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# **NORTHWEST TERRITORIES**

## **Timber Harvest Planning and Operating Ground Rules**

v. 1.3

**Forest Management Division  
Department of Resources, Wildlife & Economic Development  
Government of the Northwest Territories**

**June 2000**

## **1.0 INTRODUCTION**

The forests of the Northwest Territories are an important source of economic, cultural and spiritual wealth, both in terms of timber value and non-timber values. They are the basis for a diverse resource-based economy upon which many northern residents are dependent upon for subsistence harvesting. They also provide employment and business development opportunities through both the consumptive and non-consumptive use of timber and other forest resources. As such, Northern residents expect that their forests will be managed to meet their diverse present needs and those of future generations. They also expect that these forests will also be managed in a manner that ensures that ecological integrity is maintained so that future forests will continue to provide a sustainable supply of ecosystem goods and services (e.g., timber, wildlife, recreation, aesthetics, air, water).

### **1.1 Purpose of the Ground Rules**

The mandate of the Department (Department of Resources, Wildlife & Economic Development) is to balance development of northern resources with protection of those resources and the environment. The purpose of the ground rules is to ensure that all timber harvesting operations regulated by the Department is conducted in a manner consistent with this mandate.

The *Northwest Territories Timber Harvest Planning and Operating Ground Rules* (the ground rules) are to be used by the Timber Cutting Permit and Timber Cutting Licence applicants, holders and employees of the Department to plan, conduct and monitor timber harvesting operations in the Northwest Territories. They are intended to provide direction to timber operators in planning and carrying out their day to day harvesting activities and assist Departmental staff in the field application of forest management principles and operating requirements.

The ground rules provide sufficient flexibility to accommodate most variations in site conditions. They represent the basic standards of performance for planning and harvesting timber. They are the minimum standards for the protection, maintenance and integration of non-timber values into timber harvest planning and operations. The standards, provided in these ground rules, are to be met on all timber operations. Departures from these may be authorized only by prescribing special operating conditions that must be included as part of the written terms and conditions in the approved Operating Plan (OP).

### **1.2 Application of the Ground Rules**

The ground rules are authorized under Section 13 of the Northwest Territories *Forest Management Act*. Compliance with the provisions and requirements of the *Northwest Territories Timber Harvest Planning and Operating Ground Rules* is a standard condition of any Timber Cutting Licence or Timber Cutting Permit.

The ground rules will be applied using sound judgement, practical experience, and technical and professional competence. They will not cover all situations. Modifications and additions will be required on occasion to deal with special circumstances dictated by site-specific considerations and changing management priorities.

The Forest Management Supervisor or Authorized Officer (as defined by the Northwest Territories *Forest Management Act* and *Forest Management Regulations*) has the authority to approve Annual Operating Plans and may waive or amend the application of specific ground rules in unusual or special circumstances. However, it must be done in writing and must conform to departmental policy, the *Forest Management Act*, the *Forest Management Regulations* or any other applicable territorial or federal legislation or statute. This authority does not apply where other agencies or persons have legal jurisdiction. The responsibility for regulating all land use activities on federal crown land (most of the Northwest Territories), including those related to timber harvesting operations, are with the federal Department of Indian and Northern Affairs (DIAND).

### **1.3 Implementation**

These ground rules shall be in effect from April 01, 2000 or as directed otherwise by the Forest Management Supervisor. The ground rules will be reviewed on a regular basis to ensure completeness and applicability. They will be revised as required.

Harvest designs and cutblocks approved for layout before April 01, 2000 may be harvested as designed under previous ground rules. Harvest designs approved after April 01, 2000 will be approved in accordance with these ground rules.

Logging operations will be guided by these ground rules for operations conducted after April 01, 2000.

## **2.0 TIMBER HARVEST - GENERAL**

### **2.1 Timber Harvest Plans**

Harvest plans that provide descriptions and details of the proposed timber harvesting operations are required for all applications for a Timber Cutting Licence or Timber Cutting Permit.

#### *Timber Cutting Licence*

A Timber Cutting Licence is a multi-year harvest allocation, generally for a large volume ( $>5000 \text{ m}^3/\text{year}$ ). It requires the development and submission of operating plans in the form of a Long Term Development Plan (initial step) that covers the entire scope of the proposed operation and a yearly Operating Plan that details the proposed operation for the coming harvest season.

#### *Timber Cutting Permit*

A Timber Cutting Permit is a one-year harvest allocation, for a small volume ( $5,000 \text{ m}^3$  or less). For a Timber Permit, an applicant may proceed with layout and completion of the Operating Plan for submission prior to the initial Department review.

#### **2.1.1 Development and Submission Requirements for a Long Term Development Plan**

##### *Long Term Development Plan*

The Long Term Development Plan (LTDP) gives a comprehensive description of a timber operator's proposed general harvest strategy for the period of their Timber Cutting Licence (one to five years). The LTDP provides general information on the proposed harvest operation that can be used by the Department to carry out a preliminary review. This initial analysis of proposed licence harvest operations (larger volume) is required to ensure that early in the process (prior to any field layout), the proposal follows the guidelines and resource reporting requirements and considerations, as prescribed in the *NWT Timber Harvest Planning and Operating Ground Rules*. The LTDPs assists the timber operator and the Department in recognizing and planning integration of timber harvesting and related activities with other timber operators, forest resources, users and agencies with resource management responsibilities and authority (e.g., DIAND, DFO). It also ensures that the public consultation process is addressed early in the planning process to an appropriate level of detail.

#### **Standards:**

- 1. The Long Term Development Plan (4 copies) is a required attachment to an application for a Timber Cutting Licence in the NWT.**

2. The timber operator shall submit a Long Term Development Plan to the Department **at least 10 months** in advance of the intended first season of operation. The LTDP will be reviewed, referred to other appropriate government agencies or other required review boards, and will be subjected to a public consultation review process prior to licence approval.
3. The Department shall respond within 45 days of receipt of a licence application and Long Term Development Plan, as prescribed in the *Forest Management Regulations*.
4. The Long Term Development Plan shall be in a format and to a level of detail as prescribed in the *Forest Management Regulations*.
5. When two or more operators with overlapping timber dispositions (or harvest rights) propose harvest operations for the same planning area, they shall develop their respective Long Term Development Plans in a manner to ensure the plans are coordinated with each other. The Forest Management Supervisor reserves the right to set levels of cooperation.
6. The Forest Management Supervisor may require subsequent revisions be made to an approved Long Term Development Plan where such changes are deemed necessary to ensure the sustainability of the forest resource or are required to protect other important resource values.

#### **2.1.2 Development and Submission Requirements for an Operating Plan**

##### *Operating Plan*

An Operating Plan (OP) outlines how timber harvesting will be implemented in a timber disposition during the coming harvest season. The OP describes how, where, and when the operator will develop roads, harvest timber, integrate operations with other users, mitigate the impact of logging and reclaim disturbed sites.

##### **Standards:**

1. A yearly Operating Plan is required for all timber harvesting operations covered either by a Timber Cutting Licence or Timber Cutting Permit.
2. An Operating Plan is to be prepared using the standard GNWT Operating Plan form and follow the guidelines for completion of the plan as prescribed by the Forest Management Supervisor.
3. An Operating Plan is required for each season of operation under the provision of the Long Term Development Plan. The OP for each season's operation must be generated out of the provisions of the Long Term Development Plan.

4. As part of the Operating Plan, detailed harvest plans, to be completed on the appropriate forms, are required for each proposed cutblock. Site specific information is required for the Department review and consultation process; to ensure that the proposed operations will meet both timber and non-timber management objectives for the site; and that environmental protection is adequately addressed within the plan. The individual block plan must include a description of the following:
- a) stand conditions (and stand inventory number when available);
  - b) pre-harvest ecological assessment (PHEA);
  - b) cutblock details (e.g., size, volume to be harvested by species, number and size of landings)
  - c) major operating concerns (e.g., slopes, sensitive soils, understory, wildlife habitat);
  - d) harvesting plan indicating season of operation, harvest methods, rationale for methods employed, equipment to be used, sequencing of operations, alternative methods that could be employed to address specific concerns, start and completion dates for the entire harvest operation);
  - e) block map (1:5,000 scale) (see Section 5.1.4)

### 2.1.3 Map Requirements

#### Standards:

1. The following basic map requirements are to be met for all proposed timber harvest operations:
  - a) Overview Map (1:250,000 scale) that shows the general location and access plan;
  - b) Project Planning and Description Map (1:20,000 - 1:50,000 scale) that includes:
    - the general block layout with locations of all proposed harvest blocks (including any contingency blocks);
    - key environmental and resource values such as key wildlife habitats, the location of trapline cabins, trails, recreation trails, facilities and viewsheds, traditional use, physical and cultural heritage values;
    - deletions for the protection or maintenance of environmental and resource values;
    - access plan describing the location of roads and watercourse crossings to be constructed to access blocks;
    - inoperable and sensitive sites;

- c) **Detailed Block Plan Map (1:5,000 scale)** for each proposed cutblock that includes:
- tie points for blocks and roads including GPS points if available;
  - PHEA field plot locations and numbers;
  - slope locations and grades;
  - springs, seepage's, water source areas, watercourses and watercourse crossings;
  - roads, landings, processing areas, general skid trail layout, felling and skidding direction;
  - understory stands, buffers, retention patches and other leave areas.
2. The Overview Map and the Project Planning and Description Map must accompany an application for a Timber Cutting Licence or Timber Cutting Permit. Applications will not be considered complete until these map requirements are met.
3. A detailed Block Plan Map for each proposed cutblock must accompany the Operating Plan.

## **2.2 Submission Deadline Dates for Timber Cutting Licences and Timber Cutting Permits**

To avoid delays in the approval process and give the Department sufficient time to complete the necessary reviews, field assessments and consultation process, the following deadline dates are in effect.

### **Standards:**

1. **Timber Cutting Licence:** the completed application and accompanying Long Term Development Plan must be submitted at least 10 months in advance of the proposed initial harvest start date.
2. The yearly Operating Plan for a Timber Cutting Licence must be received by the Department by August 1 for proposed winter harvest operations (November - March) and by May 1 for proposed summer harvest operations (July - October).
3. **Timber Cutting Permit:** the completed application and accompanying Operating Plan must be received by the Department by August 1 for proposed winter harvest operations (November - March) and by May 1 for summer harvest operations (July - October).

### **3.0 TIMBER HARVEST PLANNING**

#### **3.1 Sustainable Forest Management**

Timber in the Northwest Territories is to be managed according to the principles of sustainable forest management.

#### **3.2 Timber Harvest Planning - General**

Timber harvest plans are to be developed in a manner that adheres to the principles of sustainable forest management. Blocks will be selected for harvest based on the volume and products to be harvested; the timber values in the harvest area; opportunities for harvest; all of which must be balanced against the need to protect or enhance other resource values.

