YUKON FORESTRY
HANDBOOK

Disclaimer

The information contained within this Handbook is made available and without warranty of any kind, either expressed or implied. The information may be used on the strict understanding that neither the Government of Yukon nor its ministers, employees or agents shall be liable for losses or damages of any kind, which may arise as a result of information provided within this document or any document or website that readers are directed to.

Second printing 2017

Yukon Forestry Handbook
ISBN: 978-1-55362-725-8

Additional copies

Additional copies of this document are available from Yukon Compliance Monitoring and Inspections District Offices and Forest Management branch, Whitehorse.

Front cover photo courtesy of Yukon Government
Back Inset photo by Martin Samis

Yukon
Energy, Mines and Resources
Forest Management

YUKON FORESTRY
HANDBOOK

PHOTO COURTESY OF YUKON GOVERNMENT

TABLE OF CONTENTS

INTRODUCTION

Yukon's forests are a critical natural resource that play an integral role in the health and regulation of climate locally, regionally and internationally. At a local level, forests hold many values and benefits for the community. They provide habitat for a diverse number of animals and plant species and are vital in maintaining habitat and biodiversity values. In addition, forests have a key role in protecting air and water quality.

The contribution that forests make to the territory's economy is also important. This includes providing wood and other forest products, local employment, regional development and tourism and recreational opportunities for Yukoners. Our forests are a vital cultural, social, historical and educational resource.

The purpose of this handbook is to outline selected forest management and planning activities of Yukon's Forest Management branch (FMB). The content of this handbook is intended to assist the public, forest users, wood cutters, forest owners and others to gain a clear understanding of how forestry is carried out, particularly at the management level. It also includes information useful to forest users, educators and the general public on topics such as forest inventory methods and forest health indicators.

It should be noted that this document is not intended to interpret rules relating to forest practices, nor does it create any new or additional forest practices rules. It does not include all aspects of forest practices, forest management and planning; rather it simplifies key areas of management and forest activities.

Responsibly managed forests will be protected for current and future generations to enjoy, while continuing to provide for forest products sourced from sustainably managed forests.

PHOTOS BY MARTIN SAMIS

YUKON FORESTS

Yukon is home to extensive boreal forest covering an area of approximately 28.1 million hectares (ha). The most common tree species found in Yukon forests is white spruce. For more information on other common tree species in Yukon, refer to page 52.

Yukon forests boast a number of important values including:

- ecosystem services such as fresh water, air and carbon storage;
- timber and other forest products;
- fish and wildlife habitat;
- cultural and historical resources;
- outdoor recreation opportunities;
- natural beauty.

Yukon First Nations have a unique relationship with forests. Forests provide a number of values, including cultural, social, spiritual, environmental and economic.

PHOTO BY MARTIN SAMIS

WHO MANAGES YUKON FORESTS?

The Forest Management branch, within the Sustainable Resources Division of the Department of Energy, Mines and Resources, Government of Yukon is mandated to manage and protect Yukon's public forest land. The branch provides guidance and information for the stewardship of forest practices in Yukon.

Forest planning occurs on three levels: regional, sub-regional and operational. Planning identifies values on the land base and determines harvest limits in different areas. Yukon is divided into annual harvest limit zones.

Until 2003, Yukon forests were managed by the Government of Canada. Following the release of the Yukon Forest Strategy in 1998, a process began to transfer the management of the territory's forests from the Forest Resources Branch of the federal Department of Indian Affairs and Northern Development (DIAND) to territorial responsibility. In April 2003, management of Yukon forest resources was passed to the FMB, Government of Yukon through a process called devolution.

The **primary responsibility** of the Forest Management branch is to enable the people of Yukon to utilize forest resources in a planned manner that enhances beneficial socio-economic opportunities, without undermining the ecological and social systems upon which communities depend.

Map of planning regions.

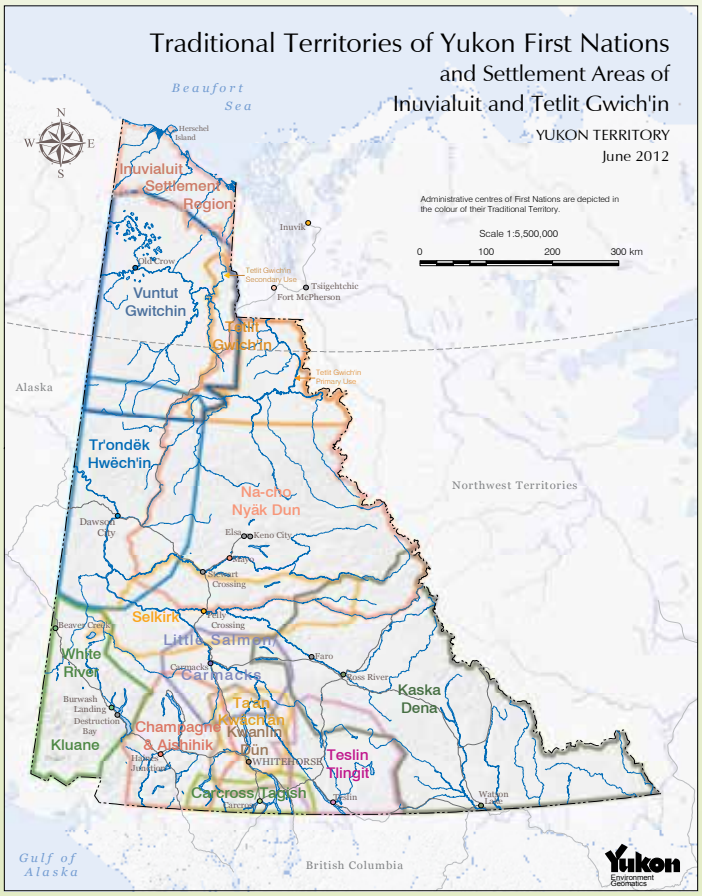
The **Forest Management branch's responsibility** is consistent with that of the Department of Energy, Mines and Resources' mandate to responsibly manage and support the sustainable development of Yukon's natural resources.

YUKON FIRST NATION FOREST MANAGEMENT

Yukon has a unique governance system. First Nations with Final Agreements have jurisdiction and authority over forest resources on Settlement Lands that are located within their traditional territories. Yukon Government is the regulatory authority over forest resources on public lands. Opportunities exist in the *Forest Resources Act* for First Nation's participation and consultation in forest planning on public lands. There are 14 Yukon First Nation Traditional Territories.

Renewable Resources Councils (RRCs) are local management bodies in Yukon where land claim agreements have been signed. Membership of the Renewable Resource Councils is made up of 6-10 members, half of which are nominated by the local First Nation and half by the Government of Yukon. RRCs provide a mechanism for local community members to provide input into planning and regulation of renewable resources such as wildlife, fisheries and forestry specific to their traditional territories by all levels of government (territorial, federal and First Nations).

The participation of Renewable Resource Councils in forest resources management planning is explicitly provided for in the Final Agreements as well as in the *Forest Resources Act*.



First Nations Traditional Territory Map

PHOTO BY SHEILA GREER

'Carcross-Tagish First Nation Elders Ghùch tlâ (Lucy Wren) [left] and Ya Gin du hen (Dora Wedge) stand in front of a traditional brush structure; 1980s.'

REGULATORY AND POLICY SETTING

Yukon forests are governed by various laws and operational documents. The *Forest Resources Act* (2011) is the primary, relevant legislation.

Prior to the *Forest Resources Act*, there was limited forestry legislation in Yukon. The *Territorial Lands Act* and Timber Regulation addressed timber harvesting, permitting and fees.

Legislation and operational guidance documents that inform this Handbook are:

- *Forest Resources Act* (including its Regulations, Standards and Guidelines);
- *Heritage Resources Act*;
- The Umbrella Final Agreement (particularly Chapter 17);
- *Territorial Lands (Yukon) Act*;
- *Yukon Environmental and Socio-economic Assessment Act* (YESAA) (2005).

The *Forest Resources Act* was developed to guide and support long term sustainable management of Yukon forests. In particular, the Act makes provisions for planning and decision making that considers all forest users, including opportunities for First Nation and public input. The legislation also contains direction on timber allocation (annual allowable cut) and features a host of compliance and enforcement tools to ensure appropriate use of forest resources.

YESAA is legislation that sets out an independent process for assessing the potential environmental and socioeconomic effects of proposed projects. Within the assessment process, the public, First Nations and non-government organizations are given an opportunity to provide comments and recommendations. Typically, assessments are carried out by the Yukon Environmental and Socio-Economic Assessment Board (YESAB) for proposed timber harvesting projects that are greater than 1,000 m^3, and for forest resources roads. More information on this process can be found by contacting the Forest Management branch and the YESAB: www.yesab.ca

PHOTO BY MARTIN SAMIS

PHOTO BY MARTIN SAMIS

Forest Resources

There's more to harvesting than just timber. From the management and planning of forestry activities to wood cutters on site, carrying out harvesting operations involves consideration of a number of factors.

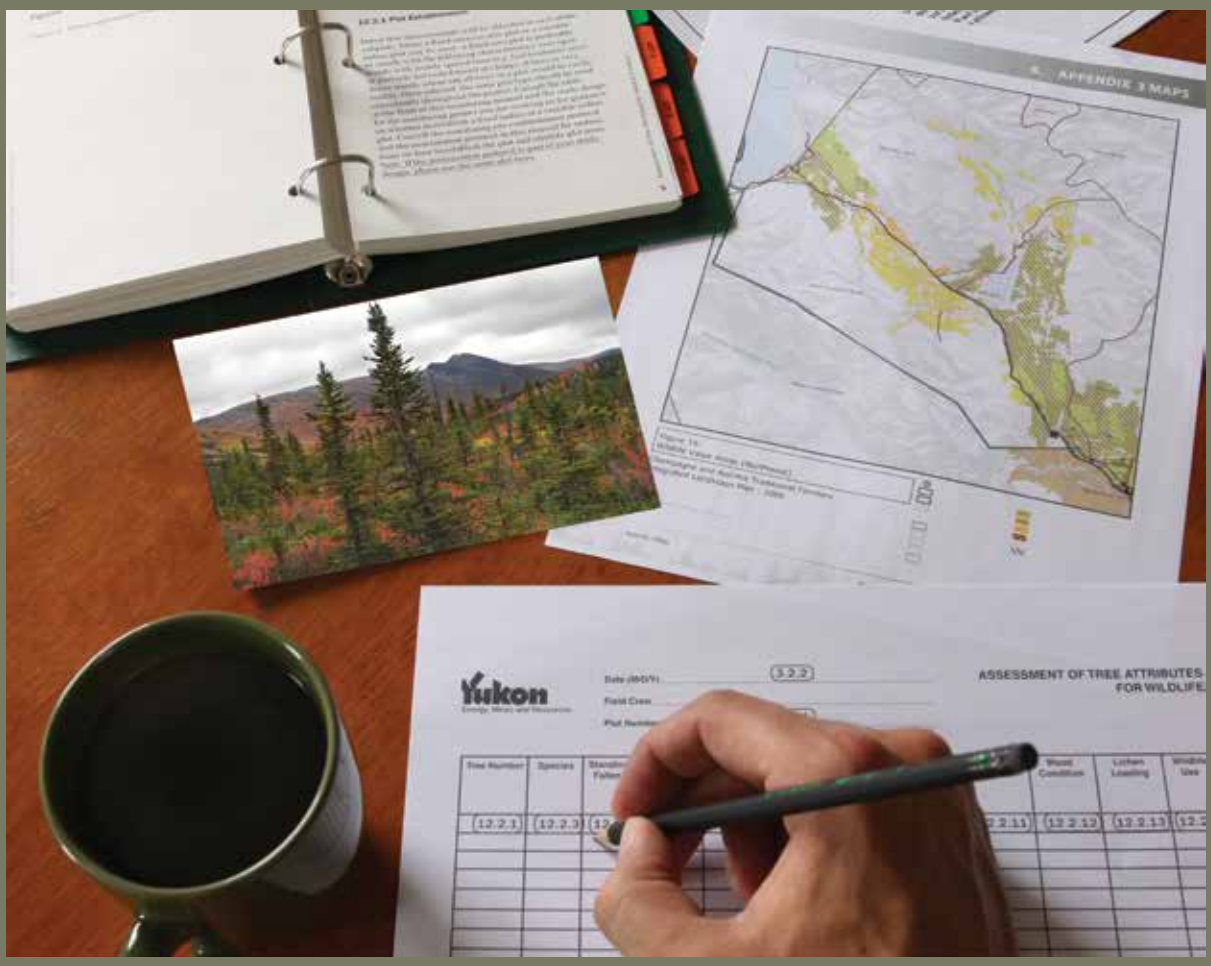


PHOTO BY MARTIN SAMIS

MANAGEMENT

Managing forests involves balancing a number of interests and forest values. It is important for current and future generations that Yukon forests are well managed and protected. The principle aim of forest management is to balance the three components of Sustainable Forest Management (SFM): economic, social and ecological considerations.

Forest Management branch's primary responsibility is to enable Yukoners to use forest resources in a planned way that enhances positive social and economic opportunities, without undermining the environmental resource that communities depend on.

Determining the **Annual Allowable Cut (AAC)** is an important outcome of forest management. The AAC establishes the maximum amount of wood that can be cut within a particular time period from a particular land area and under a particular specific set of management criteria. Under the *Forest Resources Act*, the Director of FMB makes the AAC determination based on a number of factors: results of a timber supply analysis (which largely draws on inventory data) and in consideration of economic, environmental and social factors. The AAC is based on the principles of sustainable forest management and transparency in the decision-making process.

For Your Information

Disclaimer:

Some of the information contained herein is a simplification of operational Standards and Guidelines. The Standards prescribe what actions a permittee, or wood cutter, must adhere to during harvesting operations and Guidelines outline recommended best practices.

To learn more about operational Standards and Guidelines, read our Fact Sheets and other aspects of forest management and planning in Yukon.

Visit: www.forestry.gov.yk.ca

FOREST ECOSYSTEMS AND DISTURBANCE

Timber harvesting (and related activities) is a human-caused disturbance. However, in order to minimize any environmental impacts as a result of the disturbance, mimicking disturbances that occur naturally, in particular natural fire regimes, is an approach that helps to mitigate these effects. It is the most promising and best known way to maintain the integrity of forest ecosystems. The boreal forest has adapted to fire in the landscape and regeneration of burnt areas is closely tied to factors such as the frequency and intensity of fire. Many studies have found that after timber harvesting, the richness and diversity of plant and animal communities are not reduced when compared to wildfire.

Other disturbance agents, such as windthrow, flooding, insect outbreaks, disease and lower intensity fires, can also create forest openings of varied sizes. Utilizing a variety of harvest patch sizes reflects the varied scale of natural disturbances in the boreal forest. Forest management and planning also recognizes the importance of landscape connectivity. Consideration of riparian areas, landscape features and natural disturbance patterns to inform road and cut block planning, also supports management of connectivity and resilience at a landscape level. Sound planning, based on natural disturbance patterns typically reduces total disturbance on the land base, this is particularly the case for minimizing the extent of road networks and the distribution of cut blocks.

It is important to recognize that due to northern growing conditions, boreal forests typically take longer to regenerate than in southern jurisdictions, this is factored into rotation periods. Ultimately, and by using the best knowledge available, maintaining forest ecosystem health and function across the landscape is a core objective of sustainable forest management.

PHOTO BY MARTIN SAMIS

PLANNING LEVELS

Forest planning in Yukon occurs on three levels, based on three spatial scales, to ensure the sustainable use of forests. From broad, landscape level plans to more detailed site level plans, these planning levels each serve a different function which has their own advantages in forestry planning:

1. Forest Resources Management Plans (FRMPs)

FRMPs are strategic, overarching plans at a landscape level generally greater than 1,000,000 hectares in area. These plans provide direction on where and which forest resource activities will take place in addition to identifying resource zones, forest values and sensitive areas from a broad perspective. Importantly, these plans identify where forest management activities may occur.

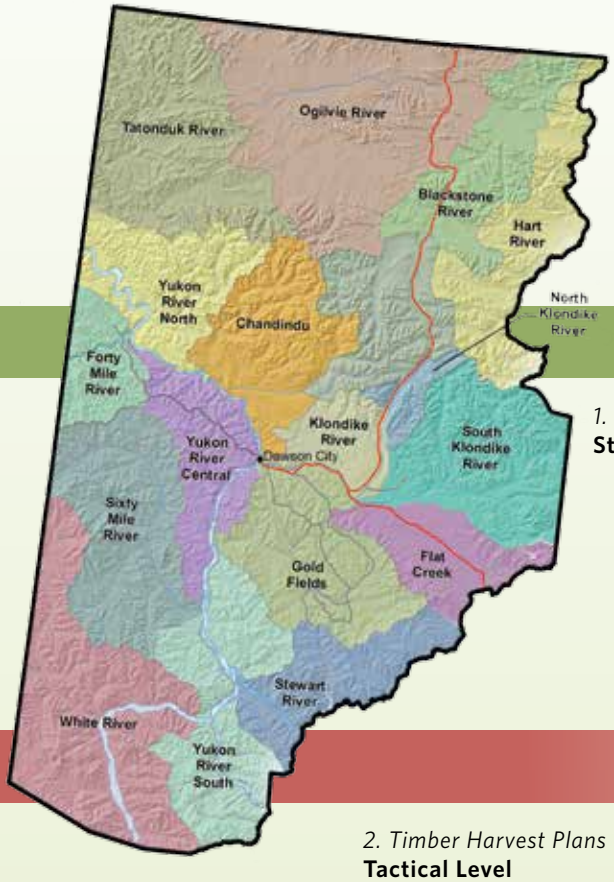
2. Timber Harvest Plans (THPs)

This level of planning occurs at landscape units ranging from 5,000 ha to approximately 300,000 ha and identifies areas proposed for forest resource harvesting. These plans are tactical, they answer 'the where and how' of timber removal. Strategies for minimizing or removing negative environmental impacts on other natural resources are identified. Heritage assessments are also carried out at this stage.

