bank protection is the primary object rather than regeneration of desired species, conversion of the stand to shrubs or other materials should be permitted to occur naturally. In addition, the strips left will minimize runoff resulting from adjacent cut areas.

Location and layout of skid trails should be avoided adjacent to stream and terrace edges (Hough, Stanbury & Associates, Ltd. 1973. pp. 81-82).

Lakes and Ponds

Lakes are often located in rock basins and have relatively stable edges. If commercial value of timber is marginal, trees and other vegetation should, in general, be left uncut. If timber is of commercial value, modified or selective cutting may be possible, dependent on tree species, to ensure site protection.

Disturbance to edges by mechanical equipment and skid trails at bottom of slopes should be avoided.

The same considerations as for streams apply:

- a) no disturbance of ground vegetation
- b) preservation of tree cover in absence of ground vegetation
- c) maintenance of tree cover on banks over 25%
- d) proper planning and distribution of skid trails
- e) use of slash as protection against runoff.

Lake edges should be protected. In small lakes and ponds where wind and waves are not a problem and where ground vegetation is reasonably dense and abrupt banks do not occur, cutting of trees does not cause major problems provided that ground vegetation is left undisturbed.

However, in larger lakes where wave action may be more intense, a strip of uncut timber should be maintained to allow the roots of larger trees to protect the banks and minimize undercutting by wave action. A minimum distance, dependent on site conditions, should be maintained in these locations to reduce the impact of blowdown (Hough, Stanbury & Associates, Ltd. 1973, pp. 85-86).

Water Travel Routes

In much of Ontario special consideration is given to water travel (canoe) routes, particularly when these routes form public access through forest management areas. What people see while travelling along rivers or lakes has a marked bearing on their impression of the countryside. Modified logging techniques, in addition to those outlined for site protection, should be considered with respect to aesthetics and the recreational experience of the boat traveller. In these situations the forest service has avoided the use of continuous leave strips, as cosmetic buffers which shield logging operations from view. Some people believe openings should be allowed so that travellers may look back upon the logged areas. However, in Ontario heavily used canoe routes are normally designated as Special Influence areas and therefore not generally subject to logging activities. Motor boats are excluded from these areas.

The general principles and techniques for leave strips applied to road travel are similar to those pertaining to boat activity. These are:

- a) informal edge layout of cutting areas
 - b) variety of cutting along the travelled route
 - c) variety of age classes and types of stand
 - d) modification to cutting on skylines
 - e) thinning and clearing for views
 - f) maintenance of site protection constraints on lake edges.
- Besides the above principles some are relevant to water

travel:

- a) the field of view from a boat is less restrictive than from a car due to slower speeds and absence of a roadbed; shorelines tend to be seen more leisurely,
- b) shorelines are seen from close up, thus making water edges and skylines visually important.

If specific scenic elements are present, for example, rocky shore edges, picturesque vegetation, distant views, or important skylines, then special attention may be given to protect them. In fact, it may be necessary to minimize all cutting along a given water route corridor. In areas where cutting impact should be minimized the following points are suggested:

- a) Cutting practices in hilly landscapes tend to be more important in relation to skylines and water edges. Selective logging should be considered to preserve amenity values.
- b) Strip cutting should be hidden behind a tree buffer and where possible a rise in terrain.
- c) On flat terrain, a dense buffer strip should be left so that logging activities are shielded.
- d) An interpretation of cutting operations along certain water routes could be offered.

Roads

Although leave strips of varying widths have long been considered necessary along logging roads, this philosophy has been slightly modified by Hough, Stanbury & Associates Ltd (1973). Although no single rule of thumb exists for a guide, some factors are:

- a) Clear-cutting is a primary silvicultural system for the boreal forest and has a tremendous impact on northern environment.
- b) Unbroken miles of cutover forest can be monotonous in areas of little topographic relief.
- c) Presence of slash and debris after logging adds to barrenness and desolation of this landscape.
- d) Monotony of unbroken clear-cuts can be changed by leaving timber, through modified cutting resulting from landscape influences along roads e.g. wetlands, rocky areas, etc., no continuous openings or closed stretches but a balance of both.
- e) In hilly areas clear-cuts are readily visible from roads; leave strips help shield extensive cutover areas.
- f) On occasion when leave strip timber is left this reserve may be thinned to allow partial views of the cutover.
- g) A combination of topography and reserve timber may screen cutovers.
- h) No definitive limits as to width of leave strip timber are suggested, but variety of forest type and topography may dictate the amount of leave timber remaining along roads.