##### **Standards:**

- 1. Timber harvest plans will incorporate practices and employ appropriate silvicultural systems that sustain the ecological integrity of forest ecosystems and ensures that the long-term productivity of the forest landbase is maintained.**
- 2. Timber harvest plans must integrate ecological, environmental, resource, traditional and cultural values.**
- 3. Timber operators shall plan to harvest only the timber volume authorized by the operator's permit or licence.**
- 4. Merchantable stands excluded from harvest to protect other resource values shall be identified in the harvest design.**

##### ***Public Consultation and Screening***

- 5. Timber harvest plans shall be referred to other relevant resource agencies and stakeholder groups through the Department's consultation process to address the concerns from other users.**
- 6. Timber operations that require environmental screening under the Mackenzie Valley Resource Management Act (MVRMA) will be screened at the preliminary plan stage by Department Regional Foresters and/or Managers, Forests.**



### *Pre-Harvest Ecological Assessment*

7. **Completion of a Pre-Harvest Ecological Assessment (PHEA) for all cutblocks blocks will be a requirement prior to approval of any harvesting operations. In the case of a Timber Cutting Permit for less than 1,000 m<sup>3</sup>, the responsibility for completing the PHEA will be with the Department. For a Timber Cutting Permit of 1,000 m<sup>3</sup> or greater, responsibility for completing the PHEA will be with the applicant. Applicants for a Timber Cutting Licence or existing licencees will be responsible for completing the PHEA's for their proposed cutblocks. The PHEA's must be completed to a standard acceptable to the Department.**

### *Pre-Harvest Silviculture Prescription*

8. **Preparation of a Pre-Harvest Silviculture Prescription (PHSP) for cutblocks will be the responsibility of the Department. All PHSP's will be subject to review and approval by the Department Regional Forester and/or Manager, Forests.**
9. **The specific silvicultural system, logging method and harvest pattern shall be recommended in the Pre-Harvest Silviculture Prescription prepared by the Department and approved by the Regional Forester. The specified silvicultural system, logging method and harvest pattern will be designated as a condition of harvest within the terms and conditions of the approved Operating Plan.**

### *Silviculture System*

10. **The silvicultural system, logging method and harvest pattern will be selected following analysis and consideration of all factors that can potentially influence the Department's ability to meet its management objectives for timber and other resources. The following factors should be considered:**
  - a) **silvics of the species of interest;**
  - b) **reproductive habits of competitive species;**
  - c) **wildlife requirements;**
  - d) **stand's potential as determined by site and environmental factors;**
  - e) **hazards created by insects and disease;**
  - f) **natural disturbance regime;**
  - g) **options for applying fire to reach management objectives (prescribed burning);**
  - h) **environmental hazards (e.g. frost, flooding);**
  - i) **size, age and vigor of the trees in the existing stand, and the overall condition of the stand as affected by past management and natural influences;**
  - j) **genetics;**

- k) aesthetics and recreational values;
- l) social and cultural values;
- m) management constraints and opportunities.

### **3.3 Designing Harvest Layouts - General**

Harvest layouts are to be designed with consideration of the following criteria and factors:

- a) stand, site and resource assessments;
- b) protection of watershed (water and soil), aesthetics, fish and wildlife habitat and other resource values;
- c) compatibility with the silvicultural requirements of the species to be reforested;
- d) appropriate harvest technology; and
- e) balance of timber volume and quality.

#### **Standards:**

- 1. Protection buffers shall be retained along all watercourses. Requirements for watercourse buffers are outlined in Section 3.6.1 of the ground rules (see Appendix I for watercourse description and classification).**
- 2. A minimum buffer of 100 m shall be maintained between cutblocks where more than one operator is harvesting in the same area or between cutblocks where the operator is authorized to harvest a single species.**

#### **Guidelines:**

1. Each harvest pass should be balanced in timber volume and quality, and logging operability.
2. Cutblock boundaries should follow natural terrain features and timber type boundaries to minimize the impact of logging.
3. Protection buffers should be identified and left where needed to achieve multiple-use objectives. Harvest plans and operations can include the use treed buffers, visual screens, operations scheduling, careful placement of roads, and cutblock designs of appropriate shapes and sizes where necessary to minimize the impact of the proposed activities on other forest resources.
4. Where one operator is harvesting both coniferous and deciduous species, the first-pass coniferous and deciduous cutblocks should not be located beside each other (i.e., share a common border). Where it is unavoidable, the maximum cutblock sizes and dimensions should not exceed the dimensions for the deciduous cutblock. The boundary between the coniferous and deciduous cutblocks is to be clearly marked.

5. Where prescribed burns are proposed for silvicultural site preparation or slash hazard reduction, cut-blocks should be designed to facilitate control of fire.
6. In water-source areas or where the water table may be significantly altered by logging creating a risk of reforestation failure, harvest designs should avoid or moderate any changes that could reduce the capability of the site to grow trees. Design considerations may include reduction of cutblock sizes and widths, temporary deferral of harvest, use of a selection harvest pattern, or special site preparation techniques.

#### *Roads and Landings*

7. Roads and landings should not exceed 10% of the area within a cutblock.
8. Roads used to access first-pass cutblocks should be designed so they can be used in succeeding harvests.

### **3.3.1 Cutblocks**

#### **Standards:**

1. Unless otherwise specified, the following maximum cutblock sizes will apply when clear-cutting is used as the method of harvest:
  - a) Pine Stand (stand where pine comprises 80 percent or more of the merchantable timber volume): maximum cutblock size is 100 ha. Where more than one pine stand is identified for harvest in the yearly Operating Plan, the average cutblock size shall not exceed 60 ha.
  - b) Deciduous Stand (stand where aspen/poplar comprises 80 percent or more of the merchantable timber volume): maximum cutblock size is 50 ha. Where more than one deciduous stand is identified for harvest in the yearly Operating Plan, the average cutblock size shall not exceed 30 ha.
  - c) Alluvial Forest Site - Spruce Stand (stand where spruce comprises 20 percent or more of the merchantable timber volume): maximum cutblock size is 5 ha. Where more than one alluvial spruce stand is identified for harvest in the yearly Operating Plan, the average cutblock size shall not exceed 3 ha.
  - d) Upland Forest Site - Spruce Stand (stand where spruce comprises 20 percent or more of the merchantable timber volume): maximum cutblock size is 20 ha. Where more than one upland spruce stand is identified for harvest in the yearly Operating Plan, the average cutblock size shall not exceed 12 ha.
2. Where “green-patch” retention logging is incorporated into the cutblock design, the area of the green retention patches shall be excluded from the determination of cutblock area.

Proposed cutblocks larger than these standards, may be approved by the Forest Management Supervisor, provided the request is supported by acceptable reasons that may include reducing environmental impacts and protection of other resource values.

*Adjacency to Previously Harvested Cutblocks*

4. **Where a harvest is planned for areas bordering or including previously harvested cutblocks, the following standards shall apply:**
  - a) **where the new cutblock is located beside a previously harvested cutblock whose regenerated stock meets the applicable stocking standard and height requirement, the maximum cutblock size prescribed (Section 3.3.1 Standard 1) shall apply;**
  - b) **where the new cutblock is located beside a previously harvested cutblock that does not yet meet the applicable regeneration stocking and height standards, the combined area of the existing and proposed cutblock shall not exceed the maximum cutblock size prescribed (Section 3.3.1 Standard 1).**

Cutblocks proposed for stands harvested previously using a selection cut, in which coniferous stocking is 3 m or more in height, may be larger than these standards, provided that the Operating Plan submitted shows that sufficient healthy conifers will be left to meet the reforestation standards after logging.

**3.3.2 “Green-Up” Requirements**

**Standards:**

1. **Subsequent-pass cutblocks can be approved for harvest when previously harvested cutblocks are reforested to accepted NWT standards and the following height requirements are met:**
  - a) **coniferous cutblocks: regeneration has reached 2 m where a three-pass harvest is planned and 3 m where a two-pass harvest is planned.**
  - b) **deciduous cutblock: regeneration has reached 3 m in height and 10 years have passed since the previous harvest pass.**
2. **In special cases, such as for important resource concerns, the retention period for a subsequent-pass cutblock shall be extended to allow regeneration to reach a target height greater than that specified in Standard 1 above. Conversely, the retention period may be shortened when there is a serious risk of timber loss or exclusion (e.g., insects, disease).**

### **3.4 Incorporating Timber Management Values with Timber Harvest Planning**

Timber harvest operations are to be planned to ensure the efficient use of the available merchantable timber and minimize losses resulting from natural or human-caused events or premature harvest.

#### **3.4.1 Priority of Harvest**

The harvest plans are to be developed in a manner that sequences the harvest according to priorities as determined by stand age, condition or other management requirements, objectives and resource values. This is to ensure that acceptable utilization standards for timber resources are maintained, wastage is minimized, and benefits from forest resource utilization maximized.

##### *Minimum Stand Age*

##### **Standards:**

- 1. The minimum stand age when using a clearcut silvicultural system will be determined by the growth and yield function appropriate to the site class and species to be harvested. Where growth and yield information is not available, the minimum stand age for clearcut harvesting is:**
  - a) 70 years for aspen stands**
  - b) 80 years for pine stands**
  - c) 100 years for spruce stands**

##### **Guidelines:**

1. When other silvicultural systems are employed (i.e., shelterwood, seed-tree, selection, modified clearcut – strip), minimum stand age at harvest can vary according to the specific system selected and the specific management objectives for the stand (e.g., precommercial thinning, commercial thinning, salvage, wildlife habitat improvement, community protection).

##### *Stand Health/Condition*

##### **Guidelines:**

1. Healthy, vigorous stands (stands whose net volume is still increasing) should be retained for succeeding harvest passes.

2. **A maximum merchantable size can be set by the Department where equipment and or milling facilities cannot properly use oversized stems or to meet other management objectives (e.g., wildlife trees, seed tree retention).**
3. **Merchantable trees harvested shall be felled, skidded, decked and handled so that waste of merchantable timber is avoided. Breakage or mechanical damage to merchantable logs shall be kept to a minimum.**
4. **All merchantable logs shall be removed from the harvest blocks. Logs that are too long for transport shall be bucked into merchantable log lengths.**
5. **All merchantable deciduous and coniferous trees, logs or pieces on right-of-ways, skid-trails, landings and campsites shall be recovered and used where a market for the species exists. This requirement can be waived by the Forest Management Supervisor where such trees, logs or pieces are required for wildlife habitat or to maintain other resource values.**

**Guidelines:**

1. **Conifer and deciduous log butts or large ends exhibiting advanced decay greater than 50 percent in area of the cut surface may be bucked at 0.6 m intervals or less to 50 percent sound wood. This approach may not be employed where tree length scaling is used. In this system tree lengths may not be altered prior to the scaling process.**

**3.4.3 Silvicultural Systems and Harvest Sequencing**

The silvicultural (regeneration cutting) systems most often used include clearcutting for pine and spruce and coppicing for birch and aspen, in a pattern of alternating cut-and-leave blocks and patches using a two-pass system.

**Standards:**

1. **Silvicultural systems other than clearcutting shall be used where it is deemed more appropriate to meet environmental, ecological or timber management objectives, or to protect other important resource values. This can include other even-age management silvicultural systems (e.g., shelterwood, seed tree) or in special circumstances an uneven-age management silvicultural system (group or single tree selection) which could involve multiple entries over the rotation period.**
2. **Where a two-pass harvest is planned, all timber stands in a timber disposition that currently meet the merchantability standards and are near, at, or older than rotation age shall be included in the harvest design.**
3. **Where a three-pass harvest is planned, all timber stands that will be merchantable in 40 years and will be near, at, or older than rotation age shall be included in the harvest design.**

2. Wherever feasible, priority should be given to harvesting:
  - a) stands that are the oldest or in the poorest condition (i.e., as indicated by stand breakup, severe blow-down, serious insect or disease infestation or unusually high volumes of dead timber);
  - b) stands in which greater than 30% of the merchantable timber is classed as dead or dying, due to fire, insect, disease or change in environmental conditions;
  - c) stands with a high risk of loss (e.g., land scheduled for industrial development such as oil and gas developments or conversion to agricultural use).
3. Retention of mature or over-mature timber can be considered to meet other management objectives (e.g., wildlife, recreation, aesthetics, watershed protection).

### 3.4.2 Stand Merchantability and Utilization Standards

Merchantability and utilization standards are set by the Department to minimize waste and ensure that optimum use is made of all merchantable timber from harvested stands.