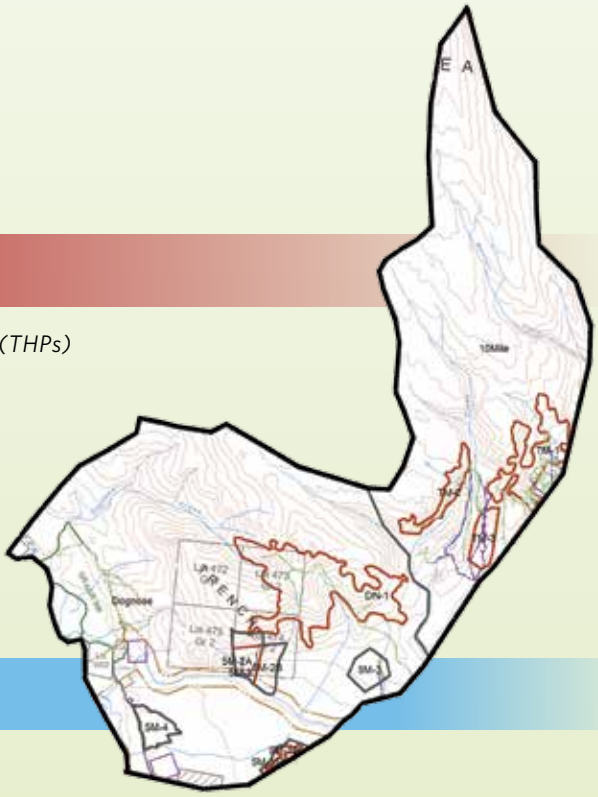
3. Site Plans

Site plans are a specific management plan that extends over 1-500 ha. Site plans identify stand level management activities, methods and standards for harvesting to ensure the integrity of forest resource values. These plans are focused on the operational and technical aspects of harvesting at the site level. Site plans may include a reforestation plan to ensure sufficient regrowth of forests after harvesting takes place.

PLANNING LEVEL SCALES



1. Forest Resources Management Plans (FRMPs)
Strategic Level



2. Timber Harvest Plans (THPs)
Tactical Level

3. Site Plans
Operational Level

I. PRE-OPERATIONS

For a more straightforward and efficient operation yielding the best returns, wood cutters should consider the following factors in their planning.

SITE CONDITIONS

Examining site conditions in a proposed harvest block can inform decisions on a number of objectives. In particular, determining site conditions is an important step in planning for the success of harvesting and reforestation activities and other objectives.

Assessing Site Conditions

There are several site condition factors that can be measured to help determine site planning. These include assessing:

- Assess **product grade** → Quality and volume of tree species
- Choose the best **harvesting system** → Tree species, spacing, density Age class, health, constraints, terrain
- Determine **regeneration capability** → Tree species Soil conditions → How much forest should be left behind.
- Main **habitat values** on site → Forest structure and connectivity *Eg. which trees and patches to retain* → What wildlife features exist on site? *Eg. Nests and dens (see p. 31)*

For a comprehensive list of site plan requirements, contact a local Area Forester.

PHOTO BY FINELLA PESCOTT

Seasonal harvesting

Protecting the soil is one of the most important physical environmental factors in maintaining the productive capacity of the forest. Fine textured soils (clays and silts) are the most susceptible to compaction. Prevent compaction of these soils by using low ground pressure techniques and machinery. Refer to the Forest Resources Roads section for more information on basic soil classification.

- → Soil compaction can cause degradation of site productivity;
- → Soil assessment is important to determine soil type and protect soils for future regeneration success.
- → Refer to p. 86 for more information on soils.

REFER TO the Soil Conservation Standards & Guidelines to learn more about soil protection in relation to harvesting operations. Visit **www.forestry.gov.yk.ca**

TIMING OF OPERATIONS

There are several timing factors to consider when planning harvesting.

Winter Harvesting

Most harvesting occurs **in winter** due to **site sensitivity**

Advantages of winter harvesting:

- less site and soil disturbance
- may reduce timber damage
- allows harvesting to occur on high compaction soil types when they are frozen
- it may reduce handling costs

Summer Harvesting

Advantages of summer harvesting:

- reduces seasonal timber supply shortage
- may provide better seedbed for natural regeneration
- longer work days
- easier on equipment
- lower road maintenance

PHOTO COURTESY OF YUKON GOVERNMENT

ADDITIONAL DRY SEASON HARVEST CONSIDERATIONS

Road construction

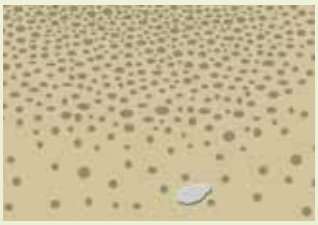
Roads built for dry season harvesting may cause more soil disturbance than winter roads. All weather roads must be constructed to a higher standard, which can be more expensive.

Fire hazard

There is a greater risk of summer harvesting starting a wildfire.

Weather

Conditions must be dry during harvesting operations.
Rain can limit operations due to soil compaction concerns.



Soils

Dry season operations are limited to sites with appropriate soils. Operations on coarse-textured soils reduce the chance of compaction damage.

Wildlife needs:

Consider the breeding and nesting period of wildlife species on a site. For more information on the timing of your operations with species breeding and habitat needs visit:

- www.env.gov.yk.ca
  or
- Contact a local Area Forester

ECONOMIC FACTORS

There are a number of economic factors to consider when planning and undertaking a forestry operation. Taking the time to assess financial considerations and seeking the right advice will save time and increase the return on operations.

Quantity

- If you are planning to harvest timber, consider how much is available. Find out how much timber is allowed to be cut in your region (refer to AAC information on p.14) and how much existing permit holders are permitted to cut.

Market

- What market opportunities exist for your product? Determine what the demand is for those products.

Location

- What is the distance to the nearest processing facility and/or market? Examine how distance could affect transportation costs, such as fuel and haulage rates.

Stand Condition

- What state is the forest area in? How mature is the forest? Consider the stand age and timber quality of the area.

Risk

- Forest areas are susceptible to insect infestation, disease, windthrow, flood and wildfire. Consider these risks.

TO LEARN MORE about permitting thresholds visit **www.forestry.gov.yk.ca**

TIMING OF COMMERCIAL OPERATIONS CONSIDERATIONS

PHOTO BY MARTIN SAMIS

Operating Season

- How long is the operating window? Perhaps the weather or wildlife requirements could affect the timing of operations. Remember that operations can only take place on dry or frozen ground.

Market Timing

- If harvesting and brokering forest products, wood cutters should consider optimal periods of the year to sell.

Landowners

- Landowners should consider their timeframe carefully. Investments in forest management made today may not see a financial return for years or decades.
- Planning forest management investments may substantially increase efficiency and returns.

Availability

- What is the availability of local employment and equipment? An adequate supply of these should be ensured when operations are planned.

WOOD PRODUCTS

Benefits of Wood

There are a number of advantages to using wood products. Wood is a renewable and sustainable resource.

Heating

The use of firewood (cordwood), pellet, wood chips and briquettes is a cost effect way to heat buildings.

Building

Wood used as a building product is durable, attractive, cost effective and versatile. Wood is also fast and efficient to build with. The production and processing of wood uses less energy than most other building materials. This gives wood products a smaller carbon footprint. In fact, wood products store carbon. On average, 50% of wood is made up of carbon by dry weight.

DID YOU KNOW?

Approximately 17% of heating in Yukon comes from fuelwood.

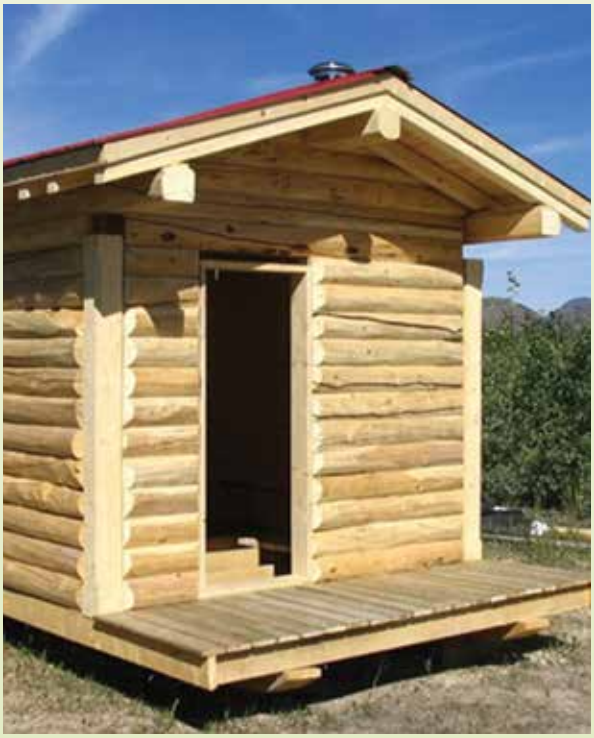
A local wood products industry supports the local economy. It sustains jobs and reduces our reliance on importing wood from elsewhere.

PHOTOS COURTESY OF ARCTIC INLAND

WOOD PRODUCTS

PHOTO COURTESY OF YUKON GOVERNMENT

PHOTO COURTESY OF DIMOK TIMBER



PHOTOS COURTESY OF DIMOK TIMBER

II. OPERATIONAL CONSIDERATIONS

HERITAGE RESOURCES

PHOTO COURTESY OF YUKON GOVERNMENT

Heritage resources are sites or objects that are the evidence of past human presence on the landscape.

Yukon has a rich and diverse array of heritage resources. Heritage resources can largely be categorized as follows:

Historical sites generally preserve built heritage dating from early Gold Rush times to the Alaska Highway construction era.

Archaeological sites and objects may be historic in age or may date to before European contact. Archaeological resources most often consist of the remains of ancient camps, hearths, stone tools and debris.

Palaeontological resources are also protected as heritage resources under Yukon legislation. These are fossil and other remains of extinct or prehistoric plants and animals, including tusks of woolly mammoths, bones of ancient horse, bison and other ice age fauna as well as fossil remains and traces of plants, vertebrate and invertebrate animals.

Any heritage resources found in Yukon are protected under the *Historic Resources Act* and Yukon Archaeological Site Regulations. **No artifact can be removed from historic or archaeological sites without a permit.**

Artifacts An artifact is an object of historical or archaelogical interest that is older than 45 years and has been abandoned.

Archaeological remains that are thousands of years old are often buried in only a few centimetres of soil and may not be recognized by the untrained eye.

PHOTO COURTESY OF YUKON GOVERNMENT

Collection of copper artifacts

PHOTO BY MARTIN SAMIS

Mining camp artifacts

PLANNING AND IDENTIFYING SITES

Road and landing construction areas should be reviewed for 1) visual evidence of heritage resources and; 2) any listed heritage sites. Any known heritage site should be mapped and excluded from the harvest area.

Information on the location of heritage sites (historical, archaeological and palaeontological) can be obtained from the Heritage Resources Unit of the Department of Tourism and Culture and First Nations if a site is on settlement land. Those areas which are already mapped as having a high potential for heritage resources which could be impacted by forest activities require an **historic resources impact assessment** prior to activities starting.

Some clues that can point to evidence of heritage resource include:

- Sites where people lived were generally on well-drained, elevated ground not too far from a water source;
- Ridges or hills were preferred game lookouts and were also favoured for burial sites;
- A change in vegetation, such as a grassy clearing in a spruce forest or axe cut stumps can be clues of an inhabited area.

Unfinished stone spear point

PHOTO COURTESY OF YUKON GOVERNMENT

FOR MORE DETAILED INFORMATION on identifying heritage sites, consult the Heritage Resources Unit document: 'Handbook for the Identification of Heritage Sites and Features' **www.tc.gov.yk.ca/heritage_guidelines.html**

SITE TYPES

Mammoth Tooth

Stone Adzes

Log Cache

ARCHAEOLOGICAL SITES

TOOLS • stone and obsidian artifacts
SHELTER • housepits
BURIAL SITES • ground depression, mounds
SUBSISTENCE • ancient hearths, ground caches

Cabin on Hunker Creek

Sled

Brush Camp

PHOTOS COURTESY OF YG

HISTORICAL SITES

SHELTER • cabins, brush camps, tent frames
BURIAL SITES • grave fences, crosses
HUNTING • hunting blinds, deadfall traps
MINING • placer workings, mines

Reporting a Site

If a heritage site is discovered during timber harvest activities, all operations at that location must cease and the area must not be distubed. A buffer of 30 metres is required to protect the site.

Yukon Heritage Resources and a local Area Forester or Natural Resources Officer must be informed of the resource(s) and site locations.

Finding a heritage resource does not necessarily mean that harvesting or other forest activities may not be able to continue. A decision will be made based on the location of the heritage site in relation to activities and the nature of the heritage resource. Once an assessment has been done, operations may be allowed to start again.

WILDLIFE PROTECTION

Maintaining habitat for wildlife is an important aspect of forest management and forest use. Current and future wildlife populations will benefit from forest operations that protect and maintain key wildlife features.

Examples include:

Maintaining Connectivity

Harvest blocks should be designed to minimize barriers to wildlife movement. Plans should include measures to provide connectivity between habitats within a landscape.

PHOTO BY MARTIN SAMIS

WILDLIFE FEATURES

Wildlife features are considered identifiable and physical parts of a habitat which have an important use for animals. These features include mineral licks, bear and wolverine dens, nest sites, beaver dams, cavity nesting and wildlife trees, game trails, cliff faces and fish over-wintering or spawning areas.

Mineral licks

Mineral licks are an important nutritional source for many animals. For known and discovered mineral licks, a buffer of 200 metres should be established to avoid any disturbance of licks. Where possible maintain continuous vegetation cover near licks.

PHOTO BY MARTIN SAMIS

PHOTO BY NATHAN LIBAL

Dens

BEAR AND WOLVERINE DENS

For any active dens discovered during operations, a buffer of 100 to 300 metres is applied, depending on bear type and if cubs are present. Dens should not be disturbed. Any bear dens discovered during forest operations must be reported to a Compliance Monitoring and Inspections District Office.

Nests

RAPTOR TREE NESTS

Active raptor nests shall not be disturbed or destroyed. A minimum 50m buffer is required around active nests. Inactive nests should be retained if determined to be inactive by a qualified professional.

PHOTO COURTESY OF EDI

PHOTO BY MARTIN SAMIS

Game trails

Game trails are consistently used travel routes that wildlife depend on for a number of purposes such as daily foraging and seasonal migration. Game trails should not be disturbed or destroyed. Any documented or known game trails should have a buffer of 200m.

WILDLIFE TREES

While all trees can contribute to habitat, dead, hollow standing trees (snags), rotting and deformed trees can be particularly important habitat. Therefore, these types of trees are often considered as and referred to as wildlife trees.

Many species of mammals and birds make use of these wildlife trees. Some birds will make their own nest in the cavity and some birds and small mammals will make use of abandoned cavity nests.

Tree cavities can be used for roosting, denning, foraging, food storage and over-wintering. Some birds excavate to feed on insects, such as bark beetles, playing a role in keeping pest populations in check.

Key characteristics of wildlife trees include:

- large size (height and diameter)
- broken tops
- decay

Clear signs of wildlife use can help identify wildlife trees:

- nests
- feeding holes
- wood chips at the base of a tree

PHOTO BY MARTIN SAMIS

PHOTO BY MARTIN SAMIS

PHOTO BY MARTIN SAMIS

PHOTO BY DOUG BISHOP

When to leave wildlife trees

Wildlife trees identified in a site plan must be reserved. Downed trees may be retained so long as trees do not interfere with activities and fuel reduction objectives. Site plans prescribe the amount of downed trees to retain in an operation; best efforts for utilization of merchantable dead timber should be made.

COARSE WOODY DEBRIS

Coarse Woody Debris (CWD) is a term used for dead, woody, above ground material that has a diameter greater than 7 cm. This debris is downed wood and does not include self-supporting woody material such as snags.

Why keep CWD?

As CWD decomposes, it provides nearby growing plants on the site with nutrients. Down logs are valuable to long term site productivity and provides habitat for many animals and plants.

PHOTO BY FINELLA PESCOTT

PHOTO BY FINELLA PESCOTT

Non-merchantable living trees that are left on a site will eventually become CWD, providing future habitat.

RIPARIAN AND WETLAND PROTECTION

Streams, lakes and wetlands are critical to healthy forest ecosystems. They provide habitat for aquatic and other wildlife species and protect water quality.

Why do we need stream and wetland buffers?

Harvesting operations and road building next to riparian areas, particularly on slopes, can affect fish habitat by destabilizing soil, which may cause sediment to flow into streams. Higher sediment levels in streams can negatively impact fish by limiting oxygen availability and reducing stream depth which may interfere with spawning beds. Forests close to riparian areas play a function in stabilizing soil and regulating water temperature. By soaking up water in wetter seasons, trees help regulate water flow. Trees in riparian areas can also be particularly important in providing nesting and foraging habitat for migrating birds.

PHOTO BY DOUG BISHOP

Trees influence the climate of riparian and wetland areas. Removing trees and other vegetation from these areas can increase water temperatures which can result in heat stress for fish.

RIPARIAN AND WETLAND MANAGEMENT AREAS'

'These areas form the buffer zone adjacent to a stream or lake where harvesting is either not allowed or is limited. Protecting these areas is important because of the food and wildlife habitat they provide and their contribution to water quality. Trees in these areas provide shade for the water and provide nutrients for aquatic and other wildlife species.