Generally, where clear-cuts are readily seen by motorists, phasing of cutting operations is important to obtain a balance between cutovers of varying ages, regeneration at various levels, and natural forest stands; the latter could be leave strips or blocks. It is important to maintain variety and contrast in the sequence of cutover areas by manipulating age classes. Aesthetic values and even interpretation of various stages of regeneration for the public may be achieved with this arrangement.

For excellent examples applicable to upland and alluvial or lowland topography, reference should be made to Hough, Stanbury & Associates Ltd. (1973).

BRITISH COLUMBIA

The topic of leave strips provoked such interest and controversy that a legislative Committee on Forestry and Fisheries was formed in 1972. This committee was charged with examining guidelines for clear-cut logging and streambank, shoreline, and water quality protection in the province. The committee recommended that because of the variability of conditions in each watershed it would be impossible to prescribe a greenbelt of specific width that would apply throughout the province. However, because of the value of leave strips for fish and wildlife, recreation aesthetics, and other uses, the banks of streams including those of intermittent, tributary, and headwater streams, should be reserved from cutting until all resource management agencies have been consulted and an on-site assessment has been made to determine:

- a) the importance of stream and stream-bank area for all resources
- b) the width and type of vegetation to be reserved from development.

Therefore, in British Columbia no legislation pertains specifically to leave strips along streams, none is proposed, and no pressure from the public or resource agencies is expected at the time of this writing. All of this is possible because an integrated resource planning system called "Folio" has been endorsed and accepted throughout B.C. The primary responsibility for this plan rests with the B.C. Forest Service, although cooperation with other resource agencies in assembling all available resource data is fundamental to the success of the system.

This new system has been put into effect at Prince George in the northern interior. Both foresters and biologists determine how the forest resources can be harvested with maximum operational economies and a minimum of degradation or disruption to the social and environmental values. Input from provincial foresters and biologists and industrial foresters is mandatory. A combined contribution is then achieved after each is submitted and reviewed on its own merit.

The zone foresters, including planners and administrators, assemble all available resource data before the plan begins. It is fundamental that a broad inventory of data be gathered for all areas. Fish and wildlife personnel contribute data and interpretations on wildlife, water, and fisheries interests. The zone forester then collates and presents this information in a folio of maps. Written comments accompany each map, including any constraints which must be considered by industrial foresters. Industrial foresters then plan the location, size, shape, and orientation of cutting areas and roads in light of the resource data and management constraints. The principles involved in multiple-use considerations are discussed below.

Wildlife

Primary concern is shown for winter ranges and additional range areas of significant importance. Both the forester and the biologist must accommodate in the plan these prime habitat values and strive to maintain a habitat suitable for wild ungulates. For example, logging operations are not to exceed agreed acreages and should be cut in specified shapes. Leave strips used to shield logging areas may constitute sheltered migration routes for big game animals. known prime habitat in nonmerchable timber should not be disturbed even by traversing it with access roads. Natural salt licks should be screened with adequate timber cover even in high-value stands, etc.

Special attention is paid to forest cover adjacent to water bodies and treed corridors which enable animals which feed in open deciduous growth to escape with ease to the protection of the coniferous forest.

Fish Protection

The primary management objective is to preserve and maintain fish habitat and maintain stream bank vegetation and water temperature and prevent siltation. Logs, fill, and other obstructions or debris likely to cause pollution must not be deposited in streams, no equipment

is to be operated in the streams, and no gravel is to be removed from these waters. Construction of crossings must not coincide with spawning dates.

The forester and fishery biologist specify those trees growing on unstable, erodible outbanks and leaning trees along water courses which must remain uncut. This implies there will be no timber harvesting within 10 chains of the streams.

Recreation

Recreation values are shown on a map depicting recreational resources and capability classes. Special consideration is given to logging and its effect on the environment, particularly in areas of high public use. It is important to maintain a forest environment which will provide enjoyment and satisfaction for the public and facilitate the use of forest land and water for recreational purposes.

Watersheds

The management objective is to control and preserve water quality through the application of appropriate watershed and stream-bank management policies and procedures. The forester must design a timber harvesting system of alternate cut and leave patches designed to reduce the potential for excessive spring runoff and sediment load to the major creeks and rivers in the area.