#### Standards:

1. All timber harvest operations shall be planned and conducted according to the following merchantability and utilization standards:
  - a) **Merchantable Stand:** a stand containing 60% of the stems with a minimum diameter outside bark (dob) at stump height (30 cm) of 19 cm or 18 cm diameter breast height (dbh) and a minimum gross merchantable volume of 80 m<sup>3</sup> per hectare.
  - b) **Merchantable Coniferous Tree:** a coniferous tree that has a minimum stump diameter (dob) of 19 cm (18 dbh) and a usable length of 2.5 m or greater with a minimum top diameter of 10 cm diameter inside bark (dib).
  - c) **Merchantable Deciduous Tree:** a deciduous tree that has a minimum stump diameter (dob) of 19 cm (18 dbh) and a usable length of 2.5 m or greater with a minimum top diameter of 10 cm diameter inside bark (dib), or to the point where the stem is unusable or there is no central stem due to heavy branching.
  - d) **Merchantable Piece or Log:** a piece or log that contains a minimum of 50% sound wood (decay-free), and is 2.5 m or greater in length with a minimum top diameter of 10 cm (dib).
  - e) **Utilization Standard:** in merchantable stands slated for harvest: all trees are to be cut such that the stump height does not exceed 30 cm above adjacent ground level; and all trees with a stump diameter (dob) of 15 cm (14 cm dbh) a 10 cm top (dib) will be harvested and utilized, unless otherwise authorized to meet other management objectives.

### Guidelines:

1. Where two-pass clear cutting is in significant conflict with other important forest values or resources (or where identified elsewhere in these ground rules), and where timber age and conditions permit, a three pass system may be used. Three-pass logging could be considered where:
  - a) there is a contiguous area of merchantable timber 1000 ha or larger;
  - b) two-pass logging will create an adverse visual impact;
  - c) in areas where the number of roads in conjunction with two-pass logging reduces visual screening and hiding cover for wildlife; or
  - d) where required to reduce impacts of timber harvesting on critical or key wildlife habitats.

### *Pine, Deciduous and Upland Spruce Stands*

2. Within areas of the boreal forest, where stand replacing fire is the major natural disturbance event responsible for forest renewal, silvicultural systems that result in the development of even-age forests should be employed. On productive sites considered for commercial harvest, this would generally include stands dominated by pine, aspen, birch, and upland black and white spruce. Even-age silvicultural systems include clearcut, seed-tree, shelterwood and coppicing.

### *Alluvial White Spruce Stands*

3. Within the boreal forest, alluvial white spruce stands often escape large-scale fire disturbance. Fire, when it does occur, tends to be small, irregular and return interval much longer than in most other areas of the boreal forest. Most natural disturbance (e.g., fire, flood) events leading to forest renewal on alluvial sites tend to be small-scale "gap" disturbances. Harvesting systems that remove the forest in small patches (up to 5 ha maximum size)(clearcuts - even-age management) or preferably as individual trees or groups of trees (<0.5 ha) (single tree or group selection - uneven-age management) limited to a maximum of 30% basal area removal per entry, or combination thereof, are most appropriate.

### **3.4.4 Operability Constraints**

#### Standards:

1. **Clearcut harvesting shall not occur in stands or forested areas subject to the following:**
  - a) **stands or forested areas located on slopes greater than 25%;**
  - b) **stands or forested areas on permafrost;**
  - c) **water source areas where soils are saturated year round.**



In special cases, where resource values can be maintained following harvest, the Department may approve the use of alternative (to clearcut) harvest methods in these sensitive sites.

#### **3.4.5 Permanent Sample Plots**

##### **Standards:**

1. Permanent sample plots (PSP's) shall not be disturbed or harvested. A no harvest zone (buffer) of 100 m, measured from the plot centre, shall be maintained around permanent sample plots to provide protection from blow-down.

#### **3.4.6 Harvest Planning for Reforestation**

##### **Standards:**

1. Silvicultural requirements are to be identified before harvest. Harvest designs are to be planned to facilitate reforestation.
2. Planning for reforestation and harvesting will be coordinated to minimize soil erosion, soil compaction and watercourse sedimentation.
3. Harvest layouts shall be designed to avoid damaging regeneration on reforested cutblocks or other areas when the reserve timber is harvested.
4. All cutblocks are to be designed and harvested in a manner that facilitates natural regeneration.

##### **3.4.6.1 Reforestation Requirements**

##### **Standards:**

1. All cutblocks shall be reforested to the applicable stocking and growth standards prescribed in the NWT Regeneration Survey Manual.
2. Silvicultural systems shall meet the silviculture requirements of the stands being managed. In most cases, the silvicultural objective will be to ensure that the stand harvested is replaced at rotation with a similar or enhanced stand, particularly in terms of volume and quality of the harvested crop species. When this is the primary management objective for the stand, reforestation techniques that promotes establishment, survival, stocking, growth and yield of crop species should be employed. Some basic considerations include:
  - a) match the silvics of the crop tree species to site conditions;
  - b) control spatial distribution of crop trees to ensure adequate stocking;

- c) **treat the site to enhance the micro and macro environment for seedling establishment, survival and growth (site preparation);**
- d) **plant high quality seedling stock;**
- e) **use stock types best suited to the site conditions and site preparation technique employed (microsite conditions);**
- f) **ensure that seedling stock are properly handled and well planted.**

Guidelines:

1. Where possible, individual cutblocks should be designed to include areas that require similar reforestation treatments.
2. Timber operators may be required to coordinate access management plans with the Department to help facilitate reforestation activities following harvest.

*Aspen*

3. Aspen stands regenerate by root suckering (coppice). In stands where the regeneration objective is aspen, to maximize the aspen suckering response, all of the aspen canopy should be removed (clearcut) at harvest. Harvest period for these stands should be confined to August 15 to April 15. In circumstances where the regeneration objective is promote spruce regeneration, survival and growth on the site following harvest, shelterwood and spring and summer harvest of aspen stands may be considered as a methods of reducing aspen suckering response (competition).

*Pine*

4. Operators may be required to use stump-side processing or other appropriate means during the harvest of pine stands to ensure that enough cones are distributed within the blocks to facilitate natural regeneration (with or without drag scarification).

*White Spruce*

5. In upland white spruce harvest blocks and on alluvial sites, no portion of a cutblock should be more than 100 m from a white spruce seed source. White spruce seed sources can include adjacent stands and/or individual seed-tree and seed-tree patches retained on the cutblock following harvest.
6. When individual white spruce trees or tree patches are retained as seed sources, trees selected should be mature, have a minimum height of 18 m and be wind-firm ( $< 60$  slenderness coefficient). Larger dominant and veteran trees are preferred when individual seed trees are retained on the harvest block, as they are more likely to be wind-firm and will disseminate seed furthest. These trees can also serve as potential snags (wildlife trees) in future.

### **3.4.6.2 Understory Protection**

#### **Standards:**

- 1. Healthy, vigorous, young understory growing stock is to be protected during all timber harvest and reforestation operations.**
- 2. Damage to thrifty understories in stands approved for harvest shall be avoided at all stocking densities, however greater attention shall be given to protecting understories as their value increases. The value of the understory may depend upon any of the following factors:**
  - a) management objective for the area (i.e., for recreation, wildlife habitat, timber and soil/watershed protection);**
  - b) density and height of the understorey;**
  - c) condition of the understorey (i.e., form, crown ratio, root condition, height, vigour and health);**
  - d) limiting physical site factors; and**
  - e) reforestation expectations.**
- 3. White spruce shall be given priority for protection in the understory; however, other tree species may also be protected for specific reasons.**
- 4. Protected species will be recognized as acceptable species in fulfilling reforestation standards. Stands with understory trees that are healthy, vigorous, wind-firm, have good form and have the potential to be crop trees by the second rotation, shall be given highest priority for protection.**
- 5. Understory protection is required during all phases of timber operations (i.e., falling, skidding, hauling, reclamation, and reforestation).**
- 6. Where understories are to be protected, cutblocks are to be designed and operations carried out in a manner to minimize the risk of blowdown of understory trees.**
- 7. In deciduous or mixedwood stands where high densities (>500 stems/ha) of thrifty white spruce understory are present and post-harvest windthrow of the protected understory is an identified concern, alternative harvesting methods that will provide wind protection to the residual stand after removal of the majority of the upper stand canopy, is required.**

### *No-Harvest Deciduous Stands*

- 8. In some circumstances, protection of the understory trees is of greater management value than the harvest of the overstory stand. Merchantable deciduous stands with significant white spruce understories and which contain less than 50 m<sup>3</sup> of merchantable white spruce should not be harvested under the following conditions:**
- a) stand contains white spruce understories of greater than 500 stems/ha, the majority (>75%) of which is classed as advanced regeneration (>5 m) or intermediate height class; and**
  - b) have an average slenderness coefficient of greater than 80 which would make them highly vulnerable to windthrow following harvest.**

#### Guidelines:

1. The requirement for alternative harvesting method for the protection of white spruce understories is stand specific and dependent on local management objectives and other resource values. This requirement should be identified through the completion of the site assessment (PHEA) and development of a silviculture prescription (PHSP), prior to harvest. The silvicultural system (includes the harvest method), specific procedures, equipment requirements and specifications will be determined by the Department in cooperation with the operator and outlined within the terms and conditions of the approved licence or permit.
2. Alternative harvest methods can include modified uniform shelterwoods (one or two pass), strip shelterwoods (one to three pass), strip clearcuts (alternate strips 50-150 m)(one or two pass), progressive strip clearcut (four pass), or combination thereof.
3. Operational procedures for alternative harvesting methods generally include:
  - a) extensive pre-planning and careful layout required;
  - b) pre-planned and pre-logged skid trails;
  - c) mechanical harvest using a zero or minimal tail-swing feller-buncher;
  - d) directional felling and decking only in skid trails;
  - e) rub stumps at junctions;
  - f) skidding only on skid trails;
  - g) reduced road lengths and widths;
  - h) longer skid distances;
  - i) operation during frozen ground conditions;
  - j) hot logging;
  - k) higher decking and reduced landing size.
4. Close field supervision during all aspects of the harvesting operation by the operator and Department field staff is required.

Specific operational guidelines are provided (see Appendix II) for harvest blocks where protection of the coniferous understory is a requirement for harvest.

### **3.4.7 Harvest Planning to Protect Forests from Insects and Disease**

#### **Standards:**

- 1. Harvest methods and reforestation strategies must be selected and designed to minimize the impacts of insects and disease on the surrounding stands and on the regeneration success of the harvested cutblocks.**

#### **Guidelines:**

1. Highest priority should be given to harvesting stands where the incidence of insect and/or disease has been high and where insect and/or disease related mortality has already begun to occur. Secondary priority should be given to stands that are most at risk where diseases and/or insects are known to be present at outbreak population levels.
2. Specific operating conditions may be required and imposed by the Department on operators harvesting trees infected with disease or infested with insect pests of concern (e.g., transport restrictions, manufacturing requirements, slash management).
3. Harvest designs should minimize the risk of stand degradation and increased incidence of decay (e.g., wounding, limb and top breakage).
4. Harvest designs should minimize the risk of blow-down, particularly in mature white spruce timber, that could provide optimal breeding habitat for spruce bark beetle with the potential to trigger outbreak infestations into the surrounding stands.
5. Wherever possible, wildlife and protection buffers should be selected from stands free of diseases or insect infestations.

### **3.5 Incorporating Wildlife, Biodiversity and Other Non-Timber Values with Timber Harvest Planning**

#### **3.5.1 “Green-Patch” Retention Logging**

#### **Guidelines:**

1. To retain structure, mimic natural disturbance patterns and provide wildlife cover, “green-patch” patch retention logging should be employed.