These steps can be used as a guide to what is required when a waterbody is located

1. Determine the waterbody type on site
2. Measure the width of streams
3. Measure and mark out the Riparian Management Area (RMA)

1. Determine the waterbody on your site

Streams

A stream is a watercourse with defined banks and a sediment bed.

Lakes

A lake is a natural body of water with a depth of two metres or greater and is one hectare or more in size (under normal conditions).

PHOTOS BY DOUG BISHOP

Fish bearing or non-fish bearing

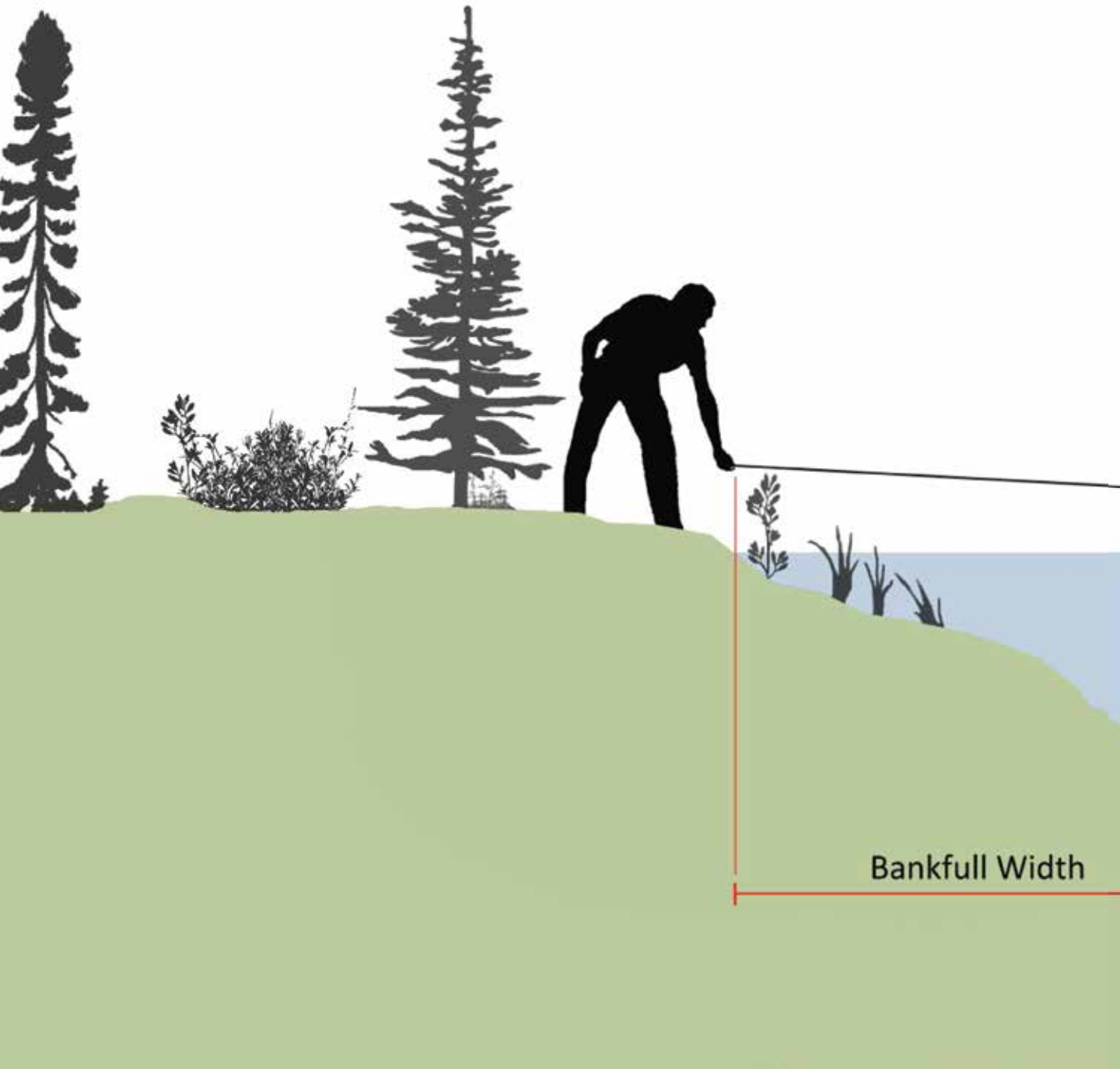
All water bodies in Yukon - other than the narrowest Class 5 streams (see Widths for Streams table p.39) - are considered to contain fish unless proven otherwise by a professional assessment. If a non-fish bearing stream flows directly into a fish bearing stream then that stream is also considered to be fish habitat.

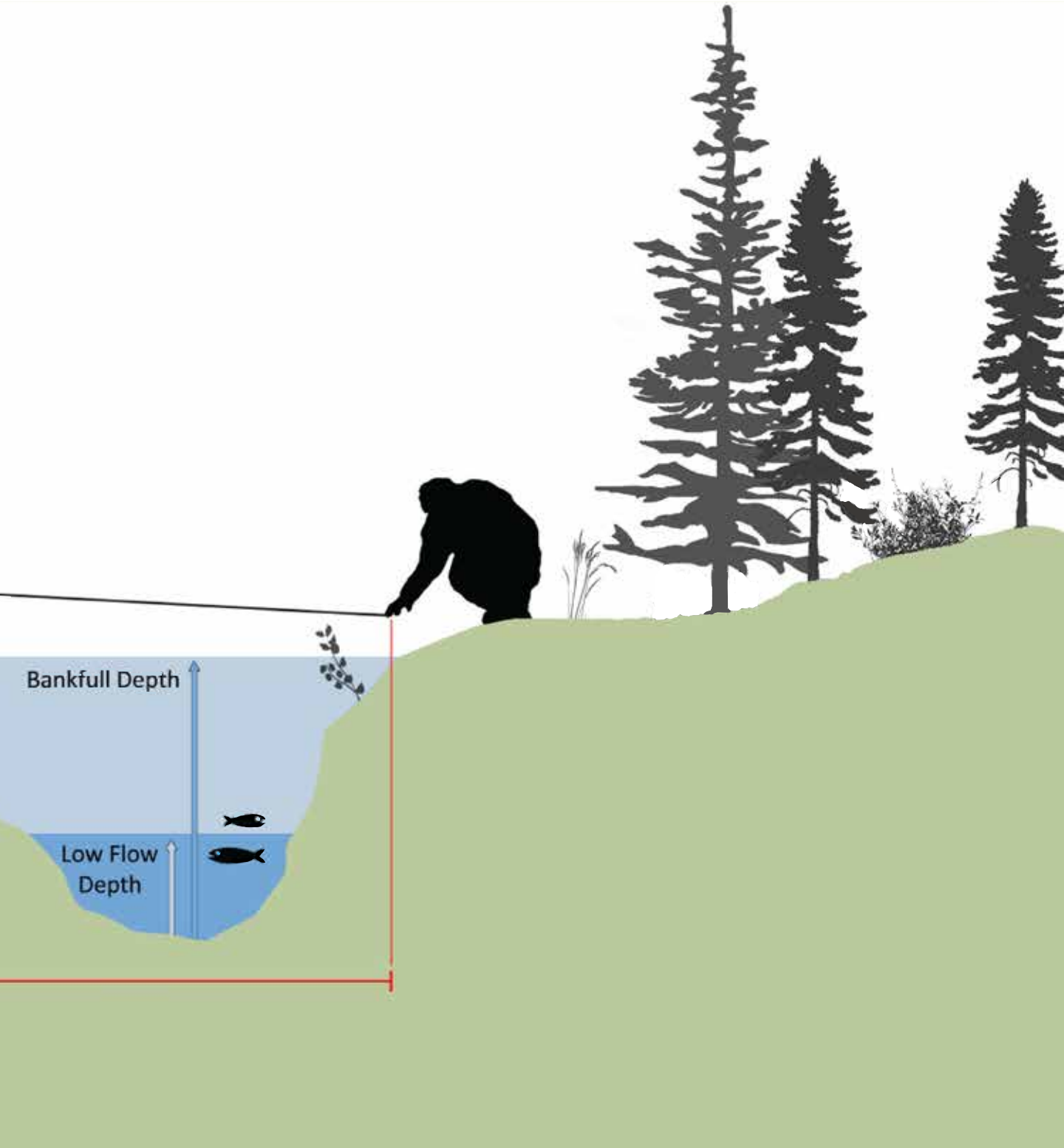
→ A biologist should determine whether a stream is fish bearing or not.

2. Measure the width of streams

How to measure bankfull width

Determine the bankfull width by measuring between opposite banks at the high water mark. Take measurements at right angles with the stream at three locations near the harvest site or stream crossing. Use an average of these measurements at the high water mark to determine bankfull width.




Bankfull Depth
Low Flow Depth

RIPARIAN MANAGEMENT AREAS

A Riparian Management Area (RMA) is made up of a Reserve Zone (RZ) and a Management Zone (MZ) which together determine the buffer distances and several harvesting restrictions.

→ All streams require a 5 metre **machine free zone** on both sides of the stream bank.

→ Care should be taken to ensure that RMAs are not isolated from nearby forests. Corridors which link RMAs and nearby forests are key to maintaining healthy habitats.

Reserve Zones

Reserve Zones are adjacent to streams (measured from bankfull widths) and Management Zones. Access through RZs may be permitted.

Management Zones

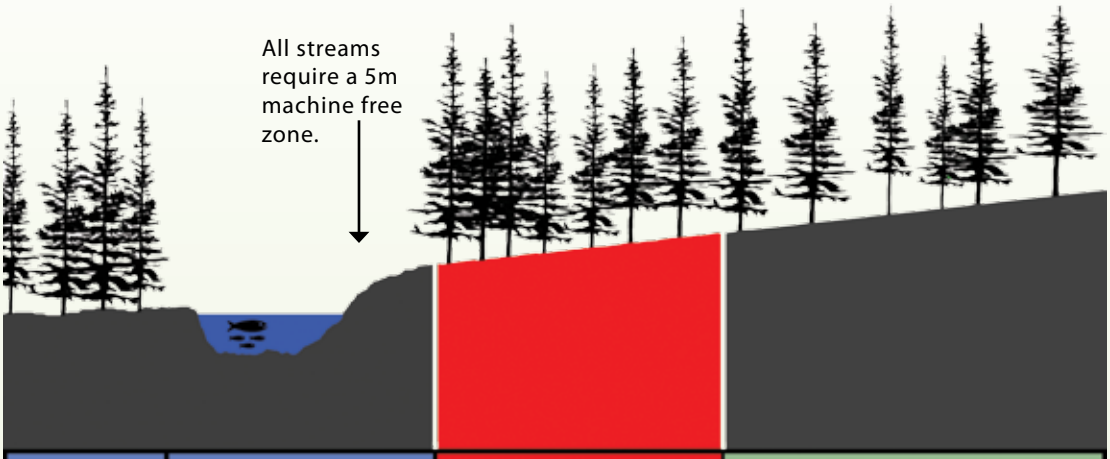
Management Zones occur adjacent to Reserve Zones and the remainder of the cut block. Harvesting may be permitted within Management Zones subject to some conditions, which include:

- measures to reduce the risk of windthrow, such as leaving feathered edges;
- wildlife attributes which are identified and protected.

3. Measure and mark out your Riparian Management Area (RMA)

Riparian Management Areas for streams and lakes should be measured according to the buffer widths. The edge of a lake is considered the outer edge of the regular high water mark for Riparian Management Areas.

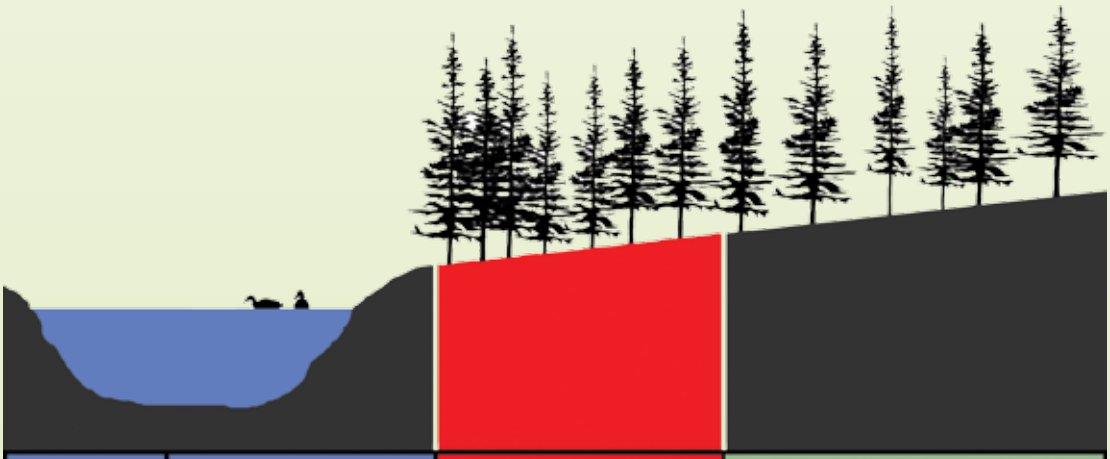
Riparian Management Area (RMA) Widths for Streams



Stream Class	Stream Width (m)	Reserve Zone Width (m)	Management Zone Width (m)
S1	20	40 - 80	60 - 120
S2	5 - 20	30 - 60	50 - 80
S3	1.5 - 5	30 - 40	60 - 100
S4	1.5	20 - 30	40 - 100
S5	Non-fish Streams	0 - 20	20 - 50

Riparian Management Area

Riparian Management Area (RMA) Widths for Lakes



Lake Class	Size (ha)	Reserve Zone Width (m)	Management Zone Width (m)
L1	50	40 - 60	120 - 200
L2	5 - 50	20 - 60	60 - 140
L3	1 - 5	20 - 40	40 - 100

Riparian Management Area

WETLAND RIPARIAN MANAGEMENT AREA

A Wetland Riparian Management Area is the area surrounding the wetland which includes the Reserve Zone (the buffer zone with no harvesting) and the Management Zone, a buffer with limited harvesting.

Buffers are important measures to protect aquatic species habitat, wetland ecosystem function and water quality, among others. Forest cover left in the Reserve and Management Areas contribute to water quality, climate and provide habitat for many species.

The following steps can be used as a guide to what is required when a wetland is located.

1. Determine the Wetland Class on site
2. Determine the Wetland Riparian Management Area
3. Measure and mark the Wetland Riparian Management Area

PHOTO BY MARTIN SAMIS

REFER TO the Wetland Riparian Management Standards & Guidelines to learn more about Wetland Areas in relation to harvesting operations. Visit **www.forestry.gov.yk.ca**

1. Determining Wetland Classes

What is a Wetland?

A wetland is an area that contains plants and soils adapted to excess water and low oxygen levels. A swamp, marsh or bog can all be considered wetlands. Wetlands may or may not have trees growing in them.

If a site contains, or is adjacent to either a marsh or shallow open water wetland class, then Wetland Riparian Management Areas apply.

Wetlands are categorised into five classes:

Bogs are the most common type of wetland in northern Canada, especially in arctic and subarctic regions. Bogs have a deep layer of peat (greater than 40cm) and typically contain acid-loving plants and high water tables. Bogs usually do not have water flowing in or outwards, which results in a 'stagnant' or still water environment.

Fens are similar to bogs as they also have a layer of peat at least 40cm deep. Fens are home to more marshy vegetation than bogs. This wetland type is common in arctic and subarctic regions.

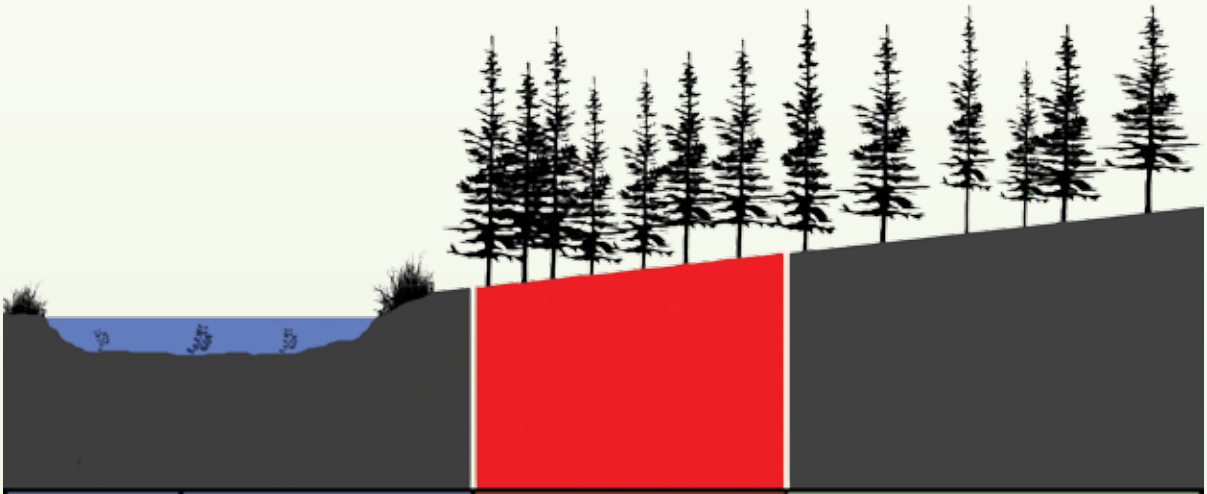
Swamps are areas that are flooded for most and sometimes all of the growing season. They are similar to marshes but swamps contain trees and shrubs, where marshes do not. Swamps are mostly found in the southern Pacific Coast and the Great Lakes region.

Marshes are flooded wetlands with vegetation adapted to wet soils. Marshes contain a water depth between 15 – 90 centimeters. They often have islands of vegetation and typically do not have large expanses of open water.

Shallow open water wetlands are a small body of water in a state between marshes and lakes. Their water depths in mid-summer is less than two meters and expanses of open water make up more than 75% of their total area. Usually, the surface is free of vegetation.