Soils

Before logging commences, detailed soil information is gathered and interpreted for road construction, erosion problems, windthrow hazards, forest capabilities, species suitability, plant competition, site preparation, and reforestation methods.

Within most areas proposed for logging sensitive areas may occur. These sensitive areas include those adjacent to swamps, lakes, and streams; special habitat for wildlife and fish; areas adjacent to and visible from

important recreational areas; areas of highly erodible soils; and high-elevation areas where regeneration may be difficult following logging.

Generally, it is felt that deferred logging areas or greenbelts become one of the most important elements in the resource plan, especially when they are established with the multiple-use concept in mind. As in Ontario, there is considerable interest in maintaining aesthetic qualities along roads. Leave strips may serve as screens and also help break up the monotony of extensive clear-cuts. Attention also is being directed towards interpreting clear-cutting practices and reforestation programs with signs at key locations on these roads. These considerations now enter into the formulation of integrated management plans.

After the integrated resource plan has been prepared, it is cosigned by various department heads; normally this includes the District Forester and the Regional Director of Fish and Wildlife. This now means that these departments are committed to a course of action. The Timber Sales Licensee is bound to operate within the designated framework because the plan becomes an integral part of his harvesting contract. The question of streamside strips is examined within the plan by classifying site--specifically the importance of streams determines the need for full, partial, or nil tree cover along streams. In some instances it may be necessary to restrict all logging and in essence not disturb these leave strips. The plan, when operational, involves federal (fishery service) provincial, industrial, and public agencies (fish and game associations). Considering that 93% of the riparian land in British Columbia remains under Crown control this system should have far-reaching significance.

Penalty action for noncompliance by a Timber Sales Licensee can result in suspended operations, possible prosecution under the Fisheries Act, and costly logging delays while undertaking corrective measures.

ALBERTA

In Alberta specific ground rules and regulations pertaining to removal of timber near stream or watercourses are listed in the Forest Act under stream or watercourse reserves. These statements apply to major pulp companies such as North Western Pulp and Power Ltd. at Hinton and Proctor and Gamble Cellulose at Grande Prairie.

Stream or Watercourse Reserves

Each watercourse is classified into one of three categories: main, secondary, or other. Main and secondary watercourses are classified on a watercourse map. The three classes and reserve timber requirements for each are as follows:

Main watercourses. Main watercourses are major streams and rivers as designated on the watercourse map. Requirements:

- a) No roads, landings, or bared areas to be located within 5 chains (330 feet) of the high water mark without the written approval of the Forest Superintendent.
- b) No disturbance of any kind and no removal of forest cover, within 3 chains (200 feet) of the high water mark except where specifically approved in writing following inspection by a Forest Officer.
- c) Where removal of forest cover within 3 chains (200 feet) is approved, no skidder, scarifier or other machine to operate within 1 chain of the high water mark. Timber in the one chain area to be removed by winching or other means such that the machine will remain outside the one chain strip.
- d) Any trees felled within the 3-chain area must be felled away from the watercourse, and no debris of any kind will be allowed to enter the watercourse. Any debris or trees which accidentally or inadvertently enter the watercourse shall be completely removed immediately (using winches) without the machine entering the watercourse.

Secondary watercourses. Small but permanent streams are designated on the watercourse map, in two colors, one denoting areas of steep terrain and one denoting areas of gentle terrain. These color designations will serve for general planning purposes and for allowable cut calculations. In practice, gentle terrain will be defined for each location as it exists in the field. Grades of 25% and less will be defined as gentle.

- a) No roads, landings, or bared areas within 5 chains of the high water mark without the written approval of the Forest Superintendent.
- b) No disturbance of any kind, and no removal of forest cover, within 1.5 chains of the high water mark except in areas of gentle terrain where neither bank is strongly sloped, where removal may be allowed up to the high water mark following inspection and approval in writing by a Forest Officer.
- c) Where removal of forest cover within 1.5 chains is approved in areas of gentle terrain, no skidder, scarifier, or other machine to operate within 1 chain of the high water mark. Timber to be removed from the 1-chain area by winching or other means such that the machine will remain outside the 1-chain strip.
- d) Any trees felled within the 1.5-chain area to be felled away from the watercourse unless otherwise approved in writing by a Forest Officer, and no debris or slash to enter the watercourse. Any debris or trees which accidentally or inadvertently enter the watercourse shall be completely removed immediately (using winches) without the machine entering the watercourse.

Other watercourses. Generally definable only on the ground, not designated on the watercourse map.