2. To enhance structural diversity, retention patches that include a variety of tree species, sizes and condition should be favoured over patches of uniform tree species, sizes and condition. Emphasis should be given to rare features, patches of less common tree species, existing snags or future large snags.
3. Retention patches can be of variable size. Patch size will be determined by the specific resource management objectives for the site.

### 3.5.2 Wildlife

#### **Standards:**

1. **Harvest plans are to be designed and harvest operations carried out in a manner that will maintain wildlife (includes fish) habitat diversity and species richness (biodiversity).**

#### *Special Wildlife Habitats*

2. **Special wildlife habitat features such as mineral licks, springs that are frequented by wildlife, and water-source areas that are potentially significant for fish spawning and egg incubation shall be protected by a buffer of 100 m.**
3. **When special habitat features are encountered during harvest operations, alteration of the harvest plan will be required to protect the resource. This may include changes to the cutblock boundaries and retention of undisturbed vegetation buffers.**
4. **In-stream work must be carried out in a manner that avoids stream sedimentation.**

#### **Guidelines:**

1. Multiple-pass, reduced cutblock sizes or selection harvesting, particularly on alluvial sites, should be considered when most appropriate to help achieve specific wildlife management objectives.
2. Small merchantable timber stands (5 ha or less) surrounded on at least three sides by riparian meadows or shrub lands should be maintained in a state of mature forest cover.
3. Small isolated islands of mature conifer (5 ha or less) within recent burn areas should not be harvested.

### *Old Growth Forests*

4. Mature and over-mature forest provides important habitat for many wildlife species. It provides essential habitat for many forest dependent species and contributes to the overall biodiversity of the forested landscape. A minimum of 12 percent of the gross productive forestland base of each forest management area should be managed as mature and over-mature forest that is representative of stand types in the area. Unmerchantable stands, watercourse protection buffers and other areas not scheduled for harvest may contribute to the 12 percent.
5. The stands managed as mature and over-mature should be distributed throughout the forest management area and be of a variety of sizes. The sizes of stands maintained in mature and over-mature condition should reflect the frequency distribution of such stands sizes occurring in the natural landscape of the area prior to timber harvesting. As a general rule, stands should be a minimum size of 4 ha and larger. Some large contiguous stands (100-400 ha) with a minimum stand width of not less than 600 m are highly desirable.

### *"Green-Patch" Retention*

6. Where retention patches of deciduous, mixed or coniferous forest are left to provide wildlife cover, patches should have a minimum dimension of not less than 200 m and be from 3-5 ha in size.
7. Retention patches left for thermal cover should contain 50% conifer basal area, have a minimum dimension of 200 m and should be greater than 10 ha in size with 10 m tree heights and 70% crown closure.
8. In deciduous cutblocks, where there are no coniferous stands suitable for providing winter thermal cover over large areas, special effort can be made to developing future thermal cover through understory protection where suitable understories exist.

### *Line-of-Sight and Distance to Cover*

9. Cutblocks and other clearings that result from timber harvesting operations beside long-term roads should be managed to minimize the line-of-sight.
10. Timber operators should incorporate irregular and natural boundaries in their harvest layout wherever possible, and limit the line-of-sight. To provide security and encourage the use of cutblocks, line-of-sight distances within cutblocks and adjacent to roads that will be used five years or longer, should not exceed 400 m. Reduction in line-of-sight distances may be accomplished through the use of terrain, vegetation and block orientation.

11. The distance to wildlife winter thermal cover should be considered when designing cutblocks, especially during planning of subsequent harvest passes. Unmerchantable, deferred, isolated, inoperable or other timber cover not scheduled for harvest may provide adequate thermal cover. Where such cover is unavailable, timber stands that will provide thermal cover should be retained as required.

#### *Travel Corridors*

12. Wildlife travel corridors are required in well-defined valleys or along permanent streams and rivers. Where feasible, these corridors should be 200-400 m in width to allow undisturbed movement of wildlife. Harvest designs may include selection harvest, narrow cutblocks, and other techniques designed to maintain or enhance travel corridors.

#### *Wildlife Trees, Snags and Coarse Woody Debris*

13. Dead and dying standing trees, as well as and some live trees (future snag recruitment) should be left in all cutblocks to provide wildlife habitat (8-10 "wildlife trees" per ha). Large-diameter dead, dying and selected live trees, including both merchantable and unmerchantable species, should be identified as a high priority for retention. Trees are preferred in a clumped distribution.
14. Quality wildlife tree should generally meet the following criteria:
  - a) dead or dying standing tree at least 15 m in height;
  - b) at least thirty (30) centimetres (cm) in diameter at breast height (dbh);
  - c) broken top;
  - d) on dead trees, some bark intact;
  - e) have minimal lean;
  - f) be windfirm.
15. Scattered pieces of coarse woody debris (8 cm diameter and greater) should be retained within cutblocks for small mammal habitat.

#### *Wildlife ("Marten") Piles*

16. Some small slash piles should be left within cutblocks to provide denning sites for furbearers and their prey species, and cover for small mammals and birds (wildlife piles).
17. The following guidelines should be used in the construction of wildlife piles:
  - a) constructed using large diameter coarse woody material - can be capped with smaller diameter material (fines);



- b) care must be taken to ensure minimal amount of ground cover and earth included - only a network of logs are to be used;
- c) various sizes of 'pockets' or cavities within the pile to provide a variety of habitats;
- d) piles should be randomly located in the cutblocks with most in close proximity to the adjacent forest (< 10 m), particularly where special habitats exist (e.g. riparian areas);
- e) connectivity to the adjacent forest using 'stringers';
- f) at least one large-diameter stem at about 45 degree angle sticking out of the pile (winter access into the pile);
- g) bulk of the pile should not exceed 2.5 m in height.

#### *Roads and In-Block Trails*

18. The following guidelines should be used by timber operators to design, construct and manage their roads to minimize the impact on wildlife:

- a) roads and trails should be constructed away from important wildlife habitat areas, including reproductive habitat for selected management species, key features such as mineral licks, and important feeding habitats and watering sites;
- b) in designated areas, road construction and hauling activities should avoid critical wintering, breeding and birthing periods when populations may be more vulnerable to sensory disturbance and harassment.
- c) restrict road access during specified critical periods and remove or block road access into some critical wildlife habitats after all operations have been completed;

19. A 200 m buffer may be required by the Department around areas identified as of particular significance for wildlife (e.g., mineral licks, reproductive habitats, important foraging and watering sites).

### **3.6 Incorporating Watershed Protection with Timber Harvest Planning**

Harvest plans are to be developed in a manner that minimizes the impacts of harvest operations on water (i.e., yield, regime and quality), watercourse structure, soils, aquatic and riparian ecosystems.

#### **Standards:**

1. **Watercourses shall be evaluated and classified according to the descriptions and classification outlined in Appendix I.**

2. **Watercourse protection buffers are required beside lakes, ponds, rivers, permanent and intermittent streams and ephemeral draws.**

*Measurement of Streams and Buffers*

3. **Watercourse widths are to be determined by taking a number of measurements of the distance between the left and right bank at the normal high water mark near areas to be harvested or crossed. Measurements are to be made with a tape, perpendicular (90 degrees to the water flow).**
4. **Buffers are measured as the slope distance from the top of the bank on both sides of a watercourse.**

### **3.6.1 Watercourse (Riparian Area) Protection Buffers**

The protection of watercourses and associated riparian areas during timber harvesting operations is of particular concern. Impacts of timber operations on important watershed values such as water yield, water quality, aquatic habitats for fish and other water-dependent organisms must be minimized. The forest ecosystems immediately adjacent to watercourses (riparian ecosystems) are often characterized by species and structures different from those in the surrounding forest. Although small in size relative to the surrounding forest, these riparian areas are particularly productive, have high biodiversity and provide important and critical habitats for many wildlife species.

**Standards:**

1. **The following no-logging standard buffers shall be established to protect watercourses and associated riparian areas from adjacent timber harvesting operations:**
  - a) **Lakes and Ponds (with recreation, waterfowl or sport fishing potential) - 100 m buffer for those exceeding 4 ha in area; and 30 m buffer for those 1 ha to 4 ha in area.**
  - b) **Lakes and Ponds (with little or no recreation, waterfowl or sport fishing potential) - 100 m buffer for those exceeding 16 ha in area; and 30 m buffer for those 1 ha to 16ha in area.**
  - c) **Ponds (less than 1 ha in area) - 10 m buffer.**
  - d) **Large Permanent (rivers) - 100 m buffer.**
  - e) **Medium Permanent (rivers) - 60 m buffer.**
  - f) **Small Permanent (rivers and streams) - 30 m buffer.**
  - f) **Intermittent (streams) - 10 m buffer**
  - g) **Ephemeral (streams and draws) - 10 m buffer**

2. **In special circumstances, where it is deemed by the Department that the standard buffers will not be sufficient to protect identified resource values of concern, an additional 'enhanced' buffer may be required. The width of the enhanced buffer will be at the discretion of the Forest Management Supervisor.**
3. **Logging may occur within an enhanced buffer, when it is deemed appropriate by the Forest Management Supervisor to meet specific resource management objectives. All harvesting within these areas will be subject to special operating conditions and restrictions required to ensure adequate protection and mitigate impacts of timber harvesting operations on the identified resource values of concern.**

Guidelines:

*Ephemeral Draws*

1. Logging may be permitted in ephemeral draws, but only if it can be demonstrated by the operator to the satisfaction of the Department that wildlife habitat will be maintained or enhanced and watershed values adequately protected. Written authorization by the Forest Management Supervisor will be required prior to any harvesting within ephemeral buffers.
  2. Logging within ephemeral buffers should be as a machine-free zone, with directional felling and limited skidding/forwarding crossings. Alternative harvesting systems to clear-cutting may be more appropriate in these instances.
- 3.7 Incorporating Tourism Values, Recreation Resources and Protected Areas with Timber Harvest Planning**

Standards:

1. **Timber harvesting is to be planned and carried out in a manner that minimizes the impact of timber operations that occur near to recreational or tourism site developments and facilities and legislated protected areas.**

Guidelines:

1. Where possible, roads should avoid high-value recreation areas, or be built according to standards that will ensure they can be used safely while minimizing their impact on the recreation values of the area.
2. Logging techniques that will minimize the visual impact of logging should be used near recreation areas, sensitive viewsheds and major travel corridors.

## **4.0 TIMBER HARVEST OPERATIONS**

### **4.1 Timber Harvest Operations - General**

Timber harvest operations are to be carried out using appropriate forest management practices in order to:

- a) minimize the waste of merchantable timber;
- b) minimize the amount and degree of soil disturbance;
- c) prevent soil, logging debris and deleterious materials from entering watercourses;
- d) maintain the capability of the site to support healthy tree growth;
- e) avoid significantly increasing the risk of timber loss;
- f) minimize the impact of logging on the environment, fish, wildlife and other resources;
- g) maintain or enhance non-timber values.