2. Determine the Wetland Riparian Management Area

Wetland Management Area (WMA) Widths



Wetland Class	Size (ha)	Reserve Zone Width (m)	Management Zone Width (m)
W1	1	0	60
W2	1 - 5	60	40
W3	5	60	140

Riparian Management Area

NOTE Wetland Class W3 includes Wetland Complexes.

A Wetland Complex is an area greater than 5 hectares that contains two or more separate wetlands with overlapping Riparian Management Areas.

Other factors to consider:

- The Yukon Wetland Technical Committee has prepared a Wetlands Inventory and list of important wetlands which should be considered in planning.
- Any streams, lakes, wetlands (including springs and seepages) not identified, classified or mapped during the planning phase, but discovered during operations, should be buffered according to Riparian Management Area classification.

TIMBER TENURE

Tenures refer to how the harvesting rights to a timber supply are allocated, and what responsibilities go with that right. The following is an overview of the licence and permitting scheme in Yukon.

Where is the timber sourced from?

All commercial harvesting must be done in an area that has a Timber Harvest Plan. Timber Harvest Plans that are approved or are under review can be viewed at www.forestry.gov.yk.ca

How to sell commercially harvested timber?

A **Cutting Permit** authorises harvesting under a Fuel Wood Licence or a Timber Resources Licence. The harvesting volumes are determined based on the limits set in the licence.

A **Fuel Wood Licence** is required in order to harvest firewood and sell commercially.

A **Timber Resources Licence** is needed for those who wish to harvest timber for milling, processing and selling.

All licencees must meet eligibility requirements such as operating under a registered business. Application forms can be obtained and submitted to any Compliance Monitoring & Inspections offices throughout the territory.

FOR MORE INFORMATION refer to the Harveting Firewood and Timber for Commercial Sales in Yukon Fact Sheet. Refer to the Forest Resource Fees Fact Sheet for more information on fees. Visit **www.forestry.gov.yk.ca**

YUKON VEGETATION INVENTORY

Taking stock of Yukon forests

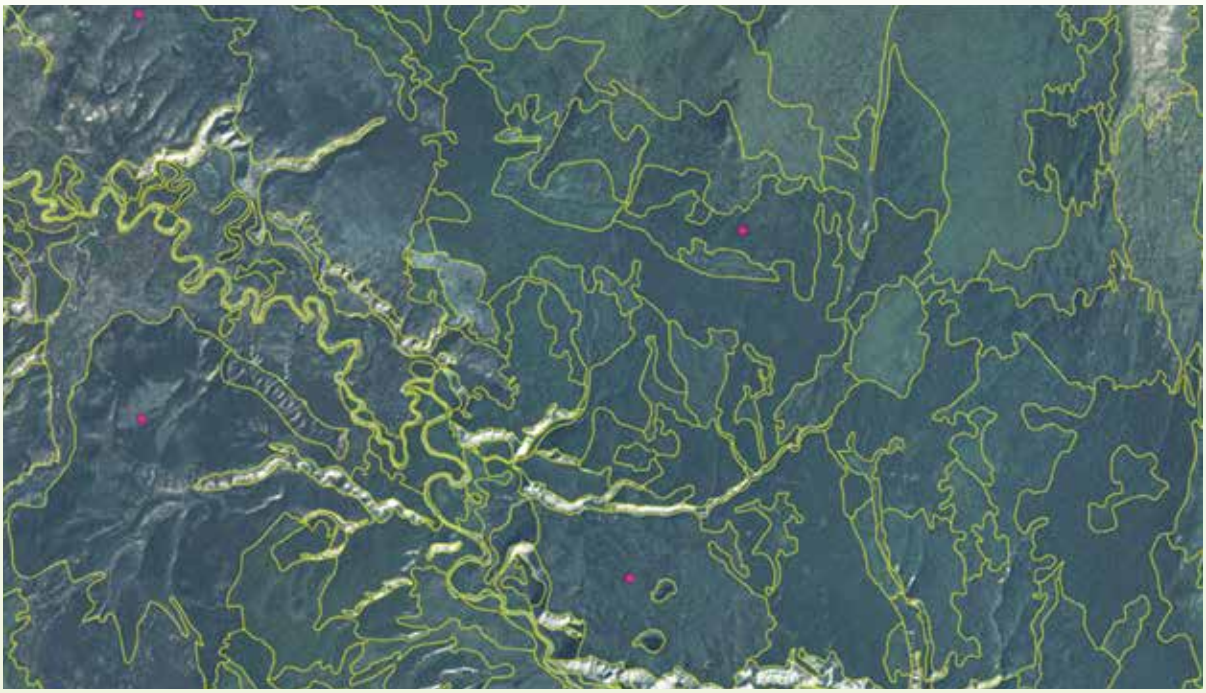
The Yukon Vegetation Inventory (YVI) maps where vegetation resources exist and provides data and information about vegetation resources in an area. The purpose of the YVI is to divide the land into recognizable units based on well-defined criteria. For forestry, the YVI forms the basis for a number of forest management uses, including:

- timber supply analysis → Annual Allowable Cut
- timber harvest planning
- land use planning
- silviculture
- forest health
- tenures
- wetland and riparian identification

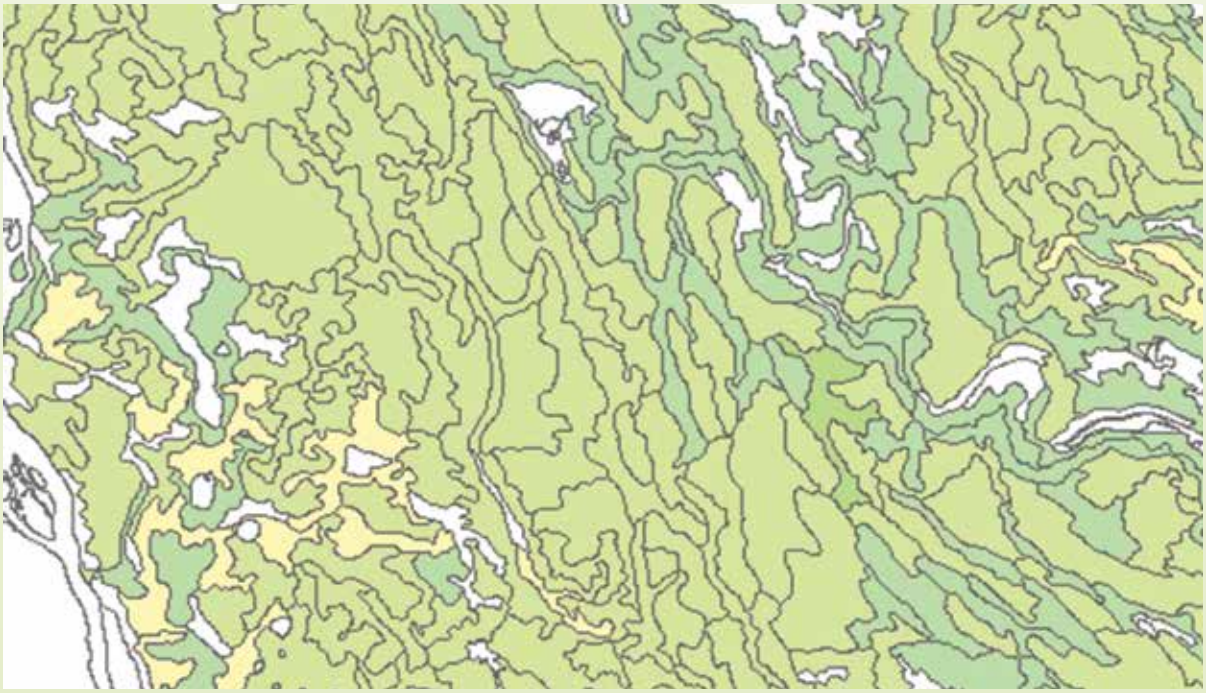
In addition, the YVI is used by multiple sectors including environmental assessment, energy, mining, agriculture and land planning. YVI is a photo-interpreted inventory based on well-defined criteria. As of 2015, Yukon has inventory for approximately two thirds of Yukon (the Boreal Cordillera ecozone).

Mapping

Mapping vegetation resources requires remote sensing technology like aerial photography, satellite imagery or LiDAR. YVI has primarily used aerial photography, which has been the most economical means for mapping and data collection. Past and current inventories have used a variety of aerial photography products that range from camera film (1:40,000 black and white photo print) to detailed 40 cm resolution colour infrared digital photos. The general process for producing a vegetation inventory includes acquiring the aerial photography and digitizing it; taking physical measurements in the field to support photo interpretation and classifying/categorizing the data.



Example of aerial photography delineation in inventory.

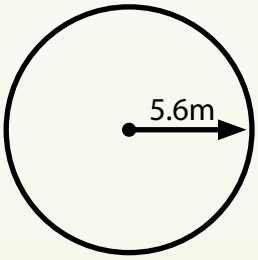


Example of inventory classification.

Vegetation inventory divides the land base into recognizable units based on criteria such as age and species.

HOW TO MEASURE THE TIMBER VOLUME OF A FOREST

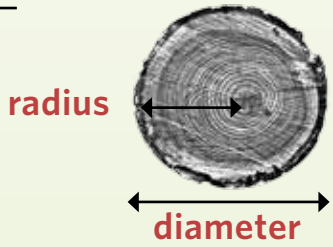
1. Firstly, determine approximately how many **trees there are per hectare**. One method is to count the number of trees in a plot (circle) with a radius of 5.6m.



A 5.6m radius plot is equal to 0.01 hectares. Take the number of trees in the plot and multiply by 100 to give 'trees per hectare'. The more sample plots used and averaged in a given area, the more accurate the estimate will be.

2. To obtain the estimated **volume of a tree**, follow this calculation:

$$\frac{(\text{Diameter at breast height (A)} \div 2)^2 \times 3.14\ (\pi) \times \text{tree height (B)}}{3\ (\text{Accounts for taper})}$$

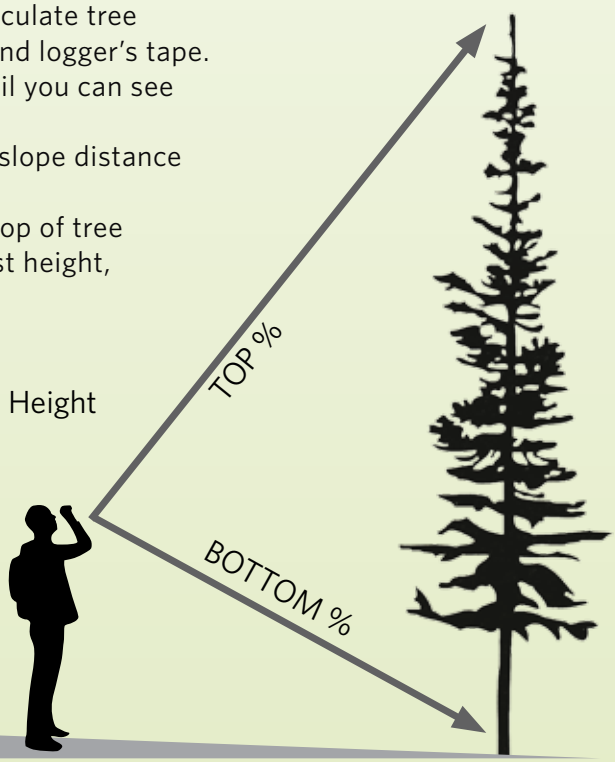


A. Diameter at breast height: Tree diameter is measured at breast height (DBH) which is 1.3 metres on the upper slope of the forest floor. Diameter tape converts tree circumference into diameter measurements. If using a measuring tape, measure the circumference of the tree and divide this value by 3.14 (π) to calculate diameter.

B. Tree height: There are numerous ways to calculate tree height, the easiest way is to use a clinometer and logger's tape.

- Walk away from the tree on flat ground until you can see the top of the tree and the base.
- Measure that distance away and record as slope distance in metres.
- Using the clinometer, record % reading to top of tree and % reading to bottom of tree or to breast height, then follow the following calculation.

$$\frac{\text{Top \% - Bottom \%}}{100} \times \text{Slope Distance (m)} = \text{Tree Height}$$



3. Finally, take the trees per hectare estimate gained using the fixed radius plot and multiply this with tree volume. The result is the estimated **volume (m^3) per hectare**.

MEASURING CORDWOOD

In Yukon, as elsewhere in Canada, harvest permits are issued in the metric system using cubic metres (m^3). The firewood market uses cordwood as a measurement. A cord is 128 cubic feet (f^3) of stacked roundwood (whole or split, with or without bark) containing wood and airspace with all bolts of similar length piled in a regular manner. A cord is a stack of wood four feet high and eight feet long in four foot lengths. To calculate the number of cords, measure the length, width and height of the stacked wood in feet, multiple these measurements to calculate the volume in cubic feet. Divide your result by 128 cubic feet to get the number of cords.

In Yukon, one stacked cord of firewood is approximately equal to 2.27 m^3 of solid wood and bark.

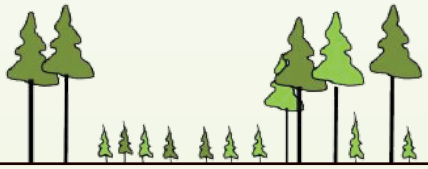
The following image displays a stacked cord of wood:

PHOTO COURTESY OF YUKON GOVERNMENT

HARVESTING SYSTEMS

Deciding on which harvesting system - also referred to as a **silvicultural system** - to use depends on a number of factors. Firstly, what are the objectives? Other factors that will influence the harvesting technique selection process are site and stand conditions, tree species, visual impacts, costs involved and factors such as the potential for windthrow and snow damage. There are a number of harvesting methods suitable for use in Yukon forests. The **two most common** systems are:

EVEN-AGED HARVESTING



Clearcutting with Reserves

This method involves harvesting most or all trees in an area and typically includes retention areas (reserves). Clearcutting is used to create certain types of forest ecosystems and to promote species that need lots of sunlight or that like to grow in large, even-aged stands.

Shelterwood

Under this method, trees are harvested underneath the shelter of remaining trees. The regrowth from the harvested trees that follows is even-aged. Variations of the shelterwood method include harvesting trees over 2 or 3 cuts. The shelterwood method is typically able to provide continuous forest cover, however variations of this method are influenced by tree type and climate factors.

UNEVEN-AGED HARVESTING

Single Tree Selections

Individual trees of all sizes are removed in a given forest area. The harvesting should balance the average volume of growth in the stand so that no more wood removed than is growing over a given period of time. Single tree selection should maintain or improve forest health by cutting trees of all sizes, not just the most valuable.

Patch Cut

The patch cut method removes trees in groups to create openings in a forest that are as wide or less than the height of 2 mature trees next to the patch. The opening is usually small enough to get enough protection from the surrounding forest.

Tree size

Consider the size of the trees on site in relation to equipment. Large trees may be too heavy for some equipment and small trees could be damaged by large equipment.

Tree diversity

What kinds of trees naturally grow together on site?

Advantages of Harvesting Systems

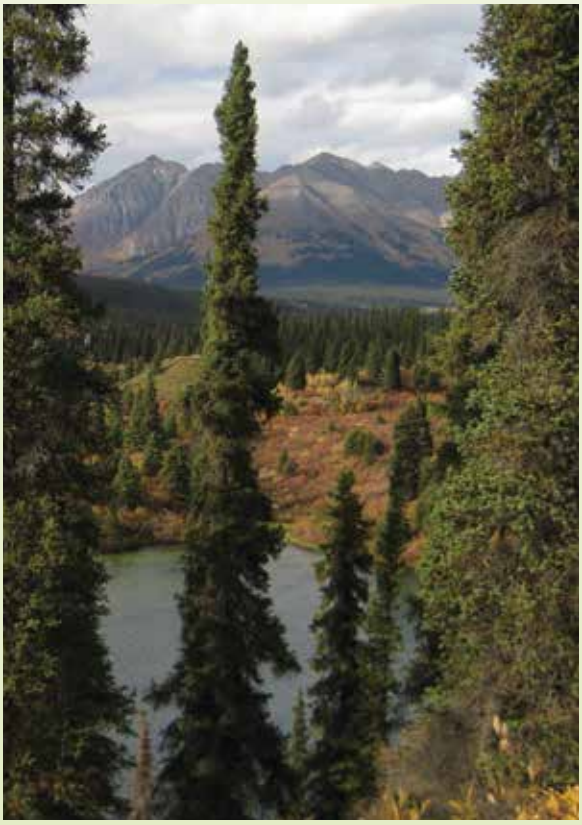
Even-aged	Less sun and root competition from nearby trees	Suitable for regenerating shade intolerant trees	Logging costs usually lower	Consistent growth rates and tree size	More options for forest management after harvesting
Uneven-aged	Can mean easier regeneration from the seed supply of remaining trees	Suitable for regenerating shade tolerant trees	Regeneration is more sheltered from the elements	Lower risk of disease, insects and wildlife	Often more aesthetically pleasing

PHOTOS BY MARTIN SAMIS

HARVESTING SYSTEMS FOR MAJOR COMMERCIAL SPECIES

White Spruce

A number of harvesting systems can be used for White Spruce including selection cutting, clearcutting and shelterwood. Even aged harvesting is typically the most appropriate. For trees of different ages on the site, selective harvesting is considered appropriate.



Black Spruce

Stand replacing fires typically mean Black Spruce grows in even-aged stands naturally. Therefore, clearcutting in strips or patches is usually considered the best harvesting system.

PHOTOS BY MARTIN SAMIS

Birch

Birch is intolerant to shade. In order to gain access to full sunlight and regenerate quickly, clearcutting is considered an appropriate method. Birch can quickly dominate areas post-harvest.