The Department will request and discuss with the company any special treatment required regarding pertinent portions of other watercourses in any operating area prior to the approval of any annual operating plan or intermediate road or cutting plan submissions. The Department's proposals will be delineated for special safeguard by the company after mutual agreement.

- a) Wherever feasible, the company will not construct roads within such watercourses.

- b) Where road construction is required across or along such watercourses all obstructions must be removed after post-logging treatment, and erosion control measures will be implemented during construction and use in accordance with any road construction standards which may be officially established for the agreement area.

Lakes

The Department classifies lakes for their recreational, waterfowl, and sport fishing potential and advise the company of the classification. Three general classifications are recognized:

- a) Lakes and water bodies with little or no recreational, waterfowl, and sport fishing potential. Around these lakes no roads, landings or bared areas will be located with 5 chains of the high water mark without written approval of the Forest Superintendent. On lakes exceeding 40 acres in area there will be no timber removal or disturbance of any kind within 3 chains of the high mark except after inspection and approval by an officer of the Department. If such removal is approved, no machinery is to operate within one chain of the high water mark, trees are to be felled away from the water and no debris is to enter the water body.
- b) Lakes and water bodies with waterfowl and sport fishing potential (equivalent to or in excess of CLI Class 1, 2, 3, or 4). These lakes will be identified on maps by the Alberta Forest Service by January 1, 1973. Around these lakes no roads, landings or bared areas will be located within 5 chains of the high water mark without written approval of the Forest Superintendent. On lakes exceeding 10 acres in area there will be no timber removal or disturbance of any kind within 3 chains of the high water mark, except after inspection and approval of an officer of the Department. If such removal is approved, no

machinery is to operate within 1 chain of the high water mark, trees are to be felled away from the water and no debris is to enter the water body.

- c) Lakes and water bodies with recreational potential. The Alberta Forest Service will identify such lakes, and advise the company of them, probably on maps. The Forest Service will delineate the area to be reserved on the ground and on appropriate maps. Any timber removed from reserved areas will be removed by the Forest Service, and the company will have first refusal at current pulpwood prices to acquire the wood removed. Such reserved areas may be formally deleted from the agreement area at the request of the company. (Schultz 1973, Vol. II, Appendix III. 3.2.)

THE LEAVE STRIP QUESTION IN THE UNITED STATES

Similar concern about leave strips in logging operations, either large or small, has been shown in the United States. In fact, there has been more controversy over clear-cutting tactics in the U.S. than in Canada (Eyre 1965; Connoughton 1970; Duffield 1970). Public resentment over removal of all timber along streams and lakeshores continues to be profound (Wood 1971). In response to the public outcry, the government formed a task force comprising practical and research forestry people which provided the U.S. Forest Service with an assessment of timber harvesting practices in various areas of the west. One major report is Forest Management in Wyoming (Bernsten et al. 1971). Lack of regeneration on large clear-cutting operations has embittered the American public. Coupled with this concern has been the published statement of hydrologists and fishery biologists that fish-kill and stream deterioration have resulted from large cuts (Shaw and Maga 1943).

It is the opinion of some resource managers that counter-proposals by industrial forestry interests to harvest stream and lakeshores on the pretext that this timber will windthrow, simply do not justify its removal.

Other values such as streambank protection, erosion control, etc. are also important. However, in some situations light selection cutting, particularly on low-yielding timber sites, could be considered a valid management alternative. For example, some mature trees would be removed but under close supervision. This operation is called "pussyfoot logging," and may come into general practice as management intensifies (Bernsten et al. 1971).

No definitive statement on leave strips can be singled out of the literature on clear-cutting operations in the United States. Considerable comment is focused on the size of the clear-cuts (Wood 1971). It does seem reasonable to assume that leave strips, particularly if they are numerous, do constitute much residual timber. For example, only 30-50% of a given watershed may be harvested until established regeneration occupies the cutovers. Leave timber in these watersheds could be left in strips or blocks. There is some semantic confusion in which the residual timber might essentially be called the leave strips. This material is left along streams, some roads, and lakes. Problems do occur when this leave material is removed before the regeneration on the cutover is established and of sufficient size to resemble a young forest, e.g. 12-15 feet tall. Unfortunately, most discussion on clear-cutting focuses on the size of the cut and seldom deals with lack of leave strips in very much detail.