#### **Standards:**

- 1. The operator must obtain licence or permit approval before any timber operations can begin.**
- 2. Written approval from the Forest Management Supervisor is required for major modifications to the terms & conditions of a licence or permit, and for any changes to the harvest design that impact upon roadside, streamside, recreation, tourism or wildlife buffers and reserves, or visually sensitive areas. Where such modifications are proposed, maps showing the changes shall be supplied to the Department for review and referral.**
- 3. Minor modifications (i.e., less than 5 percent of the cutblock area) to cutblock boundaries identified during harvest operations are permitted when approved in writing by a Forest Officer.**
- 4. All timber harvesting activities, including felling, skidding, decking and reforestation, shall be confined to within approved cutblock boundaries or approved road locations, and shall avoid damage to natural regeneration or reforested areas, unless otherwise authorized by the Forest Management Supervisor.**

#### ***Final Block Clearance***

- 5. When all merchantable logs and pieces are recovered and skidded to a collection area for loading and hauling, and where all slash cleanup has been completed to the satisfaction of the Forest Officer, a cutblock will be given final clearance.**

### *Boundary Marking*

6. **Cutblock boundaries shall be traversed and clearly marked with the appropriate coloured flagging or paint in a manner approved by the Forest Management Supervisor. Boundary marks must be clearly visible, both prior to, during and after harvesting. During initial layout, the boundary must be single flagged or marked at a minimum of 10 m intervals. Where a major change in direction occurs, the boundary is to be double marked.**
7. **At least four (4) corner posts markers are required for each cutblock. Corner post markers are to be double flagged. All corner posts are to be labeled by permit or licence number, operator name, date of marking and initialed by the individual carrying out the layout.**
8. **The following standard colours are to be used to delineate boundaries for timber harvest operations:**
  - a) **orange for harvest block boundaries;**
  - b) **pink for landings;**
  - c) **blue for roads and skid trails;**
  - d) **yellow (preferably labeled) for special management areas (e.g., wildlife reserve, seed trees, buffers, designated crossings, no harvest, machine-free, PHEA sites).**

### *Pre-Harvest Layout*

9. **Roads, trails, landings and cutblocks are to follow the design layout and specifications outlined in the approved Operating Plan (OP). Minor modifications to the approved OP layout plans can be made, subject to approval by the Forest Officer, where deemed necessary to protect resource values or remove unreasonable and unforeseen harvest constraints, while still protecting other resource values.**
10. **The timber operator will provide written justification and interim maps for review to the Forest Officer which show any minor modifications proposed. These minor modifications will be subject to approval by the Forest Officer.**
11. **The Forest Officer shall review marked boundaries, stream crossing locations, resource and protective buffers and road locations to ensure all resource and environmental concerns are addressed appropriately.**
12. **To facilitate review of the field layout, the final layout shall be submitted as soon as possible after the layout is completed to allow the Forest Officer sufficient time to conduct field checks prior to any final approval.**

- 13. The timber operator shall correct deficiencies in the layout before final layout approval is granted.**

*Skidding and Forwarding*

- 14. All skidding and forwarding operations shall be confined to designated trails within the cutblock when understory protection of white spruce regeneration is an identified condition of harvest.**
- 15. Designated trails shall not exceed a maximum width of 7 m.**
- 16. Designated trails shall not exceed 25 percent of the cutblock area.**

*Landings*

- 17. Where landings are to be used, landings shall be a maximum of 0.4 ha in size.**
- 18. The number of landings permitted are as follows:**
- a) maximum of one (1) landing per block for cutblocks less than 8 ha;**
  - b) maximum of two (2) landings per block for cutblocks 8-15 ha;**
  - c) one (1) additional landing for every 10 ha of harvest area for cutblocks over 15 ha.**

*Non-Timber Values*

- 19. Timber operators shall advise trappers of any impending harvest activities at least 10 days before operations begin, preferably by personal contact. This will allow trappers time to remove equipment that may be lost or damaged by timber operations, or to reschedule trapping activities to reduce conflicts. Timber harvesting operators are subject to the terms & conditions of the *NWT Compensation Policy*.**

## **4.2 Integration of Deciduous and Coniferous Operations**

Timber harvest operations, particularly overlapping softwood harvest and hardwood harvest operations on the same cutblocks, are to be planned and carried out in a manner that will minimize waste and maximize utilization of both the merchantable hardwood and softwood species.

**Standard:**

- 1. Where other merchantable species are inadvertently knocked down during timber harvesting operations, the operator will be required to utilize the other non-target merchantable species.**

Guidelines:

1. Where the timber operator is authorized to harvest only coniferous or deciduous timber, and all species will not be used, logging operations should be confined to the pure and mixedwood stands that were used to calculate the Annual Allowable Cut (AAC) of the species listed in the operator's timber licence or permit.
2. Normally, where both deciduous and coniferous timber is to be harvested, a single timber allocation to a single operator will be issued to include both species types.
3. Where an operator wishes only one species type, the operator may be required to employ an alternative silvicultural system (e.g., shelterwood, selection) that protects or minimizes damage during harvest to non-target merchantable species or other species that are to be retained as required to meet other resource management objectives.
4. Where more than one harvest operation is necessary to harvest both species type, all operations should be completed in the same season to avoid delaying reforestation and to reduce site disturbance.

#### **4.3 Planning, Designing, Construction, Maintenance and Reclamation of Roads, Trails, Landings and Campsites**

Responsibility for regulating land use activities on Federal Crown Land in the Northwest Territories lies with the federal Department of Indian and Northern Affairs (DIAND), through the legislative authority of the *Territorial Lands Act* and *Territorial Land Use Regulations*. Land use requirements are dictated by this act and regulations. The ground rules cannot supercede this federal legislation.

The following standards and guidelines for land use activities should be followed for all timber harvest operations, except where they are in direct contravention of existing *Territorial Land Use Regulations* or any specific terms or conditions of a *Territorial Land Use Permit* issued for the timber harvest operation:

Standards:

1. **Land use permits are required for camps and roads. All camps and roads shall be planned, constructed and maintained to the standards specified in the *Territorial Lands Act* and *Territorial Land Use Regulations* for land use activities on Federal Crown Land.**
2. **The timber operator shall submit a schedule for planning, construction, inspection and maintenance of roads as part of the Long Term Development Plan (LTDP) and Operating Plan (OP).**
3. **Merchantable timber on right-of-ways and landings shall be pre-logged and decked prior to construction.**

## *Road Buffers*

- 4. A minimum 125 m no-harvest buffer, measured from the centerline of the road right-of-way, is required along all major highways.**

### Guidelines:

1. Roads, trails, landings and campsites are to be planned, designed and constructed in a manner that will enable them to:
  - a) achieve the objectives of the harvest, timber haul, reforestation and reclamation;
  - b) meet the expected tenure and season of use;
  - c) allows for safe use;
  - d) minimize their impact on the environment, including forest resources and other values.
2. All timber harvesting operations should be planned so that existing roads, trails, seismic trails and campsites will be used wherever possible.
3. Roads, skid trails, landings and campsites should be located where they will:
  - a) avoid identified unstable areas, water-source areas, springs and seepages;
  - b) follow natural benches, moderate slopes and ridges;
  - c) avoid steep or sustained slopes/grades;
  - d) minimize the amount of mineral soil disturbed, compacted or exposed during construction;
  - e) utilize existing right-of-ways, roads and trails wherever possible.
4. The location, construction and maintenance of roads, skid trails, landings and campsites should be done in a manner that:
  - a) minimizes the potential for soil erosion and watercourse sedimentation;
  - b) prevents soil, debris or deleterious materials from entering watercourses;
  - c) protects the banks and channel of any watercourse.
5. Campsites should be located no less than:
  - a) 100 m from the high-water mark of any permanent watercourse;
  - b) 100 m from or out of sight of a numbered highway, where possible;
  - c) 100 m from a public secondary road;
  - d) 1 km from identified mineral licks and other identified wildlife areas;
  - e) 1 km from a recreational or improved tourist facility.



### *Roads and Landings*

6. Roads and landings should not exceed 10% of the area within a cutblock.
7. Seasonal or temporary roads should be constructed in a manner so that their impact on the environment and other resources is minimized and the productivity capability of the land is maintained.
8. Roads should be constructed during dry weather using mineral soil and/or gravel materials and approved techniques.
9. The fill required for road construction should be taken from the right-of-way.
10. Access to borrow pits located off the right-of-way should be constructed so that the pit is not readily visible from the road.
11. Roads should be clearly posted with appropriate traffic control and cautionary signs, particularly during periods of high recreational use (e.g., hunting season and summer) when timber harvesting or hauling operations are in progress.

### *Drainage*

12. Water from roads, ditches and bared soil surfaces should not be permitted to drain directly into watercourses. Vegetated buffers can be left or a system of obstructions (e.g., logs, rocks, mounds) installed to dissipate the force of water, where buffers alone do not retard water and soil movement effectively.
13. Cross-drainage culverts and other drainage devices should be installed as road subgrade construction progresses. Where conditions do not permit cross drains, structures such as ditch blocks can be used.
14. Ditches should be constructed to the same gradient as the road and should be deep enough to drain the subgrade, unless limited by topography. Ditch backslopes should have a regular profile from the top of the cut to the bottom with no hanging banks or sharply cut ditches.

### *Erosion Control*

15. A portion of the clearing debris and strippings from construction of roads, landings and campsites should be retained and used for revegetation and erosion control on disturbed areas.
16. Any roads to be used for harvest operations, log hauling or reforestation during unfrozen ground conditions, should be planned and constructed with appropriate erosion control and drainage structures.

17. All roads, ditches and other bared areas (e.g., landings, campsites) with the potential to drain into a watercourse area or watercourses should have erosion controls installed concurrently with grade construction.
18. Preferably, no more than 2 km of bared road surface area should be developed between the time the subgrade is constructed to when erosion control activities are completed.
19. Erosion control structures should be in place before decking timber on bared surface areas along road right-of-ways
20. On those parts of the right-of-ways not used for grade construction, disturbance to the duff and organic soil should be minimized to reduce damage to the roots of bordering trees and to provide a protective soil cover.
21. Trees with root systems damaged by road construction activities should be removed from the edge of a road cut.
22. All-weather roads should be properly maintained to reduce wheel or track ruts, and to minimize watercourse sedimentation from erosion and traffic during adverse weather.
23. All erosion control and revegetation establishment should be completed, where required to stabilize soils, during the growing season, either concurrently with or in the same year as the construction. If construction takes place in the autumn or winter, revegetation should be completed, as soon as soil conditions permit during the following growing period.

#### *Reclamation*

24. Skid trails, landings and roads that are no longer required should be permanently reclaimed by:
  - a) scarifying and returning them to an acceptable land form;
  - b) removing all watercourse crossing and drainage structures and reclaiming streambanks and approaches;
  - c) cross-ditching;
  - d) rolling back topsoil (including slash and logging debris);
  - e) revegetating erodible bared surface areas;
  - f) reforesting disturbed areas inside cutblocks;
  - g) establishing access closures where required.

25. Roads, skid trails, landings, campsites and watercourse crossings, upon abandonment should be reclaimed in a manner that:
  - a) returns the site to the original or near original landform, drainage and productivity;
  - b) stabilizes disturbed soil and minimizes the risk of erosion.
26. Roads, skid trails, landings, campsites and watercourse crossings which have a high risk of soil erosion and have been reclaimed and abandoned, should be monitored annually by the Department until they are satisfactorily stabilized.
27. Roads required as access for successive harvest passes should be temporarily reclaimed to the following standards:
  - a) remove all watercourse crossing and drainage structures, and reclaim streambanks and approaches;
  - b) stabilize all potentially erodible slopes through rollback, seed to approved vegetation species, and cross-ditch to disperse runoff and suspended sediment into undisturbed areas; and
  - c) install access closure structures where required.

#### **4.4 Timber Harvest Operations and Watershed Protection**

Responsibility for regulating land use activities on Federal Crown Land in the Northwest Territories lies with the federal Department of Indian and Northern Affairs (DIAND), through the legislative authority of the *Territorial Lands Act* and *Territorial Land Use Regulations*. Land use requirements are dictated by this act and regulations. The ground rules cannot supercede this federal legislation.

The following standards and guidelines for watershed protection should be followed for all timber harvest operations, except where they are in direct contravention of the *Territorial Lands Act*, existing *Territorial Land Use Regulations* or any specific terms or conditions of a *Territorial Land Use Permit* issued for the timber harvest operation:

##### **Standards:**

1. Care is to be taken while operating in watercourse areas to minimize damage to the soil's structure, density, fertility, drainage or porosity, especially during periods when it is water saturated.
2. Where the capability of the soil to grow trees is reduced, reclamation techniques shall be applied with the objective of restoring site productivity.