Lodgepole Pine

As Lodgepole Pine seedlings are intolerant to shade and competition, the most successful harvesting system to ensure regeneration is generally considered to be clearcutting.

PHOTOS BY FINELLA PESCOTT

NON-TIMBER FOREST PRODUCTS

Forests contain a rich array of resources besides timber. Non-timber forest products harvested in Yukon may include berries, honey, medicinal herbs, roots and mushrooms. Often a seasonal activity, the scale of collection ranges from small-scale recreational harvest to commercial enterprises. Some commercial non-timber forest products such as birch syrup, morel mushrooms and shrubbery require a Forest Resources Permit.

Birch Syrup Harvest and Production

Birch syrup is a similar product to maple syrup. It has a distinctive and caramel-like flavour. The harvesting method is also similar to that of maple syrup. Birch trees are tapped in spring and then the sap is boiled. The evaporating process results in birch syrup.

PHOTO BY LYNDSEY BERWYN LARSON

Morel Mushroom Harvesting

Morel mushrooms are a delicacy harvested in spring and early summer, usually in areas within two years following a forest fire.

Care should be taken to identify the correct mushroom to avoid picking poisonous look-alike species. Beginners should always pick with an experienced picker.

PHOTO BY TRICIA WURTZ, USDA FOREST SERVICE

Pamphlets containing more information on morel harvesting are available from the Forest Management Branch and Compliance Monitoring and Inspection Districe offices.

FIELD MARKING

The following are examples of flagging that are used in various operations.

For a comprehensive list of flagging used, look for the Field Marking Standards at: www.forestry.gov.yk.ca

FIELD RIBBON COLOUR EXAMPLES:

Harvest Block Boundary

Proposed Road Location

Personal Use Firewood Boundary

PUFW **BOUNDARY**

NOTE: All ribbons described should be 'fluorescent glow' type with arctic rating (-40°C).

PHOTO COURTESY OF YUKON GOVERNMENT

III. POST-HARVESTING

REFORESTATION

More than just tree planting

Reforestation means re-establishing forests, either by leaving seed trees to allow forests to be establish2urally, by seeding, root/stump suckering or by planting. Re-establishing forests is an important part of a harvesting project and means healthy regeneration of forests. All harvested areas in Yukon are required to be reforested unless exempted.

In most cases, the responsibility of reforesting a site typically falls to the Yukon Government. Depending on the permit type and conditions it can fall to the permit holder. Local Area Foresters can be contacted for further information on reforestation.

A site plan for a harvest area gives guidance on how reforestation can take place.

Not only does reforestation ensure that timber as a renewable resource will be available for future generations, but that flora and fauna can benefit from the various growth stages of new forests.

PHOTO COURTESY OF YUKON GOVERNMENT

There are **several factors to consider** in order to achieve successful reforestation, including:

1. harvesting method
2. site preparation
3. the timing of planting
4. selecting suitable tree species

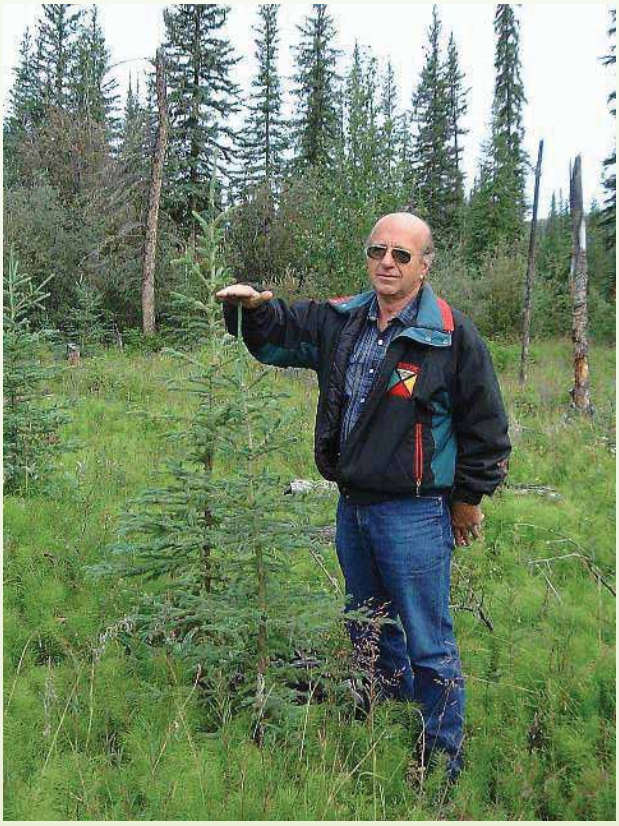


PHOTO COURTESY OF YUKON GOVERNMENT

Seed provenance

The provenance of a tree refers to the area where a tree was grown and where its seed is collected. Trees grown in local provenances are better suited to local conditions because they have successfully adapted to the local ecosystem and its climate over many generations. The Forest Management branch has a stockpile of seeds from different provenances. The FMB can be contacted for more information on sourcing seed.

STOCKING

The restocking of a harvested site or area that has been disturbed involves achieving a desired number of stems (seedlings) per hectare. Stocking standards take into account a number of factors such as species, climate and ecology. These factors are used to select appropriate tree species.

Correct stocking is an important part of reforestation. Trees compete with each other for sunlight, nutrients and water. Replacing harvested trees with the appropriate species is important in the renewal of forests for a range of values.

Getting reforestation right

Properly regenerating a site means healthy forests for the future for all values, timber and non-timber.

Minimum Stocking Rates

The appropriate level of stocking for harvesting sites is guided by the stocking standards. Stocking refers to the number of tree seedlings per hectare. The objective is to reoccupy the growing space with trees for the next generation.

PHOTOS COURTESY OF YUKON GOVERNMENT

PREPARING FOR A NEW FOREST (SITE PREPARATION)

Site preparation can be used for both enhancing natural regeneration or in preparation for planting. Site preparation involves improving growing conditions for trees by soil scarification (mechanical disturbance) and raising microsites, which improves drainage and ground temperatures. A site may not require any preparation as some sites may be in a suitable condition for planting as is.

Advantages

- reduce competition from other plants and trees
- improves seedbed conditions
- reduce fire risk by scattering or burning slash (fire fuel)
- create drier microsites in areas with standing water
- many Yukon species prefer a mineral soil (exposed) seedbed for natural regeneration.

Proper preparation of a site for reforestation is key to giving trees a good head start.

PHOTOS COURTESY OF YUKON GOVERNMENT

A burning permit is needed to burn any piles of logging slash between April 1 and September 30. Contact a Compliance Monitoring and Inspection branch for permit information.

ON-SITE REFORESTATION

When a site is reforested, one of two methods are used:

NATURAL REGENERATION (seed trees) OR →

Natural regeneration relies on mature seed trees that are in close proximity to the harvest site.

Seed trees

Larger, healthy looking trees are a sign trees have good genetics. When leaving seed trees for regeneration on a site after harvest, choose these trees to help a more resilient and productive stand grow.

Natural regeneration may not be enough to 'stock' an area post-harvest. If this is the case, fill planting may be needed to increase stocking levels.

Advantages

- Use of local seed that is adapted to the site.
- Costs are lower as there are no nursery or planting expenses.

PHOTO BY FINELLA PESCOTT

PLANTING SEEDLINGS (manual or machinery)

Planting is artificial regeneration to establish a new forest area.

Correct planting will help ensure long term success.

Advantages

- Planted seedlings have a 1-5 year head start on naturally seeded plants and this method is more reliable in meeting stocking requirements;
- Planted seedlings can be spaced to reduce competition;
- The best growing site can be used.

PHOTO COURTESY OF YUKON GOVERNMENT

PLANTING

Effective microsite planting

Effective microsite planting involves choosing the optimum planting spot to ensure maximum growth and seedling health. A good microsite is often elevated and slightly sheltered, such as beside a stump. This improves soil drainage and temperatures, increasing seedling survival. There are some helpful guidelines to follow to increase the survival rate for planted seedlings.

UNSUITABLE MICROSITES ✗	SUITABLE MICROSITES ✓
In compacted soil • e.g. quad trails or skid lines • Compacted soil has less space available to roots for oxygen, water and space to grow **In a depression** • Higher incidence of flooding and frost damage **In loose/dry/shallow soils** **In root/moss mats** **Poor rooting medium** • e.g. rotten wood/dry moss	**Area with a mix of soil, humus and decomposed material** **In a raised spot or mound** • e.g. near stumps. • Raised sites often have warmer root zone temperatures **In a spot free of competing vegetation** • Vegetation close by can compete for sunlight, soil nutrients and root space

PLANTING

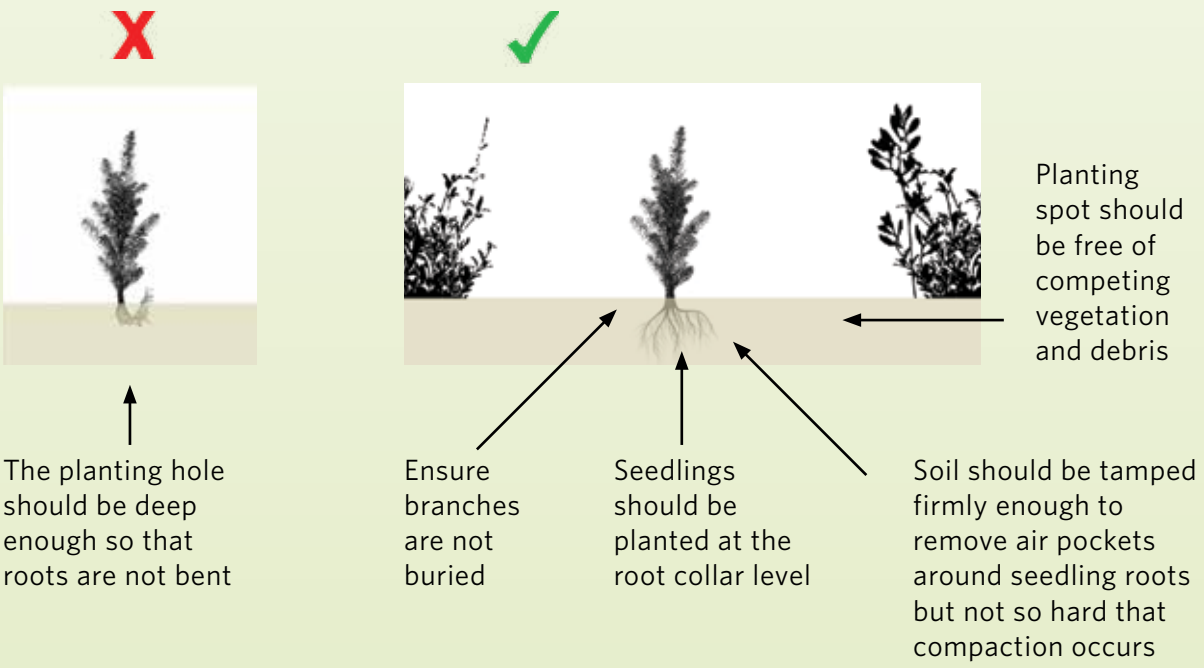
Before Planting

- Remove litter and dry moss on an area of 30cm x 30cm.
- Dig a small hole in the middle of the area.

Planting Tips

- Ensure seedlings do not freeze, dry out or gather mould in storage or during transportation;
- Choose planting spots carefully, depending on species' needs;
- Clear immediate area of debris and competing vegetation;
- Make planting hole deep enough to accommodate roots without bending;
- Plant tree upright, and to the root collar;
- Fill soil in and around roots to remove air pockets;
- Tamp down soil firmly around planted seedling.

Seedling Placement



FOR MORE INFORMATION related to planting contact the Forest Management Branch.

YUKON TREES

White Spruce *(Picea glauca)*

IDENTIFICATION
Short, sharp pointed needles with four sides. Branches are white and smooth.

GROWING CONDITIONS
A common, long-living Yukon tree species, White Spruce is able to grow in a number of climate zones. It prefers well-drained, moist soils.

RESISTANCE
White Spruce is not very tolerant to low light levels and has a low resistance to strong winds, fire, insect and fungal attack.

SEED DISPERSAL
For most natural stands, seed production in quantity begins at 30 years but can be younger on some sites.

SEEDBED
Seeds prefer mineral soils for a seedbed.

Black Spruce *(Picea mariana)*

IDENTIFICATION
Needles have shorter and more rounded cones than White Spruce. Lower branches are covered with red-coloured 'hairs'. Upper branches are clumped.

GROWING CONDITIONS
Black Spruce can withstand a variety of rainfall and altitudes. The species usually grows on wet organic soils. Black Spruce appears to be best adapted to growth on permafrost over other species because of shallow roots.

RESISTANCE
It is tolerant of shade but intolerant of windthrow. Black Spruce is easily killed by fire.

SEED DISPERSAL
Seeds dispersal is highest in spring and following fires. Seeds travel as far as 80 metres.

SEEDBED
Moist mineral soils are ideal seedbeds. Occasionally sphagnum mosses are used as seedbeds.

Lodgepole Pine *(Pinus contorta)*

IDENTIFICATION
Needles are paired and often twisted. Cones have prickles on the tips of the seed scales. Bark is thin and finely scaled.

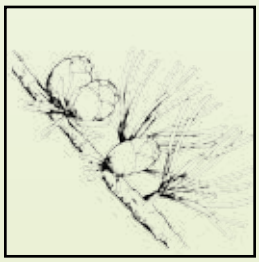
GROWING CONDITIONS
Lodgepole Pine can grow in a range of climates. The species can also grow on a range of soils but typically on moist soils.

RESISTANCE
Lodgepole Pine does not tolerate shade or heavy snowpacks. Wind resistance is medium and resistance to fire, insect and fungal attacks is low.

SEED DISPERSAL
Typically only about 60 metres.

SEEDBED
Bare mineral soil with access to full sunlight is an ideal seedbed.

Tamarack Larch *(Larix laricina)*



IDENTIFICATION
A small to medium-sized deciduous conifer, the Tamarack Larch has needles in groups of 10-20 on a short shoot.

GROWING CONDITIONS
Tamarack Larch is able to grow in under a range of temperatures and rainfall conditions. It most commonly grows on wet to moist organic soils.

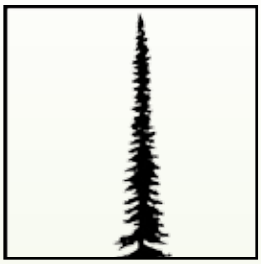
RESISTANCE
Tamarack Larch is very intolerant of shade but is generally tolerant against windthrow. Due to its thin bark, Tamarack is very susceptible to fire damage.

REGENERATION
Seed production in large quantities usually begins at 40 years.

SEED DISPERSAL
In spite of small seeds, few fall further from the tree than twice the tree height.

SEEDBED
Best seedbed conditions include moist, warm organic soil with no brush but a light grass cover or similar vegetation.

Subalpine Fir
(Abies lasiocarpa)



DID YOU KNOW?
Subalpine Fir is the territorial tree of Yukon

IDENTIFICATION
Subalpine Fir has flat needles and has a long, narrow, cone-shaped crown with a spikey point.

GROWING CONDITIONS
Subalpine Fir is found in higher altitudes because it has a low tolerance to high temperatures. Subalpine Fir is adapted to wet and dry soils.

RESISTANCE
The species is very shade tolerant but is susceptible to windthrow and insect attack. Due to its thin bark, Subalpine Fir is susceptible to fire kill.

REGENERATION
Regenerates by seed, although frequently by layering on severe sites. Regeneration usually occurs at 20 years, or older in closed canopy forests.

SEED DISPERSAL
Almost all seed is wind-dispersed. Little is known about seed dispersal distances.

SEEDBED
Seeds prefer exposed mineral and moist humus soils. Subalpine Fir has fewer seedbed requirements than similar species.

Paper Birch *(Betula papyrifera)*

IDENTIFICATION
Leaves are triangle-shaped. Bark is thin and white to red-brown in colour with dark horizontal slits. It peels in papery strips.

GROWING CONDITIONS
It tolerates a wide range of rainfall and grows on almost any soil and topographic site.

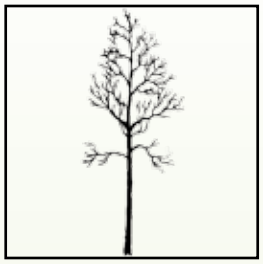
RESISTANCE
Paper birch is shade-intolerant. It can be killed by even moderate fires. Dieback can occur in residual trees after a mature stand is harvested.

REGENERATION
Usually seeds are produced at 15 years but the optimum age is 40 to 70 years. Good seed crops occur every second year in mature stands.

SEED DISPERSAL
Although the light, winged seeds are wind dispersed and can travel long distances, most seeds fall within the stand where they grew.

SEEDBED
Seeds are sensitive to moisture, temperature and light. Best germination takes place on mineral soil in shaded sites.

Balsam Poplar
(Populus balsamifera)



IDENTIFICATION
Balsam Poplars are medium to large-sized hardwoods with spade-shaped leaves. Bark is green grey and smooth and darkens in colour with age.

GROWING CONDITIONS
Balsam poplars are fast growers but are short-lived. They often grow on river flood plains. Balsam Poplars tolerate most soil moisture conditions except very dry or poor soils. Roots can survive in silty soils.

RESISTANCE
They are intolerant of low light but are highly resistant to wind and are not particularly susceptible to fire, insect and fungal attacks.

REGENERATION
Regeneration age for Balsam Poplar generally begins at 8 years and crops annually.

SEED DISPERSAL
Seed dispersal is typically within 200 metres.

SEEDBED
Moist mineral soil surfaces are the most ideal seedbeds.

Trembling Aspen
(Populus tremuloides)

IDENTIFICATION
Leaves are oval-shaped and 'tremble' in the breeze. Bark is smooth, pale green and does not peel.