PROTECTING WATERSHEDS

The streamflow characteristics of a watershed can be changed by logging and particularly by clear-cutting. Worldwide research reported by Hibbert (1967) cites the effects of forest cutting and reforestation, of which the leave strip question is part, on water yields. The relationship of forest cover to water yield is most pronounced. Strong evidence exists that streamflow response (increase) is proportional to change (decrease) in forest cover. As a new forest grows following cutting, the increase in streamflow declines but erosion and sedimentation increases are negligible (Goodell 1958). Similar streamflow increases

occurred from a 485,000-acre watershed in Colorado, where 80% of the spruce timber on 30% of the area was killed by bark beetles (Love 1955) (Bernsten et al. 1971, p. 17).

Forest managers and researchers in the U.S. believe it is quite possible that spring snowmelt runoff from small tributary drainages that are a few hundred acres or less and are clear-cut over substantial areas, could have been increased sufficiently to cause local scouring and streambank erosion. However, according to observations made by Bernsten's (1971) group in Wyoming, even when sediment was observed entering tributary drainage channels as overland flow from roads, no tributary stream channel scouring or streambank erosion was directly traceable to increased runoff from clear-cut areas.

In four national forests of Wyoming no more than 30% of any given watershed can be clear-cut at any one time. However this 30% figure is strictly a guess. Resource managers in this area still believe that the size and conditions of watersheds that this restriction applies to must be researched before a firm definition on clear-cut size can be determined.

It is generally assumed that undisturbed forests produce very small amounts of sediment and the streamflow is generally suitable for human consumption. However, many American researchers believe that the simple felling of trees does not affect water quality adversely, although it is recognized that the skidding of logs from forests can sometimes increase sedimentation considerably, depending on the location of skid trails, their drainage, the erodibility of soils, and rapidity of recovery of vegetation on skid trails.

Current timber sale operating requirements within the U.S. Forest Service include leaving a strip of uncut forest along live stream channels where possible and keeping logging residue out of the stream channels. Foresters endorse the strict enforcement of these regulations.

The sizes and proportions of watersheds that can be logged without creating hydrologic damage will require considerable research.

Fortunately, the impact of access-road construction is known in the U.S. Road construction contributes more to poor water quality than any of man's other activities. For example emphasis is placed on problems where roads are located too close to streams or built on too steep grades or inadequately drained.

SUMMARY AND DISCUSSION

The leave strip question is difficult to sum up in definitive terms. However, the following points highlight previous statements.

Arguments for retaining leave strips:

- a) maintenance of aesthetic quality along roads, streams and lakeshores
- b) screen to hide slash on cutover area which may be offensive to road and water travellers
- c) prevention of excessive streamflow which may increase sedimentation, erosion, and general degradation of fish habitat in streams
- d) reduction of influence of wind on lakeshore and smaller lakes
- e) provision of tree seed source to enhance regeneration on cutovers
- f) maintenance to some degree of a wildlife habitat which may include retention of shelter along existing migration routes.

Arguments for removing leave strips:

- a) total consumption of all merchantable timber within a sale area. Economically it is better to make one cut now and not be concerned about coming back for a second.
- b) utilization of timber which otherwise may be lost to windthrow or insect and disease attack.

In spite of the controversy, it seems that government officials will be better off to refrain from cutting these areas. As public trustee of the land, it is the governmental management agency that should be the adjudicator for this decision. Risks are inherent in either course of

action. No one seems to know what is the minimum size of leave strip that should be left in order to keep down water temperature in streams. Moreover, there seems to be little factual information on the impact of clear-cutting of stream banks on stream ecology; i.e. what changes occur in aquatic invertebrate levels and how these affect fish.

There have been many statements in favor of keeping leave strips, but there is no information on how to maintain them. Foresters need guidelines on how to manage leave strips and how long to leave them. There has been no research on what happens to these strips despite the opinion that they fall apart.

Some watershed researchers believe the cutting cycle--20 years before removal of the leave timber--may be too short. Perhaps 40 or 50 years might be more realistic. Again, these are statements which should be substantiated through research.

It seems that each leave strip, whether left alone or subjected to some manipulation through selective logging, should be judged on its own merit. So many variables and circumstances influence each situation that an on-the-spot assessment of each site is needed. The government's predicament is probably one of "damned if you do and damned if you don't." However, in Canada we may follow the lead of the United States whereby the public is involved in the planning process. The Americans have achieved some success in identifying appropriate land management alternatives by giving the public, forest resource information and assessing public opinion on management alternatives.

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