3. **Soil, logging debris or deleterious materials shall not be deposited into the water or onto the ice of any watercourse or waterbody during road construction, harvest, reclamation or reforestation operations. Such material unavoidably deposited onto the ice surface must be removed immediately.**
4. **Any previously unknown and unmapped intermittent or ephemeral streams encountered during any operations shall be given the required protection.**
5. **Equipment shall be permitted to cross permanent, intermittent and ephemeral watercourses only at approved crossings.**

**Guidelines:**

1. During harvest, reforestation or reclamation operations in watercourse areas, activities that cause wheel or track ruts should be avoided or stopped.
2. Logs should not be decked in a manner that causes damages to watercourses or water-source areas. Decks may not be placed on water-source areas during frozen periods unless specifically authorized by a Forest Officer. Where authorized the decks must be removed during the frozen periods.

**4.4.1 Locating, Designing, Constructing and Maintaining Watercourse Crossings**

Watercourse crossings are to be located, designed, constructed and maintained in a manner that:

- a) minimizes the potential for soil erosion;
- b) prevents soil, debris or deleterious materials from entering watercourses;
- c) protects the banks and channel of any watercourse;
- d) meets the intended needs of the operator safely; and
- e) meets the requirements for maintaining upstream fish passage.

**Standards:**

1. **Culverts for all classes of streams shall be designed and installed to prevent erosion at both the inflow and outflow ends of the structure. Culverts shall be of sufficient length beyond the fill, the overburden properly backfilled and stabilized to prevent sediment from entering the watercourse, and the ends of the culvert kept open at all times.**
2. **Where extended use of a seasonal or temporary road is required for activities such as reforestation or future logging operations, stream crossings shall be adequate to meet peak streamflows for the expected life of the road.**

- 3. Properly constructed logfills on temporary roads may be used to cross ephemeral watercourses during dry periods, and cross intermittent watercourses (with developed channels) during frozen periods. Where logfills are used, as soon as the temporary road is abandoned, the logfill must be properly removed so that no soil is allowed into the water channel. Logfills installed during frozen periods must be removed before the spring thaw.**
- 4. On approaches to watercourse crossings, the organic soil layer and lesser vegetation shall not be stripped from portions of the right-of-way not actually needed for the road grade.**
- 5. The timber operator shall conduct an annual inventory of roads and watercourse crossing structures until they are satisfactorily reclaimed and abandoned. All erosion control and maintenance activities proposed are to be identified in the road management section of the Operating Plan (OP).**
- 6. Stream crossings shall be kept free of accumulated debris. Culverts plugged with ice shall be reopened to prevent flooding during the spring thaw.**
- 7. Prompt action must be taken to re-establish vegetation or erosion control structures where initial work has failed.**
- 8. Stream crossings that fail shall be reclaimed or replaced (if necessary) with more appropriate crossing structures as soon as possible.**
- 9. Stream crossings shall be maintained in a manner that upstream fish passage is retained.**
- 10. Where streamflow may be potentially constricted by a temporary winter snow or ice crossing on any watercourse, the crossing shall be notched or completely removed before the spring thaw.**

Guidelines:

- 1. To minimize the risk of erosion and the deposit of sediment into a watercourse, crossings should:**
  - a) have stable approaches;**
  - b) be at right angles to the watercourse;**
  - c) be located where channels are well defined, unobstructed and straight;**
  - d) be at a narrow point along the watercourse;**
  - e) allow room for direct, gentle approaches; and**
  - f) accommodate peak streamflows.**

2. Bridge abutments should not constrict the normal stream channel. Where streambanks must be built up to construct a bridge abutment, soil should be brought in and deposited from the end of the grade; no equipment should enter the stream channel. Bridge spans should extend beyond streambanks and abutment walls.
3. The number of crossings on intermittent or ephemeral watercourses should be limited and constructed at specified locations using appropriate watercourse crossing structures, particularly for work occurring on cutblocks during unfrozen ground conditions.
4. A properly constructed logfill has the following:
  - a) enough logs to adequately fill an ephemeral draw or watercourse channel so that when the logs are removed there is little or no damage to the banks or channel bottom;
  - b) logs delimbed and bucked to at least 1.5 m longer than the grade fill at each end;
  - c) logs covered by a layer of suitable material that separates the soil from the logs, which will permit total removal of the soil cap;
  - d) a soil cap not exceeding 30 cm;
  - e) logs may be cabled or strapped where the bottom logs will not be frozen into the ground.
  - f) a bottom layer of logs may be left in place when removing the logfill to provide for summer crossing of ephemeral watercourses.
6. A properly constructed snow and ice bridge has the following:
  - a) only snow and water (no soil or debris material) for construction;
  - b) compacted snow and ice to protect the watercourse bank; and
  - c) does not impede winter stream flows.

## **4.5 Protection of Forests from Fire during Harvest Operations**

### **Standards:**

1. **Timber harvesting is to be carried out in a manner that minimizes the risk of fire starting or escaping from such operations.**

### **Guidelines:**

1. Fire-fighting equipment should be kept on hand and maintained as required. Where there is fire concern as a result of a proposed timber harvesting operation, the Department can request a fire control plan be submitted for approval prior to final approval of the Operating Plan (OP).

2. The timber operator may be requested by the Department to construct a suitable fireguard around a facility site, where a potential fire concern has been identified.

#### **4.6 Management of Logging Slash and Debris**

##### **Standards:**

1. **Slash accumulations resulting from timber harvesting and road and campsite construction shall be disposed, and slash hazard reduction shall be completed in accordance with the terms and conditions of the approved Operating Plan (OP).**

##### **Guidelines:**

1. Logging slash associated with cutblocks, including processing areas that is not required for wildlife habitat, should be:
  - a) spread without burning provided this can be done without inhibiting reforestation efforts and regeneration or causing excessive soil compaction or disturbance; or
  - b) decked, windrowed or piled (but not on organic soils) and protected by a fireguard (piles, decks and windrows shall be kept at least 8 m from standing timber with 8-m breaks at 300-m intervals); or
  - c) burned on mineral soil when and where it is safe and checked to ensure all fires are extinguished before the fire season begins.
2. Slash and debris from harvesting operations that contains large amounts of soil (i.e., often roads, landings and campsites) should not be burned. In such cases and at the discretion of the Forest Officer, slash and debris may be left in piles to provide wildlife habitat or rolled back to cover the disturbed area.

## GLOSSARY

**Alluvial Forest Site** A forested site, generally in close proximity to a watercourse (often a floodplain), that is characterized by the presence of alluvial soils - mineral soils that develop as a result of recently deposited water-borne (streams and rivers) sediments and exhibit little or no horizon development or modification (included in the Regosolic soil order).

**Allowable Cut (AAC)** The volume of timber that can be harvested within a specified forest management area in any one year.

**Biodiversity** Biological diversity of ecosystems that includes the variety and abundance biological organisms, their processes, function and structure at the genetic, species and community level at spatial scales that range from local through landscape, regional to global.

**Blow-down** Tree or trees knocked down or broken off by wind action.

**Borrow Pit** A source of fill material used in road construction.

**Buck** To cut a felled or downed tree into shorter lengths.

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

**Clear-cutting** An even-age management harvest method where all the merchantable trees in a defined area are harvested, and which results in an exposed microclimate for the regeneration of a new age class. Cutting may be done in groups, patches or strips.

**Coarse Woody Debris** Any large piece(s) of dead woody material (e.g., stumps, branches, roots) found on the ground in forest stands, including after harvest.

**Commercial Thinning** Thinning is a silvicultural treatment made to reduce stand density of trees mainly to improve growth, enhance forest health, or recover trees that may otherwise be lost to mortality. Commercial thinning is any type of thinning that produces merchantable timber, the value of which is usually at minimum equivalent to or exceeds the direct costs of harvesting.

**Community Protection** Activities that can include the creation of fire guards, fuel breaks, silvicultural treatments and/or stand conversions designed and carried out to manage forest fuels in forested areas in close proximity to communities in order to reduce risk from forest fires.

**Competition [forest]** The demand for common resources, including growing space or other conditions, by two or more plants, in an environment where resources or desired conditions are limited.



**Coniferous Cutblock** A cutblock where the regeneration objective is to re-establish a conifer-dominated stand. Generally these would be stands that contained a minimum of 20% merchantable conifer volume at the time of harvest.

**Coppicing** Regeneration of woody plants by vegetative means through the production of new stems that develop from stumps or roots (stump sprouts, shoots, root suckers).

**Crop Tree** Any tree selected to become part of a future commercial harvest

**Cross Drainage Structures** Culverts or other drainage structures that permit water to move from one side of a road to the other, normally under the road grade.

**Crown Ratio** The ratio of the total tree height to the length of live crown (portion of the tree containing live branches and foliage)

**Cutblock** A specified area of merchantable timber with defined boundaries designated for harvest.

**Deciduous Cutblock** A cutblock where the regeneration objective is to re-establish a deciduous-dominated stand. Generally these would be stands that contained a minimum of 80% merchantable deciduous volume at the time of harvest.

**Department** The Government of the Northwest Territories Department of Resources, Wildlife & Economic Development (RWED) charged with forest management responsibilities in the Northwest Territories.

**DFO** The federal Department of Fisheries and Oceans charged with fisheries management responsibilities in the Northwest Territories.

**DIAND** The federal Department of Indian and Northern Affairs charged with land use responsibilities on federal crown land in the Northwest Territories.

**Ditch Blocks** Barriers constructed across ditches to retard water flow, to redirect water from the ditch, or to form a small catch basin.

**Dominant [tree]** A tree whose height extends above the general height of the main canopy of the stand.

**Drag Scarification** Mechanical disturbance of the forest floor using drag chains and/or barrels to create favourable microsites for natural regeneration.

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

**Ecological Integrity** The quality of a natural, unmanaged or managed ecosystem in which the natural ecological processes are sustained, with genetic, species, ecosystem diversity assured for the future.

**Ecological Processes** The actions or events that link organisms and their environment, such as disturbance, successional development, nutrient cycling, carbon sequestration, productivity, and decay.

**Even-aged Stand** Forest stand composed mainly of a single age class in which the ages of most trees are within plus or minus 20 percent of rotation age.

**Federal Crown Land** Public land that is managed by the federal government.

**Final Clearance** The status given to a cutblock after all harvest and reclamation requirements have been met.

**Floodplain** A flat area bordering a watercourse, made up of unconsolidated river-borne sediment, and which is periodically flooded.

**Forest Management Act** The legislative statute that authorizes the Minister to administer and manage the forest in the Northwest Territories.

**Forest Management Area** A defined area of managed forestland.

**Forest Management Regulations** The legislative statute that describes the mechanism and regulations by which the forested lands of the Northwest Territories are managed.

**Forest Management Supervisor** The senior Department manager charged with supervision responsibilities for all forest management activities.

**Forest Officer** An employee of the Department who represents the Minister in the administration of the *Forest Management Act* and the *Forest Management Regulations* on public lands.

**Form [tree]** The classification of trees according to shape, often bole taper.

**“Green-Patch” Retention** Logging method that retains live trees in patches on the cutblock following harvest to achieve site-specific objectives.

**Group Selection** An uneven-age regeneration (selection harvest) method designed to produce a multi-aged forest by removing trees and establishing new age classes in groups.

**Guidelines** The desired actions and practices to achieve the specific objectives.

**Harvest Sequence** The order in which cutblocks will be harvested.

**Hiding Cover** Vegetation that conceals 90 percent of a standing animal (broadside) at a distance of 60 m.

**Horizon [soil]** A layer of soil approximately parallel to the land surface and differing from adjacent genetically related layers in physical, chemical, and biological properties or characteristics such as colour, structure, texture, consistency, kinds and numbers of organisms present, and degree of acidity or alkalinity.