GROWING CONDITIONS
Trembling Aspen can tolerate a range of climates: temperatures and rainfall. The species is able to grow on many soil types, particularly sandy slopes.

RESISTANCE
It is not shade tolerant and has a low resistance to insect attacks but a moderate resistance to fire and fungal attacks.

REGENERATION
The optimum age for large seed crops is 50 to 70 years but 10 to 20 year crops can occur. Regeneration also takes place through cloning and root suckering.

SEED DISPERSAL
Seeds can be carried for kilometers by air currents. Flowing water can also play a role in dispersal.

SEEDBED
Exposed mineral soils free of litter are the most ideal seedbeds.

FOREST HEALTH

Factors affecting forest health include bark beetles, leaf eaters (defoliators), diseases and animals which can impact trees from seedlings to mature trees. In Yukon forests, the biggest concerns are mostly insects, disease, drought, fire, windthrow and flood.

Events such as drought, flooding, windstorms and tree damage from roadbuilding or harvesting can trigger insect and disease populations to increase.

PHOTO BY JUKKA JANTUNEN

Natural predators feed on insect populations. Spruce bark beetle predators include the Checkered Clerid beetle and the Three-toed woodpecker.

PHOTO COURTESY OF YUKON GOVERNMENT

INSECTS AND DISEASE

Friend or Foe?

Insects and diseases are naturally present at low levels and play a role in forest ecosystems such as:

- providing a food source for other insects and forest animals;
- thinning overabundant trees;
- creating openings in the forest canopy for other plants and trees to grow.

However, epidemic outbreaks of insects and diseases can be widespread and can have serious consequences for:

- increasing fire risk;
- wildlife habitat;
- ecosystem communities;
- timber quality;
- social and economic factors.

PHOTOS COURTESY OF CANADIAN FOREST SERVICE

FOR MORE INFORMATION on insects and diseases refer to the Forest Health and Diseases pamphlets and/or the latest Yukon Forest Health Report available at local District Offices.

10 MOST DAMAGING PESTS AND DISEASES

Yukon is host to a number of damaging agents. This list covers the most damaging pests and diseases that can affect Yukon forests. Nine of these forest pests are targeted through annual monitoring of insects, which can be easily identified from aerial surveys. The list does not cover all pests and diseases that damage Yukon forests.

PHOTO COURTESY OF CANADIAN FOREST SERVICE

PHOTO COURTESY OF YUKON GOVERNMENT

PHOTOS COURTESY OF CANADIAN FOREST SERVICE

PHOTOS COURTESY OF USDA FOREST SERVICE

PHOTO COURTESY OF YUKON GOVERNMENT

PHOTO COURTESY OF CANADIAN FOREST SERVICE

1 Spruce beetle

This bark beetle is the most damaging forest pest of mature spruce forests in Yukon. A spruce bark beetle outbreak in southwest Yukon that began around 1990 has killed more than half of the mature spruce forest (primarily white spruce) over this area of 380,000 ha.

2 Northern spruce engraver

The northern spruce engraver acts as both a secondary bark beetle that attacks trees infested with spruce bark beetle, as well as a primary bark beetle that attacks and kills stressed spruce trees (mostly white spruce). This beetle population has increased in Yukon as there is more available host material as a result of the spruce bark beetle outbreak.

3 Western balsam bark beetle

This beetle attacks subalpine fir. Western balsam bark beetle has moved north from B.C. over the last 20 years and has become an active disturbance agent in mature subalpine fir stands in southern Yukon.

4 Budworms

Budworms which include the eastern spruce budworm, fir-spruce budworm, two-year cycle budworm and western black-headed budworm, cause similar defoliation damage to spruce, subalpine fir and, to a lesser degree, larch forests.

PHOTO COURTESY OF USDA FOREST SERVICE

PHOTO COURTESY OF CANADIAN FOREST SERVICE

PHOTO BY MARTIN SAMIS


PHOTOS COURTESY OF CANADIAN FOREST SERVICE


PHOTOS BY WARD STRONG, BCMoFR

PHOTO COURTESY OF
YUKON GOVERNMENT

5 Larch sawfly

This defoliator is the most damaging agent of larch in North America. In the mid- and late 1990s mature larch stands in southeast Yukon were heavily defoliated and experienced some mortality.

6 Large aspen tortrix

This defoliator periodically outbreaks resulting in severe defoliation, branch dieback and sometimes extensive tree mortality. Outbreaks have occurred in several places in southern Yukon, including Teslin Lake, Braeburn and Haines Junction.

7 Aspen serpentine leafminer

This insect pest occurs throughout the Yukon range of aspen and also defoliates balsam poplar. Currently, a massive outbreak of aspen serpentine leafminer extends from Alaska through Yukon and into B.C.

8 Pine needle cast

This tree disease (pathogen) is the most common cause of premature needle loss of lodgepole pine in Yukon. Pine stands in southeast Yukon are chronically infected, and the disease is becoming increasingly common in central Yukon.

9 Mountain pine beetle

Lodgepole pine and ponderosa pine are the most important host species. In western Canada, lodgepole pine is the primary host of this beetle. It is the most important forest health concern in western Canada. The current outbreak in B.C. is responsible for killing over 13 million ha of pine forest. Cold-induced mortality is considered a key important factor in controlling mountain pine beetle. A warming climate is expected to allow the beetle to expand its range northward, potentially as far as Yukon. Currently, it is not present in Yukon. Monitoring mountain pine beetle is a high priority because of its severe impact.

10 Tree dieback due to drought stress

Trembling Aspen is most affected by dieback due to drought stress. Aspen stands typically grow on the driest sites and are therefore most vulnerable to lower rainfall. Aspen stands experiencing dieback tend to be in an open canopy and are often stunted.

KEEPING FORESTS HEALTHY

Forest Health Strategy

The FMB Forest Health Program has four main areas of focus:

Strategic Monitoring

- This involves monitoring potential threats to Yukon forests through general measures such as regular aerial surveys.

Specific Monitoring

- Forest Health threats identified in strategic monitoring may require more focused monitoring and in some cases, preventative measures or treatment of the pest or disease.

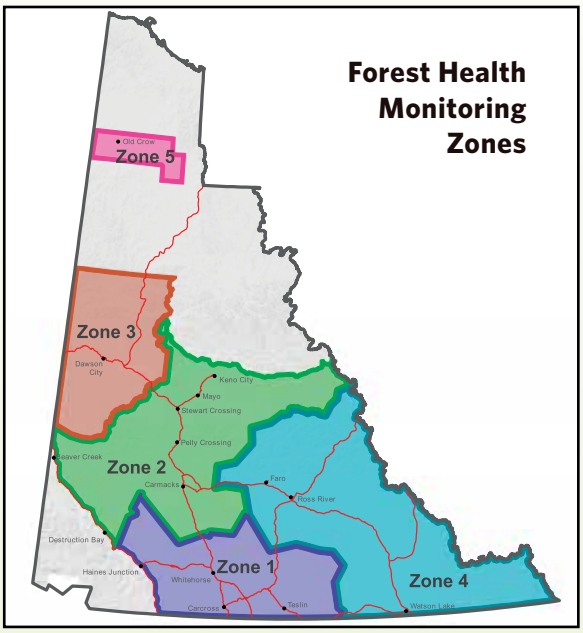
Annual Forest Health Report

- Every year, the FMB publishes a report which summarizes forest health information about insect, disease and climate damage in Yukon. The report is available to the public both at the FMB office and online at: www.forestry.emr.yk.gov.ca

Education and Training

- Education and training on forest health issues is provided to forest practitioners to help identify forest health threats;
- Reporting of pest and disease incidents can assist in being the eyes and ears of the Forest Health Strategy.

AERIAL MONITORING



Forest Health Monitoring Zones are flown on a rotational basis

There are 5 Forest Health Monitoring Zones in Yukon. One Zone is flown every year and after 5 years all zones are covered. An area(s) with an identified outbreak is included for closer monitoring in subsequent aerial surveys.

Bark Beetle Precautions

There are a number of precautions that can be taken to minimize the spread of spruce bark beetle. Precautions can be found in approved site plans as needed. They include:

Harvesting

- Time harvesting to occur outside the beetle flight period. Remove logs and debris prior to the next beetle flight period;
- Minimize stump height;
- Minimize amount of green debris left on site through either: pile-and-burn method, broadcast burn or chipping. All debris with a diameter at breast height (1.3m) of >10cm should be treated;
- Minimize windthrow hazard when designing harvest area. Survey windthrow in mid-late June following harvest to assess
- beetle presence. Salvaging green windthrow in the years following harvesting will minimize host material.

Hauling

Restrictions may be in place for hauling green wood. The Forest Management branch will inform permit holders what these restrictions may be.

Sorting

Sort yards can be a host to high concentrations of spruce bark beetle. Timber known to be infested should be milled or debarked prior to May 1.

WHAT FOREST USERS CAN DO

When operating in forests steps can be taken to:

Minimize any damage to the stand
- Scarring trees with equipment and breaking tops makes trees more susceptible to insect and disease attacks

Aim to maintain stand stability
- Choose wildlife patches from healthy stands

Watch for signs of decay or rot that indicate trees are being attacked:
- Scars, frost cracks, mistletoe, rotten branches or boring dust tubes.

If an insect or disease outbreak is discovered:

Record
- The host species (if possible)
- The location
- The number (or %) of trees affected
- Needle / Leaf colour
- Needle colour can indicate the phase of attack for Mountain Pine Beetle.
  - A key feature of beetle attack is brown boring dust / pitch tubes.

PHOTOS COURTESY OF YUKON GOVERNMENT

FOR MORE INFORMATION contact a local Area Forester or a Compliance Monitoring and Inspections District Office.

MONITORING

Monitoring means evaluating the status of a defined subject and observing trends over time.

Monitoring in Forest Management

Monitoring information allows forest managers to assess whether an activity is in line with objectives and predictions.

For example:

- future tree growth
- habitat requirements
- understanding problems with growth.

Information can be used to predict expected growth rates and sustainable harvest rates.

PHOTO BY MARTIN SAMIS

HOW MONITORING TAKES PLACE

Indicators in a Monitoring Program can provide an early signal of where changes in forest management may be needed. Indicators can help to answer the question:

"Are we achieving the goals of our plan?"

Strategic level Forest Resources Management Plans use Goals and Indicators to define benchmarks for sustainable forest management in an area. These goals are consistent with the criteria of sustainable forest management defined nationally by the Canadian Council of Forest Ministers (CCFM). The Indicators are a useful tool within the Monitoring Program.

In addition, **questionnaires** can be used to gain feedback and **permanent sample plots** can monitor the growth of stands.

FOR MORE INFORMATION on monitoring, access the Yukon Forestry Monitoring Program developed by the Forest Management branch. Program Manuals are available from the FMB.

INSPECTIONS AND ASSESSMENTS

There are a number of inspections that take place before, during and after operations are completed. Inspections can be put into two main categories:

1) Pre-Allocation Stage

Site Assessment

A Site Assessment is a thorough inspection of a number of factors relating to the proposed harvest. Assessing these factors helps to determine appropriate planning, operational and tenure options and if any additional conditions need to be placed on the permit.

For example:

SITE FACTORS

- soil classification
- stand structure
- site impacts
- road access
- terrain (even, broken, steep)
- aspect
- moisture regime
- slope position
- tree species present

PLANNING FACTORS

- land tenure
- scale of proposed operation
- duration of proposed operation

PHOTO BY YUKON GOVERNMENT

2) Monitoring Stage

Monitoring for Compliance

The terms and conditions that are tied to a permit set out what wood cutters must abide by during harvesting operations. Once permits are issued, regular inspections are carried out by Natural Resource Officers from Compliance Monitoring and Inspections District Offices.

How often?

The frequency of inspections depends on a number of factors. These include, for example, the scale of operations, environmental sensitivity and seasonal factors.

For how long?

Site monitoring continues until all the terms and conditions of a permit have been met.

Compliance and Enforcement Tools

There are a number of tools that a Natural Resource Officer may employ to address non-compliance such as warnings, tickets and court ordered fines.

* **Compliance and enforcement** is an important part of managing forests to ensure the many benefits they provide can continue.

FOR MORE INFORMATION refer to the Compliance and Enforcement Operational Policy and Procedures document or the Compliance and Enforcement in Yukon's Forests Fact Sheet available at: **www.forestry.gov.yk.ca** or contact a Compliance Monitoring and Inspections District Office.

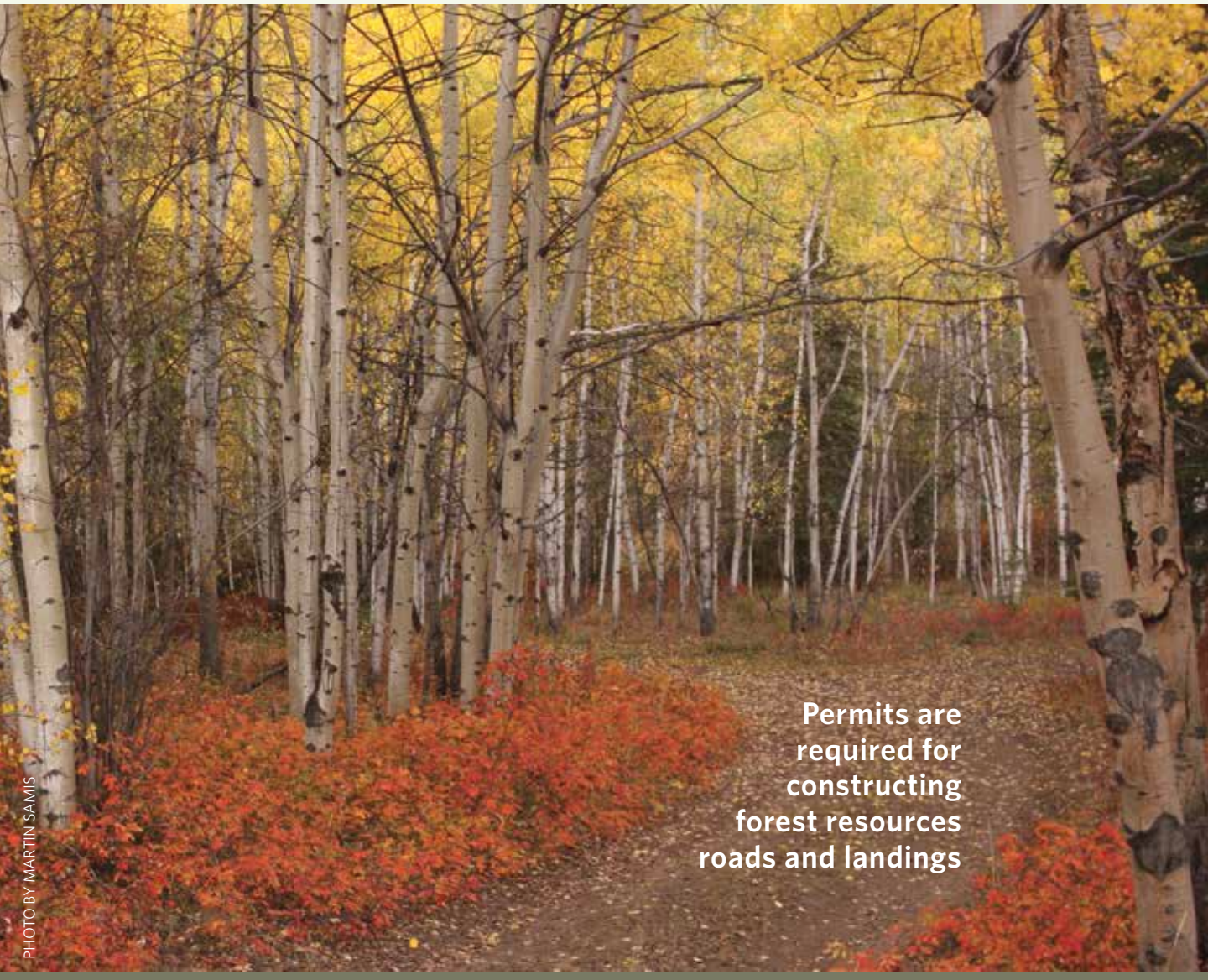
PHOTO BY FINELLA PESCOTT

Forest Resources Roads

Effective design and construction of forest resources roads and landings is an integral part of forest resources use. It ensures not only the safety of road users, but also minimizes soil disturbance, and is important for forest productivity, water quality and fish and wildlife habitat. Good road planning and building for forest projects will also save time and money in the long run.

INTRODUCTION

Forest resources roads are subject to conditions which are important in ensuring the integrity of forests as a public resource, maintaining the local environment and providing safe road use.



Permits are required for constructing forest resources roads and landings

PHOTO BY MARTIN SAMIS

PERMITTING

The location of road construction, landings and any road surveys will need to be checked and authorised prior to issuance of any permit or agreement.

All necessary permits should be obtained prior to forest resources road construction and use.

NOTE If organic material needs to be removed for road construction which is outside the road right of way, the necessary Land Use permits will need to be obtained.

A fact sheet on Land Use Permits is available at: www.emr.gov.yk.ca/lands/info_sheets.html

PHOTO COURTESY OF YUKON GOVERNMENT

FOR MORE INFORMATION refer to the 'Fact Sheet on Using Forest Resources Roads' and the 'Forest Resources Roads Standards and Guidelines' on the construction, modification and decommissioning of forest resources roads.

GENERAL PLANNING

Route selection is important when planning forest resources roads:

- Existing forest resource roads, landings and skid trails should be made use of when possible;
- Road placement should avoid Riparian Management Areas (RMAs), except when required for stream crossings.

Some basic principles will help to reduce future road maintenance and road construction costs:

- Where feasible, aim to keep roads high, dry and flat;
- Use gentle, stable terrain.

! **Roads should not pass** through Marsh and Shallow Open Water Wetlands or other designated Riparian Management Areas. Unless no other reasonable alternative route exists, in which case seasonal restrictions will apply.

PHOTO COURTESY OF YUKON GOVERNMENT

Be aware that both road construction and road use can only take place during favourable weather conditions and only on dry or frozen ground to minimise sediment flow and erosion. Road construction on permafrost areas can only take place in winter on snow.

Poor winter road use: wait until roads are dry or frozen before use

Well constructed all season road with dry weather use

PHOTOS COURTESY OF YUKON GOVERNMENT

LANDINGS

Landings are the areas where logs are brought during harvest to be sorted and loaded for transporting. The high use from heavy equipment on landings can potentially result in higher loads of sediment if the appropriate precautions are not taken.

AVOID

- Landings near waterways and springs;
- Landings in reserves;
- Landings on areas that could cause erosion:
  - → unstable areas, steep slopes;
- Increasing landing sizes to accommodate wood storage should be avoided

DO

- Minimize number and size of landings:
  - → make use of existing landings when possible;
- Remove logging debris so that site reclamation is uninhibited;
- Ensure that the primary purpose of landings is for sorting and loading logs and not for camps or other reasons.

PHOTO COURTESY OF YUKON GOVERNMENT

SOILS AND COMPACTION

Soil Types

There are various types of soils that can be found in Yukon forests. Soils can be made up of many combinations of sand, silt, loam, clay, and organic material with different soil depths, or horizons.

There are ten soil orders of the Canadian System of Soil Classification, although not all occur in Yukon. Soil orders or types are a general soil description and there are multiple sub-groups of soil classification. Brunisolic soils are the dominant soil in boreal forests (see chart below).

Soils found in Canadian boreal forests

GENERAL SOIL TYPES	CHARACTERISTICS	DRAINAGE ABILITY
CRYOSOLIC	Mineral or organic soils that have permafrost within 1m.	Good to very poor
ORGANIC	Dark coloured. Soils have approximately 30% organic matter by weight within 50 cm. No permafrost near the suface. Developed from plant matter growing in wetter areas including swamps and bogs.	Poor to very poor
GLEYSOLIC	Usually grey coloured. Soils that are periodically or permanently saturated with water and therefore depleted of oxygen.	Poor
PODZOLIC	Brown to reddish coloured acidic soils	Good to fair
BRUNISOLIC	Brownish subsurface soil horizons, often sandy.	Good to fair

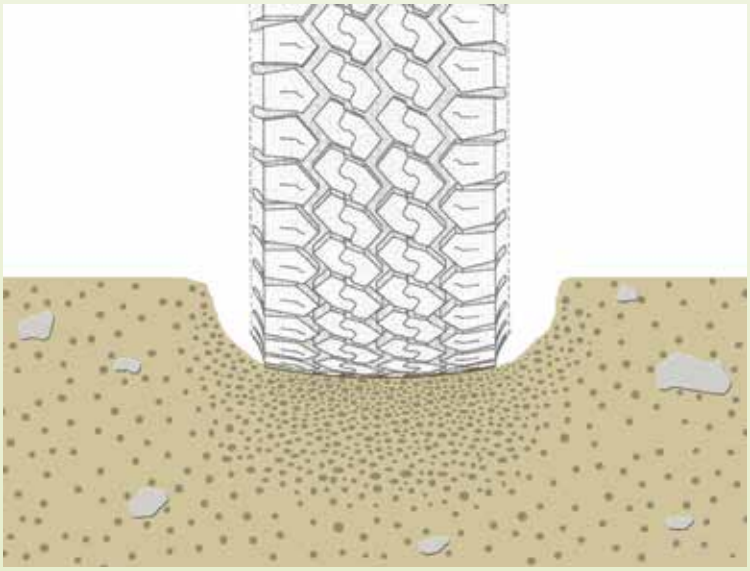
Adapted from The Canadian System of Soil Classification, Third Edition. 1998.

COMPACTION

Soil types influence soils' ability to drain. Drainage ability can be used as a general indicator of how much compaction will damage those soils. The poorer the drainage of soils, the more negative and long lasting the impacts will be from compaction.

The bearing strength of the soil is measured by its ability to withstand ground-based machinery traffic without degrading. Fine textured and moist soils are more sensitive to machinery than coarse textured, dry, well draining soils. Frozen ground and snow allows machinery access to areas that may not support machinery under other (non-frozen) conditions.

'Fine textured and moist soils are more sensitive to machinery than coarse textured, dry, well draining soils.'



Soil compaction: damage to soil structure can be long lasting and reduce site productivity.

FOR MORE COMPREHENSIVE INFORMATION on soil types, refer to the Yukon Forestry Monitoring Protocol: Field Manual and Monitoring Protocols (FMB 2009) available from the Forest Management Branch or at **www.forestry.gov.yk.ca**

DRAINAGE

Sound road structure and the protection of the local environment of your project area rely on effective control of water flow. Without proper drainage, rutting and erosion of roadbed material can result in sediment entering nearby waterways. Appropriate erosion controls for drainage need to be included in road planning and construction design. The class and location of roads, topography, slope, soil type and local rainfall should be factored in. Erosion and sediment control measures should be used during and after forestry activities which disturb areas. Design and installation of erosion controls need to withstand a 1 in 50-year peak water flow event.

PHOTO BY MARTIN SAMIS

1 in 50-year flow

A high volume water event such as a big storm that causes a stream to flood occurs on average about once every 50 years.

FOR MORE INFORMATION on peak water flow events in Yukon waterways contact:
Water Resources Branch, Environment Yukon
www.env.gov.yk.ca

PHOTO COURTESY OF YUKON GOVERNMENT

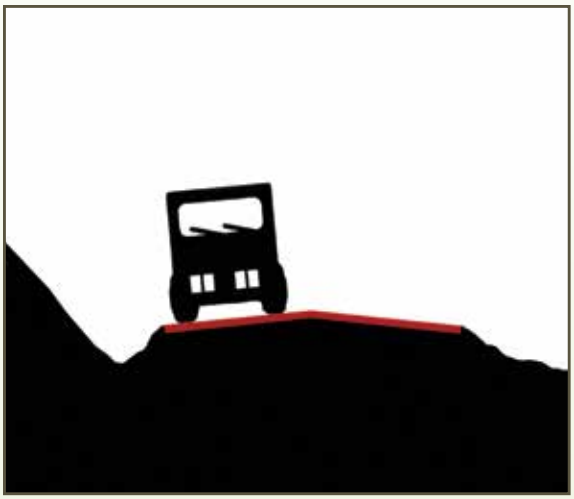
Be aware of early signs of forest resources road damage. Standing water indicates road drainage problems. Ruts are a sign of reduced road strength. Reducing traffic in wet weather prevents erosion, road damage and reduces maintenance costs.

Erosion damage:

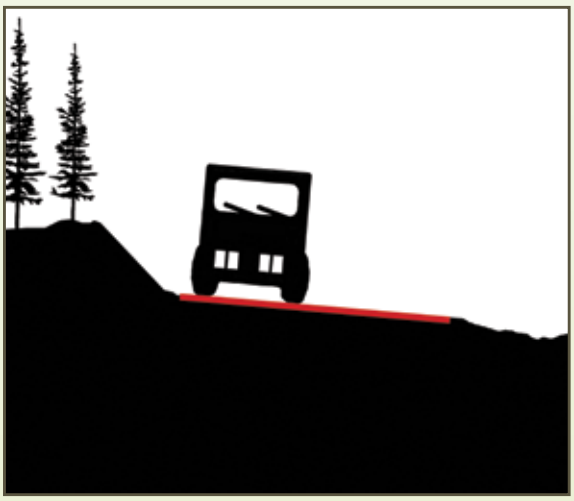
Extra precautions should be taken not to use roads with poor draining soil types in wet weather.

Historical data is available on water levels for some Yukon waterways.

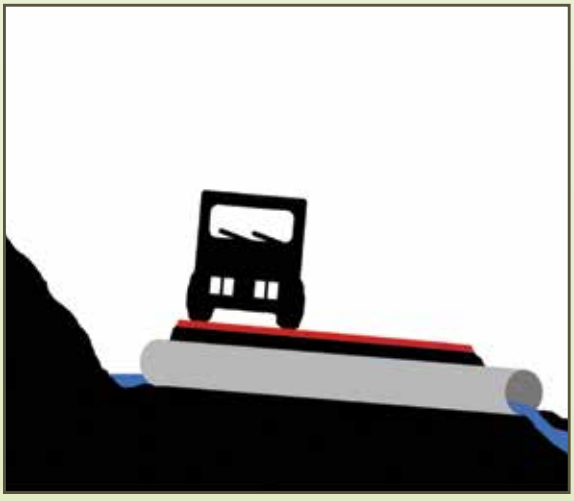
ROAD DRAINAGE PROFILES



Roads should be **crowned** to shed water.



On roads with gentle grades, roads can be **sloped** so that the downsloped side is slightly lower than the upslope to allow drainage to the downsloped side.



In steeper or wet areas, drainage **structures** such as ditches and cross drains can be used to channel water away from the road and prevent erosion on slopes.

WINTER ROADS

Winter roads may require different construction techniques and equipment. These roads can be constructed in summer or winter but are intended for winter travel only.

PHOTOS COURTESY OF YUKON GOVERNMENT

Winter Roads and Harvesting

Frozen ground can withstand higher vehicle and machinery loads than unfrozen ground. Snow on the road surface can protect the ground from rutting.

Some winter road surface preparation may be needed such as snow clearing and packing. The amount of surface preparation and the layer of snow needed to protect the ground depends on the frequency of traffic, the weight of vehicle loads and weather conditions.

PERMAFROST

Permafrost is generally considered to be soil that is frozen for two or more years. Permafrost layers may be permanent, seasonal, continuous or discontinuous.

! **Disturbance of permafrost** areas should be avoided if possible because of the potential for erosion.

Identifying permafrost

Permafrost is typically found in wet areas with north-facing slopes. However, permafrost areas are not always easy to identify from the surface.

Indicators that suggest permafrost is present include:

- thick moss layers
- soil layers that are churned
- wetlands and black spruce
- trees growing at random angles (drunken forest).

PHOTO BY FINELLA PESCOTT

PHOTO BY MARTIN SAMIS

Roads may be constructed on permafrost areas in dry weather but avoid any disturbance of the organic layer or mat. Instead, overland road construction techniques which include cross drainage or a weight distribution layer such as overfill (infilling with snow and stumps) are used.

STREAM CROSSINGS

Fish use streams to move and migrate throughout watersheds. Stream crossings need to allow fish, particularly salmon species of all ages, from fry to adults, to move both upstream and downstream.

YUKON FISH

There are 38 species of freshwater fish in Yukon.

STREAM CROSSING BASICS

- ☑ Soil and debris should be prevented from entering the stream to minimise the potential for soil erosion.
- ☑ Roads should be slightly elevated at a stream crossing to ensure run-off is directed away from the stream. Consider silt fencing to protect water quality.
- ☑ Water crossings need to be designed so as not to cause a barrier to fish passage or any other requirement needed to maintain fish populations and habitat.
- ☑ Caution should be taken not to deposit harmful substances, such as fuel, into any waters.

PHOTO BY MARTIN SAMIS

FOR MORE INFORMATION on identifying fish species and on where fish species are distributed in the territory can be found in the booklet: Yukon Freshwater Fishes online: **www.env.gov.yk.ca**

STREAM CROSSING STRUCTURES

Stream crossing structures range in design, cost and effectiveness for fish movement. Selecting the appropriate stream crossing structure will depend on different factors, such as:

- Stream depth
- Stream flow
- Fish species and habitat requirements

Culverts

Culvert size and design is important in allowing fish, at all life stages, to pass through and to ensure soil stability. To accommodate for estimated peak flow of streams, culverts should be sized for a 1 in 50-year flood.

To minimise sediment flow from the road into the stream, culverts need to extend beyond the road bed edges. Placement of the culvert should be level or just below the natural stream bed to avoid pooling at the mouth of the culvert.

PHOTO COURTESY OF YUKON GOVERNMENT

STREAM CROSSING REQUIREMENTS

- ☑ All in-stream work with heavy equipment should be authorized by the Forest Management branch and should comply with all relevant federal and territorial laws, local regulations and by-laws.
- ☑ Streams with an average high-water mark greater than 5m will require a water licence.
- ☑ The design of bridge and culvert constructions on fish bearing streams need review and may be subject to timing constraints, supervision, fish salvage and monitoring.

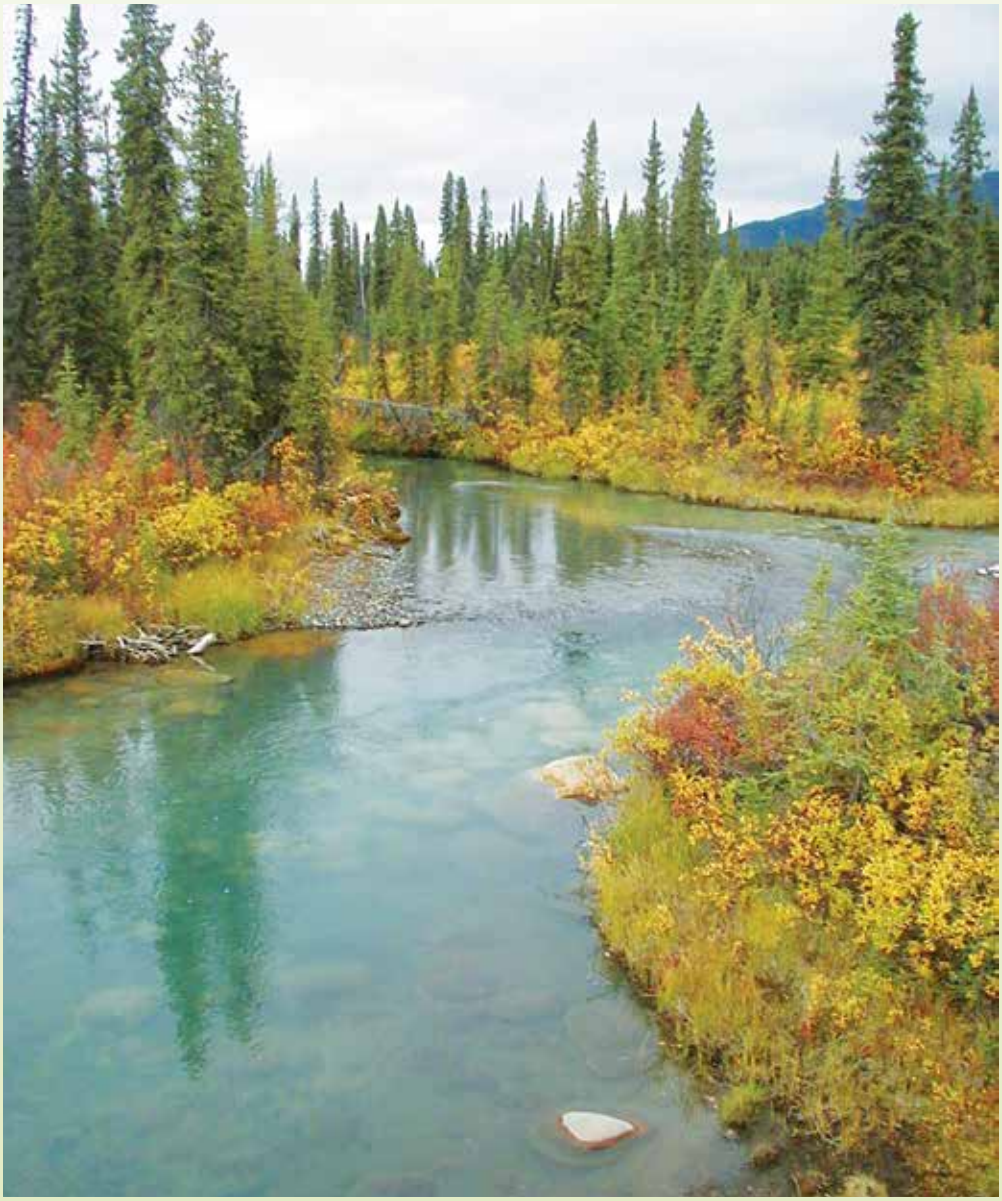


PHOTO BY DOUG BISHOP

BRIDGES

'Bridges should be positioned over well-defined, narrow streams and at right angles with the stream.'

Bridges are needed to cross larger and wider streams and particularly those with more woody debris flow. Bridges can be a less complicated option than culverts and are least likely to obstruct fish movement. Bridges should support stable and gently sloping roads to minimise sediment run-off. The design of bridges should allow for the maximum weight of anticipated traffic and to withstand a 1 in 50-year flood. Bridges should be positioned over well-defined, narrow streams and at right angles with the water course.

PHOTO COURTESY OF YUKON GOVERNMENT

SNOW FILLS AND ICE BRIDGES

Snow fills and ice bridges are temporary constructions built for winter access. Snow fills are made by filling a stream channel with snow and ice bridges are constructed on larger streams that have enough depth to prevent the ice bridge from having contact with the stream bed. Winter stream flows must not be interfered with. It is a permit holder's responsibility to make sure that all ice bridges are capable of supporting the equipment taken across them. Stream banks must be protected with compacted snow and ice.

When operations are finished on a project area, or when stream flow is noticed, whichever comes first, snow fills and ice bridges should be removed if they appear to impede water.

To minimise sediment entering the stream, use only clean snow and water for construction.

PHOTO COURTESY OF DEPARTMENT OF ABORIGINAL AFFAIRS AND NORTHERN DEVELOPMENT

Ice bridge built over large stream channel

Log Fills

Log fills are designed to be used on streams with only occasional or seasonal flow. They are suitable only for streams that are dry at the time of construction to provide temporary access for off-road equipment. The impact on stream banks and beds is reduced when equipment crosses during dry periods.