**Hot Logging** A logging operation in which all or most operations (felling, skidding, delimbing, decking and truck loading) are carried out concurrently. With understory protection, the purpose of hot logging is to reduce the size of landing or processing areas required for decking and log storage.

**Intermediate Height Class** Trees whose canopy lies immediately below or extends slightly into the bottom of the main canopy of the stand.

**Line-of-Sight Distance** The distance at which an object can be identified.

**Logfill Crossings** Stream crossings constructed with logs placed in a streambed parallel to the flow of the water.

**Long Term Development Plan (LTDP)** A plan that provides a comprehensive description of a timber operators proposed general harvest strategy and reclamation operations for the period of the Timber Cutting Licence (two to five years).

**Mature and Overmature Stands** Forest stands that have reached or exceeded rotation age and generally have a reduced and declining growth rate. Such stands normally have large mature or overmature trees, an abundance of large live trees with heart rot, numerous snags, stubs and high stumps, and an abundance of large downed coarse woody debris.

**Microsite** The smallest habitat unit occupied by an individual organism as determined by the special relationship between the organism and its site specific immediate environment.

**Mixedwood Stands** Forest stands containing both deciduous and coniferous species.

**Natural Disturbance** Any naturally occurring, relatively discrete event in time that disrupts ecosystem, community, or population structure and changes resources, substrate availability, or physical environment.

**Natural Disturbance Regime** The natural pattern of periodic disturbances, such as fire, flood and wind events that impact forests.

**Natural Regeneration** The renewal of a forest stand by natural rather than human means (e.g., seeding in from adjacent stands vs. artificial regeneration - planting).

**Normal High-Water Mark** Watercourse water levels corresponding to the top of the unvegetated channel or lakeshore.

**Objectives** The aims or results the Department expects to achieve through the standards and guidelines established in the ground rules.

**Operator** The timber disposition holder or person responsible for controlling harvest planning and operations in the timber disposition. It also refers to those persons working on behalf of the disposition holder while conducting timber operations.

**Operating Plan (OP)** An operating plan prepared and submitted by the timber operator each year. The OP outlines how timber harvesting will be implemented in a timber disposition. It describes how, where, and when the operator will develop roads, harvest timber, integrate operations with other users, mitigate the impact of logging and reclaim disturbed sites.

**Precommercial Thinning** The removal of trees not for immediate financial return but rather to reduce stocking in the stand to concentrate growth on the more desirable trees.

**Permanent Roads** Roads that will be in use for more than two years.

**Permanent Sample Plots (PSP)** Plots established in forest stands for long-term timber growth-and-yield studies.

**Pre-Harvest Ecological Assessment (PHEA)** The process of evaluating a site prior to harvest, according to a specific set of procedures, to accomplish certain forest management objectives. This assessment system uses an ecological approach to site evaluation as opposed to single variable or very restricted set of variables.

**Pre-Harvest Silviculture Prescription (PHSP)** The planned strategy and series of treatments, that will be used to harvest and then control the establishment, composition, constitution and growth of forests from regeneration through to the desired endpoint of the forest stand to meet specific forest management objectives.

**Prescribed Burn** A fire managed for the purpose of reducing logging slash or for site preparation to facilitate reforestation.

**Protected Area** Generally an area with legislated protection to control human activity and limit or exclude industrial development.

**Recreation/Tourism Sites** Sites with recreation and tourism developments that are managed for recreation.

**Regeneration** The renewal of a tree crop by natural or artificial means. It may also refer to the young crop itself.

**Reserve Block** An area of timber shown on a harvest layout design, that is or will be merchantable by the final harvest pass, to be retained for a subsequent-pass harvest.

**Retention Period** The length of time between harvesting passes.

**Right-of-Way** A strip of land over which a power line, railway line, road or other linear development extends.

**Rollback** Strippings and debris returned to disturbed areas for reclamation purposes.

**Root Suckers** New shoots that arises from roots (e.g., aspen)

**Rotation** Generally, the time interval between regeneration of the crop trees until harvest.

**Salvage** The utilization of standing or downed trees that are dead, dying or deteriorating due to natural events (fire, windthrow, insect/disease mortality) or clearing for industrial development, before the timber values are lost.

**Scarification** Treatment given to the ground surface of a site to create a favourable environment for natural regeneration.

**Seasonal and Temporary Roads** Roads that will be used only during the current harvesting operation or less than two years.

**Seed Tree System** An even-age management system that retains mature trees scattered randomly throughout the block following harvest in order to provide a seed source for natural regeneration.

**Seepage** An area where water emerges from the ground.

**Selection Harvest [System]** An uneven-aged silvicultural system in which selected trees are harvested individually or in small groups at periodic intervals throughout a rotation; the objective is to improve the timber condition, composition, structure and value.

**Sensitive or Complex Sites** Sites that have soil, water, slope, aesthetic, vegetation or wildlife characteristics that require special protection beyond the normal precautions described in the ground rules.

**Shelterwood System** An even-age silvicultural system that leaves sufficient overstory trees on the site following harvest to provide a shaded, more favourable microenvironment for regeneration.

**Sight Distance** The distance at which 90 percent or more of an adult big game animal is hidden from the view of a human. This distance may vary from one stand to another.

**Silvics** The study of the life history and general characteristics of forest trees and stands, with particular reference to environmental factors, as a basis for the practice of silviculture.

**Silviculture** The theory and practice of controlling the establishment, composition, structure and growth of forests.

**Silvicultural Systems** Systems that follow accepted silvicultural principles, whereby the tree crops are tended, harvested and replaced to produce a crop of a desired form. This includes even-aged (i.e., clearcutting, shelterwood or seed tree cutting) or uneven-aged (i.e., selection cutting) systems.

**Single-Tree Selection** An uneven-age regeneration (selection harvest) method designed to produce a multi-aged forest by removing individual trees of all age classes more or less uniformly throughout a stand with the objective of enhancing growth of the residual trees and providing space for regeneration.

**Site Preparation** The manipulation of the forest floor, organics and upper soil horizons to create a favourable growing environment [microsite] for regeneration. It is used to create a proper seedbed, provide a suitable rooting environment, manage moisture (too much or too little), increase soil aeration, control competing vegetation, and/or increase nutrient availability. Site preparation is also used to enhance planter access and production, provide for efficient crop tree distribution over an entire site, improve overall reforestation efficiency and establish a systematic pattern to increase efficiency of follow-up stand-tending treatment.

**Skid Clearance** The clearance given to a cutblock when all merchantable trees are harvested and the logs and pieces are skidded from the cutblock to a landing

**Skid Trail** An unimproved temporary forest trail suitable for use by equipment such as bulldozers, skidders and forwarders in bringing trees or logs to a landing.

**Slenderness Coefficient** The ratio of the height of a tree to its diameter.

**Snag** A dead standing tree at least 6 m in height that may provide roosting or cavity nesting/denning opportunities for wildlife.

**Soil Damage** Disturbance to soil structure, fertility, porosity or hydraulic conductivity, which has led to a reduction in the capability of the soil to grow trees.

**Spruce Bark Beetle (*Dendroctonus rufipennis*)** An insect bark borer that generally attacks white spruce and may kill mature stands during heavy infestations.

**Stand** A community of trees sufficiently uniform in species, age, arrangement or condition so as to be distinguishable as a group in the forest or other growth in the area.

**Standards** The minimum strategies, practices and requirements needed to achieve objectives.

**Stocking** A measure of the proportion of an area occupied by trees/seedlings, expressed in terms of a percent-age of occupied fixed area sample plots.

**Stock Type** Specifications for seedlings used in planting operations for artificial regeneration (species, age, size, production method, season of planting).

**Stringers** Full length tree stems that extend from slash piles to the forest edge.

**Strippings** The layers of humus-bearing topsoil and fine woody material above mineral soil.

**Stub** A standing dead tree that is generally less than 6 m.

**Subgrade** The road base.

**Subsequent-Pass** Any harvest occurring after the first harvest pass.

**Sustainable Forest Management** Management of forests in order to maintain and/or enhance the long-term health and productivity of forest ecosystems for the benefit of all living things while providing environmental, economic, social and cultural opportunities for present and future generations.

**Three-Pass Harvest** A harvest pattern in which all the available merchantable timber in an area is harvested in three separate passes. Normally it is done over approximately equal areas and in equal volumes.

**Timber Disposition** The licences and permits that allow timber operators to harvest from public lands.

**Timber Cutting Licence** A multi-year timber harvest allocation, generally for a large volume (5000 m<sup>3</sup>/year or greater).

**Timber Cutting Permit** A one-year timber harvest allocation, generally for a small volume (2000 m<sup>3</sup> or less).

**Timber Operations** All activities related to timber harvesting including site-assessments, planning, road construction, harvesting, reclamation and reforestation,

**Trim Allowance** An allowance on a bucked log to permit trimming and squaring of lumber in the sawmill.

**Two-pass Harvest** A harvest pattern in which all the merchantable timber in an area is harvested in two harvest passes. Normally, the harvest is done over approximately equal areas and in equal volumes.

**Understorey [trees]** Trees growing under the main forest canopy.

**Uneven-aged Stand** A forest stand in which the trees differ markedly in age, usually with a span greater than 20 years.

**Upland Forest Site** A forested site that generally has a higher elevation than the adjacent alluvial plain or low stream terrace. These sites are generally characterized by the presence of mineral soils with developed horizons.

**Viewshed** The visible area, as it appears from one or more viewpoints.

**Vigour [tree]** Healthy physical condition and growth.

**Watercourse** The bed, bank or shore of a river, stream, creek, draw or lake or other natural body of water, whether it contains or conveys water continuously or intermittently.

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

**Water-Source Area** The portion of a watershed where soils are water-saturated and/or surface flow occurs and contributes directly to streamflow.

**Wildlife** Any vertebrate species found in a forest environment, excluding domestic animals.

**Wildlife Tree** Any tree that provides an important or critical habitat element for the maintenance or enhancement of wildlife.

**Wind-firm [tree]** A tree that is able to resist breakage and windthrow, usually a function of tree form and structural root development.

**Wind-firm Boundaries:** cutblock boundaries established at locations that are stable and minimize the potential for timber losses from wind.

**Winter Thermal Cover** An area of at least 10 ha having a conifer canopy at least 10 m in height, with at least 70 percent crown closure and a minimum width of 200 m that is used by animals to assist in their temperature regulation during the winter.



## Appendix I. Watercourse descriptions and classification.

((Source: adapted from Alberta Timber Harvest Planning and Operating Ground Rules. 1994)

Classification	Mapping Designation	Physical Description	Portion of Year Water Flows	Channel Development
Large Permanent	<ul style="list-style-type: none"> <li>Double line.</li> </ul>	<ul style="list-style-type: none"> <li>Major rivers.</li> <li>Well defined floodplains.</li> <li>Valley usually exceed 5 km in width.</li> </ul>	<ul style="list-style-type: none"> <li>All year.</li> </ul>	<ul style="list-style-type: none"> <li>Banks and channel well-defined.</li> <li>Unvegetated channel width greater than 250 m.</li> </ul>
Medium Permanent	<ul style="list-style-type: none"> <li>Usually double or solid line.</li> </ul>	<ul style="list-style-type: none"> <li>Large rivers and streams.</li> <li>Usually well defined floodplain.</li> <li>Valley usually exceed 400 m in width.</li> </ul>	<ul style="list-style-type: none"> <li>All year.</li> </ul>	<ul style="list-style-type: none"> <li>Banks and channel well-defined.</li> <li>Unvegetated channel width 5-250 m.</li> </ul>
Small Permanent	<ul style="list-style-type: none"> <li>Usually solid or heavy broken line.</li> </ul>	<ul style="list-style-type: none"> <li>Permanent streams.</li> <li>Often small valleys.</li> <li>Sometimes floodplain and bench development.</li> </ul>	<ul style="list-style-type: none"> <li>Generally all year.</li> <li>Smaller streams may freeze completely in winter.</li> </ul>	<ul style="list-style-type: none"> <li>Banks and channel well-defined.</li> <li>Unvegetated channel width 0.5 - 5 m.</li> </ul>
Intermittent	<ul style="list-style-type: none"> <li>Usually broken light line.</li> </ul>	<ul style="list-style-type: none"> <li>Small stream channels.</li> <li>Small springs are main source outside periods of spring runoff and heavy rainfall.</li> </ul>	<ul style="list-style-type: none"> <li>During wet season or storms.</li> <li>Dries up during drought.</li> </ul>	<ul style="list-style-type: none"> <li>Distinct channel development.</li> <li>Channel usually unvegetated.</li> <li>Channel width to 0.5 m.</li> <li>Some bank development.</li> </ul>
Ephemeral	<ul style="list-style-type: none"> <li>Not normally mapped.</li> </ul>	<ul style="list-style-type: none"> <li>Often a vegetated draw.</li> </ul>	<ul style="list-style-type: none"> <li>Flows only during or immediately after rainfall and snowmelt.</li> </ul>	<ul style="list-style-type: none"> <li>Little or no channel development.</li> <li>Channel is usually vegetated.</li> </ul>
Watersource Areas (except bogs)	<ul style="list-style-type: none"> <li>Not mapped.</li> </ul>	<ul style="list-style-type: none"> <li>Areas with saturated soils or surface flow.</li> <li>Seepages.</li> </ul>	<ul style="list-style-type: none"> <li>All year.</li> <li>May freeze in winter.</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>
Lakes and Ponds	<ul style="list-style-type: none"> <li>Solid line.</li> </ul>	<ul style="list-style-type: none"> <li>Water collection areas permanently filled with water.</li> </ul>	<ul style="list-style-type: none"> <li>Normally surface frozen completely in winter.</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>

## Appendix II. Understory protection guidelines

Understory Density (stems/ha)	Description	Management Objectives	Target Percent (%) of Understory to be Protected by Crown Closure Density Class				Operational Guidelines for Understory Protection of Coniferous Regeneration
			A	B	C		
0 - 250	<ul style="list-style-type: none"> <li>Coniferous regeneration is scattered and widely spaced such that it can be avoided by harvesting equipment.</li> </ul>	<ul style="list-style-type: none"> <li>Protect all or most existing coniferous regeneration (80-100%).</li> <li>Management result - production of a deciduous-dominated mixedwood stand at second rotation that will yield some volume of white spruce sawlogs.</li> </ul>	100	90	80		<ul style="list-style-type: none"> <li>Use "avoidance" strategy during all phases of the harvesting operation.</li> <li>Avoid stems, crowns and root areas of all visible coniferous seedlings.</li> <li>May require skidding only during dry weather or frozen ground conditions.</li> <li>Special care required during bunching and skidding operations to ensure avoidance.</li> </ul>
>250 - 500	<ul style="list-style-type: none"> <li>Coniferous regeneration is clumped and closely spaced such that most of it cannot be avoided by harvesting equipment.</li> </ul>	<ul style="list-style-type: none"> <li>Protect most of the existing coniferous regeneration (60-80%).</li> <li>Management result - production of a coniferous-dominated mixedwood stand at second rotation that will yield a significant volume of white spruce sawlogs.</li> </ul>	80	70	60		<ul style="list-style-type: none"> <li>Care and thought required to protect coniferous regeneration.</li> <li>Some pre-planning may be required, although most protection can be achieved by operations decisions by the operator and Department field staff during the active logging operations.</li> <li>Operational procedures for conventional clearcut harvesting or selection harvest include:               <ul style="list-style-type: none"> <li>- fell and deck in openings and on skid trails;</li> <li>- avoid clumps of regeneration (may require leaving some merchantable stems);</li> <li>- bunch or fell parallel to and in the direction of skidding;</li> <li>- where manual felling or a mechanical feller-director is the harvest means, line skidding required;</li> <li>- where a feller-buncher is employed as the harvest means, grapple skidding should be used;</li> <li>- operate on dry or frozen ground conditions;</li> <li>- skid trails evenly spaced with skidding only on designated skid trails (no random skidding);</li> <li>- reduce lengths and widths of skid trails;</li> <li>- increased skid distances.</li> </ul> </li> <li>Close supervision required during all phases of the harvesting operation by the Operator and Department field staff.</li> </ul>

Understory Density (stems/ha)	Description	Management Objectives	Target Percent (%) of Understory to be Protected by Crown Closure Density Class			Operational Guidelines for Understory Protection of Coniferous Regeneration
			A	B	C	
500+	<ul style="list-style-type: none"> <li>Coniferous regeneration is closely spaced, more or less continuous and cannot be avoided by harvesting equipment.</li> <li><b>No Windthrow Hazard</b> identified.</li> <li>Conventional clearcut harvesting methods with modification can be used.</li> </ul>	<ul style="list-style-type: none"> <li>Protect most of the existing coniferous regeneration (50-70%).</li> <li>Management result - production of a fully stocked or near fully stocked coniferous stand at second rotation.</li> </ul>	70	60	50	<ul style="list-style-type: none"> <li>Extensive pre-planning and careful layout required.</li> <li>Operational procedures for conventional clearcut harvesting include:               <ul style="list-style-type: none"> <li>- pre-planned and pre-logged skid trails;</li> <li>- directional felling and decking only in skid trails (shingling);</li> <li>- where manual felling or a mechanical feller-director is the harvest means, line skidding required;</li> <li>- where a feller-buncher is employed as the harvest means, grapple skidding should be used;</li> <li>- herringbone skid trail pattern; rub stumps at junctions;</li> <li>- log from back to front of block;</li> <li>- skidding only on skid trails;</li> <li>- reduced road lengths and widths;</li> <li>- longer skid distances;</li> <li>- avoid clumps of coniferous regeneration with marginal merchantable overstory;</li> <li>- limb and top in bush;</li> <li>- operate on frozen ground conditions;</li> <li>- hot logging, higher decking and reduced landing size.</li> </ul> </li> <li>Close supervision required during all phases of the harvesting operation by the Operator and Department field staff.</li> </ul>

Understory Density (stems/ha)	Description	Management Objectives	Target Percent (%) of Understory to be Protected by Crown Closure Density Class			Operational Guidelines for Understory Protection of Coniferous Regeneration
			A	B	C	
500+	<ul style="list-style-type: none"> <li>Coniferous regeneration is closely spaced, more or less continuous and cannot be avoided by harvesting equipment.</li> <li><b>Windthrow Hazard identified.</b></li> <li>Alternative (to clearcut) harvest methods that will provide wind protection after removal of the majority of the upper stand canopy are to be used.</li> </ul>	<ul style="list-style-type: none"> <li>Protect most of the existing coniferous regeneration (50-70%).</li> <li>Management result - production of a fully stocked or near fully stocked coniferous stand at second rotation.</li> </ul>	70	60	50	<ul style="list-style-type: none"> <li>Alternative harvest methods to reduce windthrow hazard to residual understory trees can include:               <ul style="list-style-type: none"> <li>- modified uniform shelterwoods (one or two pass);</li> <li>- strip shelterwoods (one to three pass);</li> <li>- strip clearcuts (alternate strips 50-150 m)(one or two pass);</li> <li>- progressive strip clearcut (four pass).</li> </ul> </li> <li>Operational procedures for alternative harvesting methods include:               <ul style="list-style-type: none"> <li>- extensive pre-planning and careful layout required;</li> <li>- pre-planned and pre-logged skid trails;</li> <li>- mechanical harvest using a zero or minimal tail-swing feller-buncher required;</li> <li>- directional felling and decking only on skid trails;</li> <li>- rub stumps at junctions;</li> <li>- skidding only on skid trails;</li> <li>- reduced road lengths and widths;</li> <li>- longer skid distances;</li> <li>- operate on frozen ground conditions;</li> <li>- hot logging, higher decking and reduced landing size.</li> </ul> </li> <li>Close supervision required during all phases of the harvesting operation by the Operator and Department field staff.</li> </ul>

Understory Density (stems/ha)	Description	Management Objectives	Target Percent (%) of Understory to be Protected by Crown Closure Density Class			Operational Guidelines for Understory Protection of Coniferous Regeneration
			A	B	C	
500+	<ul style="list-style-type: none"> <li>Deciduous-dominated stand with less than 50 m<sup>3</sup> merchantable white spruce.</li> <li>Coniferous regeneration is closely spaced, more or less continuous and cannot be avoided by harvesting equipment.</li> <li>Majority of coniferous understory is advanced regeneration (&gt; 5 m) with an average slenderness coefficient of 80.</li> <li>High Windthrow Hazard identified.</li> </ul>	<ul style="list-style-type: none"> <li>Protect all of the existing coniferous understory.</li> <li>NO HARVEST</li> </ul>				

(Source: adapted from Alberta. Anonymous)

*DRAFT*

**a) stands with 0-250 understory stems/ha:**

- use "avoidance" as the coniferous regeneration is widely scattered and spaced such that it can be largely avoided by logging equipment;
- management objective is to protect most (80-100%) of the existing coniferous regeneration to produce a deciduous dominated forest at second rotation that will also yield a small volume of white spruce sawlogs;
- operational procedures for all methods of harvest include: avoid stems, crowns and root areas of all existing visible coniferous understory; where manual felling or a mechanical feller-director is employed as the harvest means, line skidding is to be used; where a feller-buncher is employed as the harvest means, grapple skidding should be used; line skidding may require skidding only in dry weather or on frozen ground; and care required in bunching, and skidding to enable avoidance.

**b) stands with 251-500 understory stems/ha:**

- care and thought is required to protect coniferous regeneration;
- some pre-planning likely required (layout for landings, roads, and skid trails), although most can be accomplished through operations decisions at the time of logging by the operator and Department field staff;
- management objective is to protect a significant percentage (60-80%) of the coniferous understory to create a mixedwood at second rotation that will yield a significant volume of white spruce sawlogs;
- operational procedures for conventional clearcut harvesting or selection harvest include: fell and deck in openings and on skid trails; avoid clumps of regeneration (may require leaving some merchantable stems); bunch or fell parallel to and in the direction of skidding; where manual felling or a mechanical feller-director is employed as the harvest means, line skidding is to be used; where a feller-buncher is employed as the harvest means, grapple skidding should be used; operate on dry or frozen ground conditions; skid trails evenly spaced with skidding only on designated skid trails (no random skidding); reduce lengths and widths; increase skid distances; will require close supervision during harvesting activities by operator and Department field staff.

**c) stands with greater than 500 understory stems/ha:**

- extensive pre-planning and careful layout required;
- management objective is to protect sufficient coniferous regeneration (60-100%) to produce a fully or nearly fully stocked coniferous stand at second rotation;
- operational procedures for conventional clearcut harvesting include: pre-planned and pre-logged skid trails; directional felling and decking only in skid trails (shingling); where manual felling or a mechanical feller-director is employed as the harvest means, line skidding is to be used; where a feller-buncher is employed as the harvest means, grapple skidding should be used; herringbone skid trail pattern; rub stumps at junctions; log from back to front of block; skidding only on skid trails; reduced road lengths and widths; longer skid distances; avoid clumps of coniferous regeneration with marginal merchantable overstory; limb and top in bush; operate on frozen ground conditions; hot logging, higher decking and reduced landing size; will require very close supervision during harvesting activities by operator and Department field staff.