Log fills should be removed at the same time a harvesting operation finishes and before any stream flow recommences (prior to spring breakup).

MAINTENANCE

Maintaining roads, water crossings and drainage structures is necessary to ensure the safety of roads and to prevent damage to the surrounding environment. All active forest resources roads must be maintained. Forest resources roads are assigned to a designated maintainer to carry out maintenance needed.

If heavy equipment is used for maintenance on stream crossings, approval must be obtained from your local Area Forester. Forest resources roads are maintained so that rain runs off adequately, ensuring road surfaces dry effectively. Certain signage and warnings may be required to be in place during operations. Stream crossings and drainage structures should be kept free of debris to ensure stream function.

'All active forest resources roads must be maintained.'

Keep clear: all stream crossings and drainage structures, such as this cross-drain culvert, should be kept free of debris.

Uncrowned road: crown flat roads to shed water from road surfaces.

PHOTOS COURTESY OF YUKON GOVERNMENT

If a serious issue(s) with a forest resources road is identified that could affect the surrounding environment or be a safety issue, then road use or construction must stop until the problem is fixed. If water quality is negatively affected during operations, a local Natural Resources Officer must be informed immediately.

Contact the **Forest Management branch** to find out which local Area Forester is assigned to a particular area. Toll free (in Yukon): **1.800.661.0408 Ext: 3999**

PHOTO COURTESY OF YUKON GOVERNMENT

Poor maintenance: this road requires a culvert.

REFER TO the Road Classification Standards to what minimum site distances should be kept available on the Forest Management Branch website: **www.forestry.gov.yk.ca**

DECOMMISSIONING

Forest resources road decommissioning, or putting roads 'to bed', involves stopping the use and maintenance of forest roads, either temporarily or seasonally through deactivation or permanently through rehabilitation.

- Effective measures should be used to prevent erosion and sedimentation during decommissioning activities, particularly when culverts are removed.
- Note that permission must be obtained to decommission a forest resources road. The FMB will ensure that deactivated roads are monitored until they are reactivated or rehabilitated.
- At least 30 days notice must be given before decommissioning a road by notifying a local Area Forester and posting a notice at a main access point.
- Access to the decommissioned road to a public highway must be either blocked for deactivated roads or removed if a road is rehabilitated. Signs must be posted at the closest point from the decommissioned road to a public highway stating that the road is closed to use.

Decommissioned road with logs placed to prevent access.

Decommissioning or deactivation activities will need to be finished before seasonal break-up of operations or when operations are finished, whichever happens first.

Reclaimed road: this road will eventually turn back into forest.

PHOTOS COURTESY OF YUKON GOVERNMENT

YUKON GOVERNMENT

Forest Management branch
(also contact details for **local Area Foresters)**

Mailing Address:
Box 2703 (K-918)
Whitehorse, Yukon Y1A 2C6

Physical Address:
Mile 918 Alaska Highway
Whitehorse, Yukon
Phone: (867) 456-3999
Toll free (in Yukon): 1-800-661-0408
Ext: 3999
Fax: (867) 667-3138
Email: forestry@gov.yk.ca
www.forestry.gov.yk.ca

Environment Yukon
Mailing Address:
Box 2703 (V-3A)
Whitehorse, Yukon
Canada Y1A 2C6

Main Office Location:
10 Burns Road, Whitehorse
(across from the airport)
Phone: (867) 667-5652
Toll free (in Yukon): 1-800-661-0408
Ext: 5652
Fax: (867) 393-7197
Email: environment.yukon@gov.yk.ca
www.environmentyukon.gov.yk.ca

Fish and Wildlife branch
Phone: (867) 667-5715
Toll free (In Yukon): 1-800-661-0408
Ext: 5715
Fax: (867) 393-6263
Email: fish.wildlife@gov.yk.ca

Water Resources branch
Phone: (867) 667-3171
Toll free (In Yukon): 1-800-661-0408
Ext: 3171
Fax: (867) 393-3195
Email: water.resources@gov.yk.ca

Heritage Resources Unit
Department of Tourism and Culture

Mailing Address:
Box 2703
Whitehorse, Yukon
Canada Y1A 2C6

Office Location:
133A Industrial Road
Whitehorse, Yukon
Phone: (867) 667-5983
Toll free (In Yukon): 1-800-661-0408
Ext: 8589
Fax: (867) 667-5377
www.tc.gov.yk.ca/heritage_resources.html

YUKON GOVERNMENT

COMPLIANCE MONITORING AND INSPECTIONS DISTRICT OFFICES

KLONDIKE DISTRICT
DAWSON AND OLD CROW

Dawson City
1242 Front Street
P.O. Box 279, Y0B 1G0
Ph: (867) 993-5468
Fax: (867) 993-6233

KLUANE DISTRICT
HAINES JUNCTION AND BEAVER CREEK

Haines Junction
Mile 143 Haines Road
PO Box 5370, Y0B 1L0
Ph: (867) 634-2256
Fax: (867) 634-2675

NORTHERN TUTCHONE DISTRICT
MAYO AND CARMACKS

Mayo
Laurier Street and 6th Avenue
PO Box 100, Y0B 1M0
Ph: (867) 996-2343
Fax: (867) 996-2856

Carmacks Sub District Office
Corner of River Drive and Nansen Road
PO Box 132, Y0B 1C0
Ph: (867) 863-5271
Fax: (867) 863-6604

SOUTHERN LAKES DISTRICT
WHITEHORSE AND TESLIN

Whitehorse
Mile 918 (Km 1425.7) Alaska Highway
PO Box 2703, Y1A 2C6
Ph: (867) 456-3877
Fax: (867) 393-7404

Teslin Sub District Office
Km 1246 Alaska Highway
PO Box 97, Y0B 1B0
Ph: (867) 390-2531
Fax: (867) 390-2682

TINTINA DISTRICT
WATSON LAKE AND ROSS RIVER

Watson Lake
Km 1007 Alaska Highway
Box 289, Y0A 1C0
Ph: (867) 536-7335
Fax: (867) 536-7331

Ross River Sub District Office
Across from Ross River General Store
PO Box 107, Y0B 1S0
Ph: (867) 969-2610
Fax: (867) 969-2309

A

Active den
An animal den where there is evidence of current use or use during that season.

Annual Allowable Cut (AAC)
The amount of timber that is permitted to be cut annually from a particular area. AAC is used as the basis for regulating harvest levels to ensure a sustainable supply of timber.

Archaeological sites
Contain remnants of ancient objects or signs of use that predate written history, typically these are found on or below ground.

Archaeological sites, historic resources and historic sites have the same meanings as stated in the Historic Resources Act (2002) and Archaeological Sites Regulation.

Artifact
An object that has historical or archaeological interest and is older than 45 years and has been abandoned.

B

Bankfull width
The average cross-sectional area of a stream that is often used to determine stream class based on width.

Basal area
The cross sectional area of a tree, usually measured at 1.3 meters above ground (see DBH). Basal area is used to measure tree volume and in calculations to estimate the volume of wood in a given stand. It is typically expressed as square units per unit area.

Berm
Low earth or snow mound constructed in the path of flowing water to divert its direction.

Biodiversity
Refers to biological diversity: the variety, distribution and abundance of different plants, animals and micro-organisms, the ecological functions and processes they perform and the genetic diversity they contain at a local, landscape or regional level of analysis.

C

Climate change
An alteration in measured quantities (e.g., precipitation, temperature, radiation, wind and cloudiness) within the climate system that departs significantly from previous average conditions and is seen to endure, bringing about corresponding changes in ecosystems and socio-economic activity.

Coarse Woody Debris (CWD)
Sound and rotting logs, branches and stumps that provide habitat for plants, animals and insects and a source of nutrients for soil development. The type and size of material designated as CWD varies among classification systems.

Cross ditch
Shallow trench used to capture road surface and ditchline water and direct it across a road.

Cross drain culvert
A pipe laid under the road to drain water from the uphill to the downhill side of the road.

D

Decommissioning
The process by which a road is taken out of active use either temporarily or seasonally through deactivation, or permanently, by putting roads 'to bed'. Rehabilitation activities would follow after a forest resource road is permanently taken out of use.

Defoliator
An agent that destroys tree leaves or needles.

Diameter at Breast Height (DBH)
Usually measured at 1.3 meters above ground, DBH is used to measure tree size and estimate wood volume.

Ditch block
A physical barrier in a ditch line located just below a cross drain culvert, designed to direct water flow into the culvert.

E

Ecosystem
A dynamic system of plants, animals and other organisms, together with the non-living components of the environment, functioning as an interdependent unit.

Ephemeral draws
Streams that have seasonal or wet weather flows but are not defined streams, due to lack of bank and stream bed development.

Even-aged harvesting
A harvesting system (or silviculture system) that intends to regenerate and sustain an even-aged stand. Clearcutting, seed tree, and shelterwood are examples of even-aged systems.

F

Fish stream
The portion of a stream that contains fish as outlined in the Yukon Territory Fisheries Regulations at any time of the year; or, that has a slope gradient of 20% or less and flows directly into a stream frequented by fish or water body known to support fish; and, has no access constraints or barriers.

Forest
An ecosystem characterized by a more or less dense and continuous tree cover, often consisting of stands varying in composition, structure, age class and associated processes, and commonly including meadows, streams, fish and wildlife.

Forest management
The practical application of scientific, economic and social principles to the administration and working of a forest for specified objectives.

Forestry practices
Any activity that is carried out on forest land to facilitate the use of forest resources, including, but not limited to: timber harvesting, road construction, silviculture, grazing, recreation, pest control and wildfire suppression.

Forest resources
Includes all flora in a wild state and for greater certainty, includes mushrooms.

Forest Resources Act
The Act (2011) is the first resource legislation developed by the Government of Yukon since management of forest resources was transferred from the Government of Canada in 2003. The legislation provides forest managers with the tools to sustainably manage Yukon's forest resources. The Act contains regulations, standards and guidelines that set out for forest users what practices must be adhered to and what is advisable.

Forest Resources Management Plan (FRMP)
A plan prepared as set out in Part 2 of the Forest Resources Act.

G

Game trails
A path used regularly by an individual or group of animals for valuable purposes such as to find food or water and for short or long migrations.

H

Habitat
The environment in which a population or individual lives; includes not only the place where a species is found, but also the particular characteristics of the place (e.g., climate or the availability of suitable food and shelter) that make it especially well suited to meet the life-cycle needs of that species.

Harvesting
The practice of felling and removing trees or the removal of dead or damaged trees from an area.

Harvesting method
The mix of felling, bucking and yarding systems used in logging a stand of timber.

Hauling
Term used to describe transporting logs from one place to another, usually from a landing to a mill for processing.

I

Icebridge
Is a body of ice that forms across the width of a stream or lake that can support the weight of vehicles and machinery.

Inventory (forest)
A survey of a forest area to determine such data as area, condition, timber, volume and species for a specific purpose, such as planning, purchasing, evaluating, managing or harvesting.

L

Lake
A naturally occurring static body of water >2 m in depth and >1 ha in size. Size of the lake is determined by the surface area of the lake under normal conditions.

Landings
An area within a forest harvesting operation where logs are stockpiled before they are transported away from the site.

Local Area Forester
A local Area Forester is designated for each of six Yukon regions (Watson Lake and Ross River; Teslin; Whitehorse; Haines Junction to Beaver Creek; Carmacks, Mayo, Faro and Pelly Crossing; Dawson City to Old Crow). Local Area Foresters are responsible for a number of aspects of forest management for the region to which they are assigned. They are the primary contact for forest planning for assigned regions and also play advisory and supervisory roles in forestry operations.

L

Log fill
A structure in which logs are piled to form the foundation of a temporary stream crossing.

Machine Free Zone
A harvestable zone in which motorized equipment cannot be used.

Management Zones
Areas adjacent to reserve zones where forest management activities occur that are directed at maintaining land user interests

Microsite
A small area in which the local topography and climate is different to that of the surrounding environment such that it influences growing conditions for biota dependent on it. For example, a shaded and cooled area below the base of a tree or an unsheltered area at the height of a mound offer different growing conditions for seedlings.

Monitoring (forest)
The process of collecting data at specific locations and times related to particular forest management activities. Monitoring supports determining the status in activities or forest systems at various points in time to provide information on trends that may detect changes.

N

Natural Regeneration
The renewal of a forest stand by natural seeding, sprouting, suckering or layering seeds that may be deposited by wind, birds or mammals.

Natural Resource Officers
NROs are based in local Compliance Monitoring and Inspection district offices. They play a key role in monitoring and inspections and perform many duties including the issuance of some permits. Under the Forest Resource Act, NROs are also designated as Forest Officers.

Non fish-bearing water bodies
Those water bodies which have been professionally assessed as being non-fish bearing.

Non-Timber Forest Products
A non-timber forest resource such as berries, mushrooms, oils, birch syrup and medicinal plants.

P

Planting
Methods of artificial regeneration usually through planting seedlings, cuttings or direct seeding.

R

Reforestation
The re-establishment of trees on denuded forest land by natural or artificial means, such as planting and seeding.

Rehabilitation
The rehabilitation of forest resource roads refers to the process of restoring land areas used as roads back to forest area through activities such as revegetation and reforestation.

Reserve Zone (RZ)
A buffer area between a stream or lake and a Riparian Management Zone. No timber harvesting is permitted in an RZ. Zone widths vary depending on stream class.

Riparian
An area of land adjacent to a stream, lake or wetland, typically identified by vegetation that is very different from vegetation found in nearby upland areas.

Riparian Management Zone (RMZ)
The area between a Reserve Zone and a harvesting operation. Limited harvesting may be allowed in this zone.

Riparian Management Area (RMA)
The Reserve Zone and the Management Zone combined.

Rutting
Depressions in soil, soil erosion and ponding that result from operating heavy equipment on wet soils.

S

Seed provenance
Refers to the area in proximity to a given seed source. Planting seeds of a local provenance is important for preserving local genetic diversity, which can help in maintaining the health and resilience of a stand (or plant community).

Seed trees
Trees selected to be left standing to supply seed sources for natural regeneration. Selection is usually made on the basis of physical factors such as size and health as indicators of quality seed.

Shelterwood harvesting
A harvesting system (or silvicutulture system) in which trees are harvested in a sequence of cuts designed to create a new even-aged stand under the shelter of remaining trees.

S

Skid trail
A path used by ground skidding equipment when transporting trees or logs to a landing.

Silviculture
The art and science for establishing and maintaining communities of trees and other vegetation that have value to people.

Snag tree
A standing dead or partly dead tree that smaller branches have fallen off and that often has a missing top.

Snow fill
Snow is compacted in a stream bed to allow for transportation of vehicles and machinery between banks.

Soil compaction
Increased soil density as a result of compression, which often causes long lasting damage to soil structure.

Sorting
Refers to the sorting of logs, usually at a landing prior to hauling but also takes place at a mill. Sorting takes place based on criteria such as size and quality.

Stocking
Stocked or stocking means a measure of the density of living trees in an area

Stream
A watercourse with defined banks and a sediment bed. There are five classes of streams in Yukon.

Sustainable Forest Management (SFM)
The management of forests that maintains and can enhance the long-term health of a forest ecosystem that balances three core principles of environmental, social and economic objectives for the benefit of present and future generations.

T

Timber tenure system
Refers to the collection of legislation, regulations, contractual agreements, permits and government policies that define and constrain a person's right to harvest the territory's timber.

U

Uneven-aged harvesting
A harvesting method (or silviculture system) that aims to create or regenerate a stand structure with more than one age class. Single-tree and group selection are examples of uneven-aged harvesting methods

W

Water-bar
A shallow ditch dug diagonally across a road to prevent excess waterflow on the road surface.

Wetland
Land where the water table is at, near or above the surface or which is saturated for a long enough period to promote such features as wet-altered soils and water tolerant vegetation. Wetlands include organic wetlands or "peatlands", and mineral wetlands or mineral soil areas that are influenced by excess water but produce little or no peat (Canadian Wetland Classificiation System).

Wetland complex
An area greater than 5 hectares that contains 2 or more separate individual wetlands.

Wetland Management Area (WMA)
The area between a wetland and a harvesting operation. It consists of a Reserve Zone (with no harvesting) and a Riparian Management Area (may allow limited harvesting).

Wildlife features
Refers to natural features of particular importance to wildlife such as mineral licks, raptor nests, bear dens and game trails.

Wildlife tree
Dead or live (green) trees that are being used by wildlife for nesting, maintenance of stand-level biodiversity.

Winter/Frozen Ground
Refers to ground that is sufficiently frozen to support a vehicle without rutting, compacting or gouging of the surface for a period of the year.

CONTRIBUTORS

Finella Pescott

Jeannie Abbott, Bill Beard, Doug Bishop, Richard Cherepak, Cory Chouinard, Liz Clubine, Greg Cowman, Sue Deforest, Jesse Devost, Lyle Dinn, Gavin Dykshoorn, Max Fraser, Alex Goeppel, Ruth Gotthardt, Shirley Hill, Lyle Henderson, Nicole Hulstein, Chera Hunchuk, Carolyn Hutchison, Rod Jacob, Stacey Jones, Cassandra Kelly, Devin Kite, Rob Legare, Pat MacDonell, Donelle Mahan, Marc Meyer, Mark Pedersen, Julie Pepin, Jennifer Platz, Richard Potvin, Kirk Price, Diane Reed, Martin Samis, Eric Schroff, Colin Schut, Robin Sharples, David Swinson, Charlaine Thibault, Greg Thompson, Myles Thorp, Sherry Tyrner, Tamar Vandenberghe, Aldo Van Eyk, Lisa Walker, Lauren Waters, Catherine Welsh.

This Handbook was made possible with the assistance of many other individuals whose efforts are greatly appreciated.

Publisher
Queens Printer
Government of Yukon

Yukon
Energy, Mines and Resources
Forest Management

100%